Public Distribution System in Kerala: A Study in the Context of National Food Security Act 2013

Thesis submitted to University of Calicut
for the award of the degree of

DOCTOR OF PHILOSOPHY IN ECONOMICS

By

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This is to certify that this thesis titled '**Public Distribution System in Kerala: A Study in the Context of National Food Security Act 2013**' prepared by Mr. Pramod E K for the award of the Degree of Doctor of Philosophy in Economics of the University of Calicut, is a record of bonafide research work carried out by him under my guidance and supervision. I also certify that, this has not been previously submitted for the award of any degree, diploma, associateship or other similar titles of any other University or Institution. Both the adjudicators have not recommended any modifications or suggestions and therefore the original thesis is resubmitted as such. The soft copy is attached is the same as that of resubmitted copy.

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DECLARATION

I hereby affirm that the work for this thesis titled **'Public Distribution System in Kerala: A Study in the Context of National Food Security Act 2013'** submitted to the University of Calicut for the award of the Degree of Doctor of Philosophy in Economics is an original record of research work carried out by me under the guidance and supervision of Prof. (Dr.) Y C Ibrahim, Professor & Principal, Government College, Kodanchery.

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Kodanchery **Pramod E K**

ABSTRACT

The Public Distribution System (PDS) in India is an important social welfare program aimed at ensuring food security for the country's large population. The National Food Security Act (NFSA), 2013 represents a major shift in policy by legally recognizing the right to food and strengthening the PDS to address hunger and malnutrition. The study "Public Distribution System in Kerala: A Study in the Context of NFSA 2013" examines the role of the National Food Security Act 2013 and PDS in improving the food availability, affordability, and proper utilization among poor households. Although Kerala is often considered one of the better-performing states in the implementation of PDS, the state continues to face challenges related to food availability and access due to factors such as declining agricultural land, rising cost of living, and changing food consumption patterns. Despite these challenges, there is limited academic research examining the functioning and effectiveness of PDS in Kerala after the introduction of NFSA. Therefore, this study seeks to address this research gap by analysing the performance of PDS under NFSA in Kerala and assessing its effectiveness in reducing food insecurity and ensuring a sustainable food security system.

The study aims to examine the trends in food grain production in Kerala and assess the role of the Public Distribution System (PDS) in meeting the food requirements of households. It also analyses the various phases of PDS development and key policy reforms, with special emphasis on recent end-to-end computerisation and its impact on efficiency in the context of the National Food Security Act, 2013. Further, the study evaluates the availability, accessibility, and utilization of PDS among both priority and non-priority cardholders, while identifying major gaps in its functioning, particularly errors of exclusion that result in vulnerable households being left out or inadequately served. Additionally, it explores the effectiveness of PDS, gaps in its usage, and factors influencing utilization among priority and non-priority households**,** providing insights for improving food security policies in Kerala.

The study finds that Kerala faces a continuous decline in domestic food grain production, especially rice, due to land use changes, high labour costs, and a shift to commercial crops, making the state highly dependent on inter-state procurement and the Public Distribution System (PDS) for food security. After the implementation of the National Food Security Act (NFSA), 2013**,** the PDS in Kerala transformed from a rationing mechanism into a rights-based entitlement system, supported by digital reforms such as end-to-end computerization, biometric authentication, and the One Nation One Ration Card (ONORC) system. While these reforms improved transparency and reduced leakages, they also created new challenges for vulnerable groups like the elderly, migrants, and digitally illiterate households. The study shows that priority households, particularly AAY and PHH cardholders, utilize PDS more effectively, though issues such as irregular supply, technical problems, and limited use of portability persist. Significant inclusion and exclusion errors in beneficiary identification remain a major concern, affecting the equity and efficiency of the system. Overall, higher PDS utilization improves household food availability and food security, but it has limited impact on food quality and dietary diversity, indicating the need for complementary nutrition policies. The findings also support theoretical perspectives from welfare economics, public goods theory, and social justice approaches, highlighting the essential role of state intervention in ensuring equitable and sustainable food security in Kerala

Key words: Public Distribution System**,** Food Security, NFSA 2013, Hunger and End to end Computerisation

സംഗ്രഹം

ദേശീയ ഭക്ഷ്യസുരക്ഷാ നിയമം (2013), 'ഭക്ഷ്യാവകാശത്തെ' നിയമപരമായി അംഗീകരിക്കുകയും, പൊതുവിതരണ സംവിധാനത്തെ ശക്തിപ്പെടുത്തുകയും ചെയ്യുന്നതിലൂടെ, 'വിശപ്പും പോഷകാഹാരക്കുറവും' പരിഹരിക്കുന്നതിനുള്ള ഇന്ത്യയുടെ ഭക്ഷ്യ നയത്തിലെ ഒരു നിർണായക വഴിത്തിരിവായി മാറുന്നു. "കേരളത്തിലെ പൊതുവിതരണ സംവിധാനം: ദേശീയ ഭക്ഷ്യസുരക്ഷാ നിയമം (2013) പശ്ചാത്തലത്തിലുള്ള പഠനം" എന്ന ഈ പ്രബന്ധം, ഭക്ഷ്യസുരക്ഷാനിയമം നിലവിൽ വന്നതിനുശേഷം കേരളത്തിലെ പൊതുവിതരണ സംവിധാനത്തിന്റെ പ്രവർത്തനം, ഫലപ്രാപ്തി, സ്വാധീനം എന്നിവ വിശദമായി വിലയിരുത്തുന്നു. ഭക്ഷ്യധാന്യങ്ങളുടെ ലഭ്യത, പ്രാപ്യത, വിനിയോഗം, സ്ഥിരത എന്നീ പ്രധാന ഘടകങ്ങളെ ആസ്പദമാക്കി, കേരളത്തിൽ ഭക്ഷ്യസുരക്ഷ ഉറപ്പാക്കുന്നതിൽ പൊതുവിതരണ സംവിധാനം വഹിക്കുന്ന പങ്ക് ഈ പഠനം പരിശോധിക്കുന്നു. കൂടാതെ, ഭക്ഷ്യകമ്മി കുറയ്ക്കുന്നതിൽ പൊതുവിതരണ സംവിധാനത്തിന്റെ സംഭാവനയും ആധാർ സീഡിംഗ്, എൻഡ്-ടു-എൻഡ് കമ്പ്യൂട്ടറൈസേഷൻ എന്നിവയുൾപ്പെടെയുള്ള നയപരിഷ്കാരങ്ങളുടെ സ്വാധീനവും പഠനം വിശകലനം ചെയ്യുന്നു. അതോടൊപ്പം, പൊതുവിതരണ സംവിധാനത്തിന്റെ ഫലപ്രാപ്തി, ഉപയോഗത്തിലെ വിടവുകൾ, മുൻഗണനാ-മുൻഗണനേതര കുടുംബങ്ങളിലെ ഉപയോഗ വ്യത്യാസങ്ങൾ എന്നിവയും ഈ പഠനം പരിശോധിക്കുന്നു.

ദേശീയ ഭക്ഷ്യസുരക്ഷാ നിയമം നിലവിൽ വന്നതിന് ശേഷമുള്ള കേരളത്തിലെ പൊതുവിതരണ സംവിധാനത്തിന്റെ പ്രവർത്തനത്തെക്കുറിച്ചുള്ള അക്കാദമിക് പഠനങ്ങൾ പരിമിതമായ സാഹചര്യത്തിൽ, ഈ ഗവേഷണം അതിന്റെ പ്രകടനം വിലയിരുത്തി ഭക്ഷ്യസുരക്ഷാ സംവിധാനത്തെക്കുറിച്ചുള്ള പ്രധാന അറിവുകൾ നൽകുന്നു.

പഠനഫലങ്ങൾ പ്രകാരം, ഭൂവിനിയോഗത്തിലെ മാറ്റങ്ങൾ, ഉയർന്ന ഉൽപാദനച്ചെലവ്, വാണിജ്യവിളകളിലേക്കുള്ള മാറ്റം എന്നിവ കാരണം കേരളത്തിൽ ആഭ്യന്തര ഭക്ഷ്യധാന്യ ഉൽപാദനത്തിൽ, പ്രത്യേകിച്ച് അരിയുടെ ഉൽപാദനത്തിൽ, തുടർച്ചയായ ഇടിവ് സംഭവിച്ചതായി കാണുന്നു. 2013-ന് ശേഷമുള്ള കാലഘട്ടത്തിൽ, എൻഡ്-ടു-എൻഡ് കമ്പ്യൂട്ടറൈസേഷൻ, ബയോമെട്രിക് പ്രമാണീകരണം, "വൺ നേഷൻ വൺ റേഷൻ കാർഡ്" സംവിധാനം തുടങ്ങിയ ഡിജിറ്റൽ പരിഷ്കാരങ്ങളുടെ പിന്തുണയോടെ, പൊതുവിതരണ സംവിധാനം അവകാശങ്ങളെ അടിസ്ഥാനമാക്കിയുള്ള വിതരണ സംവിധാനമായി രൂപാന്തരപ്പെട്ടു. ഈ പരിഷ്കാരങ്ങൾ സുതാര്യത വർധിപ്പിക്കുകയും ലീക്കേജ് കുറയ്ക്കുകയും ചെയ്തിട്ടുണ്ടെങ്കിലും, പ്രായമായവർ, കുടിയേറ്റ തൊഴിലാളികൾ, ഡിജിറ്റൽ പരിജ്ഞാനമില്ലാത്തവർ തുടങ്ങിയ വിഭാഗങ്ങൾക്ക് പുതിയ വെല്ലുവിളികളും സൃഷ്ടിച്ചിട്ടുണ്ട്.

വിതരണത്തിലെ ക്രമരഹിതത്വം, സാങ്കേതിക തടസ്സങ്ങൾ, പോർട്ടബിലിറ്റിയുടെ പരിമിതമായ ഉപയോഗം തുടങ്ങിയ പ്രശ്നങ്ങൾ തുടരുന്നുണ്ടെങ്കിലും, മുൻഗണനാ കുടുംബങ്ങൾ പൊതുവിതരണ സംവിധാനം കൂടുതൽ ഫലപ്രദമായി ഉപയോഗിക്കുന്നതായി കണ്ടെത്തുന്നു. അതേസമയം, ഗുണഭോക്തൃതിരിച്ചറിയലിൽ ഉൾപ്പെടുത്തൽ-ഒഴിവാക്കൽ പിഴവുകൾ ഒരു പ്രധാന ആശങ്കയായി തുടരുന്നു, ഇത് സംവിധാനത്തിന്റെ തുല്യതയെയും കാര്യക്ഷമതയെയും ബാധിക്കുന്നു. ചുരുക്കത്തിൽ കേരളത്തിൽ തുല്യവും സുസ്ഥിരവുമായ ഭക്ഷ്യസുരക്ഷ ഉറപ്പാക്കുന്നതിൽ സ്റ്റേറ്റിന്റെ സജീവ ഇടപെടലിന്റെ അനിവാര്യതയെ ഈ പഠനം ശക്തമായി അടയാളപ്പെടുത്തുന്നു.

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ABBREVIATIONS

AAY	:	Antyodaya Anna Yojana
APL	:	Above Poverty Line
ARD	:	Authorized Ration Dealer
BPL	:	Below Poverty Line
CAG	:	Comptroller and Auditor General of India
DBT	:	Direct Benefit Transfer
DPSP	:	Directive Principle of State Policy
ePoS	:	Electronic Point of Sale
EWS	:	Economically Weaker Sections
FAD	:	Food Availability Decline
FCI	:	Food Corporation of India
FED	:	Food Entitlement Decline
FPS	:	Fair Price Shop
GHI	:	Global Hunger Index
GHR	:	Global Hunger Report
GRF	:	Global Report of Food Crises
GOI	:	Government of India
GOK	:	Government of Kerala
ICDS	:	Integrated Child Development Scheme
HDI	:	Human Development Index Households
HOF	:	Female Heads of Household
ICRIER	:	Indian Council for Research on International Economic Relations
ILO	:	International Labour Organisation
IT	:	Income Transfer
KSITM	:	Kerala State IT Mission
LSD	:	Local Self-Government Departments
MGNREGS	:	Mahatma Gandhi National Rural Employment

		Government Scheme
MIS	:	Management Information System
MPI	:	Multidimensional Poverty Index
NCAER	:	National Council of Applied Economic Research
NEF	:	Non- Electrified Family
NGO	:	Non-Governmental Organisation
NIC	:	National Informatics Centre
NPS	:	Non- Priority Subsidy
NPNS	:	Non-Priority Non-Subsidy,
NPSS	:	Non-Priority State Subsidy
NSSO	:	National Sample Survey Organisation
OBC	:	Other Backward Classes
OMP	:	Open Market Price
ONORC	:	One Nation One Ration Card
PDS	:	Public Distribution System
PHH	:	Priority Households
PMGKAY	:	Pradhan Mantri Garib Kalyan Anna Yojana
PP	:	Price charged under the PDS
PPP	:	Private Public Partnership
RPDS	:	Revamped Public Distribution System
SC	:	Scheduled Caste
SDG	:	Sustainable Development Goal
SFSS	:	State Food Security Scheme
ST	:	Scheduled Tribe
SUPPLYCO	:	The Kerala State Civil Supplies Corporation Ltd.
TPDS	:	Targeted Public Distribution System
UPDS	:	Universal Public Distribution System
USDA	:	United States Department of Agriculture
WFP	:	World Food Programme
WHO	:	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Background of the Study

The Public Distribution System (PDS) in India has been an integral part of the social welfare programs, which have been designed to ensure food security for the large and varied population of the country (Singh, 2006). The "National Food Security Act (NFSA), 2013" marks a radical shift in the approach to ensure food security for all persons (Bhadra, 2021). To counter the challenges of hunger and malnutrition, which have been a long reality in India, the PDS was introduced. The NFSA, which is a landmark legislation, seeks to consolidate and strengthen the PDS, thereby reiterating the right to food as a fundamental human right. The current study investigates the functioning of the PDS and its impact in the Post-NFSA regime in Kerala, which is characterized by its unique socio-economic parameters and political setting. It is due to the fact that the state has always shown its commitment to social welfare and development that it becomes a relevant context for assessing the effectiveness of the PDS in achieving the objectives that are specified in the NFSA2013. The "NFSA of 2013" is a turning point that emerges in the light of India's never-ending struggle against poverty and malnutrition. This legislation brings the PDS into new focus as a critical tool for ensuring that every citizen has the right to food. The aim of this research is to explore the intricate relationship that exists between the PDS and the socio-economic aspect of Kerala, a state that is known for its one-of-a-kind political scenario and its commitment to social welfare. Moreover, the research aims to identify the effects that the PDS has caused in the area of food security in the post-NFSA era. In general, the research analyzes the Public Distribution System in the state of Kerala exploring its dynamics, challenges, and successes in the process of its implementation.

1.1.1 The Concept of Food Security

The concept of food security has undergone significant changes in the past decades, beginning with the World Food Conference in 1974. The concept of food security was

born in the mid-1970s, when the World Food Conference defined food security as "*having a reliable, sufficient supply of basic foods to meet growing demands and to stabilize against fluctuations in production and prices*." By 1983, the FAO changed focus, defining the food security equation as "*ensuring that people have physical and economic access at all times to basic foods needed to meet growing demands and to stabilize against fluctuations in production and prices*." Then, in 1986, World Bank report on poverty and hunger highlighted the importance of the timing of food insecurity, distinguishing between chronic food insecurity, which is associated with chronic poverty and low incomes, and transitory food insecurity, which occurs during times of shock, such as natural disasters, economic downturns, or conflicts. Amartya Sen's famine theory in 1981 complemented this work, underlining that people's access to food is determined by their entitlements, what they can gain from production, work, trade, and transfers.

Today, the FAO's widely accepted definition provides the foundation for the concept: *"Food security exists when all people, at all times, have physical, social, and economic access to enough, safe, and nutritious food that meets their dietary needs and preferences for an active, healthy life*." This definition highlights four components: availability, accessibility, utilization, and stability.

1.1.2 Dimensions of Food Security

In accordance with FAO, 2008, there are four different dimensions of food security:

1. The availability of food, that is both locally produced and imported from other countries.

2. Accessibility occurs when the food is able to reach the customer (via the infrastructure of transportation) and the consumer has the funds to make a purchase. In addition to the physical and economic accessibility, there is also the socio-cultural accessibility, which ensures that the cuisine is suitable for the culture and that there are social protection nets in place to assist those who are less fortunate.

3. The third dimension is with respect to its utilization. In order to live a life that is both healthy and full, the individual must be able to consume sufficient quantities of food that are of high quality. This is necessary in order for the individual to reach his or her potential. At this level, it is necessary to ensure that both the food and the water are safe and clean; hence, proper water and sanitation are also involved.

4. The fourth domain, stability, is concerned with the capacity of a nation, community, or individual to endure shocks to the food chain system. These shocks can be generated by natural disasters or by man-made disasters.

The four pillars of food security are: availability, which is about what can be produced or brought into the country; accessibility, which is about whether or not people have access to enough food; utilization, which is about people's ability to use the nutrients; and stability, which is about all of these factors being stable. In order to have food security, all four of these must be in balance. Recently, sustainability has been added as another factor, which is about resilience. Berry et al. (2015) define sustainability as: "*ecological balance, biodiversity, and climate change at the regional and global levels, as well as social, cultural, and economic considerations that influence food systems*."

Instead of looking at food security as four pillars, it is more useful to think of it as a process from farm to table, through processing and distribution. The FAO's 2009 model of food security as four pillars availability, accessibility, utilization, and stability has been very popular, but it is a process that is not four equal pillars, but rather four factors that are interrelated and affect each other, and whose importance changes depending on the country's situation, level of development, and needs, as Berry et al. (2015) explain.

A more useful conceptualization is a "*pathway" rather than "pillars*." The State of Food Insecurity in the World (2013) pointed out the interrelationship between national production (availability), individual nutrition (utilization), with accessibility by households including physical access by infrastructure and transportation, economic access by purchasing power, cultural food preferences, nutritional knowledge, and the

role of social protection programs (HLPE, 2012).Hence food security may be conceptualized as cyclical and continues process rather than a linear progression.

1.1.3 The Global Food Security

The goal of ensuring food security is not limited to any particular region of the world. It is a complex global issue that interconnect the quantity of food availability, the capacity to access it, the way in which the people utilize it, and how well these conditions remain stable over time**.** In the same way, the FAO in its classic definition describes food security as a situation in which: "*Everyone, everywhere, at all times should have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences for a healthy and active life*." The present state of World is characterized by large, overlapping trends of increased population growth, climate change, economic inequality, and conflicts that further compress our food security systems. With a global population of 7.9 billion in 2021, the demand for food increases, making sustainable and inclusive food systems more important than ever (World Bank, 2021). Even with the advancement made in agriculture production, nearly 768 million people, or one in nine, remain persistently hungry (FAO, 2021). This discrepancy is a harsh reminder of the issue of access, particularly in low- and middle-income countries. The need to ensure that everyone has access to enough nutritious food is one of the most pressing human rights issues of our time.

However, the change in climate is an additional issue that poses a threat to food security. According to the IPCC (2019), the nations that are agriculturally dependent are vulnerable to climate change-related disruptions, such as droughts, floods, and erratic weather patterns, which can impact the production of food and livelihoods. Hence, climate change resilience in agriculture, achieved by adopting sustainable practices in agriculture, efficient water management, and climate-resilient technology, is essential for ensuring food security in future. To address this challenge, the international institutions has initiated various efforts to address hunger and promote sustainable food systems. One of the key initiatives is Sustainable Development Goal 2 (SDG 2) launched by the United Nations, which has set a target to end all forms of hunger, achieve food security, improve nutrition, and promote sustainable agriculture

by 2030. Other key players in addressing hunger include the World Food Programme (WFP), which is critical in providing emergency food assistance in conflict-affected areas, disaster-stricken areas, and among the vulnerable.

At the International level, there have been efforts by many nations to implement tools of policy that can help to ensure wider access to food for people with lower incomes. In India, the Public Distribution System (PDS) is a crucial safety net that provides subsidized food grains to the weaker sections of society. However, the PDS does not function effectively and efficiently in all states; its success depends on how effectively it is managed, the governance structure, and the social and economic setting of the region. Kerala is one such state that has been a crucial part of this conversation. Kerala has been able to implement the National Food Security Act (NFSA) 2013 through its improved Public Distribution System, which is in complete sync with international best practices for the distribution of food.

1.1.4 Food Security in India

Over the last few decades, the food production in India has expanded at a faster rate than the growth of population. The Green Revolution, which began in the latter half of 1967 and continued until 1968, was a significant turning point that led to a tremendous increase in the production of agricultural crops, particularly food grains, which in turn altered the situation regarding food security in India (Conway, 2019). It increased wheat output by a factor of three during the subsequent three or four decades, while at the same time, cereal production increased by a factor of two during this time period (Grigg, 2019). As a result, both food insecurity and poverty in the country decreased by more than fifty percent.

The "Directive Principle of State Policy (DPSP)" is the guiding philosophy for food security in India. This principle is reflected in the Constitution of India, which was ratified in 1950 (Abeyratne, 2020). According to Article 47, "The state shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties." Some studies indicate that the per capita energy supply has greatly increased, "with norms of 2400 kilo calories for rural areas and 2100 kilocalories for urban areas." There have been around 58

million people who have emerged from the vicious circle of poverty as a result of this growth. In spite of the progress that India has made to secure food security, the country is still in a pitiful position. The food security status issue in India continues to score as "alarming" according to the Global Hunger Index, which was published in 2014 by the International Food Policy Research Institute" (Von Grebmer et al., 2014*)*. Out of the 120 countries in the globe, it is ranked sixty-fifth. As a result of inflation, the prices of food items are rising on a daily basis, which is causing misery for individuals in India who are already struggling with poverty because they are no longer able to afford them.

In India, the issue of food insecurity is addressing with a broad set of policy rather than just a policy to control price fluctuations. In spite of remarkable achievements in the production of rice and wheat, it is still very dependent on imports for staple products such as edible oils and pulses. Besides the agricultural sector faces very fundamental, structural and environmental challenges, such as fragmented land, unstable climate, inadequate irrigation, and pressures to diversify the crops, which cumulatively hamper agricultural productivity and food security. Food availability is at the core of security, and therefore it is very important to comprehend how agricultural growth evolves. The Public Distribution System is a very important component that distributes subsidized food to economically weaker sections of society. The policies and interventions of government's influences food security very significantly. In addition to the National Food Security Act 2013, employment programs, social protection and safety nets, vocational training, and education all contribute in improving household access to food and refining economic resilience.

1.1.5 Food Security in Kerala

The state of Kerala is well-known for its unique development experience, particularly in the field of health, education, and as a result the level of human development. However, even with these unique achievements, ensuring the availability and accessibility of sufficient food is an area of concern of the policy makers associated with the development process in Kerala. For several decades, Kerala has been giving importance to social welfare, including the Public Distribution System (PDS) which

is the backbone of the state's food security system, and ensures necessary food grains to the economically backward sections. This welfare policy approach is augmented with the National Food Security Act (NFSA), 2013, which declares the right to food as a basic right for all citizens. One of the greatest strengths of the PDS in Kerala is its decentralized structure and presence of Fair Price Shops in all parts of the state, even in the hilly areas, providing necessary food items to the poor at subsidized rates. This is considered as more efficient and transparent compared to many other states in India. However, the state of Kerala has not only focused on ensuring sufficient quantity of food but also emphasized nutritional security aspects rather than mere calorie intake. The project like *Milma* Diary development and the *Kudumbashree* are the examples that helped in improving dietary diversity, women empowerment and stable income. (chadha,2016).

However, the increasing rate of urbanization, the reduction of agricultural land in general, the shifting cropping pattern in particular and the emerging dietary changes all are putting heavy pressure on the state's food grain production. As a result, Kerala is facing severe challenges in ensuring food security. Kerala has become a net importer of food from other states, making it vulnerable to price fluctuations. Other problems like food wastage, storage, and distribution also require serious attention and policy intervention. In addition to above factors, the climate change and its consequence like unpredictable rainfall, frequent floods, change in temperature etc. is also adversely affecting the agriculture performance and food security situation in Kerala.

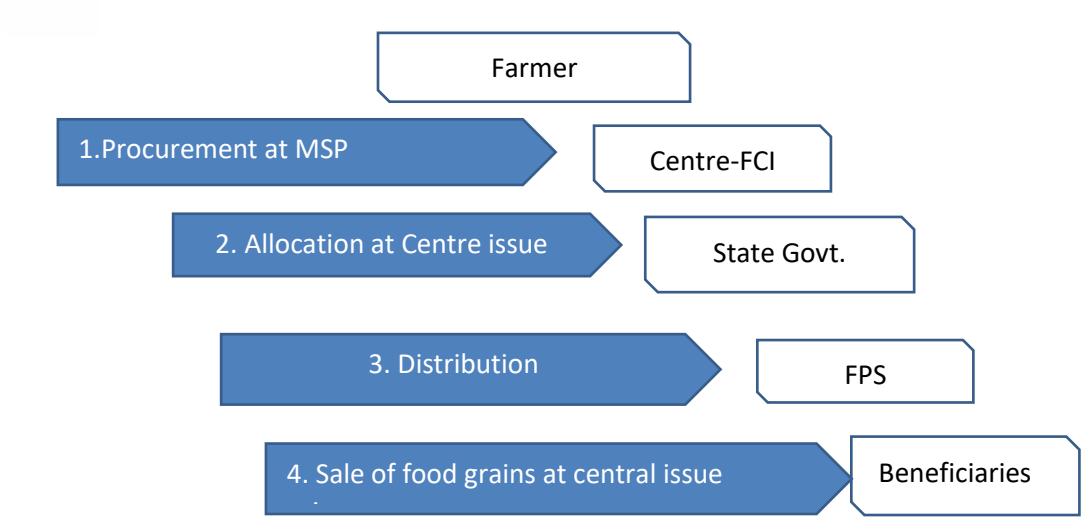
1.1.6 Public Distribution System and Food Security in India

The Public Distribution System acts as a vital agency of safety net in reducing food insecurity in India where millions of people suffer from chronic hunger, mass poverty and large-scale malnutrition. (George & McKay, 2019**).** The evolution of public distribution of grains in India had its origin in the 'rationing' system introduced by the British during World War II. When the war ended, it was decided to abolish the rationing system. However, on attaining independence, India reintroduced it in 1950 (FAO, 2015)**.** With a network of more than 4.62 lakh FPS, distributing commodities

worth more than 300 billion rupees annually to about 160 million families, the PDS in India is perhaps the largest distribution network of its kind in the world. (Dev and Sharma, 2010). Ensuring safety net, maintaining a stabilized price structure for food and the regular availability of essential commodities across the country for the vulnerable sections of society are the major objectives which shaped the present Public Distribution System. Thus, the PDS stands as not only a welfare programme but also an essential tool for reducing poverty and ensuring nutritional security.

The administrative structure of PDS presented in fig 1.1 shows that the scheme is implemented by the central and state government through a network starting from farmer to consumer through FCI and FPS.

Fig. 1.1 The Public Distribution System: Operational Layout



The eligibility criteria for fixing the beneficiaries are determined on the basis of socio-economic parameters and poverty estimates (Devi, 2018). Over the years, it has become an indispensable component of India's food security system, particularly for the marginalized sections of society. In addition, there is enough empirical evidence viewing that in states where the PDS has operated efficiently, it has resulted to a reduction in poverty, an improvement in calorie intake and nutritional status (Khera, 2011; Arora et al., 2021).

In spite of its relevance, the PDS faces persistent operational and managerial challenges such as the problem of leakages, the error of targeting, inefficiencies in last-mile deliveries etc. has raised concerns about its overall effectiveness (Tanksale & Jha, 2015). Diagnosing these limitations, the Government of India introduced significant reforms, like digitalization in association with the enactment of the National Food Security Act (NFSA), 2013.The land mark legislation, The National Food Security Act 2013, promulgated on 5th July 2013, marks a shift in policy that the accessibility of food as a legal entitlement rather than a welfare provision. The Act legally entitles up to 75 per cent of the rural population and 50 per cent of the urban population to receive subsidized food grains through Public Distribution System. At present, there are about 80 crore people have been covered under this scheme, and it remains as a cornerstone of India's food security strategy. Importantly, the system is not static; it is continuously evolving through digitization, Aadhaar-based authentication, improved targeting, and supply chain reforms.

1.1.7 National Food Security Act 2013

The enactment of National Food Security Act (NFSA) of 2013 is a remarkable achievement in the treatment of food (in)security in India, as it categorizes access to food as a legal right, rather than a welfare policy option. The prime aim of NFSA was to address the issue of hunger, malnutrition, and inequity in distribution of food grains, and it seeks to ensure a more systematic and inclusive mechanism for food distribution in the country. The NFSA has significantly changed the social, economic, and political setting of India by providing a legal guarantee for food rights. The NFSA is essentially a rights-based approach to ensuring food and nutrition security for a substantial portion of the population. The most notable aspect of the NFSA is its focus on the identification of beneficiaries in such a manner that the neediest are given priority. The NFSA also provides a clear entitlement of subsidized food grains, which makes access to basic food items possible for the poor. This aspect of the NFSA addresses not only the problem of hunger but also the problem of health, nutrition, and well-being.

The key mechanism for the implementation of the NFSA is the strengthening of the Public Distribution System (PDS). The NFSA seeks to extend the coverage of the PDS to ensure that the subsidized food grains reach the most marginalized and inaccessible areas of the country. The NFSA seeks to ensure that the distribution of subsidized food grains through the Fair Price Shops is more transparent and efficient, thus ensuring that a more reliable food distribution system is developed. The NFSA also gives considerable importance to nutritional support services to the most vulnerable sections of society, such as pregnant women, lactating mothers, and children under 14 years of age. This is achieved by integrating various programs such as the Integrated Child Development Services (ICDS) and the Mid-Day Meal Scheme. The NFSA seeks to address malnutrition and improve the nutrition status of mothers and children by incorporating these programs into its framework (NFSA, 2013).

One of the most important aspects of the Act is the manner in which it divides households into two categories: Priority Households and Non-Priority Households. Priority households are identified on the basis of socio-economic parameters, which make them more vulnerable, and as such, they are allocated greater entitlements. The process of identification of beneficiaries is based on variables like, income of household, nature of employment, housing conditions, and other social conditions. As per the NFSA entitlement schedule, priority categories of households are allotted 5 kilograms of subsidized food grains per person per month, while other households are allocated 3 kilograms of subsidized food grains per person per month.

The NFSA execution has succeeded in enlarging the number of beneficiaries and able to ensures that millions of poor in India have access to subsidized food grains. The act has also assisted to reduce the extreme hunger, instability in food consumption, and succeeded to provide a safety net for those who are economically disadvantaged. However, Issues like improper identification of beneficiaries, corruption, pilferage of grains, and lack of proper implementation, to name a few, continue to hamper its effectiveness in some regions (Khera,2011). Despite these challenges, the NFSA is one of the revolutionary legal initiative against hunger and malnutrition in India.

1.3 Statement of the Problem

Kerala, which has a significant food shortfall, has been a primary attraction of economists from all over the world due to the distinctive development experience. However, because the state that suffers from a persistent food shortage, the issue of food security has always been and will continue to be a significant socio-economic concern in the state. As a result, several earlier studies have investigated the many facets of the food security problem in Kerala. Looking at the supply side, food security is dependent on three major considerations: the domestic production of food within the state, the flow of food from other states, and an effective Public Distribution System. For any economy to be food secure, it has to maintain agricultural production to keep pace with the growing demand for food. A region can be termed self-sufficient if its domestic production is sufficient to meet the entire demand within the region. However, even in regions that are self-sufficient in food production, there may be pockets of deficiency due to imbalances in distribution, geographical, or market-related reasons. In such regions, the need for a distribution system like PDS arises to bridge the gap between what is produced and what is required.

Kerala is a case study in itself, as it is a state that is structurally dependent on the importation of food from other parts of the country. There is a large gap between the amount of food grain that people eat and the amount that the state can produce on its own, particularly with regard to rice, which is the staple food of most people. As Kannan (2000) says, "*The rice requirement of Kerala has been increasing over the years, and by 2010, the state was producing only 14 percent of its total rice requirement*." This is important because cereals account for 64 percent of the calorie intake in rural areas and 57 percent in urban areas, and they also contribute to almost half of the protein intake of the state. The reduction in the agricultural land used for growing staple foods such as rice and tapioca since independence has resulted in a drastic reduction in the production of food in the state, making Kerala even more dependent on other sources.

While Kerala may be a beacon of human development indicators, its food security situation remains quite precarious. Now, with declining land for agriculture, a rising

cost of living, and changing food preferences, the ability to access sufficient food is only going to get harder for those at the margin of the economy. It is in this context that the Public Distribution System has remained Kerala's strongest defense mechanism delivering necessary commodities to poor families at subsidized rates. The NFSA of 2013 further strengthened this strategy by providing a legal guarantee of food security entitlements to eligible families. However, doubts persist regarding the efficiency, equity, and sustainability of the PDS system, particularly in relation to addressing hidden hunger, nutritional deficiencies, and disparities in the state. Therefore, the primary research question is: how effectively has the PDS system in Kerala and the NFSA framework worked to alleviate food insecurity, and is this strategy sufficient to construct a strong and sustainable food security system in the long term?

1.3 Research Gap

Despite the existence of a large body of research work on the Public Distribution System (PDS) and its implementation in various states of India, there still exist a number of significant gaps that need to be addressed. The state of Kerala is known to be one of the better-implemented states regarding the implementation of the PDS. However, there still exists a lack of academic work on the evolution of the system after the implementation of the National Food Security Act (NFSA), 2013. While the NFSA aimed at the conversion of food security into a legal right and aimed at increasing coverage and nutritional support, there still exists a lack of critical study on its effectiveness in the state of Kerala. Moreover, there is a lack of sufficient research that evaluates the impact of the PDS under the NFSA on food security. While some research indicates improvement, others indicate that there are still issues with last-mile delivery, accuracy, and nutritional content. The mixed results indicate that there is a need for a comprehensive evaluation of Kerala's performance in the PDS under the NFSA framework. It is important to address these research gaps to determine whether the objectives of the NFSA are being met in Kerala. It is also important to evaluate the impact of the NFSA and related policy reforms on food

security in Kerala. In this background, the study aims to investigate the performance of Kerala's PDS under the NFSA and to answer the following research questions.

1.4 Research Questions

The following are the research questions arising out of the problem of Public Distribution System

1. What are the trends in the production of food grains in Kerala and what is the role of PDS in meeting the total food requirement of households in Kerala?
2. What are the phases of development of PDS and major policy changes especially the recent end-to-end computerization and what is its impact on the efficiency of PDS in the context of the "National Food Security Act, 2013?"
3. What is the availability, accessibility and utilization of PDS by the priority and non-priority card holders in Kerala during the period of the NFS Act?
4. Which are the factors determining the utilization of PDS among the priority and non-priority groups identified?

1.5 Objectives of the Study

The broad objective of the current study is to analyse the developing situation of food security within the framework of food policy reform, specifically focusing on the significance of the "National Food Security Act, 2013 in the state of Kerala." In alignment with this aim, the following objectives are addressed:

1. To study the trends in the production of food grains in Kerala and estimate the role of PDS in meeting the total food requirement of households in Kerala.
2. To analyse the phases of development of PDS and major policy changes especially the recent end-to-end computerisation and its impacts on the efficiency of PDS in the context of the National Food Security Act, 2013.
3. To examine the availability, accessibility and utilization of PDS by the priority and non-priority card holders in Kerala during the period of the NFS Act.

4. To study the major gaps in PDS use particularly the errors of exclusion where the intended beneficiary households belonging to weaker sections are excluded from the system or are inadequately served.

5. To identify the factors determining the utilization of PDS among the priority and non-priority groups

1.6 Hypotheses of the Study

1.Null Hypothesis (H_0): There is no significant effect of geographic location, socio-economic status, and infrastructure development on the availability, accessibility, and utilization of the PDS among priority and non-priority cardholders in Kerala during the implementation of the National Food Security Act (NFSA).

2.Null Hypothesis (H_0): The level of PDS utilization among both priority and non-priority households is not significantly affected by exclusion errors or by the type of ration card they possess.

1.7 Methodology

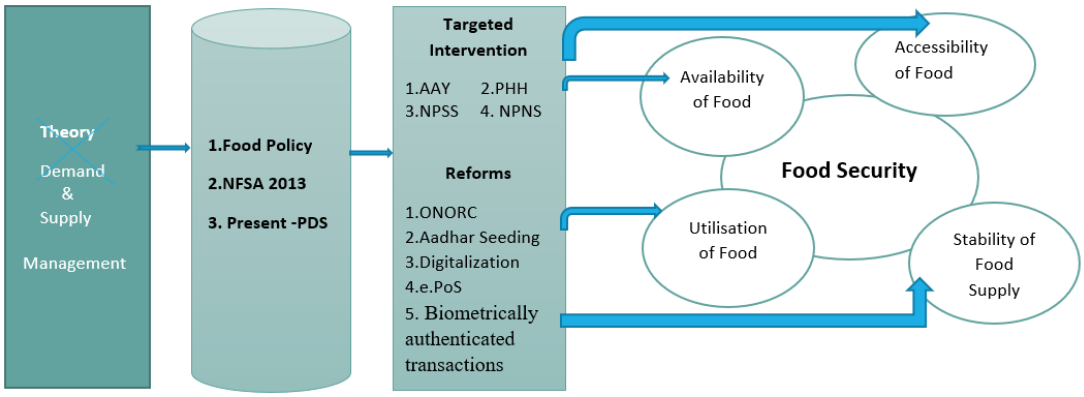
The methodology of the research was planned in such a way as to examine the dynamics of food security and the working of PDS in the state of Kerala. A mixed methodology was used in the research to have a clear understanding of the topic. This section gives a short introduction to the conceptual framework, research design, data collection, analysis, and ethics.

1.7.1 Conceptual Framework

The conceptual framework of the study describes the theoretical and conceptual underpinnings for analyzing the Public Distribution System (PDS) in Kerala in the context of the National Food Security Act (NFSA), 2013. The present section ensures a conceptual clarity for realizing the interlinkages between food security, nutrition, public policy, and the performance of the PDS. The conceptual framework relies broadly on well accepted definitions of food security from FAO, WHO, and USDA and the key concepts of food security -availability, accessibility, utilization, and stability of food. These concepts are used to prepare the connected indices like

availability score, accessibility score and utilization score to examine the performance of the PDS in Kerala, especially in the context of the NFSA2013. The present framework also addresses how demographic and socio-economic variables such as income, household size, gender, and geographical location affect the utilization of the PDS.

Figure 1.2 Conceptual Framework



The NFSA2013, is conceptualized as a fundamental policy shift that has ensured more food entitlements, introduced digital governance, and improved transparency and accountability in the distribution system. The present analysis is also taking in to consider the important theoretical arguments from welfare economics, public good theory and social justice theory. The theoretical groundworks of the framework provide support for the hypothesis put forwarded for the study that the performance of the PDS has improved after the NFSA reforms, especially for priority households Finally, the theoretical framework conceptualizes that the PDS not only act as an agency of food distribution but also as a instrument of poverty reduction, nutritional, and social equity in Kerala

1.7.2 Key Concepts and Variables

Food Security: It is a state in which *"all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preference for an active and healthy life"* (FAO,2006, p.1).

Food Insecurity: Food insecurity refers to the lack of consistent access to the food necessary for an active and healthy life. It is usually measured in terms of the availability, accessibility and utilization of food. According to the United States Department of Agriculture (USDA), food insecurity occurs when *"access to adequate food is limited by a lack of money or other resources*" (USDA, 2021). Food insecurity can be temporary or chronic, and can occur as a result of socio-economic inequalities, climate change, or political instability (FAO, 2020).

Malnutrition: Malnutrition is a condition that results from an imbalance in nutrient intake, which can manifest as under nutrition (lack of essential nutrients) or over nutrition (excessive intake of certain nutrients). The World Health Organization (WHO) defines malnutrition as "*a deficiency, excess, or imbalance in a person's intake of energy and/or nutrients*" (WHO, 2020). In the context of food security, addressing malnutrition involves not only ensuring adequate food availability, but also ensuring the nutritional quality of the food consumed (FAO, 2013).

Vulnerability: In the context of food security, vulnerability refers to the vulnerability of households or individuals to food insecurity due to various external factors such as economic shocks, natural disasters or political conflict. According to Chambers (1989), "*vulnerability is not only exposure to risks but also the inability to cope with those risks*."

Public Distribution System: The Public Distribution System (PDS) is a food security initiative in India that provides essential food items at subsidized prices, especially to households below the poverty line. The PDS is designed to address food shortages, stabilize prices and ensure food access to vulnerable groups. Reforms in the PDS, including digitization of ration cards and direct cash transfers, have sought to reduce leakages and inefficiencies in the system (Khera, 2011).

Subsidized Food grains: Subsidized food grains are staple food items provided at reduced prices through government programs such as the PDS in India. The National Food Security Act (NFSA), 2013, ensures that up to 75% of the rural population and 50% of the urban population are eligible for subsidized food grains, ensuring food security for the low-income group (Government of India, 2013).

Targeted Public Distribution System (TPDS): The Targeted Public Distribution System (TPDS) is an evolution of the PDS, which aims to more precisely target food distribution to specific groups based on socio-economic status. Introduced in 1997, TPDS distinguishes between priority households (those below the poverty line) and non-priority households (those above the poverty line), ensuring that the neediest receive food subsidies at lower prices (Srinivasan, 2002).

Food Policy: Food policy refers to a set of laws, regulations, and measures adopted by governments to ensure food security, regulate food distribution, and improve nutritional status. Policies such as procurment price policy, agricultural subsidies, issue price and legal measures like NFSA are significant in improving the food security and addressing malnutrition (Maxwell & Slater, 2003).

Errors in exclusion and determinants of utilization: Errors in exclusion refer to the exclusion of eligible households from the public distribution system due to issues such as incorrect targeting mechanisms or lack of awareness. The study attempts to identify factors that influence PDS utilization such as demographic factors, socioeconomic status, and geographical location.

Efficiency and Availability of Public Distribution System: Efficiency in the public distribution system refers to the ability of the system to deliver food grains to beneficiaries in a timely, cost-effective and transparent manner, and to reduce leakage and wastage. On the other hand, accessibility depends on the extent of the public distribution system, which ensures that eligible households, especially those in rural and marginalized communities, have access to subsidized food grains with minimal disruption (Swaminathan, 2012). Efficiency is often measured in terms of targeting accuracy, reduced leakage and administrative transparency, which are key areas of focus after the introduction of policy reforms such as digitalization. Accessibility includes both physical extent (e.g. proximity to fair price shops) and financial extent (ensuring affordable prices to beneficiaries). Studies have shown that despite reforms, access to the public distribution system can be uneven, especially for disadvantaged households and those in remote areas (Khera, 2011).

1.7.3 Relationships between Key Variables

This section shows the hypothetical relationships between these key variables and how demographic factors influence PDS utilization based on relevant theoretical models.

Relationship between PDS efficiency and food security: The efficiency of PDS plays a crucial role in ensuring food security, especially in a state like Kerala that is highly dependent on food imports. According to the welfare economics model, PDS should function as a mechanism to ensure equitable access to food, thereby reducing food insecurity. Study hypothesize that improved PDS efficiency through policy reforms such as digitalization and transparency measures will lead to better food security outcomes for both priority and non-priority groups in Kerala. Efficiency improvements are expected to reduce leakage, increase targeting accuracy, and increase availability of food grains.

Linkage between NFSA implementation and accessibility: The National Food Security Act (NFSA), 2013, was introduced to address the growing food insecurity by expanding the coverage and entitlements under the PDS. The main provisions of the NFSA, including the digitalization and end-to-end computerization of ration cards, are aimed at increasing the availability of food grains to low-income households. Study hypothesize that the implementation of the NFSA has significantly improved the accessibility of the public distribution system in both rural and urban areas of Kerala, with a greater impact on priority households who benefit from lower prices and greater entitlements.

Linkage between public distribution system reforms and utilization: One of the main objectives of recent public distribution system reforms, including the digitalization of ration cards and direct cash transfers, is to increase the utilization of the system. Theoretical models of welfare economics suggest that reducing transaction costs and improving access to services will increase the utilization of welfare programmes such as the PDS. Study hypothesize that the technological and policy reforms introduced in Kerala have positively impacted the utilization of the PDS in both the priority and non-priority groups, although priority groups are

expected to show higher utilization rates due to increased affordability and entitlements

Impact of Demographic Factors on the Utilization of the PDS: Demographic factors such as age, gender, income, and geographical location have a significant impact on the utilization of the PDS in Kerala. These factors not only determine availability but also affect the effectiveness of food distribution programs. Based on the theoretical framework of social justice and welfare economics, Study hypothesize the following relationships:

Income and Socio-Economic Status: Low-income households like below the poverty line household (BPL), especially those eligible for large food subsidies, are more likely to utilize the PDS. The welfare economics literature argues that the welfare programs like public distribution system are designed to uplift the poor sections, by ensuring the availability and accessibility of essential goods. (Chambers,1989). The study hypothesizes that the role of socioeconomic status is significant in the use of the public distribution system, with lower-income showing higher rates of use.

Geographical location: The geographical location especially the rural and urban setting of the household are well documented and it act as a critical factor in determining the availability and use of public Distribution System. The study hypothesize that despite of the reforms aimed at improved accessibility, rural household in Kerala face greater barriers in using the public distribution system than those in urban areas.

Family size and Age: The size of household in number and the number of old age members may have more need for food leading to more reliance on Public Distribution System for their food security. The present study hypothesises that the size of the family is positively associated with the usage of Public Distribution System, as larger families seeking more food grains. Similarly, household with older members may rely much more on Public Distribution System, as senior citizens are often vulnerable to food insecurity.

Gender and Usage: Traditionally, the gender-based discrimination act as an important barrier in achieving efficient food allocation and access within the

household. Studies have shown that in female-headed households, the food security of house hold is more prioritised and therefore they are more likely to use the scheme like Public Distribution System.

1.8. Research Design

The research design of the present study entitled 'Public Distribution system in Kerala: A study in the context of National Food Security Act 2013' comprehensively examines the dynamics of the state sponsored food distribution programme i.e. the PDS and its effects on vulnerable sections of the society The present research design make the use of the mixed methods that combines the quantitative and qualitative data to make better idea and understanding about the complexities associated with food (in)securities and the efficiency of Public Distribution System. The presence of quantitative data ensures measurable information related with efficiency aspects of PDS and the qualitative data adds the experiences and perceptions of the beneficiaries. Thus, present search ensures a deeper understanding of how different socio-economic groups in the society experience food security via PDS. The use of data integration also helps in examining the complicated relationship between variables such as the impact of policy reforms on food distribution and accessibility. Thus, the present research design follows a series of process having collection, analysis and interpretation of both quantitative and qualitative data.

1.8.1 Data Collection Methods and Sample Design

The present study made use of both primary and secondary data to systematically analyse the effectiveness of PDS and its role in strengthening food security. To meet the primary research objective of assessing the effectiveness and utilisation of PDS, a primary household survey was conducted in two districts of the State through structured surveys and semi-structured interviews. The sampling design was developed through a stratified proportional sampling technique, based on official data (2024) from the Civil Supplies Department, Government of Kerala. To ensure that the study captured a comprehensive picture of the availability and utilization of the PDS, the four major ration card categories under the PDS, namely Antyodaya Anna Yojana (AAY), Priority Households (PHH), Non-Priority State Subsidy (NPSS) and, Non-Priority Non-Subsidy, were considered. Thiruvananthapuram and Kozhikode were selected to represent the Travancore-Cochin and Malabar regions respectively. These

districts were selected considering their administrative and socio-economic diversity, comprising urban, semi-urban and rural areas. Structured schedules were provided to collect quantitative data on key food security indicators and utilization of the PDS. The surveys targeted a group of respondents to capture a range of diverse experiences and opinions. This quantitative data provided a basis for analyzing trends and correlations related to food security. Semi-structured interviews were conducted with beneficiaries and officials involved in the PDS. The flexibility of the semi-structured interviews allowed the respondents to express their views and share individual narratives that improved the quality of data.

The collection of Secondary data involves the analysis of existing documents, including government reports, PDS documents and relevant academic literature. The important Secondary data source include the report of Planning Commission, FCI, NSSO, FAO, Directorate of Civil Supplies, Department of Food & Public Distribution etc. The production, area and yield statistics were taken from the State Economic Review, Kerala (various issues) and the Directorate of Economics and Statistics, Government of Kerala. Other data sources made use of in this study are the National Family Health Survey, Annual Report of Ministry of Food and Civil Supplies, Department of Civil Supplies, GOI (Various issues). Th combined use of primary and secondary data ensured a more comprehensive understanding of the functioning and challenges of PDS in the state. By reviewing these secondary sources, the study aimed to identify patterns, challenges and successes in the implementation of food security policies in Kerala, thereby enhancing the overall understanding of the research topic.

Table 1.1 presents the district-wise distribution of ration cards and total beneficiaries across the 14 districts of Kerala, which are divided into two administrative regions, Travancore-Cochin and Malabar. According to this dataset, Thiruvananthapuram and Kozhikode contribute the most in terms of ration card ownership and total beneficiaries. Thiruvananthapuram representing travancore-cochin and Kozhikode, representing Malabar, were selected as representative sample locations based on the fact that both districts comprise various administrative divisions including corporations, municipalities and panchayats.

Table 1.1

District-wise Distribution of Ration Cards and Beneficiaries in Kerala in 2024 and District Selection for Samples

Sl. No.	Region	District	Total Ration Cards	Total Beneficiaries	District Selected*
1	Travancore-Cochin	Thiruvananthapuram	1025756	3410629	Thiruvananthapuram
2		Kollam	796338	2798181	
3		Pathanamthitta	364519	1364230	
4		Alappuzha	622429	2274786	
5		Kottayam	556582	2086142	
6		Idukki	321302	1117391	
7		Ernakulam	916127	3343812	
8	Malabar	Thrissur	906416	3360345	Kozhikode
9		Palakkad	814907	3054089	
10		Malappuram	1051225	4773082	
11		Kozhikode	825370	3398223	
12		Wayanad	237378	882921	
13		Kannur	682071	2811356	
14		Kasaragod	347511	1474949	
		Total	9469976	36150136	

Source: The Department of Civil Supplies, Government of Kerala, 2024, retrieved from https://civilsupplieskerala.gov.in/index.php/cards

Table 1.2 shows the ration card distribution by card type in the selected districts of Thiruvananthapuram and Kozhikode. The figures indicate that there is a total of 1,025,756 ration cards in Thiruvananthapuram and 825,370 ration cards in Kozhikode. In both the districts, there is a significant presence of Priority Housing Households (PHH) and non-Priority Housing Households (NPHH) and a lower proportion of AAY card holders.

Table 1.2

Selected District-wise Distribution of Ration Cards in Kerala in 2024

District	Total Ration Cards	AAY	PHH	Non Priority State Subsidy	Non Priority Non Subsidy
Thiruvananthapuram	1025756	60254	460665	173903	330934
Kozhikode	825370	38127	318229	213553	255461
Total	1851126	98381	778894	387456	586395

Source: The Department of Civil Supplies, Government of Kerala, 2024, retrieved from https://civilsupplieskerala.gov.in/index.php/cards

$$\text{Sample size} = \frac{\frac{z^2 \times p\,(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p\,(1-p)}{e^2 N}\right)}$$

To determine the appropriate sample size for statistically significant results, a standard formula for calculating sample size was used, assuming a 95% confidence level (Z = 1.96), a 5% margin of error (e = 0.05), and a population proportion (p) of 0.5 for maximum variability. Although the estimated sample size was 385, a total of 545 valid responses were collected in the actual fieldwork conducted in 2025. This oversampling ensures the enough representation of four categories of card holders namely AAY, PHH, NPSS, NPNS in three layers of location ie Corporation, Municipalities and Panchayat. By collecting more data than required, the study mitigated the risk of lack of sufficient representation in advance, thereby ensuring that the final dataset maintained its analytical power and met the required criteria for inferential statistics. The total was then distributed proportionally across the two selected districts and four cardholder categories. This proportional stratification ensured that the sample accurately reflected the composition of the cardholders of the PDS system in each district (Table 1.3a&b).

Table 1.3a

Actual Sample Size Surveyed

District	Total Sample	AAY	PHH	NPSS	NPNS
Thiruvananthapuram	302	22	121	69	90
Kozhikode	243	18	98	56	71
Total	545	40	219	125	161

Source: Primary Survey, 2025

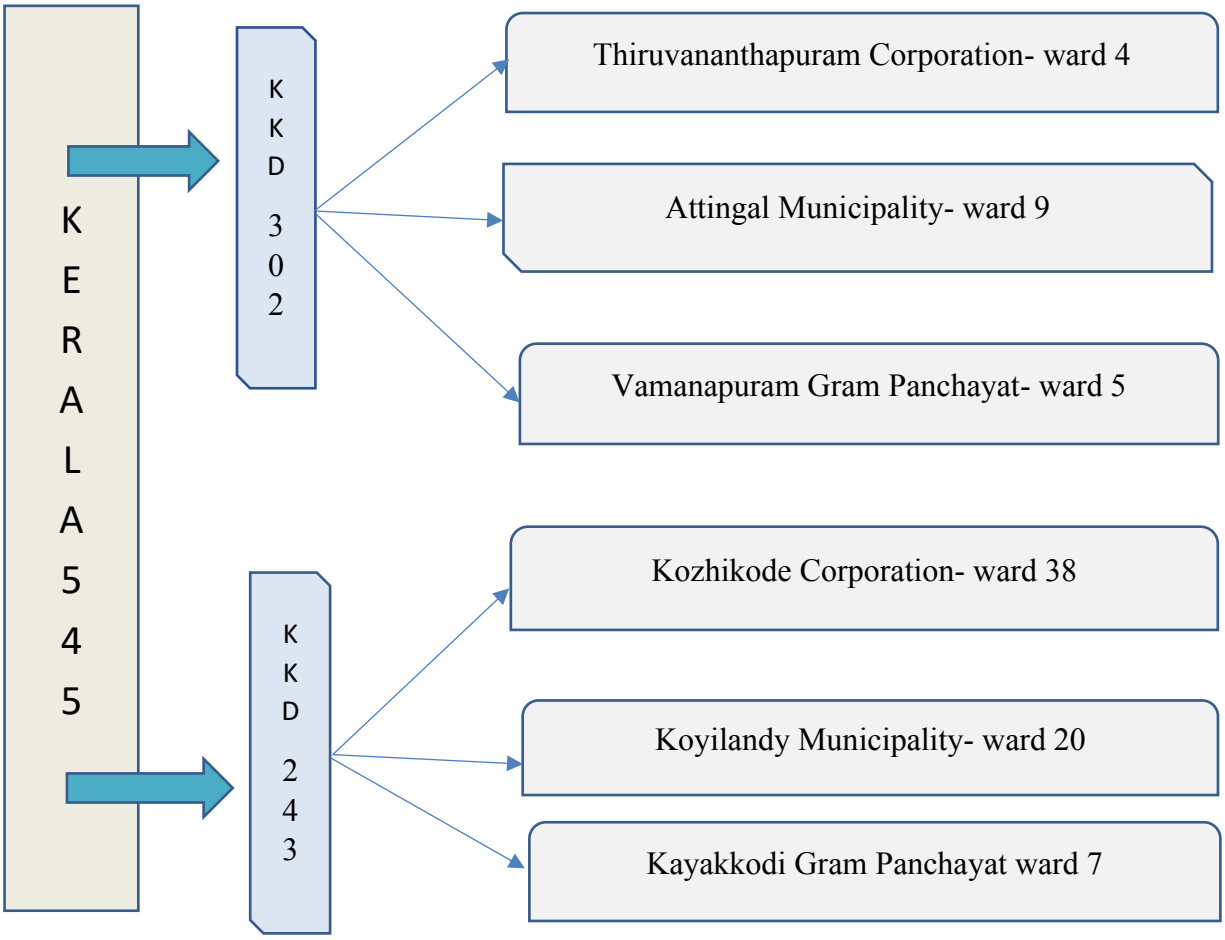
Table 1.3b

Actual Sample Size –Urban Rural Wise

	Corporation	Municipalities	Panchayats	Total
AAY	10	13	17	40
NPNS	39	51	71	161
NPSS	30	40	55	125
PHH	54	69	96	219
TOTAL	133	173	239	545

Source: Primary Survey, 2025

Fig.1.3 Sample Frame



1.8.2 Data Analysis Tools

The data analysis section of the study presents a brief review of descriptive statistics to present demographic profile of the respondent and later the analysis make use of different indices to present the dimensions of food security. The statistical tools, like t-tests and chi-square tests, were used to identify the relationships between variables and recognize differences among groups based on socio-economic features. To identify more complex associations, the present study used multiple regression analysis to determine how the variables such as income, education, and location influenced food security outcomes. In addition, techniques such as ANOVA and MANOVA were also used to check the simultaneous effects of multiple independent variables.

1.8.3 Assessment Indices: Availability, Accessibility and Utilisation Indices

The conceptual framework presented in fig 1.1 and the United Nations definitions also established the role of availability, accessibility and utilisation dimensions of food security. One of the major objectives of the study is labelled as to examine the availability, accessibility and utilization of PDS by the priority and non-priority card holders in Kerala during the period of the NFS Act. Hence addressing the food security based on these dimensions is an important task. To address the objective, different indices like availability score, accessibility score, utilisation score and socio-economic indices have been used here to assess the food security of household in Kerala. The construction of the score in the present study follows widely recognized composite index method used in social science and welfare research rather than an ad-hoc method .The methodology adopted is consistent with standard formula such as FAO's Multidimensional Measurement of Food Security, UNDP's Human Development Index (HDI), Min-Max Normalisation approach, and Alhyre-Foster Multidimensional Poverty Index (MPI) frame work that combines multiple variables into a single standardized Score. Similar to these accepted methods, the study used multiple variables of availability, accessibility and utilisation, normalising them to scale of 0 to 1, and combined them with equal weightage to avoid arbitrary preference for any dimension.

1.8.4 Transfer of Income-category wise Estimation

The study uses the following model to estimate the quantum of financial benefit to the household. which depends on three main factors: the quantity of the item purchased, the open market price (OMP) of the item, and the price charged under the PDS (PP). Mathematically, income transfer (IT) is expressed as:

$$\mathbf{IT = (OMP - PP) \times Q}$$

where OMP is the open market price, PP is the PDS issue price, and Q is the quantity of goods purchased by the household from fair price shops.

Multivariate analysis: The statistical Techniques like multiple regression analysis and multivariate analysis of variance (MANOVA) were used to recognize how multiple independent variables simultaneously affected the dependent variables. Multiple regression analysis was used to assess the impact of several independent variables on the dependent variable of food security. The formula for multiple regression is

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon$$

Y= food security score, while Xi included independent variables such as household income, education level, and PDS utilization.

Factor Analysis: The Factor Analysis technique was used to identify the relationships between variables availed in the survey. By reducing the data dimensionality, factor analysis revealed latent constructs related to food security and PDS utilization, making it easier to interpret complex relationships among the variables. In the context, this technique was used to identify underlying relationships among multiple variables related to food security and PDS effectiveness. The factor model is represented as:

$$X_{ij} = \lambda_j F_i + \epsilon_{ij}$$

where X_{ij} is the observed variable, λ_j represents the factor loading, F_i is the latent factor, and ϵ_{ij} is the unique factor. Factor analysis revealed latent constructs related

to food security and PDS utilization, simplifying the interpretation of complex relationships among the variables.

Structural Equation Model (SEM): The Structural Equation Model was used to assess the complex relationships among observed and latent variables. The Structural Equation Model is represented as:

$$Y = \beta X + \Gamma W + \epsilon$$

Where, Y represents food security outcomes, X the directly influencing factors (e.g., PDS access), and W encompassed mediating variables like household income. This approach addresses a simultaneous analysis of multiple relationships, revealing the causal pathways influencing food security.

1.9 Significance of the Study

The present study entitled 'Public Distribution System in Kerala: A study in the context of NFSA 2013, assess the extent of accomplishment of food security with its own dimensions in Kerala. The study examines the crucial role of NFSA, a key act envisioned to ensure food security for poor house hold, address the issues of food availability, affordability, utilization of food. In addition, the study examines the extent of food deficit, the role of PDS in meeting the deficit, the recent policy changes including legal measures like NFSA, Aadhaar seeding and the end to end computerization of PDS in ensuring food security in Kerala.

A significant portion of the research helps us to realize how the beneficiaries belonging to the priority and non-priority categories avail, access and utilize the PDS during the NFSA period. The research aims to identify effectiveness of PDS, gaps in the PDS use and the factors affecting its utilization among the priority and nonpriority categories. By assessing these issues, the research aims to suggest policy measures to improve the status of food security in Kerala. The significance of this study goes beyond academic interest; it has real implications for policymakers, the findings may provide valuable recommendations for improving the public distribution system and food security in Kerala.

1.10 Limitations of the Study

- The present research relied mainly on data collected from persons by means of survey and interview methods, which may contain personal biases and inaccuracies.
- The research findings are based on data gathered over a particular period, and thus may not be entirely relevant in other years when economic and policy factors change.
- The research was conducted only on selected districts in Kerala, and thus may not be representative of the entire state or other states in India.
- The present research was conducted mainly on the Public Distribution System, and thus other factors that may be crucial in ensuring food security, such as income, employment, and agriculture, were not entirely explored.
- The secondary data gathered from government documents and records may not have been entirely accurate and up-to-date, which may influence some of the results.
- Food security is a complex phenomenon, and the research may not have entirely explored all its dimensions.

1.11 Structure of the Thesis

- Chapter 1 is an introduction to the research study, which provides the background and significance of food security and the PDS in the context of Kerala. The chapter defines the research problem, objectives, and research questions. The conceptual framework and research methodology are also described in this chapter, which helps to understand the challenges and successes of the PDS in achieving food security.
- Chapter 2 provides a literature review of the existing theories and concepts of food security and the PDS. The chapter reviews the previous studies on food security and the PDS, which helps to understand the strengths and weaknesses

of the studies. The research gaps are also identified in this chapter, which are addressed in the research study. The chapter also provides theoretical support to define the research problem.

- Chapter 3 describes the trends of food grain production in Kerala, both historically and currently. The chapter identifies the factors that influence agricultural production and the role of the PDS in fulfilling the food needs of households. The chapter evaluates how far the PDS promotes local production and helps to achieve food security in Kerala.

- Chapter 4 outlines the history of the PDS in Kerala, with emphasis on major changes, particularly computerization and the NFSA, 2013. The chapter explains the role of technological advancements in shaping transparency, efficiency, and accountability in food distribution.

- Chapter 5 gives the use of priority and non-priority households in accessing and utilizing the PDS after the NFSA. The chapter investigates the effects of digital changes, such as ePoS devices and Aadhaar authentication, on food accessibility. The chapter also determines whether the aims of the NFSA have been met at the grassroots level.

- Chapter 6 highlights the shortcomings of the PDS, specifically the errors of exclusion, where eligible families are excluded from the PDS. The chapter compares the utilization of the PDS among priority and non-priority cardholders and investigates the effects of digital divides on food security outcomes.

- Chapter 7 summarizes the research study, its findings, and proposes areas for future research.

- Chapter 8 highlights the major recommendations of the study based on the findings.

CHAPTER II

THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

The present chapter summarises the theoretical perspective and the thematic review of the important literature associated with the PDS and food security. In addition to the brief presentation of major theories associated with the topic, the review of literature helps us to understand the major research associated with the title and policy reforms starting from its inception to the present form of end to end computerization. The key areas of research include the issue of food insecurity, the role of PDS in eradicating poverty, conceptual approach to food security and famine, theories associated with hunger, problems with targeting of the scheme etc all of which become the concern of scholars associated with the topic.

In the present study, enough attention is placed on theory and its insights to food security with interdisciplinary approach from different social science including economics, political science and public policy. In addition, the present chapter critically examines various academic enquiry on the Public Distribution System in India, a recognized scheme that aims to enlarge food availability through subsidized distribution. Besides empirical studies, this chapter presents a strong theoretical framework drawn from welfare economics, public goods theory, and social justice theories. By assimilating empirical evidence and normative theory, this chapter lays the groundwork for a sufficient understanding of the role of the state in safeguarding food security and addressing hunger in a socially just and economically rational manner.

2.1 Theoretical Framework

The theoretical base of the present study focuses on the concept of food security, its dimensions, and the extent in which these dimensions are satisfied in PDS especially during NFSA period. The study also justifies the state intervention in food distribution with the theoretical arguments from welfare economics, public goods theory, and social justice theories.

The theoretical framework for the present study "Public Distribution System in Kerala: A study in the context of NFSA 2013", basically rooted to the multidimensional concept of food security which includes availability, accessibility, utilisation and stability. The entire thesis is centred around the above said dimension of food security, which examine the extent in which these dimensions are applicable in PDS for ensuring food security in Kerala.

As a supply-side intervention, from procurement to distribution, the PDS, enhance the availability of food at the accessible rate and reach through the legal entitlement. The enactment of NFSA2013 ensures stability of food grains supply and affordability. Beyond mere access, the provision of distribution of essential food grains with fortification ensures, nutritional utilisation through the commodity composition of grains. The Centre theoretical suggestion is that public distribution of food is justified where and to the extent that, free flow of demand and supply cannot simultaneously guarantee all dimension of food security for vulnerable household, necessitating a strategy like PDS that carefully balance this interconnected objective.

A search on theories of famine with inter disciplinary approaches, brings the root into four major categories: Climatic, Demographic, Socio-Economic and Political theories. The natural disaster like flood, demographic reasons like population pressures etc may spark food crises, but the actual famines often stem from deeper systemic issues. Famine doesn't arise just from a drop-in food supply but from people's inability to access food due to poverty, unemployment, or exclusion from the market (Sen 1981). In the political reasoning, it is seen that the mismanagement by the political leadership during the situation like war may worsen the situation far from fair distribution. These conclusions spot the importance of the state intervention in handling the supply and demand for food grains through public distribution, price controls, and social safety nets to ensure food security, particularly for poor households.

From a Welfare economics perspective, the rational for public distribution of food is grounded on its capacity to correct market failures, such as inefficiency in production, distribution, asymmetric information regarding nutrition and the merit good character

of food which may justify states paternalistic transfers to ensure minimum nutritional standards. (Basu, 2016). Observing food security as a public good makes it apparent that state intervention is vital for handling food scarcity (Sen, 1981).

The theory of public goods recommends a compelling justification for collective action in distribution of food grains by revealing that while food has the features of private good, food security itself, possesses characteristics of a public good, causing external benefits that extent for beyond the individual benefit. While food may not fit the strict definition of a pure public good, guaranteeing food security for a population can be considered as a public good due to its widespread externalities. (Samuelson, 1954). A hunger free society yields positive externalities—including less communicable disease transmission, enhanced social security, better human capital, and greater political legitimacy—that accrue to all members of society, regardless of level of income and purchasing power.

Rawls's theory of social Justice offers the systematic philosophical base for public distribution of food, grounding it in fundamental principles of right rather than utility. The Rawlsian conceptual device, the original position behind a veil of ignorance requires rational individuals to choose principles of Justice, without knowing their own position in society. That is, the state has an ethical responsibility to ensure that all individuals have access to basic needs, including food. In addition, Rawls established the interference of state through fair distribution of food and institutional fairness with theories such as difference principle**,** concept of primary good, distributive injustice, participatory injustice and intergenerational justice**.** (Rawls,1971)

2.1.1 Food Insecurity: Understanding Hunger and Theories of Famine

The concept of Food insecurity refers to a social scenario where individuals or households lack consistent access to sufficient and nutritious food, while famine represents an extreme and acute manifestation of food insecurity, often involving widespread starvation, malnutrition, and mortality. Though both are rooted in inadequate access to food, famine is typically the result of a convergence of multiple crises such as natural disasters, conflict, economic collapse, or policy failures.

Moore (1990) argues that there is no single definition of famine that is universally accepted by the scientific community. A search about the theoretical approaches to food security, brings the theories into four major categories: Climatic, Demographic, Socio-Economic and Political theories (Engler S, 2013) as presented in Table 2.1

Table 2.1

Review of Famine Theories

Theory groups	**Theories and Concepts**	**Variable affected**
Climates Theories	Famine belts/Droughts	Food supply
Demographic Theories	Malthusian &Neo-Malthusian theories	Food supply
Socio-economic Theories	Food Availability Decline (FAD) Food Entitlement Decline (FED) Market Failure	Food Supply Food Demands Both Supply and Demand.
Political Theories	Political mismanagement &War	Both Supply and Demand Both Supply and Demand

The Climate theory explains food insecurity as the result of climatic phenomena. Cox, associate this with the concept of "famine belt" in which he directly connects climate condition to food insecurity and famine. (Cox 1981). This theory contended that in the national or local level, climate linked phenomena such as drought and floods are a major factor causing food insecurity and famine. Demographic factors continue to play a significant role in discussions surrounding food insecurity and famine. The Malthusian and Neo-Malthusian theories, which emphasize the relationship between population growth and resource availability, remain deeply entrenched in these debates. The advocates of this theory reasoned that food shortage occurs when the availability of food is less than the food requirement of the population. But the arguments are not sufficient to address the question: why do famines not occur in drought-stricken areas, such as the Middle East or even some parts of Spain, on a regular basis (Devereux 1993). Demography based elements are still extensive in the discussions on food insecurity and famine. The core of this argument is based on a segment on Malthus's book "*An Essay on the Principle of Population*".

I think I may fairly make two postulates. First, that food is necessary to the existence of man. Secondly, that the passion between the sexes is necessary and will remain nearly in its present state [...] Assuming then my postulate as granted, I say, that the power of population is indefinitely greater than the power in the earth to produce subsistence for man. Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio" (Malthus 1798).

Recently, Neo-Malthusian theory, a further advancement of the basic Malthusian theory, understand the "people: arable land ratio" (Devereux 1993) as a criterion for calculating the threats of food insecurity. Even though we have separate arguments based on climate and demography, the primary designers of these approaches, Adam Smith and Malthus argued that famines are primarily caused by an unexpected decay in food availability. They consider natural factors like climate change as the main causes for food insecurity and it influences the harvest and advances in prices. In the socio-economic category, we can put theories in to three heads such as (1) Food Availability Decline (FAD), (2) Food Entitlement Decline (FED) and (3) the Theory of market failure. The "Food Availability Decline" theory briefs scarcities of food arises because of the available quantity of food is less than the food necessity of the people. It considers the influence of natural factors as the prime cause for food insecurity and link the famine to influence on harvest failures, advances in prices, etc. The theory is subjected to criticism due to various issues including famines are often caused by non-natural drivers. The Food Entitlement Decline theory consider food entitlements failure rather than alleged availability of food to the crisis. Therefore, the distribution of food is more important than its availability. Sen defines entitlements as a "set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces". (1984) In spite of worldwide acclaim, Sen's "entitlements" have been criticised for "being ahistorical, apolitical, economistic and static" (Devereux 2001). It is also argued that importing food in a situation of existing insecurity is the only way to minimise the food problem and to "save lives". (Bowbrick 2008). The theory of "market failure" links the occurrence of food insecurity and famine to the failure of invisible hand especially in local areas. That does not mean that markets do not operate at all – even though this may also be

the case – they just do not meet the demand of the local people at the right time and place (Devereux 1993).

The political theories list the elements of war, political mismanagement, taxation policy of the government etc are grouped under the head of "*political theories*". Bose (1990), argues that most of the famines of twentieth century had causes closely related to politics, others also noted that such trends holds true for previous and later famines (Pfister and Brazdil 2006; Keller 1992; O Grada 2009). As shown, all such theories have certain limitations. Therefore, we have no single and "exact theory of famine".

2.2. Insights from Theory: Approaches to Food Security

In this section, we intend to proceed by focusing on the different approaches that derived from the theory, which have drawn attention to different components of food security, and, in turn, have contributed to well defined concept of food security. A deep-rooted search in the literature on food (in)security: theory and policy brigs the following approaches to food security: 1. Food availability approach, 2. Income-based approach, 3. Basic needs approach, 4. Entitlement approach, 5. Sustainable livelihoods approach, 6. The Capability Approach. These approaches are reviewed in the following section.

2.2.1 Food availability approach

The "food availability" approach, is certainly the oldest one and still the most influential. Although Giovanni Botero, a Venetian philosopher, is credited with developing the basic ideas of this approach in 1588, Thomas Malthus (1789) popularised it. Indeed, it's frequently called the Malthusian approach. The strategy focuses on striking a balance between the rate of growth of population and the rate of increase in food availability. It is necessary for the first to remain equal to the second in order to preserve this equilibrium. This sentiment is aptly captured in the definition of food security articulated during the World Food Conference of 1974. *"Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices" (UN 1974).* The policy implications of this approach realise the need to reduce the

rate of growth of population (demand side) and the need to boost per capita food production. The strategy that is often recommended and executed to realize this goal is increasing the productivity of agriculture. It's interesting to note that Malthusian fears of scarcity of food grains have been revived since the 1970s and the ideas such as "ecological footprint" and "carrying capacity" have become more significant especially due to ecological concerns.

2.2.2 Income Approach

The earlier perception of food security, mainly based on availability of food, has undergone a move towards a more macroeconomic perspective. The scholars associated with the disciple argue that the issue of food security should not be exclusively tied to the agricultural output, without considering the significance of interdependence of various sectors in the economy. To address this, the first effort to broaden the discipline involved analysing national economies as a whole, incorporating variables like GDP and economic growth. This macroeconomic framework aligns with influential economic theories, such as Ricardo's comparative advantages, emphasizing specialization in sectors where a country has a productivity advantage. The most important modification in this regard was from food availability at macro-level to income at micro-level. (Reutlinger and Selowsky 1976; Haq 1976). This approach is very similar to the one traditionally used to assess poverty i.e. lack of enough income necessary to buy at the given conditions the amount of food required (Sibrian et al. 2007; Sibrian 2008). The different items of foods are converted into calories (characteristics) and if availability of calorie is lower than a threshold identified by international nutritionists, they are considered food insecure.

An important problem associated with this method is that, most of the studies on food demand have many biases due to the fact that they consider calories as that of any other good, without considering the actual effect of nutrition and calories on productivity and income (for details see Svedberg, P. (2002). The approach emphasised with income is better suit for an ideal market economy in which transactions are based with invisible hand.

2.2.3 Basic needs approach

The Basic Needs Approach to development was developed by the International Labour Organisation (ILO) in the late 1970s with the goal of including non-economic aspects in addition to economic progress (ILO 1976). This change in policy was brought about by the realisation that, even with economic growth, enduring problems like poverty, unemployment, and underemployment required a different approach. Subsequently, economists Paul Streeten (1981) and Frances Stewart (1985) played pivotal roles in re-launching the approach. Their contributions emphasized prioritizing basic human needs and addressing distributional aspects, adopting a general and inclusive development paradigm**.**

Proponents of the basic needs model viewed development as an active process aimed at ensuring that the basic needs of all individuals were met. The fulfilment of basic needs was a prerequisite for a "*full life*" that was composed of both material and non-material elements (Stewart 1985). The pragmatic nature of the basic needs approach required a minimal interpretation of a full life, which led to the creation of a concise list of basic needs. Although differences exist between different authors, as Denton (1990) has highlighted, a common set usually includes essential items such as food, shelter, and clothing. Magrabi et al. (1991) have emphasized the central importance of food, considering it perhaps the most basic need. Scholars in various disciplines, including Maslow (1943) in psychology, have echoed similar views. The definition of "fundamental rights", especially Henry Shue's concept (1996), has focused primarily on the "human right to adequate food", as emphasized by Kent (2005). The discussion in the development literature has significantly shaped the discussion of food security and has led to the widely accepted "food first perspective" (Maxwell and Smith 1992; Maxwell 1996). This approach focuses directly on assessing whether individuals have enough food to eat, marking a major shift in analysis from the macro to the micro level. It prioritizes food as the main, and perhaps the only, component of food security. In contrast to the (micro) income-based approach to assessing food security, the primary advantage of the food first approach lies in its ability to focus

directly on the essential commodity of interest (food), rather than on the income required to purchase it.

2.2.4 Entitlement approach

For long time the discussions surrounding hunger and famine were predominantly influenced by the food availability approach, which can be traced back to Malthusian thought. However, it was Sen's entitlement approach during the early 1980s redirected the emphasis of food security from national food availability to the crucial issue of people's access to food. The entitlement approach played a significant role in reframing the issue of hunger and famine by reducing the emphasis on overall food supply and placing greater importance on the socio-economic circumstances of individuals.

"The entitlement approach concentrates on each person's entitlements to commodity bundles including food, and views starvation as resulting from a failure to be entitled to any bundle with enough food" (Sen 1981: 434). Entitlements depend on two factors: 1) the personal endowments, which are the resources a person legally owns such as house, livestock, land, and non-tangible goods (Osmani 1995), 2) the set of commodities the person can have access through trade and production, i.e. the "exchange entitlement mapping" (Sen 1981: 435). Starting with a situation where a person has merely enough resources to survive, a decline in resources can inevitably lead to the person becoming starved. Still, a person may fall into the hunger trap even with the same endowments because of a reduction in the exchange entitlement mapping.

The entitlement failure may take various forms. Given an economy in which each group, for simplicity, produces one commodity (including labour), and given a food exchange rate (commodity price/food price), any group risks to starve due to an entitlement failure either because of a reduction of food production for personal consumption or because of a fall in the food exchange rate (Sen 1981). In the first case, there is a 'direct entitlement failure', in the second case a 'trade entitlement failure'. Food producers are affected by the former because of a decrease in their

output. However, the latter impacts non-food producing groups, which face difficulties when food becomes less readily available.

Amartya Sen's impact is evident in the formulation of two crucial definitions related to food security. “All people at all times have both physical and economic access to the basic food they need” (FAO 1983), and “Access by all people at all times to enough food for an active, healthy life” (World Bank 1986). In "Hunger and Public Action" (1989), Dreze and Sen go beyond the analysis of food entitlements to include more expansive entitlements that cover bundles of commodities such as drinkable water and services such as health care and sanitation. This contribution emphasises the significance of taking into account access to other necessities that have a direct bearing on hunger and food security in addition to food. “Starvation is a matter of some people not having enough food to eat and not a matter of there being not enough food to eat” (Sen 1981: 434). Opting the entitlement approach over previous ones offers a superior assessment from various perspectives. A comparison with the food availability approach has already been conducted, revealing ample evidence of significant food insecurity and under nutrition in countries with seemingly sufficient food per capita. Moreover, the deviation from the income-based approach is reduced, given that income plays a crucial role in facilitating access to food.

“In dealing with starvation and hunger, the focus on incomes – though defective – is not entirely disastrous. And of course, it is a good deal better than the focus on total food output and population size. The weighting system of real income and cost-of living pays sufficient attention to food in a poor community to make real income a moderately good ‘proxy’ for entitlement to food in most cases” Sen (1983: 756), The entitlement approach, in contrast to the food-first approach, takes a wider view of variables, making it possible to foresee future food deprivations. Lower quantity of assets can be a sign of future difficulties in getting enough food. In Sen's works, the terminology he employs, such as hunger, under nutrition, or nutritional deprivations, differs from the commonly used "food security." This distinction is intentional, as "food security" is closely associated with the "food first" framework generally or when their terms of trade diminish. If people go hungry on a regular basis all the time,

or seasonally, the explanations of that have to be sought in the way the entitlement system in operation fails to give the persons involved adequate means of securing enough food. Seeing hunger as entitlement failure points to possible remedies as well as helping us to understand the forces that generate hunger and sustain it. (Dreze and Sen 1989).

2.2.5 Sustainable livelihoods (SL)approach

Although the concept of Sustainable livelihoods had been utilized previously, Chambers (1983) notably highlighted the importance of livelihood in the 1980s. Through his influential book, he introduced the foundational components of this approach, with a specific focus on rural development and poverty. Subsequently, both Chambers and other scholars have further elaborated and expanded upon the framework in subsequent works (Chambers 1987; Chambers and Conway 1992; Chambers 1995; Ellis 2000; Scoones 2005). This approach has gained more attraction among development organizations than in academia, with it being widely adopted by NGOs, government agencies, and UN agencies. The SL framework comprises three interrelated concepts: vulnerability, resilience, and coping strategies, which contribute to a more comprehensive analysis of food security. The sustainable livelihood ideas have also been extensively applied to measure food security, particularly in humanitarian emergencies (Maxwell 1995; Maxwell et al. 1999, 2003) and in situation of famines (Howe and Devereux 2004).

2.2.6 Capability Approach

The capability approach to food security was discussed in 1989 by Jean Dreze and Amartya Sen in their pioneering work "*Hunger and Public Action*". A puzzling aspect of this book and its proposed framework is that, despite its broader scope and deeper implications compared to the rights approach, it has been little acknowledged, discussed, and applied among scholars and practitioners. Most studies and reports on food security since 1989 that mention Sen often refer to his book "*Poverty and Famine*" and the rights approach, ignoring "Hunger and Public Action". The overwhelming popularity and praise of the former work seems to overshadow the latter. This situation is not only strange, but also very puzzling (Muro & Burchi, 2012).

The capability approach to food security overcomes the limitations of the rights approach by shifting from a "*command over products*" perspective to a broader perspective of "*nutritional capabilities*." This approach emphasizes basic human capabilities, which include the "access" and "utilization" dimensions of food security, and freedom from hunger. It goes beyond the traditional concerns of basic needs, rights, and the sustainable livelihoods (SL) approach. In their book Hunger and Public Function, Dreze and Sen (1989) highlight the complementary inputs essential to nutritional well-being, including health care, clean water, sanitation, and education. A theoretical discussion by Sen (1985) on the variable relationship between food consumption and nutritional attainment identifies the contingencies that influence this transition.

Although there is a lack of a unified theory explaining the root causes of famine, existing theories link the problem to demand management, supply factors, or a combination of both.

The above discussion on food security, famine theory and the different approaches to food security reflect the need for a policy to address the supply and demand for food grains. Food availability, income; the discussion of basic needs, entitlement, sustainable livelihoods, and the capacity approach call for state intervention to ensure availability and accessibility.

2.3 Public Distribution System – Demand and Supply Management Model

The PDS which is a significant component of the food security system in the country, operates as a critical mechanism through which the state intervenes in the food grain market to influence the market prices and reduce the fluctuations therein, by regulating the supply in line with the demand. (Jharwal,1999). By acquiring food grains from farmers at Minimum Support Prices and distributing them to consumers through FPS at subsidized rates, the PDS manage supply with demand, supports the interest of both farmers, and consumers.

The theoretical base of the procurement of food grains and PDS operations is protecting the interest of farmers at the time of harvest and ensure the enough supply

to the consumers during the lean season. Thus, when the availability of food grains increases in the market during the harvest season resulting in the fall in the market prices, the government mobilises it through its agencies like Food Corporation of India (FCI) to undertake purchase operations at pre-determined prices thereby not allowing the price to fall to un-remunerative levels. This is the way in which government protect the interests of the farmers. During the lean season, food grains are supplied on a large scale to reduce the open market prices thereby protecting the interests of the consumers. Thus, the demand-supply framework emphasizes the relevance of State interference in ensuring food security and protect the interest of both producers and consumers.

2.4 REVIEW OF LITERATURE

The persistent shortage of food, particularly in staple crops such as rice, has attracted the attention of research scholars on different aspects of food security in Kerala. The issue of food security is a critical concern for policymakers, researchers and economists, especially in states like Kerala, where food insecurity persists despite remarkable achievements in human development. In spite of the unique development experience, the state of Kerala faces challenges in ensuring adequate food availability due to declining agricultural production and increasing external dependency. The present section summarises important literature associated with the problem of food insecurity and the role of PDS in limiting the gravity of food security on poor household.

2.4.1 Food Security: Concepts and Perspectives

According to the FAO, "food security is a scenario that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that satisfies their dietary needs and food preferences for a life that is both active and healthy." (FAO,1996) A fourth component, stability, was introduced as the short-term temporal indication of the ability of food systems to absorb shocks, whether they are natural or man-made, during the most recent revision to this concept, which took place at the "World Summit on Food Security in 2009" (FAO, 2009).

The focus of food security was originally on guaranteeing the presence of food and the stability of prices for essential food items in the early 1970s, a period marked by worldwide food shortages. This was a result of the highly unpredictable fluctuations in agricultural commodity prices, along with the instability in currency and energy markets during that period (Berry et al., 2015). Earlier, the World Food Conference 1974, defined food security as "the availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices" (Shaw, 2001).Later on, as people had a more understanding of the issues associated with food security, including the deficiency in protein, the focus shifted from the mere supply of food to a more comprehensive strategy (Conway, 2012).

"In 1983, the FAO published a revised definition of food security as "ensuring that all people at all times have both physical and economic access to the basic food that they need" (Guanqi, 2016). The next significant event occurred in 1986 when the "World Bank" released its landmark report titled "Poverty and Hunger" (World Bank, 1986). By making a distinction between "acute, transient food insecurity, which is caused by natural or man-made disasters, and chronic food insecurity, which is associated with poverty, this created a temporal scale for food security." The notion of food security was expanded further to include the following: "access of all people at all times to sufficient food for an active, healthy life" (Berry et al., 2015). This addition was made in response to the above-mentioned factors. The further evolution of the concept took place in 1994, "with the publication of the Human Development Report by the United Nations Development Program," which took into consideration the criteria for human security. At this point in time, the topic of human rights was brought up concerning food security, which could be understood as falling under the greater umbrella of social security (UN Development Program, 1994). During that period, this multidimensional and diverse operational construct did not have a coherent definition. This is because research on food security is frequently context-specific, depending on which of the several technical viewpoints and policy issues are being considered. In preparation for the 1996 World Food Summit, multinational consultations redefined food security to unify such complexity (Shaw, 2008). This

redefinition reflected the complex interaction that exists between individuals, households, and even on a global level. "When all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life." According to the "*Food and Agriculture Organization of the United Nations (FAO)*," food security is thought to have been achieved at all levels. The terms "*nutrition security*" and "food and nutrition security" came into being about the same time that the term "food security" began to develop in the middle of the 20th century. After that, the concept of food security and nutrition is deemed to include food security as a subset. Then, the definition of food security was further redefined in "The State of Food Insecurity in the World 2001" by including the social emphasis that was mentioned earlier (FAO, 2002). It was acknowledged that addressing poverty is essential, but that it is not sufficient on its own to accomplish this objective (FAO, WFP, and IFAD, 2012). Following that, the most recent official amendment, which was made at the "World Summit on Food Security in 2009," added stability the fourth dimension of food security (FAO, 2009). Recently, there has been a proposal that the element of sustainability should be incorporated as a fifth dimension in order to combine the long-term temporal dimension (Berry et al., 2015).

2.4.2 Global Challenges in Achieving Food Security

Food security, a multifaceted phenomenon, has different gravity in different regions of world, irrespective of the level of growth. Attaining food security at national and international level faces number of hurdles in availability, accessibility, utilisation, and stability of food. The State of Food Security and Nutrition in the World 2022 and the Global Report of Food Crises (GRFC) for 2023 reported that, worldwide, the level of hunger continued alarmingly high with an undernourished population of 828 million in 2021 (Global Hunger Index report, 2022) as against 815 million people in 2016 and 777 million people in 2015 (Global Hunger Index report, 2016).

The population growth, a Malthusian variable, influencing demand act as important obstacle in achiving food security, as it is projected to mark 10 billion by 2050. In spite of scientific achievement and consequent increase in food production, problems

like, change in climate, conflict between nations and regions, income inequality, and wastage of food etc continue to challenge reliable access to enough nutritious food especially among the poor. The mounting demand for food grains push pressure on agricultural and natural sources, especially in under developed countries where growth of population is highest (Godfrey et al., 2010). The sustainable farming, better storage facility and advanced supply network are very much essential to ensure food for everyone.

The climate change including variation in temperature, change in rainfall, and the frequency of extreme climate events, such as floods and droughts, are spoiling crop yields and livestock production (Wheeler & von Braun, 2013). In regions of Africa and South Asia, where rain-fed farming is crucial, small farmers feel these impacts most acutely (Vermeulen et al., 2012). According to the Global Report on Food Crisis 2022, the number of people facing acute hunger reached an average of 193 million in 2021, especially across Africa, south of the Sahara, South Asia, Central and South America, and beyond. Apart from the COVID-19, the factors like Ukraine war and the climatic extremes, which have seriously worsened the poverty in many countries, especially in the Central African Republic, Chad, the Democratic Republic of the Congo, Madagascar, Yemen, Somalia, South Sudan, and Syria.

Armed conflict and political instability often result in fall in production of food, making it hard for affected people to access food (World Food Programme, 2021). Although there is enough food to feed everyone, the disparities in wealth and income, especially in low- and middle-income countries, limit fair access to food (Barrett, 2010). In addition, the one-third of food produced for human consumption is wasted each year (FAO, 2011). Unfortunately, more waste happens in high-income countries at the consumer level, while in UDCs food is often wasted due to poor storage and transportation facility. These worldwide challenges to food security and its relations are very complex and linked together. It call for a combined effort from various stakeholders like governments, international organizations, and civil society to build resilient effective food distribution systems. These combined efforts must address the

population growth, climate change, political conflict, and economic inequality while cutting down food waste and ensuring fair global trade practices.

2.4.3 Definition and Objectives of PDS

The Public Distribution System in India is one of the largest, comprehensive and expensive food security initiatives, which is managed by the Ministry of consumer Affairs, Food and Public Distribution. The PDS evolved as a system of management of adequate food at affordable price for all in the country. It is a means of providing basic commodities such as rice, wheat, sugar, and oil to the people at subsidized rates through a network of fair price shops or ration shops (Department of Food and Public Distribution, 2023). The PDS has several different objectives. Its main objective is to ensure that households, especially in rural areas and poor urban areas, have access to sufficient food (Gulati & Saini, 2015). Its objective is to protect low-income households from price increases and volatility by providing essential commodities at subsidized prices. The system also acts as a social safety net as a means of providing assistance to poor or otherwise vulnerable people (Dorin, 2017). Another objective of the PDS is to ensure that market prices do not rise excessively and unnecessarily, (Ja, Srinivasan 2001). It helps to even out seasonal variations in the production and availability of food grains. This ensures that essential food items are available at affordable prices and prevents prices from rising and falling too much, which can be detrimental to consumers, especially those on low incomes. In addition, to the above objectives, which is directly assisting the people as consumers, the PDS also support the farmers with a minimum support price (MSP) for certain agricultural products. Such support, with MSP, ensures more income to the farmers and act as incentive to produce more. (Chand, 2022). Thus, PDS in India serves a dual purpose; it not only delivers subsidized food grains to the poor household but also assist the farmers through the process of procurement at MSP.

2.4.4 Overview of Public Distribution System (PDS)

The Public Distribution System in India -a producer cum consumer support programme -has launched in the wake of food grain shortage of Second World War and has evolved in the present form, in the wake of food grain shortages of the sixties,

with the goal of price stabilization in the grain market. The PDS, includes a network of institutions from the procurement stage to the distribution of goods to the poor household. The Food Corporation of India (FCI) is the agency that is in charge of the procurement, storage, transportation, and distribution of food grains in the country. The Public Distribution System (PDS) in India, under the NFSA 2013, has launched a new phase of operation in delivering the essential food grains to the households at a subsidised rate. As the largest network of its kind in the world, the PDS shelters and distribute essential food grains to the poor household of the people of nation.

The prime aim of the PDS are to ensure price stability, food security for households, and protect them from food inflation. (FCI, 2021). In the early phase of its operation, the PDS functioned as a universal programme, helping all citizens regardless of their income. However, concerns about the inefficiency and the higher financial burden, the GOI switched the programme to the Targeted Public Distribution System (TPDS), which focuses on assisting only the poor (Swaminathan, 2002). With the enactment of the National Food Security Act (NFSA) in 2013, the scheme was further enhanced by covering two-thirds of the population representing themselves as AAY and PHH. The introduction of prioritisation instead of universal scheme has led to debate, the supporters argues that it directs resources better to those in need, while critics argue that it often makes errors, leaving out the deserving families (Dutta and Ramaswami, 2001).Recently, number of efforts like digitalisation, Aadhaar linking, biometric identification, and use of electronic Point of Sale (ePoS) devices have been made to improve the efficiency and effectiveness of the PDS. (George, 2021). Despite of its problems, the PDS remains an imperative mechanism. Its success varies among the states, some states like Kerala known as exemplary for effectiveness.

2.4.5 Components and Structure of PDS

The Public Distribution System in India is joint, multi tired mechanism involving central and state government to supply subsidised food grains to the vulnerable sections of society through a network of FPS. It is process of cooperative administration of union and state government involving a procedure of purchase from farmers, storing at FCI, allocation to the state government and distribution to the

consumers through FPS. (Jha & Srinivasan, 2001). The FCI, which operates at the national level, is in charge of buying, preserving and storing of these goods in Central and State Warehouses. (Department of Food and Public Distribution (2023),

Following the procurement, the Union government allocates the food grains to each state as per number of families that have been designated as Priority and Non-Priority ration cards. (Chand, 2022). Following the allotment, the State governments distribute these food grains through their respective Food and Civil Supplies Departments. They accomplish this by way of a network of Fair Price stores (FPS), also referred to as ration stores. As per the norms of NFSA2013, these stores are maintained by cooperatives, NGOs, or private businesses and provide the subsidised goods to the qualified families. Based on specific socioeconomic factors, PDS households or beneficiaries are divided into groups known as *AAY*, Priority Households (PHH), and Non-Priority Households (NPHH). They receive ration cards that allow them to purchase the designated goods from the FPS in their neighbourhood (Dorin, 2017). Through an end-to-end computerization process, comprising the e-PDS and Direct Benefit Transfer (DBT) systems, the whole PDS process is digitally recorded from procurement to distribution with the purpose of increasing the system's efficiency and transparency (Khera, 2021).

2.4.6 Role of PDS in Food Security

The PDS has played an important role in achieving food security. Food security includes the availability, accessibility, consumption and stability of food supply. In India, the PDS is crucial for distributing essential goods to a large population. It is a key element in efforts to reduce poverty and support those who are undernourished (Pooja O. Narada,2007). The PDS contributes significantly to food security in multiple ways (Dreze & Khera,2015). The FCI buys food grains and distributes them to BPL and APL households through ration shops. Kumar et al. (2014) supported previous studies by showing that access to the PDS has been vital in reducing poverty and improving food security in India. Their study reveals that the PDS's share in calorie consumption has been steadily increasing since 2004-2005, then it helped in reducing poverty by 3.5 percentage between 2014 and 2012. Mooij (2012) argued

that the PDS acts as a safety net, especially important in Kerala and Karnataka. He pointed out that the PDS has helped reduce poverty and improve food security in these states.

Abannavar and Harale (2014) found a positive link between food security and social development in India. This connection was strongest in education and health. Ajendran and Diwankar (2015) found a strong link between food security and the PDS in India. They noted a decline of 23.4 percentage points in the percentage of the rural and urban population living in poverty from 1993-1994 to 2011-2012. This decline was mainly due to the expansion of the PDS, which made food more affordable for poor households. The PDS has helped economic access by providing food grains at subsidized prices. This has lowered food costs for low-income households, leading to an increase in their average monthly per capita spending. Supporting studies include those by Suryanarayana (2001), Amaresh and Nirankar (2001), and Deepa and Shanmugam (2016).

Pal and Singh (1996) suggest expanding PDS coverage to less served states and subsidizing prices for the poor. Achuthan and Savani (1995) recommend that PDS benefits focus on the poorest households and improve distribution efficiency. Mohinuddin Alamgir and Poonan Arora (1991) propose a grassroots approach to food security. Pushpa Girimaji (1992) and Gurumoorhty (1992) highlight PDS distribution issues and suggest forming vigilance committees for effective grain distribution. The PDS is a major policy tool of the Government of India for ensuring food security, particularly for vulnerable groups (Ashok Gulati and Shweta Saini, 2015). Researchers such as Suryanarayana (2001), Kripa Shankar (2002), and Himanshu (2013) have studied the close link between the PDS and poverty eradication in India. Additionally, Nirankar and Amaresh (2010) found that the PDS offers significant relief to the poorest sections of society, especially in rural areas.

Parasuraman S. and Rajarethnam T (2011) assessed food security in Vidarbha, finds substantial under nutrition among children, adolescents, and women and recommended for expanding the PDS to include families above the poverty line. Roopa Sharma (2011) recommends for more Fair price shops, supply of better goods

and improved supervision. George (1983) examined the impact of food subsidies withdrawal on nutritional status in Kerala and Gujarat. He found calorie intake decreased by 46 points among the higher-income group and by 138 among the lowest income group.

Despite its significant role, critiques of the PDS point out problems such as leakages, corruption, inclusion and exclusion errors, and the quality of food grains supplied (Kochar, 2005). Amalesh Banarjee (2004) discusses food security challenges and suggests improvements for the PDS. Kripa Shankar (2004) highlights the inefficacy of the TPDS without assured income for vulnerable households. Bhagyalakshmi (2004) supports food grain banks as a solution to food insecurity. Ruder Datt (1999) advocates for economic development as the key to achieving lasting food security. Chauhan (1999) emphasizes rural development efforts. Shanthanu Nagpal (1999) calls for political awareness and cooperation for food security in the Hindukush Himalaya region. Gordon (1998) evaluates the cost-benefit analysis of the PDS in Haryana and Karnataka, supporting ongoing food subsidies. Rahim (1997) reviews PDS management in Andhra Pradesh, recommending organizational improvements. Amita Shah (1997) calls for better access to land for resource-poor households to ensure food security.

2.4.7. Universal to Targeted: The Targeted Public Distribution System in India

The Development of The Public Distribution System (PDS) in India has witnessed number of reform initiatives since its launching. Its development can be divided into four main phases: pre-independence, the early post-independence period, the move to a targeted system, and the latest updates under the National Food Security Act (NFSA).

The origins of the PDS in India go back to the rationing system set up by the British during World War II, mostly in urban areas to ensure that necessary goods were available during wartime. (Balakrishnan, 1990). After independence, the government extended the scheme to the entire nation and enlarged the number of other essential items beyond just food grains. During the period, the PDS has become vital in meeting food shortages and food inflation. (Parappurathu et al., 2013). Though the PDS was

considered as vital element to ensure food security in India , it was seriously criticized on multiple grounds and structural change in policy have been suggested for a number of reasons -including its failure to serve households of poor, urban bias, ineffectiveness in assisting the low income/ high poverty regions, large fiscal burden due to general entitlement to all households, the inefficiency of the FCI, diversion and poor quality of the grain supplied etc. (Tyagi, 1990). (Radhakrishna & Subbarao, 1997). Parikh (1994) Ahluwalia (1993). Following the recommendations of the Chief Ministers Conference in July 1996, the government decided to streamline the PDS in the form of Targeted PDS (TPDS).

As a result of large-scale criticism for its inefficiency and accepting the recommendations of the Chief Ministers Conference in July 1996, the GOI decided to streamline the PDS in the form of Targeted PDS (TPDS). The TPDS classified the beneficiaries into Below Poverty Line (BPL) and Above Poverty Line (APL) category, each getting different levels of subsidies (Suryanarayana, 1995). The enactment of the NFSA in 2013 and consequent classification of beneficiaries in to Priority and Non-Priority category marks a major shift in policy of Targeting in the PDS. The act legally guarantees enough food for the subsistence of the poor and empowering women by assigning that ration cards in the name of the eldest adult woman in each household (Drèze & Khera, 2017). The reforms in PDS also includes additional reforms, such as end to end computerization, digitization of beneficiary data, and the introduction of Aadhaar-based biometric checks to improve transparency and reduce leakage. (Gulati & Saini, 2015). Hence the effectiveness and efficiency of such reforms are still a topic of ongoing research and discussion.

2.4.8 Revamped Public Distribution System (RPDS)

The Govt. of India launched the Revamped Public Distribution System (RPDS) in 1992 by targeting the poor household residing in hilly, remote areas of the country. This marked a shift towards a more focused approach in the PDS. However, Shankar (1997) critically examined the RPDS's performance in remote tribal villages, finding significant issues with corruption, where entire food grains and a large portion of kerosene and sugar were diverted to the black market.

2.4.9 Targeted Public Distribution System (TPDS) (1997): Further reforms were introduced in 1997, with the launch of the Targeted Public Distribution System (TPDS). The TPDS aimed to serve the poorest of the poor in the country by providing them food grains at a highly subsidized rate. Households were categorized into Above Poverty Line (APL), Below Poverty Line (BPL), and *AAY* beneficiaries, which is the poorest of the BPL households (Khera, 2011). Indira Hirway (2003) presents additional problems with the BPL census 2002-2003 and suggests an alternative approach to targeting and poverty alleviation in India. Mathura Swaminathan and Neeta Misra (2001) focus on the cost arising from targeting errors – exclusion errors and inclusion errors in the system of public distribution in India. They suggest that the large size of target groups under hunger and malnutrition strengthens the demand for a policy of broad coverage and expanded and improved food and nutrition programs, including the public distribution system. The policies of targeting, a standard component of structural adjustment programme, inflicted on developing countries by the international financial institutions, the deeper plot to dismantle the welfare programmes (Madhura Swaminathan 2000). Reshmi R.Nair (2008) has stated that the shift from universal PDS to targeted PDS excludes a considerable number of the poor from the safety net of the PDS in Kerala. What is needed now is not a demand for universalisation of the PDS but a revision of the food security norm, a more BPL-friendly system and its efficient functioning (Suryanarayana M H 2008). Hence a well-targeted and properly functioning PDS is an important constituent of our food security (Asthana M.D. (2010) .The national food security act still include the policy of targeting the bottom 67 percent is still a big problem since it exclude a lot otherwise abled persons. (Ashok et al., 2013). The status of food security in Kerala in the context of targeting with that of other south Indian states found in the lowest position but it is better in the case of the other two dimensions like accessibility, and food utilization. It is also argued that targeting the PDS is logically sound, but that narrow targeting is not a practical way to start in a food deficit state like Kerala (Pillai, 2013)

2.4.10 National Food Security Act (2013): In 1996, the World Food Summit delegates achieved a significant milestone by formally adopting the Right to Adequate Food, paving the way for a rights-based approach to food security. More than 40

countries have incorporated the right to food into their constitutions, and the FAO estimates that the right to food could be legally protected in approximately 54 countries (McClain-Nhlapo, 2004). The enactment of the NFSA in 2013 marked a significant milestone in the evolution of the PDS in India. The NFSA 2013 has ensured the entitlement of highly subsidized food grains to two-thirds of India's population. The enactment of NFSA has solidified the importance of the Public Distribution System (PDS) in ensuring food security in the country. (Drèze & Khera, 2017). The execution of National Food Security Act (NFSA), 2013 in Kerala and consequent coverage of two-third of its population directly address the chronic food insecurity of state. By officially recognizing the right to food, the priority household are eligible 5Kg grains per person and the AAY card holders which represent the poorest of the poor receive 35 Kg food grains per household. (Government of India, 2013). Recognizing the importance of food security, the State of Kerala also implemented the Act, and introduced reforms like digitalization of system, online management of food grain inventories and e PoS device in FPS to prevent leakages (George, 2019).

2.4.11 PMGKAY 2020

The COVID-19 pandemic has harshly impacted the food security at national and international level. In response to this pandemic, the Government of India introduced Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY), which doubled the monthly food grain distribution to 80 crore beneficiaries under the National Food Security Act. The policy has succeeded in preventing large-scale hunger deaths in India, making it one of the world's major food security interventions. (Pramod and Ibrahim 2023).

2.4.12 Challenges Faced by PDS in India

The diversion of subsidized food grains from intended households to the open market, the leakage, is one of the most important challenge in ensuring food security. The Corruption at various stages, from procurement to distribution, adds the gravity of such leakages (Khera,2011). The PDS has also faced number of criticisms for incorrect identification of beneficiaries, consequent increase in error of targeting. (Swaminathan & Misra,2001). The poor quality of food grains not only weakens the

nutritional goals of the food policy but may also discourage beneficiaries from availing the PDS (Singh, Bhogal & Kaur, 2020).

2.4.13 Key Provisions and Initiatives for PDS in Kerala

Under the National Food Security Act, the state of Kerala has executed number of regulations and initiatives to ensure successful implementation of PDS and to food security. (George, 2017). The "One Nation One Ration Card" scheme, which enhances the migrant workers and their families to access PDS benefits from any FPS in the state is one of such initiatives. (Kerala Food and Civil Supplies Department, 2020). The digitalisation of ration card data base, Automation of Fair Price Shops, and electronic Point of Sale (ePoS) devices, etc enhanced the transparency in transactions of food grains (John & Mutatkar, 2018).The "Akshaya", the program meant for digitalisation of public services, also assisted the people for availing the PDS benefit. (Kerala State IT Mission, 2020). Despite these efforts, issues like beneficiary identification, the poor quality of the food grains, and the inadequacy of food grain entitlements are still unsettled.

2.4.14 Performance of PDS in Kerala

Kerala's socio-political environment, administrative effectiveness, and creative policy initiatives have all had a substantial impact on the success of the Public Distribution System. With broad coverage and minimal leakage, Kerala's PDS is regarded as one of the most thorough and successful in the nation (Ibrahim and Pramod 2006). The question of achieving food security viz- a- viz food availability and self-sufficiency in production is unrealistic to expect in Kerala, but food security has been enhanced considerably through a pro-poor public policy regime. It will be a hard choice for Kerala either to continue with the universal coverage of PDS involving unsustainable subsidies or to restrict the PDS only to the poor with implications for enhancing the state’s vulnerability to food security (Kannan, K.P. 2000). In Kerala, the PDS served about 90% of the rural population, while the leakage rate was just 7 percent. (Khera 2011). This stands in stark contrast to the national average, where substantially greater leakage rates have been observed. The author credits Kerala's distinctive socio-political climate, which is characterised by active citizen participation, political

mobilisation, and welfare-oriented policies, for this achievement. The effectiveness of its ration stores is another factor in PDS's performance in Kerala. Since cooperative organisations run the majority of the ration stores in Kerala, the system is accountable and transparent (Balakrishnan, 2019). Further enhancing the PDS's efficacy are e-governance initiatives including the digitalization of ration cards and the deployment of electronic Point of Sale (ePoS) devices (Department of Food and Public Distribution, 2017.George (2017) emphasized challenges related to system sustainability, including the costs of procurement and the long-term impact of monoculture farming on PDS commodities. To address these challenges and further enhance the system's effectiveness, continued efforts are essential, even though Kerala's PDS has made significant progress in ensuring food security.

2.4.15 Analysis of Beneficiary Inclusion and Exclusion Errors

The assessment of targeting errors is vital to realize whether and to what extend the benefit of NFSA is reaching the priority household. The error of targeting is the most discussed academic issue in the operation of food policy in India. (Swaminathan & Mishra (2001), Jain S.K. (2004), Mooij (2001), Datta and Ramaswami (2001). The Exclusion errors arises when eligible households are wrongly removed from the scheme while Inclusion errors happen when non-eligible households are incorrectly added. Cornia & Stewart (1993) states that a shift from universal treatment to targeted programmes increases errors of exclusion, (called F mistakes) that are on account of failure to reach the target population, while lowering the errors of inclusion (also called E mistakes or mistakes of excessive coverage). They reasoned in favour of a weighting policy that places more weights on the F mistakes i.e. errors of exclusion than on the E mistakes, the errors of inclusion. In a study of Maharashtra, Swaminathan and Mishra (2001) examined the targeting errors and found the evidence in support of the Cornia-Stewart hypothesis. As per the estimates of NSSO, 25 percentage of non-poor families had access to the PDS, while about 61.2 percentage of the poorest households were included in the scheme during 2011-12(Dreze & Khera, 2015). It highlights intensity of error both in inclusion and exclusion. The exclusion error in Kerala is around 7 percentage, whereas the national average is 10

percentage (Himanshu et al. (2020). The same study found that 8.3percentage of families of the beneficiary in Kerala are non-poor, indicating the need for better identification and inclusion. The government is trying to reduce such targeting errors -inclusion and exclusion - by digitizing the beneficiary list and using Aadhaar-based biometric authentication (Khera, 2017). However, the effectiveness of these policies in Kerala's PDS needs to be assessed.

2.4.16 Studies on the Impact of NFSA on PDS in Other States

The NFSA 2013 has changed the PDS significantly in many Indian states and several scholars have examined the impact of these changes. A study conducted by Madhura Swaminathan (2000) before the NFSA2013 pointed out that there are notable regional differences in its operation. For example, four southern states (Andhra Pradesh, Tamil Nadu, Kerala, and Karnataka) carries about 50 percent of the total PDS food grain off-take in the country. Meanwhile, the four northern states (Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh) only received 10 percent of the total off-take. The analysis showed that states with broad coverage and good distribution systems offered better access to the PDS for the poor. In contrast, states with weak and ineffective distribution networks failed to reach either the poor or the rich. The case of Kerala showed that with political will, food and nutrition security could improve through an effective public food distribution system.

In a study by Khera and Puri (2017), researchers found that the NFSA may have increased the frequency of deliveries and the quantity of grains given to recipients in Bihar. In West Bengal, Chatterjee et al. (2020) found that the implementation of the NFSA has enhanced food security for disadvantaged families by improving access to subsidized grains. However, the policy outcomes are not always positive in every state. The study conducted by Deshpande and Sharma (2019) in Maharashtra found that the NFSA led to a substantial exclusion of eligible families because of wrong identification and targeting. Joshi and Kumar (2018) also highlighted issues like in grain leakage, corruption, and violations of the NFSA in Uttar Pradesh. In contrast, Tripathy and Mishra (2021) found that, the NFSA greatly improved the reach and

effectiveness of the PDS in Odisha when it combined with state programs like the State Food Security Scheme (SFSS).

2.4.17 PDS Performance and Impact across States: comparative study

Large number of studies has been conducted to evaluate the performance and effect of the scheme across the states reveals the gap in effective implementation and the consequent outcome. Among Kerala and Punjab, two states with very dissimilar socio-economic and agricultural practices, the states of Kerala's PDS was much effective in controlling diversion of food grains than Punjab's. However, the coverage and inclusiveness of poor household is higher in Punjab compared to the state of Kerala. (Menon et al. 2020). With respect to south Indian states, Kerala and Tamil Nadu done better in terms its effectiveness, with less leakages and better than other states namely Karnataka and Andhra Pradesh. (Choudhary 2019). The study conducted by Kumar and Rao (2018) examined the performance and inclusion rate of PDS in Bihar, Odisha, Gujarat and Kerala, and it shows substantial gap in implementation of NFSA. Compared to western states, the eastern states face more challenges in PDS implementation, leading to higher exclusion errors and leakages. (Kumar and Sharma 2019). With respect to urban and rural locality, the urban area faced unique issues in reaching the poor, while the scheme in rural area reported better results in reducing food insecurity. (Gupta and Khan 2018)

2.5 Conclusion

The theoretical framework and review of literature depicts a series of academic search and ideas that briefs the various dimensions of food security. Theories of famine reveal that hunger is not only caused by the scarcity of food but also by a lack of access to it. Studies on food insecurity and hunger are based on both traditional and contemporary theories of famine. This approach clearly states that hunger is often caused by socio-economic constraints rather than just the scarcity of food. Insights from these theories enable us to understand the different approaches to food security, including rights-based approaches and market-based approaches. The Public Distribution System (PDS) in India, particularly under the National Food Security Act (NFSA) of 2013, is a crucial component of ensuring that people have access to food

through the distribution of subsidized grains. Welfare economics supports such state interventions, particularly in terms of efficiency and equity in resource distribution. The concept of public goods supports the argument that food security should be available to all, while the theory of social justice emphasizes equity and the moral need to ensure that food is a basic human right. There are extensive studies on the importance of the PDS in providing subsidized food, especially to the economically weaker sections before the enactment of NFSA 2013. The NFSA of 2013 further reinforces the concept of food entitlements, reiterating the role of the state in ensuring food security.

CHAPTER III

TRENDS IN FOOD GRAIN PRODUCTION AND THE ROLE OF PDS IN MEETING FOOD SECURITY IN KERALA

Food security is a critical aspect of sustainable development, particularly in regions with high population densities and limited agricultural resources (FAO,2017). In Kerala, where urbanization and land constraints affect food production, the PDS plays a crucial role in bridging the gap between household food requirements and domestic production. The PDS is a government-sponsored programme designed to provide essential food grains at subsidized rates, particularly to vulnerable sections of society, contributing significantly to food security at the household level (Gulati & Saini, 2015).

Over the years, food grain production in Kerala has faced challenges due to changing agricultural practices, land use policies, and a gradual shift towards cash crops, which provide higher returns than traditional food grains (Nair & Menon, 2018). These trends have influenced the state's reliance on external sources to meet its food grain needs, making the PDS vital in ensuring access to affordable food. According to recent studies, rice and wheat the primary staples are increasingly sourced from outside Kerala to meet local demand, emphasizing the importance of PDS in maintaining household food security (Planning Commission, 2019).

In this chapter, the study examines the historical and current trends in food grain production in Kerala, analyzing the factors influencing these patterns. The study also explores the contribution of the PDS in fulfilling the food grain needs of households across the state. This analysis aims to highlight the extent to which the PDS complements local production and helps to achieve food security for both rural and urban populations in Kerala. By understanding these dynamics, the study can give an overview into the broader challenges and opportunities within Kerala's food security framework and assess the role of policy interventions in supporting sustainable food access.

3.1 Understanding Kerala's Agricultural Landscape: An Introduction

Kerala's food grain production has evolved considerably over the decades, shaped by historical, economic, and environmental factors unique to the region. Historically, Kerala was an agrarian state, with rice being the dominant crop cultivated across its fertile plains and lowlands. However, as the state developed, agricultural practices and priorities shifted, influenced by a range of social and economic changes that altered the landscape of food grain production (Nair, 2017). The transition from a predominantly food grain-based economy to one with a growing focus on cash crops reflects a significant shift in the agrarian priorities of the region.

Rice and tapioca remain culturally and economically important crops in Kerala, symbolizing both sustenance and local tradition (Harilal & Joseph, 2019). Yet, despite their significance, these crops face competition from high-revenue cash crops such as rubber, coconut, and spices, which occupy a substantial share of Kerala's agricultural land today. This shift has implications for food security, as reliance on external sources of food grains has grown, making the state vulnerable to supply fluctuations and price volatility in the national market (Krishnan, 2020). Land use trends further underscore the state's agricultural transformation, with a notable reduction in area under food grain cultivation as farmers seek higher returns from cash crops. Changing crop patterns are also influenced by environmental factors, including soil quality, water availability, and climate conditions that affect the productivity of food grains in the region (Sivaramakrishnan,2021). This section provides an overview of these shifts in Kerala's food grain production, examining the historical trajectory, key crops, and evolving land use trends that shape the state's agricultural condition and food economy.

3.1.1 Kerala's Agricultural Landscape: A Historical Perspective

Agricultural production in Kerala has undergone significant transformations over the decades, shaped by the state's unique socio-economic, cultural, and environmental contexts. Historically, Kerala was predominantly an agrarian society where food grain production, particularly rice, was the mainstay of the economy. Rice cultivation was widespread due to the region's fertile soil, abundant water resources from monsoon rains, and favorable climatic conditions. In early agrarian societies, rice held not only economic importance but also cultural significance, being deeply intertwined with the

local customs, diet, and lifestyle of Kerala's people (Harilal & Joseph, 2019). Other food grains, such as pulses and millets, were also part of the traditional agricultural system, but rice remained the cornerstone due to its resilience and adaptability to the region's environment (Gopalan, 2016).

The first major shift in Kerala's agricultural landscape began in the mid-20th century with land reform policies, particularly those introduced in the 1950s and 1960s. These reforms aimed to redistribute land from wealthy landlords to tenant farmers, thereby promoting agricultural equity and productivity. While the reforms were groundbreaking, providing land ownership to marginalized communities, they also had unintended consequences. Many new landholders, seeking to maximize income, gradually shifted from food grains to cash crops, which promised higher returns. This shift marked a departure from the traditional subsistence-oriented agriculture to a more market-driven approach, which focused less on food grains and more on high-value crops (Kurien, 2018). This transformation had profound implications, including a gradual decline in local food grain production, leading Kerala to become increasingly dependent on food imports to meet its needs.

The Green Revolution in the 1960s and 1970s, which aimed to increase food grain productivity across India through the introduction of high-yielding varieties, chemical fertilizers, and improved irrigation, had a relatively limited impact on Kerala. Unlike other regions in India, Kerala's farmers were slower to adopt these high-yield varieties due to small landholdings, diverse cropping patterns, and specific agro-climatic conditions that did not always support new crop strains. Furthermore, Kerala's geographical constraints such as fragmented and hilly landscapes—posed challenges to the intensive, technology-driven agricultural practices promoted by the Green Revolution (Sadanandan, 2020). As a result, the state did not experience the same surge in food grain productivity that characterized the agricultural economies of other states, further contributing to Kerala's dependency on external food sources.

Over the subsequent decades, Kerala's agrarian economy increasingly shifted towards cash crops like rubber, coconut, tea, and spices, which offered better economic returns compared to traditional food grains. This transition was driven not only by the higher profitability of cash crops but also by Kerala's unique position in the global spice and plantation crop markets. The growing demand for these commodities, both domestically and internationally, incentivized farmers to replace food grains with

more profitable crops (Menon & Harikumar, 2019). While this shift boosted Kerala's export earnings and provided substantial income for farmers, it also had repercussions for food security. The reduction in food grain cultivation increased the state's reliance on food imports, exposing it to market fluctuations and price volatility, and raising concerns about sustainable food availability.

In recent years, policy initiatives aimed at reversing the decline in food grain production have been introduced. The National Food Security Act of 2013, which sought to improve food accessibility through the PDS, plays a crucial role in ensuring food availability for low-income households in Kerala. The PDS has been instrumental in providing subsidized rice and other essentials, thereby compensating for the shortfall in local production. Additionally, state government policies have attempted to support food grain farmers through subsidies and incentives aimed at revitalizing rice cultivation. However, despite these efforts, challenges remain, as structural and economic constraints continue to limit the viability of large-scale food grain production in the state (Chandran, 2021). Kerala's agricultural sector thus illustrates the complex interplay between economic incentives, cultural practices, and policy interventions. While the shift towards cash crops has brought economic benefits, it has also underscored the importance of a balanced agricultural policy that addresses both profitability and food security. Understanding Kerala's historical trajectory in food grain production is essential for developing sustainable policies that can support the state's unique agricultural needs. This historical perspective not only overview on the factors that influenced Kerala's agricultural evolution but also provides critical insights for policymakers striving to ensure food security while accommodating economic growth.

3.2 Land Use Trends in Kerala: A Temporal Analysis

The state of Kerala has witnessed significant shifts in land use and crop patterns over the past several decades, influenced by socio-economic factors, market demands, and environmental constraints. The trends reflect a gradual decline in food crop cultivation, particularly rice, and an increase in the area devoted to cash crops such as rubber, coconut, and spices. These changes have had profound impacts on Kerala's agricultural landscape, food security, and economy.The land use pattern in Kerala has undergone significant changes between 1970–71 and 2023–24, reflecting both

economic transformation and demographic pressures. The table 3.1 highlight the critical shifts in land utilization, revealing the dynamic nature of agricultural and non-agricultural land use in the state. This trend reflects the state's urbanization and industrialization, necessitating land for residential, commercial, and infrastructural development. Forests, which accounted for 27.85 percent of the total geographical area, have remained constant since 1980–81, highlighting the state's success in conserving forest cover. In contrast, land put to non-agricultural uses has shown a steady rise from 6.94 percent in 1970–71 to 15.69 percent in 2023–24, indicating rapid urbanization and infrastructural development. Barren and uncultivable land declined sharply from 2.21 percent to just 0.24 percent, while permanent pastures and grazing lands nearly disappeared, suggesting a decline in traditional livestock-based land use. Land under miscellaneous tree crops also contracted drastically, reflecting changes in cropping patterns and rural land use priorities.

Table 3.1

Land Use Trends in Kerala (Area in 1000Ha)

Land use classes		**1970-71**	**1980-81**	**1990-91**	**2000-01**	**2010-11**	**2020-21**	**2023-24**
Forests	Area	1055	1082	1082	1082	1082	1082	1082
	%	27.15	27.85	27.85	27.85	27.85	27.85	27.85
Land put to non-agricultural uses	Area	275	269	297	381	384	461	610
	%	7.08	6.94	7.65	10.1	10	11.86	15.69
Barren and uncultivable land	Area	72	86	58	29	19.5	9.5	9.4
	%	1.85	2.21	1.5	0.77	0.5	0.25	0.24
Permanent pastures and other grazing land	Area	28	5.4	19	0.164	0.153	0	0
	%	0.07	0.14	0.04	0.01	0.1	0	0
Land under miscellaneous tree crops	Area	132	64	34	15.4	3.6	2.4	2.1
	%	3.4	1.64	0.8	0.35	0.1	0.06	0.05
Cultivable waste	Area	79	129	95	59	92	94	102
	%	.20	3.32	2.43	1.64	2	2.42	2.63
Fallow other than current fallow	Area	22	27	26	34	52	43	51
	%	.05	0.69	0.68	0.88	1	1.1	1.32
Current fallow	Area	24	44	44	79	76	54	57
	%	.62	1.12	1.13	2.04	2	1.4	1.48
Net area sown	Area	2171	2180	2247	2206	2071	2035	1973
	%	.06	56.1	57.82	56.38	53	52.37	50.76
Area sown more than once	Area	761	705	796	815	575	533	563
	%	19.59	18.15	20.49	20.97	15	13.74	14.5
Gross cropped area	Area	2933	2885	3043	3021	2648	2568	2536
	%	77.01	74.25	78.31	70.74	68	66.1	65.27
Total Geographic area		3886	3886	3886	3886	3886	3886	3886

Note: Land put to non-agricultural uses includes marshy land, still water, water logged area and social forestry; Source: Department of Economics and Statistics, GoK

Meanwhile, cultivable waste has fluctuated but remained around 2–3 percent of the total area. The extent of fallow land, both current and other fallow, has increased slightly, pointing to challenges in agricultural sustainability and profitability. Net sown area has steadily declined from 56.1 percent to 50.76 percent, while gross cropped area also reduced from 74.25 percent to 65.27 percent, signalling a contraction of the agricultural base. This decline in net sown area raises concerns about the agricultural sector's ability to meet food demand amidst increasing population and urbanization pressures. The area sown more than once also dropped from a high of 761thousand hectares in 1970-71 to 533thousand hectares in 2020-21, indicating a reduction in cropping intensity and potentially less efficient land use. The area sown more than once has also declined, showing reduced crop intensification.

3.2.1 Agrarian Transition: A Shift from Food Crops to Commercial Crops.

Unlike other states, the agriculture sector in Kerala is dominated by commercial crops like coconut, rubber, tea, coffee and spices. The state has a significant share in the export of cashew, spices, coir and coir products. With more market dependency and relative profitability of cultivation, the share of commercial crops in total area under cultivation in the state has been rising at the cost of food crops like rice and tapioca (Jeromi 2003). Predominance of cash crops, compiled with high population density has ensured that the region has remained a chronically food deficit state. In this section we shall briefly look in to the commercialization process of cropping pattern especially the extent of predominance of commercial crops over food crops. More than 80 percentage of the total cropped area in the state at present is used for the cultivation of 10 major crops viz paddy, tapioca, coconut, rubber, pepper, coffee, arecanut, cardamom, cashew and tea. Area under these major crops and their relative share in the states total cropped area for the period 1960-61 to 2023-24 are shown in Table 3.2

Within a period of 60 years from 1960-61, the proportion of area under paddy, which is the predominant food crops in the state has declined from 31.16 percentage to 7.11 percentage showing an overall decrease of 76 percentage. Similarly, area under tapioca, which is the second major food crops in the state, has declined from 10.3

percentage of total cropped area in 1960-61 to just 2.2 percentage of total area in 2023-24. Thus, the share of area under food crops witnessed steep decline during the period of investigation. In other words, the land area under paddy and tapioca cultivation shrank to more than one-fourth compared to 1961. On the other hand, the share of area under commercial crops, such as coconut, rubber, pepper and coffee increased significantly during the period. The proportion of area under coconut increased from 21.32 percentages of total cropped area to 30 percentages, registering on impressive growth of 43 percentage during the period of investigation. Coconut is widely regarded as the principal competitive crop of paddy and as the two crops show opposite growth trends in area, as shown in Table 3.2. It is the conversion of paddy lands to coconut that is often mentioned in our context.

Table 3.2

Area Under Major Crops in Kerala (% to total cropped area)

Year	**1960-61**	**1970-71**	**1980-81**	**1990-91**	**2000-01**	**2010-11**	**2020-21**	**2023-24**
Paddy	31.16	29.34	27.79	18.38	11.6	8.05	7.9	7.11
Tapioca	10.31	10.01	8.49	4.81	3.7	2.73	2.5	2.2
Coconut	21.32	24.52	22.58	28.59	31.2	29.10	30.2	30.19
Rubber	5.23	6.11	8.24	12.62	15.8	20.17	21.7	21.6
Pepper	4.25	4.01	3.75	5.54	6.6	6.50	3.2	2.87
Cashewnut	2.31	3.50	4.9	3.8	2.9	1.66	1.5	4.3
Coffee	0.72	1.08	2.01	2.47	2.8	3.20	3.4	3.4
Arecanut	NA	NA	2.12	2.13	2.9	3.77	3.8	3.7
Cardamom	1.22	1.62	1.87	2.2	1.4	1.56	1.5	1.6
Tea	1.6	1.28	1.25	1.1	1.2	1.4	1.4	1.4
Food crops	41.47	39.85	36.28	23.19	15.3	10.78	10.4	9.31
Non-Food-crops	36.65	42.12	46.72	58.45	64.8	67.36	66.7	69.06

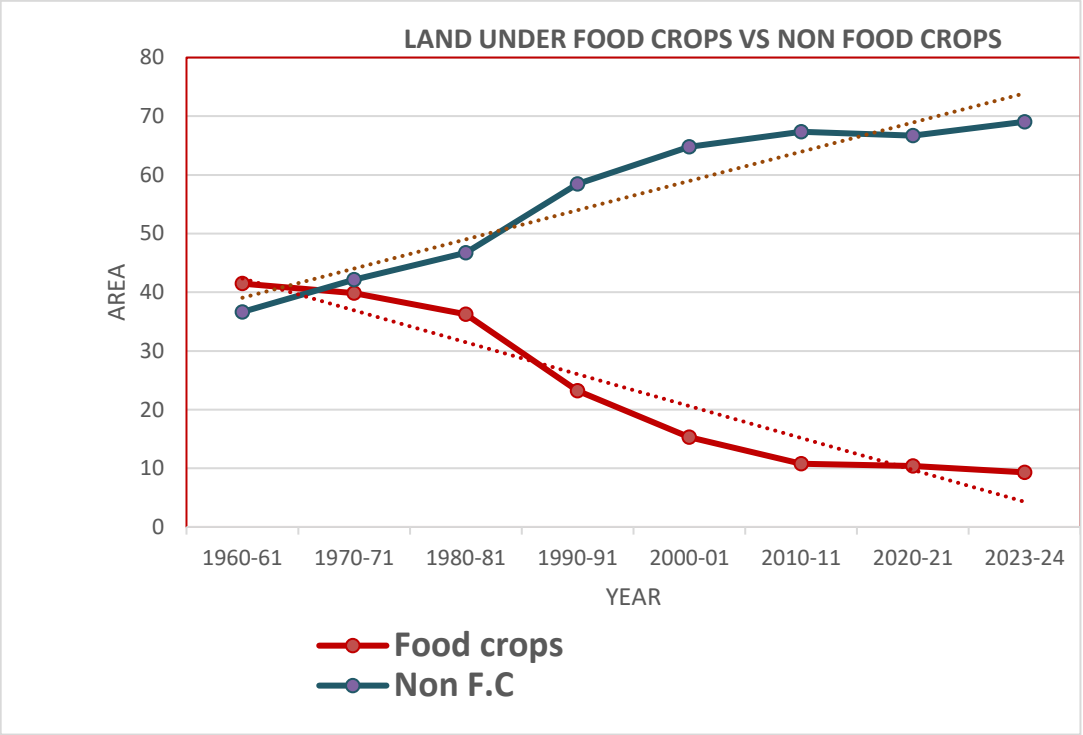
Source: Economic Review, Various Issues, State Planning Board, Thiruvananthapuram.

The land use data of leading crops in Kerala presented in table 3.2 clearly demonstrates a structural transformation in Kerala's agricultural sector. In 1960–61, food crops occupied 41.47% of the total cultivated area, while non-food crops

accounted for 36.65%. Over the decades, the share of land under food crops steadily declined, falling sharply to 23.19% by 1990–91 and further to just 9.31% by 2023–24. Conversely, non-food crops, primarily composed of plantation and commercial crops such as coconut, rubber, arecanut, coffee, tea, and pepper, expanded their dominance, rising from 36.65% in 1960–61 to 69.06% in 2023–24. The figure 3.1 also depicts the changing pattern of land use in Kerala between food crops and non-food crops from 1960–61 to 2023–24. This shift indicates a decisive reallocation of agricultural land away from food production towards cash crops, reflecting changing farmer incentives, market demand, and profitability structures. While this transition has supported income growth in the agrarian sector, it has also reduced Kerala's self-reliance in food production, increasing the state's dependence on imports of food grains from other regions. The widening food and non-food crop divide reflect farmers' growing preference for commercial and plantation crops, driven by higher profitability and market orientation, but it also raises serious concerns regarding the sustainability of domestic food production and food security in Kerala.

The figure 3.1depicts the changing pattern of land use in Kerala between food crops and non-food crops from 1960–61 to 2023–24. The area under food crops shows a continuous and sharp decline over the study period, falling from over 40 per cent in the early 1960s to below 10 per cent in recent years. In contrast, land under non-food crops exhibits a steady increase, supported by a positive linear trend, indicating a structural transformation in the agricultural sector. This shift reflects farmers' growing preference for commercial and plantation crops, driven by higher profitability and market orientation, but it also raises serious concerns regarding the sustainability of domestic food production and food security in Kerala.

Fig 3.1 Land under food crops vs non-food crops in Kerala



The overall performance of four lead crops in land utilisation is presented in Fig 3.2. The share of food crops namely paddy and tapioca witnessed a sharp decline whereas the share of area under rubber and coconut has increased considerably during the period of investigation. Thus, the better performance of non-food crops like rubber and coconut is at the cost of food crops like paddy and tapioca. Overall, Kerala's land use trends suggest a gradual diversion of agricultural land toward non-agricultural purposes, food crops to commercial crops, declining crop intensity, and shrinking rural resource bases, reflecting the state's shift from an agrarian economy towards urbanization and service sector dominance

Fig 3.2 Area Under Four Major Crops in Kerala1960-61 to 2023-24



3.3 Food Grain Production in Kerala: A Temporal Perspective

Understanding the trends in food grain production is crucial for assessing the food security status in Kerala, particularly within the framework of the National Food Security Act, 2013. Food grains, especially rice, form the backbone of Kerala's agricultural economy and play a vital role in the dietary patterns of its population. This section aims to provide a comprehensive statistical analysis of food grain production, focusing on recent production data for key crops and examining how these trends have evolved over the past few decades.

Recent production data reveal significant insights into the performance of food grains in Kerala, where rice remains the primary staple, supplemented by other essential grains. The analysis covers fluctuations in production levels, identifying the factors that contribute to these changes, such as climatic variations, agricultural practices, and policy impacts. Moreover, understanding production trends over the past few decades highlights the challenges faced by farmers and the adaptive strategies employed in response to evolving agricultural conditions.

3.3.1 Trends in Area, Production and Productivity of Paddy in Kerala

Paddy and tapioca have historically been the two most significant food crops in Kerala, serving as staples that ensured household food security. While paddy was the primary cereal, tapioca functioned as an alternative staple, especially during periods of scarcity. Over the past few decades, however, both crops have experienced a notable setback. The area under cultivation has steadily declined due to land-use shifts, urban expansion, and the growing preference for commercial crops. Consequently, production has fallen, and despite improvements in yield levels through technological interventions, overall output has not kept pace with the state's food requirements. This decline highlights the structural challenges in Kerala's agriculture and its increasing dependence on external sources for food security.

The data on paddy cultivation in Kerala from 1960–61 to 2023–24 reveals a paradoxical trend of declining area and production alongside rising productivity. In 1960–61, paddy was cultivated in 778 thousand hectares**,** yielding 1,067 thousand metric tonnes, with a productivity of 1,371 kg/hectare. The cultivated area reached its peak in 1970–71 at 875 thousand hectares**,** but thereafter began a consistent decline. By 2023–24, the area under paddy had contracted to just 180 thousand hectares, representing a drastic reduction of nearly 80% from the 1970s level. Production broadly mirrored the trend in area, reaching a peak of about 1.33 million tonnes in 1975–76, before entering a long-term decline. By 2010–11, production had fallen to 522 thousand tonnes, and despite a brief recovery to 633 thousand tonnes in 2020–21, it again dropped to 530 thousand tonnes in 2023–24. This demonstrates that improvements in yield have not been sufficient to fully compensate for the massive contraction in cultivation area.

In contrast, productivity has shown consistent and remarkable growth. From 1,371 kg/hectare in 1960–61, yields increased steadily to 1,942 kg/hectare by 1990–91, and further to 2,958 kg/hectare by 2023–24. This more than twofold rise in productivity reflects the adoption of high-yielding varieties, improved agricultural practices, and technological interventions

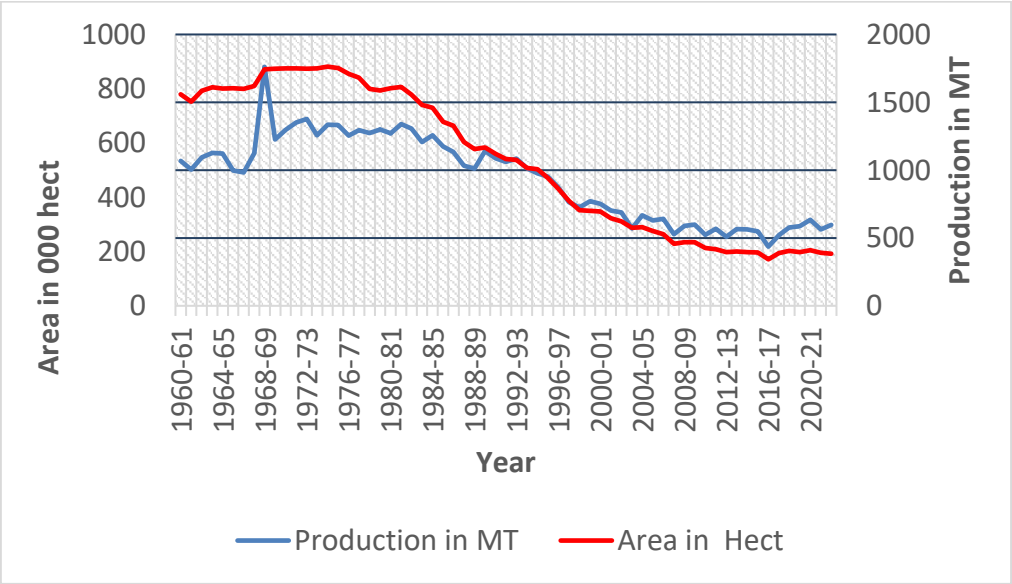
Table 3.3

Area, production, productivity of Paddy in Kerala

Year	Area (1000 hectares)	Production (in 1000 MT)	Productivity (Kg /Hectare)
1960-61	778	1067	1371
1965-66	802	997	1243
1970-71	875	1298	1348
1975-76	876	1331	1520
1980-81	801	1271	1587
1985-86	678	1173	1729
1990-91	559	1086	1942
1995-96	471	953	2023
2000-01	347	751	2162
2005-06	275	629	2285
2010-11	213	522	2452
2015-16	196	549	2790
2020-21	205	633	3091
2023-24	180	530.	2958

Source:Economic Review, Various Issues, State Planning Board, Thiruvananthapuram.

Fig 3.3. Rice Production in Kerala: A Temporal Perspective



The figure 3.3 presents the temporal trend in rice production and area under cultivation in Kerala from 1960–61 to 2020–21. Both area and production show an increasing trend until the late 1960s and early 1970s, followed by a sustained decline thereafter. The sharp reduction in area under rice cultivation from the mid-1980s onwards emerges as the primary factor behind the fall in production, indicating large-scale conversion of paddy lands to non-agricultural and commercial uses. Although production levels show minor fluctuations in recent years, they remain significantly below earlier peaks, highlighting the structural weakening of rice cultivation and raising concerns regarding long-term food security in Kerala.

3.3.2 Trends in Area, Production and Productivity of Tapioca in Kerala

The cultivation of tapioca in Kerala shows a distinct trajectory of decline in area alongside remarkable gains in productivity. In 1960–61, tapioca occupied 242,206 hectares, producing about 1.68 million tonnes, with a relatively low productivity of 6,949 kg/hectare. The cultivated area expanded during the 1970s, peaking at 326,865 hectares in 1975–76, when production also reached a high of over 5.39 million tonnes. However, from the 1980s onwards, the area under tapioca declined steadily, falling to 55,869 hectares by 2023–24, a contraction of nearly 80% compared to its peak. Despite this drastic reduction in area, tapioca production remained comparatively resilient due to substantial improvements in yield levels. Productivity increased more than sixfold, from 6,949 kg/hectare in 1960–61 to 42,345 kg/hectare in 2023–24, with notable accelerations after the 1990s. The most dramatic jump was observed in 2020–21, when productivity reached 94,813 kg/hectare, largely due to technological improvements, adoption of high-yielding varieties, and better cultivation practices, although production that year (3.03 million tonnes) did not reach past historical highs because of reduced area.

Overall, the data reveal a structural shift in tapioca cultivation since the late 20th century due to land diversion, urbanization, and changing food preferences. These trends suggest that tapioca has transitioned from a food-security staple of earlier decades to a high-productivity crop cultivated in limited pockets, reflecting both technological advancement and broader changes in agricultural land use. The

trajectories of paddy and tapioca cultivation in Kerala between 1960–61 and 2023–24 highlight a common pattern of declining cultivation area coupled with remarkable improvements in productivity. Paddy, once the dominant staple, witnessed an almost 80% reduction in area, with production falling in tandem despite steady yield gains. Similarly, tapioca, which peaked in the 1970s as a key food-security crop, also lost nearly 80% of its area by 2023–24, though its productivity rose more than six-fold. These trends point to a structural transformation in Kerala's agriculture, where technological and agronomic improvements have enhanced efficiency, but shrinking land under traditional food crops has curtailed overall output. The shift underscores the broader reallocation of agricultural land towards non-food and commercial crops, with important implications for food security and the sustainability of the state's agrarian economy.

3.4. Commercial Crop Dynamics in Kerala: Trends in Area, Production and Productivity

Non-food crops such as rubber, coconut, pepper, coffee, and arecanut constitute the backbone of Kerala's commercial agriculture and play a decisive role in shaping its agrarian economy. Unlike food crops, which have witnessed a sustained decline in area and output, the cultivation of these plantation and cash crops has expanded steadily, driven by higher profitability, export potential, and favourable agro-climatic conditions. Rubber, in particular, has emerged as a dominant crop, contributing significantly to household incomes and industrial raw material supply, while coconut continues to retain its traditional importance in Kerala's agricultural landscape. The overall performance of non-food crops has been relatively robust, cushioning farm incomes despite setbacks in food crop production. However, this structural reorientation towards commercial crops raises critical questions regarding long-term food security, land use sustainability, and the vulnerability of the farming sector to global market fluctuations.

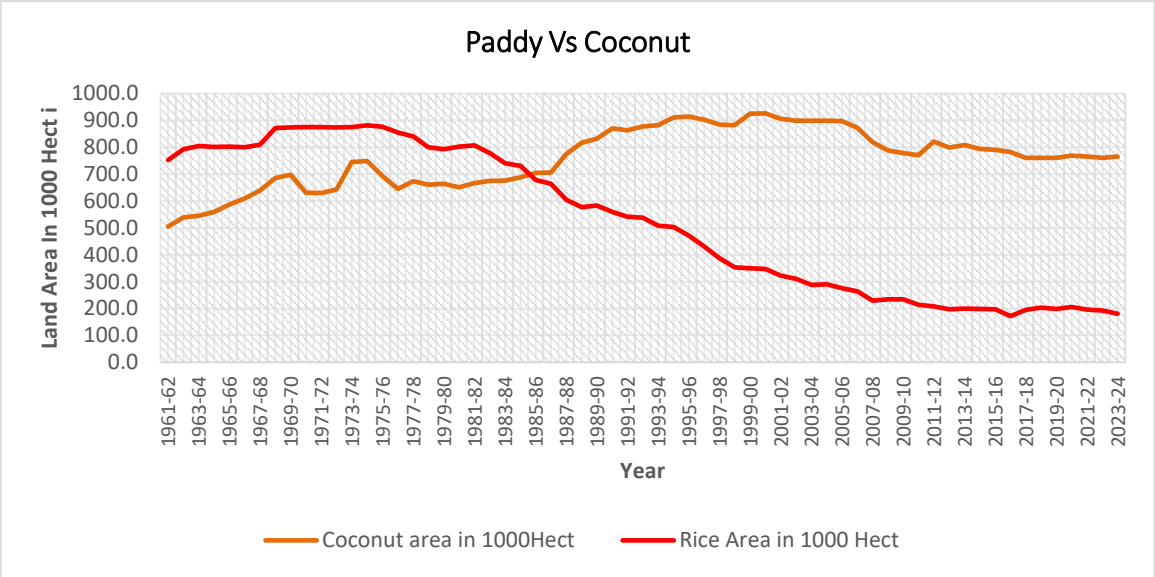
3.4.1Trends in Area, Production and Productivity of Coconuts in Kerala

Coconut cultivation has historically held a central place in Kerala's agricultural economy, both as a subsistence crop and as a source of income. The area under

coconut expanded from 500,768 hectares in 1960–61 to a peak of 925,783 hectares in 2000–01, but subsequently declined, stabilizing around 765,842 hectares in 2023–24. Production followed a similar trajectory, rising from 3,229 million nuts in 1960–61 to a high of 6,326 million nuts in 2005–06**,** before declining in the subsequent decade, with a modest recovery to 5,523 million nuts in 2023–24. Productivity, measured in nuts per hectare, exhibited an uneven pattern: after falling during the 1960s and 1970s, it began to improve from the mid-1990s, reaching 7,046 nuts per hectare in 2005–06 and further to 7,211 nuts per hectare in 2023–24.

The figure highlights a clear structural shift in land use between paddy and coconut cultivation in Kerala over the long run. Paddy area shows a persistent and sharp decline from the mid-1970s onward, accelerating after the late 1980s, indicating the gradual withdrawal of land from food-grain cultivation due to rising costs, labour shortages, and conversion to alternative uses. In contrast, coconut area records a steady expansion up to the late 1990s, followed by relative stabilization with minor fluctuations in the subsequent years. This contrasting trend underscores a transition in Kerala's agrarian landscape away from traditional paddy cultivation toward perennial commercial crops like coconut, with important implications for food security, cropping patterns, and sustainability of the agricultural sector.

Fig 3.4 Performance of land area Paddy Vs Coconut



The trends in coconut farming suggest that while expansion of area initially drove production growth, recent gains are increasingly attributable to improvements in productivity. However, the overall stagnation in production despite higher yields reflects both area contraction and challenges such as pest infestations, price fluctuations, and competition from other crops. Coconut thus remains a vital non-food crop in Kerala, but its long-term sustainability requires renewed policy focus on yield improvement, replantation, and value-addition.

Table 3.4

Trends in Area, Production and Productivity of Coconuts in Kerala

Year	Area (in hectare)	Production (million nuts)	Productivity (nuts per Hectare)
1960-61	500768	3229	6430
1965-66	586313	3293	5616
1970-71	630212	3981	5048
1975-76	692945	3439	4963
1980-81	651370	3008	4618
1985-86	704682	3377	4792
1990-91	870022	4232	4864
1995-96	914370	5235	5638
2000-01	925783	5536	5980
2005-06	897833	6326	7046
2010-11	770473	5287	6862
2015-16	790223	5873	7432
2020-21	768809	4788	6228
2023-24	765842	5523	7211

Source: Economic Review, Various Issues, State Planning Board, Thiruvananthapuram.

3.4.2 Trends in Area, Production and Productivity of Rubber

The trends in rubber cultivation in Kerala from 1960–61 to 2023–24 reveal three distinct phases of growth and stagnation. The area under cultivation expanded steadily from 1.22 lakh hectares in 1960–61 to over 5.5 lakh hectares by 2023–24**,** with the most rapid expansion occurring up to the 1990s, after which the area largely

stabilized. Production rose correspondingly from 23,032 MT in 1960–61 to a peak of 7.7 lakh MT in 2010–11**,** before declining sharply to 4.39 lakh MT in 2015–16 due to falling global prices, rising costs, and reduced tapping, and then partially recovering to 5.33 lakh MT in 2023–24**.** Productivity showed a steady rise from 188 kg/ha in 1960–61 to a maximum of 1,495 kg/ha in 2005–06**,** reflecting scientific improvements and better planting material, but declined thereafter, falling to 796 kg/ha in 2015–16 and recovering modestly to 968 kg/ha in 2023–24**.** Overall, the data highlight a transition from an expansion-driven phase to a productivity-led phase, followed by stagnation and decline, underscoring the challenges faced by Kerala's rubber sector in sustaining growth under changing economic and ecological conditions.

Table3. 5.

Area, Production and Productivity of Rubber

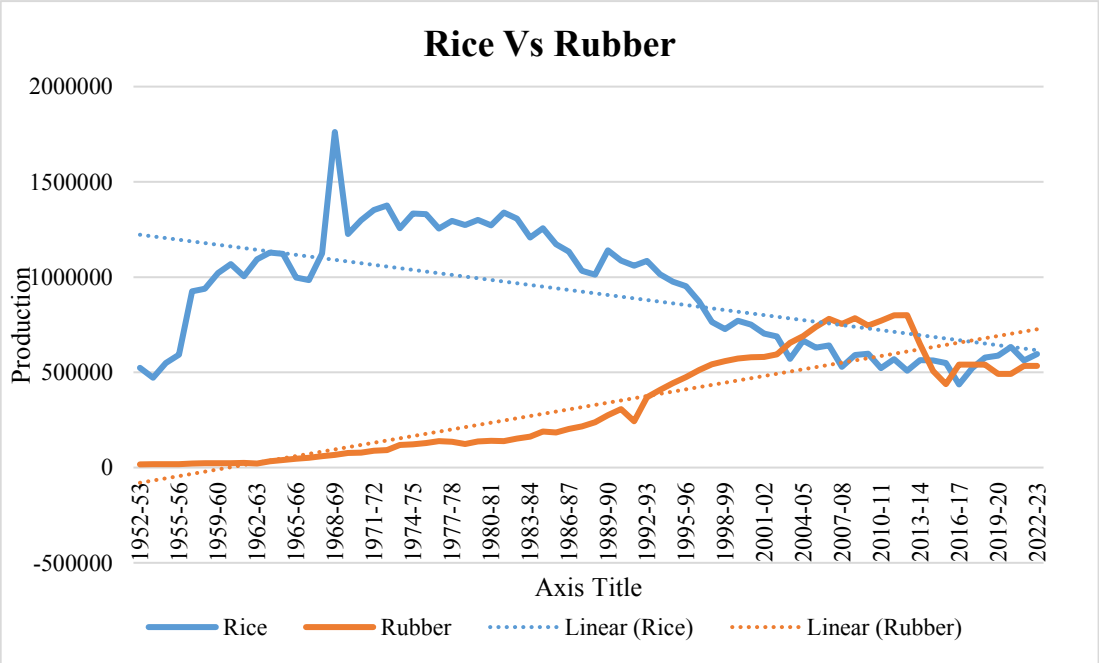
Rubber	Area in Hectare	Production in MT	Productivity kg /Hectare
1960-61	122327	23032	188
1965-66	149634	46953	314
1970-71	179259	78731	439
1975-76	206686	128769	623
1980-81	237769	140333	590
1985-86	330315	184700	559
1990-91	411615	307521	747
1995-96	448988	474555	1057
2000-01	474364	579866	1222
2005-06	494400	739225	1495
2010-11	534230	770580	1442
2015-16	550840	438630	796
2020-21	550650	492500	894
2023-24	551030	533500	968

Source: Economic Review, Various issue

The figure 3.5 illustrates the long-term trend in the production of rice and rubber in Kerala from 1952–53 to 2021–22. Rice production shows a clear declining trend over the period, despite fluctuations and a peak during the late 1960s and early

1970s, indicating a gradual contraction of paddy cultivation in the state. In contrast, rubber production exhibits a steady and sustained increase, particularly from the 1980s onwards, reflecting a structural shift in Kerala's agricultural sector toward commercial plantation crops. The opposing linear trends highlight a transition from food crop dominance to cash crop expansion, with important implications for food security and agricultural sustainability in Kerala.

Fig 3. 5 Comparison of Trends in Production of Rice and Rubber in Kerala (in MT)



3.4.3. Trends in Area and Production of Coffee & Tea

Table 3.6 presents a comprehensive overview of the trends in area and production of other plantation crops in Kerala, specifically coffee and tea, from 1960-61 to 2022-23. In the early 1960s, coffee cultivation covered 16,798 hectares, producing 7,409 metric tons (MT). Over the next decade, the area under coffee expanded dramatically to 31,564 hectares, with production nearly doubling to 13,574 MT by 1970-71. This period of growth indicates a rising interest and investment in coffee cultivation, likely driven by increasing domestic and international demand. The 1980s continue this trend of expansion for coffee, with the area reaching 57,949 hectares and production

climbing to 23,540 MT by 1980-81. However, a more significant transformation occurs within the rubber sector during the same timeframe. Tea cultivation, while historically significant, shows slower growth; the area remains relatively stable at 34,616 hectares, with production increasing to 60,638 MT. Entering the 21st century, the trends in these plantation crops show both resilience and challenges. In 2000-01, coffee reaches an area of 84,735 hectares with production at 70,550 MT, while rubber continues to dominate with 474,364 hectares and 579,866 MT produced. Tea, on the other hand, struggles to maintain its position, with production lagging behind at 69,132 MT from an area of 36,847 hectares. The years leading to 2021-22 show a slight stabilization in the areas of coffee and rubber, with coffee remaining around 85,880 hectares and rubber increasing marginally to 551,030 hectares. Production levels fluctuate slightly, with coffee producing 69,900 MT and rubber producing 533,500 MT in 2021-22. The tea sector sees a more significant variability, with production figures decreasing to 60,360 MT in 2021-22 after a peak in previous years. Overall, the data in Table 3.6 reflects the complexities of plantation crop cultivation in Kerala, highlighting significant growth in both coffee and rubber areas over the decades, contrasted with the more stagnant growth of tea. The fluctuations in production levels across these crops suggest the influence of various factors, including market demand, climatic conditions, and agricultural practices.

Table 3.6
Trends in Area and Production of other Planation Crops

Year	Coffee		Tea	
	Area (in Ha)	**Production (in MT)**	**Area (in Ha)**	**Production (in MT)**
1960-61	16798	7409	37632	40373
1970-71	31564	13574	37593	41449
1980-81	57949	23540	36164	50716
1990-91	75057	20910	34616	60638
2000-01	84735	70550	36847	69132
2010-11	84931	65650	36965	57291
2020-21	85880	68545	35872	66850
2021-22	85880	69900	35872	60360
2022-23	85957	68020	35651	65980

Note: - Not available Source: Estimated from Department of Economics and Statistics, GoK

3.4.4 Trends in Area, Production and Productivity of spices in Kerala

Table 3.5 provides a comprehensive overview of the production trends of key spices in Kerala from the fiscal year 1960-61 to 2022-23, showcasing the evolution of this vital agricultural sector. The data captures the production figures in metric tons (MT) for various spices, including cardamom, cloves, ginger, nutmeg, pepper, and turmeric, highlighting the significance of spices in Kerala's economy and agricultural landscape. The production of cardamom exhibits a notable upward trajectory, increasing from 1,280 MT in 1960-61 to 22,165 MT by 2022-23. This remarkable growth underscores Kerala's position as a leading producer of cardamom, driven by favourable climatic conditions and successful cultivation practices. In contrast, the production of cloves, which is recorded sporadically, shows minimal variation, with figures peaking at 90 MT in 2010-11 and declining slightly to 54 MT in 2022-23, suggesting challenges in maintaining clove production in the state. Ginger production presents a fluctuating pattern, starting at 11,270 MT in 1960-61, peaking at 46,685 MT in 1990-91, and subsequently declining to 11,007 MT by 2022-23. This decline indicates potential issues related to pest management, market demand, or climatic factors affecting ginger cultivation. Nutmeg production also reflects variability, with a notable increase to 17,212 MT in 2022-23, demonstrating the potential for growth in this spice category despite past challenges. Pepper production, historically significant for Kerala, reaches a peak of 60,929 MT in 2000-01 but experiences a decline over the following decades, dropping to 27,654 MT in 2022-23. This trend may reflect the impact of price fluctuations, changes in market demand, and competition from other pepper-producing countries. Meanwhile, turmeric production shows a steady increase from 4,187 MT in 1960-61 to 7,540 MT in 2022-23, reflecting the growing recognition of turmeric's health benefits and its expanding market both domestically and internationally. Overall, the trends depicted in Table 3.4 indicate the dynamic nature of spice production in Kerala. While some spices, such as cardamom and turmeric, demonstrate significant growth, others face challenges that necessitate strategic interventions. Addressing the issues impacting the production of spices such as ginger, nutmeg, and pepper is essential to sustain and enhance Kerala's reputation as a premier spice producer. Continuous investment in agricultural research, improved

cultivation techniques, and market access will be crucial for the future development of this vital sector in Kerala's economy.

The "Growth Index of Production of Important Crops" table 3.7 offers a comprehensive view of the production trends of significant crops in Kerala over several decades, from 1981-82 to 2022-23, with a base year of 2011-12 (index = 100). This base serves as a benchmark, allowing for comparison of growth rates across different years. The data illustrates how certain crops have gained or lost prominence over time, reflecting broader shifts in agricultural priorities, market dynamics, and external policy influences. The growth index data highlights Kerala's evolving agricultural sector, where traditional crops like rice have seen decreased emphasis while high-value export-oriented crops such as cardamom have gained prominence. This shift reflects a response to market dynamics, where farmers may prioritize crops with greater profitability or export potential. Additionally, government policies, climate factors, and global market trends appear to play a crucial role in influencing these agricultural changes. The diversification seen in Kerala's crop production points toward an adaptive agricultural strategy that seeks to balance local food needs with economic opportunities in global spice markets (Table 3.7).

Table 3.7 presents the growth index of production of major crops in Kerala from 1981-82 to 2022-23, with 2011-12 as the base year (=100), highlighting significant inter-crop and inter-temporal variations. Rice shows a long-term declining trend, with very high index values during the early 1980s followed by a steady fall up to the mid-2000s, reflecting structural shifts away from paddy cultivation due to land-use changes, rising costs, and labour constraints. Although modest recovery is observed after 2018–19, rice production remains relatively unstable compared to perennial crops. Coconut exhibits comparatively stable performance over the period, hovering around the base index in the post-2011 years, indicating resilience despite climatic shocks and market fluctuations.

Among plantation crops, rubber demonstrates a strong upward trajectory from the early 1980s to the early 2000s, peaking around the base year, followed by a pronounced decline thereafter, particularly after 2013–14, mirroring adverse price

movements and reduced tapping intensity. Coffee and tea display moderate fluctuations, largely oscillating around the base year, suggesting relative stability but limited growth momentum. In contrast, spice crops show marked volatility. Pepper records exceptionally high growth indices during the mid-1990s and mid-2000s, reflecting price-led production responses, but a sharp decline after 2013–14 indicates vulnerability to pest incidence, climate variability, and international competition.

Cardamom stands out with a remarkable and sustained increase in the post-2011 period, reaching very high growth index values by 2022–23, underscoring its increasing commercial significance and favourable market conditions. Conversely, ginger exhibits a continuous decline after the base year, pointing to production instability, disease prevalence, and market uncertainty. Turmeric shows cyclical fluctuations with intermittent growth spurts, but lacks a consistent upward trend. Overall, the table reveals a gradual shift in Kerala's agricultural production structure away from food crops toward select high-value spices, alongside increasing volatility in crop performance, underscoring the need for crop-specific policy interventions to ensure stability, sustainability, and income security for farmers.

Table 3.7

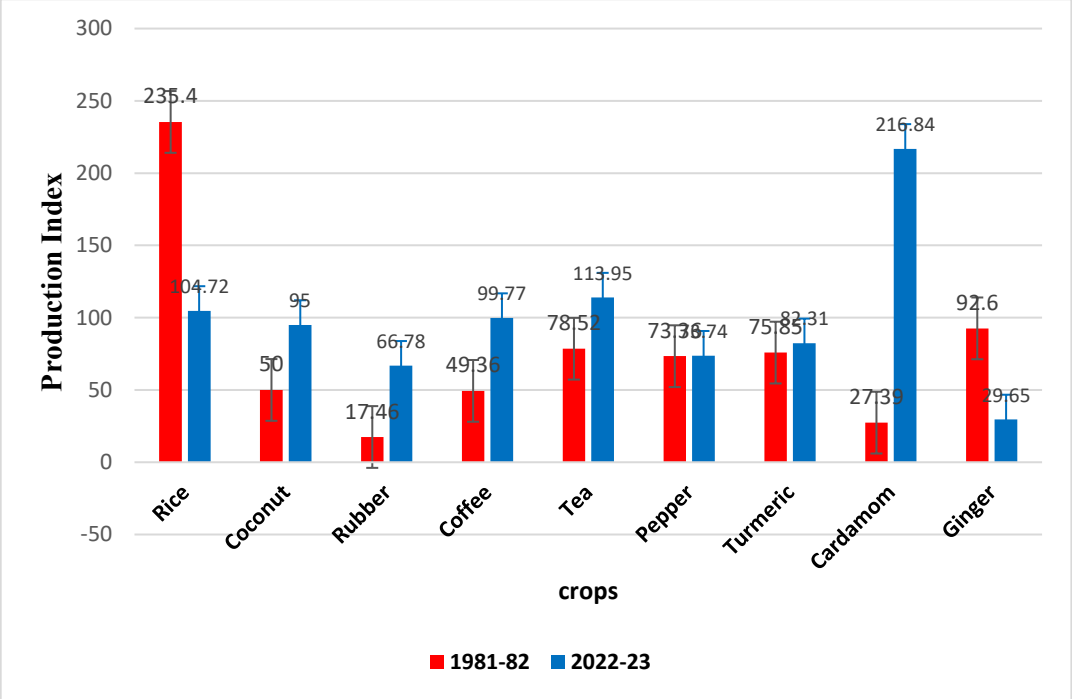
Growth Index of Production of Important Crops in Kerala

Year	Rice	Coconut	Rubber	Coffee	Tea	Pepper	Turmeric	Cardamom	Ginger
1981-82	235.40	50	17.46	49.36	78.52	73.36	75.85	27.39	92.60
1982-83	229.56	54	19.11	31.95	78.47	65.40	65.34	18.59	85.07
1983-84	212.29	44	20.30	13.88	76.53	65.46	73.51	19.20	98.87
1984-85	220.71	58	23.64	n.a	97.28	46.27	65.27	27.88	111.10
1985-86	206.16	57	23.12	34.54	90.89	88.32	78.04	32.67	119.77
1986-87	199.26	53	25.30	34.54	86.93	81.01	78.77	24.46	128.36
1987-88	181.48	56	27.11	33.63	89.72	124.85	73.51	20.05	122.59
1988-89	177.96	71	29.84	69.56	122.85	115.31	72.83	27.59	121.27
1989-90	200.57	73	34.47	31.17	112.37	144.36	72.00	27.59	127.33
1990-91	190.97	71	38.49	30.67	104.72	124.80	64.47	33.75	123.06
1991-92	186.36	78	30.43	29.39	114.12	134.15	65.82	33.75	135.42
1992-93	190.67	86	46.14	53.05	94.01	132.44	71.26	25.14	122.30

1993-94	178.20	87	51.11	67.83	106.19	132.92	79.23	43.34	101.48
1994-95	171.37	90	55.43	67.83	104.85	158.01	116.83	46.17	134.00
1995-96	167.49	88	59.40	66.01	111.91	182.84	120.30	52.63	125.13
1996-97	153.14	89	64.18	69.41	119.71	150.79	123.84	44.51	124.91
1997-98	134.38	88	67.83	74.31	112.64	122.77	108.04	51.75	117.49
1998-99	127.72	86	69.98	73.17	101.42	182.69	101.11	48.82	106.03
1999-00	135.45	96	71.70	88.70	107.00	126.78	105.24	64.42	111.36
2000-01	132.05	93	72.58	103.48	119.39	162.47	113.73	74.15	115.01
2001-02	123.64	92	72.64	97.82	114.14	155.30	86.77	81.98	108.23
2002-03	121.07	96	74.46	92.88	95.59	179.62	87.31	84.91	87.31
2003-04	100.18	99	82.00	93.66	99.39	184.04	71.13	86.82	88.81
2004-05	117.24	101	86.46	79.65	85.50	199.94	78.58	84.29	122.03
2005-06	110.72	106	92.53	88.27	97.37	233.61	103.66	95.53	151.62
2006-07	112.76	102	97.68	87.24	92.67	171.37	125.60	83.59	114.47
2007-08	92.88	95	94.27	71.36	89.38	111.87	93.56	68.78	85.46
2008-09	103.73	98	98.07	83.90	89.33	90.64	80.09	83.64	82.99
2009-10	105.16	95	93.31	86.91	99.84	113.22	76.34	76.31	77.05
2010-11	91.87	89	96.45	96.30	98.94	120.71	78.00	77.63	89.42
2011-12	100.00	100.00	100.0	100.00	100.00	100.00	100.00	100.00	100.00
2012-13	89.33	98	100.14	100.00	108.74	123.46	86.89	100.00	59.43
2013-14	99.18	100	81.14	97.76	108.69	78.42	78.69	136.96	57.97
2014-15	98.79	100	63.55	99.30	112.56	108.50	85.83	156.53	61.92
2015-16	96.53	99	54.90	101.55	99.99	112.35	89.50	190.77	59.38
2016-17	76.71	91	67.64	93.11	106.22	90.84	81.88	167.75	55.16
2017-18	91.62	88	67.69	97.49	107.47	101.21	111.02	179.51	51.12
2018-19	101.63	89	67.69	94.87	104.93	98.07	84.24	112.84	40.74
2019-20	103.18	81	61.64	96.02	102.34	92.12	83.73	98.57	32.10
2020-21	111.38	81	61.64	100.54	115.45	89.57	93.38	201.23	32.58
2021-22	98.79	93	66.78	102.53	104.24	86.71	93.15	208.08	34.71
2022-23	104.72	95	66.78	99.77	113.95	73.74	82.31	216.84	29.65

Note: Base Year: 2011-12; Source: Estimated from Department of Economics and Statistics, GoK

Figure 3.6 Comparison of Trends in Production of Leading crops in Kerala (in MT)



Source: Estimated from Department of Economics and Statistics, GoK

A long-term view of the production trends of rice and rubber in Kerala reveals distinct shifts that reflect broader changes in land use, agricultural priorities, and market dynamics in the region. While rice, a staple food crop, once dominated Kerala's agricultural landscape, its production has fluctuated significantly over the decades. In contrast, rubber, a major non-food cash crop, has shown a steady and often exponential increase, underscoring the economic incentives driving the shift from food to non-food crops (Figure 3.1).

In the early 1950s, rice production was substantial, with production reaching over 500,000 metric tons (MT) by 1952-53. The production trend for rice remained strong through the 1960s, peaking around 1,176,000 MT in 1968-69, which marked a high point driven by favourable agricultural policies and government support aimed at food self-sufficiency. However, from the 1970s onward, rice production began to decline due to a combination of factors, including increased labor costs, the fragmentation of landholdings, and growing competition for land from more profitable crops like rubber.

Conversely, rubber production in Kerala has experienced a marked upward trajectory, with production rising from just 16,649 MT in 1952-53 to over 500,000 MT in recent years. This growth was particularly rapid from the late 1980s onwards, fuelled by the strong demand for rubber both domestically and internationally. By the early 2000s, rubber production outstripped rice, reflecting a significant shift in Kerala's agricultural focus. Rubber's profitability, market stability, and favourable climatic conditions in Kerala made it an attractive alternative to traditional food crops, leading to extensive conversion of rice paddies and other farmland into rubber plantations.

The comparative trends between rice and rubber illustrate the shifting land use patterns in Kerala, where economic considerations have increasingly prioritized non-food cash crops over food crops. This shift raises important concerns about food security and the dependency on the PDS to meet local food demands. As Kerala continues to prioritize high-value plantation crops like rubber, the reliance on PDS for rice and other staple grains becomes critical to ensure food security for its population. These trends underscore the need for balanced agricultural policies that can support both economic growth and food self-sufficiency. While the economic benefits of non-food cash crops are evident, the increasing dependence on external sources for staple foods highlights the necessity of a strong and efficient PDS to address any resulting food deficits.

The shifts in production patterns of food and non-food crops in Kerala have significant implications for food security and the effectiveness of the PDS. As agricultural land use transitions between these categories, it becomes crucial to address the challenges posed by these changes to ensure adequate food availability and accessibility for the population.

In recent decades, Kerala has witnessed a marked decline in the area under food crops such as rice and an increase in the cultivation of non-food crops, including rubber and spices. The area under rice cultivation has reduced from approximately 197,000 hectares in 2012-13 to about 190,171 hectares in 2022-23, reflecting a continuous downward trend. Conversely, plantation crops, particularly rubber, have expanded significantly, with the area under rubber cultivation increasing from 122,327 hectares in 1960-61 to 551,030 hectares in 2022-23. This shift raises concerns about the self-sufficiency of food grains in the state and highlights the necessity of a strong PDS to mitigate food insecurity.

The PDS plays a critical role in stabilizing food prices and ensuring that vulnerable populations have access to essential commodities. Kerala's reliance on the PDS is evident in the percentage of households benefiting from subsidized food grains, which reached approximately 90% of the state's population by 2020 (Food and Civil Supplies Department, 2020). Furthermore, the implementation of the NFSA in 2013 has enhanced the coverage and efficiency of the PDS, aiming to provide legal entitlements to food grains for the eligible population.

3.5 Food Deficit in Kerala

The preceding analysis of trends in the production, productivity, and cultivated area of major crops in Kerala provides overview into the state's agricultural sector and its ongoing shifts. Kerala's agricultural sector has undergone considerable changes over recent decades, with notable declines in both the area under cultivation and the production levels of staple food crops like rice. These trends, compounded by the state's high population density and limited arable land, have led to a notable deficit in food self-sufficiency. Consequently, Kerala depends significantly on external sources to meet its food grain needs, creating vulnerabilities in terms of food security, price fluctuations, and supply chain disruptions. The discussion highlights key elements such as the shift from staple food crops to high-value cash crops, the effects of declining productivity in the food sector, and the challenges posed by Kerala's unique land constraints and urbanization pressures. Moreover, it examines the role of the PDS in ensuring access to essential food supplies and how the state's dependence on imported food grains amplifies its susceptibility to external economic and climatic factors.

Table 3.8 shows the estimated Rice Requirement, Internal Availability, and Supply Gap in Kerala provides an analysis of rice production and demand in Kerala from 1975 to 2023. It highlights the growing gap between the rice required to meet the state's consumption needs and the rice produced locally. The data indicates a consistent decline in internal rice production over the years, coupled with a steady increase in the state's population and, consequently, its rice requirements. In 1975-76, internal rice production was 1,331 thousand tonnes, which was sufficient to cover a large portion of the estimated requirement of 2,726 thousand tonnes. However, by 2010-11, production had decreased to just 598.3 thousand tonnes, with a huge gap in

meeting the demand of 3,903 thousand tonnes. This trend underscores the growing reliance on external sources to meet Kerala's rice needs, a pattern reflected in the rising deficit percentages. From 56% in 1975-76, the deficit increased to 86% by 2010-11 and remained above 85% in subsequent years. This continuous rise in the deficit percentage signals a deepening food security challenge, as the state increasingly depends on imports to meet its rice requirements. The population's growth, from 233.1 million in 1975 to 353 million in 2022-23, directly contributes to the increasing rice demand. However, internal production has struggled to keep pace, exacerbating the supply gap. Despite some fluctuations in rice availability, such as an uptick in 2020-21 to 626.9 thousand tonnes, the overall trend remains one of increasing shortfalls in rice production. The percentage deficit is a critical indicator of Kerala's vulnerability, as it nears 90% in recent years, signifying a heavy dependence on external rice imports. The situation suggests the urgent need for agricultural reforms and interventions to improve rice production or explore alternative strategies for securing adequate rice supplies. These could include investments in irrigation, improving productivity, and diversifying the sources of rice supply, while simultaneously promoting sustainable agricultural practices to boost self-sufficiency.

Table 3.8
Estimated Rice Requirement, Internal Availability and Supply Gap in Kerala (in 1000 Tonnes)

Year	Availability from Internal Production	Net Availability	Estimated Requirement	Estimated Deficit	Deficit in Percentage
1975-76	1331.0	1198.0	2726.0	1528.0	56.0
1980-81	1272.0	1145.0	2977.0	1832.0	62.0
1985-86	1173.0	1056.0	3183.0	2127.0	67.0
1990-91	1087.0	978.0	3403.0	2425.0	71.0
1995-96	953.0	858.0	3621.0	2763.0	76.0
2000-01	751.0	676.0	3725.0	3049.0	82.0
2005-06	700.0	567.0	3888.7	3321.6	85.0
2010-11	598.3	538.3	3903.0	3364.0	86.0
2015-16	549.3	416.3	4021.5	3605.2	89.6
2020-21	626.9	499.9	4093.1	3593.2	87.8
2022-23	592.7	475.7	4128.2	3652.5	88.5

Source: Estimated from Economic Review, Various Years, Government of Kerala

3.6 Ensuring the Right to Food and the Role of the Public Distribution System in Kerala

Food security remains a pressing concern in Kerala, especially given the state's unique agricultural landscape and increasing dependency on external sources for staple foods. Kerala's food security is heavily supported by the PDS, which plays a pivotal role in ensuring accessible and affordable food grains for its population. The PDS in Kerala, governed by the NFSA 2013, aims to provide subsidized grains to priority households, thereby addressing food accessibility and affordability concerns (Government of India, 2013).

Kerala has been at the forefront in addressing food security, focusing on providing accessible food at subsidized rates. The state has a history of social welfare policies aimed at reducing inequality and improving living standards. These policies are rooted in the notion that access to food is a fundamental right for all citizens, regardless of income or social status. In this context, the PDS serves as an essential mechanism in ensuring that even the most vulnerable populations can secure basic food resources at affordable rates. Food security in Kerala extends beyond mere availability to include accessibility, quality, and stability. The state government's commitment to these aspects is reflected in the consistent expansion and refinement of its PDS framework. Kerala's PDS has adapted to various economic challenges, including inflation, supply chain disruptions, and changing population dynamics, ensuring that food resources remain consistently available to households in need (Mohan, 2022).

Historically, Kerala's PDS has undergone several reforms, evolving from a targeted system focused on vulnerable populations to a more inclusive system designed to mitigate the rising costs of staple foods (Khera, 2011). One of the most significant transformations was the end-to-end computerization of the PDS in Kerala, a reform that significantly improved transparency and reduced leakages (Department of Food and Public Distribution, 2020). With improved digital tracking, Kerala's PDS distribution is now more efficient and accurate, ensuring that essential commodities reach eligible households consistently. This reform is crucial, as Kerala produces only about 15-20% of its food grain requirements, making the PDS indispensable in securing the remaining supply through imports (Government of Kerala, 2021).

Kerala's PDS is also instrumental in addressing the nutritional needs of its population. In line with the NFSA's provisions, the PDS seeks to not only address hunger but also support nutrition security, as reflected in the distribution of fortified grains (Swaminathan, 2021). However, the challenges associated with fluctuating food prices, climate-induced agricultural constraints, and rising dependency on imports underscore the ongoing need to strengthen Kerala's PDS to safeguard food security. So, the PDS in Kerala is a cornerstone of food security in a state that relies heavily on imports for its food grains. By providing affordable access to essentials and addressing nutritional needs, the PDS contributes significantly to Kerala's socio-economic stability. Nevertheless, to ensure the sustainability of food security, Kerala must continue to enhance the efficiency and resilience of its PDS amidst growing environmental and economic challenges.

The analysis of rice requirement, availability, and PDS contribution in Kerala reveals a significant structural transformation in the state's food security dynamics over the last five decades. While rice requirements have steadily increased from 2,496 thousand tonnes in 1971 to 4,128 thousand tonnes in 2023, local net production has sharply declined both in absolute terms and as a percentage of requirement—from 47% in 1971 to just 12% after 2011. This indicates a growing dependence on external sources to meet consumption needs. The PDS has played a compensatory role, with its contribution rising substantially in relative terms. For instance, PDS support accounted for 34% of rice requirements in 1971 but peaked at 49% in 1991, and even in recent years remains around 28–33%, despite the production shortfall. Notably, PDS contributions often surpass net production, reaching as high as 267% of net production in 2016, underscoring the system's critical role in bridging the supply-demand gap. However, fluctuations in the share of PDS in total market supply—from 143% in 1971 to 47% in 2023—highlight both the volatility and continued reliance on external procurement. These trends collectively reflect Kerala's long-term structural shift away from self-sufficiency in rice production toward market and PDS dependency, emphasizing the importance of sustained policy support for food security.

Table 3.9

Ensuring the Right to Food: Rice Requirement, Availability, PDS Contribution, and Market Dependency in Kerala

Year	Population	Requirement	Net production	PDS Contribution	Private channel	Net production as a % Of Requirement	PDS Contribution as a % Requirement	Market Dependency
1971	213.47	2496	1168	843.32	485	47	34	19
1981	254.53	2977	1145	1063.29	769	39	36	25
1991	290.99	3403	978	1671.39	753	29	49	22
2001	325.30	3804	676	461	2667	17	12	71
2011	326.62	3818	470	1159	2189	12	30	58
2016	341.35	3992	494	1322	2176	12	33	55
2021	350.0	4093.1	499	1209	2385	12	30	58
2023	353.0	4128.2	475	1167	2486	12	28	60

Source: 1. State planning board, Thiruvanthapuram; 2. Department of Economics &Statistics

3.7 Conclusion

Kerala's agrarian landscape has undergone a significant transformation over the past few decades, marked by a steady decline in the area under food crops and a simultaneous expansion of land devoted to cash crops such as rubber, coconut, and pepper. This land use shift has reduced the state's self-sufficiency in food production, leading to a widening gap between demand and supply of essential food grains, particularly rice—the staple diet of the population. The extent of food deficit in Kerala has been aggravated by high population density, limited cultivable land, and the growing economic preference for cash crops, which provide higher returns to farmers. As a result, Kerala remains heavily dependent on food imports from other states and markets to meet its consumption requirements. In this context, the PDS has played a crucial role in bridging the gap by ensuring the availability of rice and other essentials at subsidized rates. The efficiency and wide coverage of the PDS have not only cushioned households against acute food shortages but also contributed to maintaining food security despite declining local production. However, the persistent food deficit highlights the structural challenges in Kerala's agricultural sector and the need for balancing commercial crop cultivation with sustainable food crop production.

CHAPTER IV

PHASES OF DEVELOPMENT OF PDS: POLICY REFORMS AND IMPACTS OF COMPUTERIZATION UNDER NFSA, 2013

The Public Distribution System has been a cornerstone of India's food security strategy, evolving through various phases of development to address changing socio-economic challenges. The enactment of the National Food Security Act, 2013, marked a critical shift, mandating the delivery of subsidized food grains to two-thirds of India's population. Kerala, a state with a long history of PDS effectiveness, has been at the forefront of these reforms. The state's high literacy rate and proactive governance have facilitated the implementation of significant policy changes, including end-to-end computerization, to enhance the system's efficiency and transparency.

The PDS in India, pivotal for ensuring food security, has undergone significant transformations, especially under the NFSA of 2013. By 2023, India achieved the digitization of 19.79 crore ration cards, covering all states and union territories under NFSA reforms. Furthermore, nearly 100% of Fair Price Shops (FPSs)—approximately 5.33 lakh out of 5.34 lakh—have been equipped with electronic Point of Sale (ePoS) devices for biometric authentication, ensuring the rightful targeting of beneficiaries. These advancements mark a leap in transparency and efficiency in the delivery of subsidized food grains (PIB, 2023).

Recent reforms, such as the end-to-end computerization of the PDS, have streamlined operations. Nearly 95% of allocated food grains are now distributed via ePoS, reducing leakages and enhancing accountability. Another milestone is the introduction of fortified rice through the Targeted Public Distribution System (TPDS) to combat malnutrition. As of March 2023, 95.72 lakh metric tons of fortified rice were distributed across 27 states and union territories, with full nationwide implementation expected by March 2024 (PIB, 2023).

In Kerala, these reforms have been instrumental in ensuring food security for approximately 96% of the population under the NFSA, with robust mechanisms in place to minimize leakages and prevent malpractices (Government of Kerala, 2023). The state has also implemented the One Nation, One Ration Card (ONORC) system, allowing seamless portability of entitlements across districts and states, significantly benefiting migrant workers. Despite its advancements, Kerala faces unique challenges in ensuring equitable access and reducing exclusion errors in the PDS. The state depends heavily on imports for food grains due to limited agricultural production, making the PDS vital for food security. The 2024 budget highlights a renewed focus on food storage and modernization, with specific allocations for infrastructure improvements that directly impact states like Kerala (India Budget, 2024).

This chapter examines the historical phases of PDS development, the transformative impact of computerization, and the implications of policy reforms under the NFSA, 2013. It provides a detailed analysis of Kerala's progress and challenges in integrating technological advancements into its food distribution system, offering insights into how these reforms have reshaped access, accountability, and efficiency in ensuring food security.

4.1 Evolution of Public Distribution System

The PDS has undergone significant transformations since its inception, evolving in response to India's changing socio-economic and political landscape. Its journey can be broadly classified into four distinct phases: the pre-independence phase, the post-independence phase, the shift to Targeted Public Distribution System (TPDS) in the 1990s and Recently PDS under NFS Act.

4.1.1 Pre-independence phase: Origins of PDS during World War II

The PDS in India, one of the most significant instruments for ensuring food security, has its origins in the pre-independence phase, during the period of World War II. During pre-independence phase, India witnessed widespread poverty, famine, and food insecurity, with a high vulnerability to fluctuations in food prices and availability (Kumar & Ayyappan, 2014). With the onset of World War II, the colonial government

was faced with the dual challenge of ensuring adequate food for the military while managing the increasing demands of the local population. This led to the introduction of rationing as a system for distributing food to the public. In 1940, the British government introduced ration cards to regulate the distribution of essential commodities. The rationing system was initially set up in urban centers, where food shortages were most acute due to the diversion of food supplies to support the war effort (Desai, 2015).

According to some scholars, the British were more concerned about ensuring sufficient food supplies for British troops and managing the logistics of wartime supplies rather than addressing the broader issue of food insecurity among the Indian populace (Dandekar & Rath, 1971). The colonial authorities also imposed controls on food prices to prevent inflation, but these controls were often insufficient in preventing hoarding and black-market activities (Sarkar & Bhattacharya, 2022). The Bengal Famine of 1943, one of the most tragic events of the war period, drew international attention to the failure of the colonial administration to address food insecurity. The famine resulted in the death of an estimated 3 million people, largely due to food shortages exacerbated by wartime policies that prioritized the British war effort over Indian welfare (Banerjee & Iyer, 2005). It was during this period that the first official discussions began regarding a national food policy to address food scarcity and ensure better management of food resources.

4.1.2 Post-independence phase: Universal PDS and Challenges

The PDS, a critical aspect of India's food security mechanism, has undergone significant transformation since the country gained independence in 1947. Initially established as a means to ensure the equitable distribution of food grains, PDS became a central part of India's strategy to combat poverty, hunger, and malnutrition in the post-independence era. The concept of a Universal PDS (also known as Integrated PDS) was introduced to serve the dual purpose of controlling food inflation and providing food security to the most vulnerable sections of the population.

Emergence of PDS in Post-Independence India: In the early years following India's independence, one of the major challenges the new government faced was ensuring

food security for its large and diverse population. To address these concerns, the Indian government set up the PDS as a means to distribute food grains to the public at subsidized rates. The Universal PDS was envisioned as a comprehensive program aimed at making food available to every citizen, irrespective of their socio-economic status. The immediate post-independence period was marked by food shortages, especially due to the partition of the country in 1947, which disrupted food production and trade. To address these challenges, the Food Corporation of India (FCI) was established in 1965 to streamline food procurement and distribution, ensuring that food grains could be supplied to different parts of the country in a timely and cost-effective manner (Kohli, 2004).

The Universal PDS was envisioned as a way to provide subsidized food to all sections of society, regardless of income or status. The system expanded across India with the goal of making food universally available, reducing hunger, and stabilizing food prices, especially in rural areas. The post-independence government's priority was to ensure that food was not just available but affordable for all, particularly in rural and remote areas. The National Food Policy, which was introduced in the 1960s, laid the foundation for a Universal PDS by committing the government to provide essential food items such as wheat, rice, and sugar to all citizens through the PDS network (Khera, 2011).

The Challenges of Universal PDS: Despite the good intentions behind the Universal PDS, several challenges quickly emerged, undermining its ability to deliver food security effectively. One of the key issues that affected the Universal PDS was inefficiency in the distribution channels. The PDS relied heavily on a centralized distribution system, where food grains were procured by the central government and then distributed to various states for onward distribution to the public through ration shops. However, many states struggled with infrastructure issues, including poor roads, storage facilities, and communication systems, which resulted in delays in the distribution of food grains (Dev & Sharma, 2010). In addition, there were widespread reports of leakages and diversions, where food meant for the poor was siphoned off by middlemen or black marketers. Corruption within the system, particularly at the

level of local officials and ration dealers, contributed significantly to the inefficiency of the PDS, undermining its effectiveness. The implementation of the Universal PDS was marred by widespread leakages, with a significant portion of the food grains meant for the poor being diverted by intermediaries, black marketers, or even corrupt government officials. Corruption at local levels was a serious issue, with ration dealers involved in pilferage, selling subsidized grains in open markets for higher prices (Kumar *et.al*, 2016). The inability to maintain accountability in the distribution network was a major flaw in the system. The universal coverage of the PDS meant that all sections of society, including the relatively affluent, were eligible to receive subsidized food grains. This led to significant inequities in the system, as the benefits of the PDS were not always targeted at those who needed them the most. In many cases, wealthier individuals and families continued to access subsidized food, while the truly needy were left out or were unable to take full advantage of the system due to logistical issues, corruption, or the lack of awareness (Kumar *et.al*, 2016). So, this system failed to target the most vulnerable segments of the population, such as the poor and marginalized groups. Many wealthier households continued to benefit from subsidies, while those most in need faced difficulties in accessing the system due to logistical challenges or exclusionary practices (Ghosh, 2010). The inefficiency in identifying and reaching the most vulnerable households undermined the true potential of the PDS. The Universal PDS placed a significant financial burden on the Indian government. Subsidizing food for the entire population, regardless of income level, resulted in unsustainable costs. The cost of procuring, transporting, and distributing food grains created a heavy fiscal burden on the government, which often had to divert resources from other important sectors like healthcare, education, and infrastructure development (Kumar *et.al*, 2015).

4.1.3 Targeted Public Distribution System (TPDS)

.In the 1990s, the PDS in India underwent a significant transformation with the introduction of the Targeted Public Distribution System (TPDS). The shift was primarily driven by the realization that the universal approach to food distribution was not effectively addressing the disparities in access to food among different socio-

economic groups. The Universal PDS, which had been in place since the post-independence era, was found to be inefficient in targeting the most vulnerable populations. It was also financially burdensome, with subsidies being given indiscriminately to all citizens, including the wealthier sections of society. The introduction of the TPDS in 1997 marked a significant shift away from the Universal PDS. The TPDS aimed to target only the poorest sections of society—the below-poverty-line (BPL) families—while excluding wealthier households from accessing subsidized food. The government identified families below the poverty line through socio-economic criteria, and only they were eligible to receive food grains at subsidized rates. The shift to TPDS was intended to address the inefficiencies and inequities of the Universal PDS. However, it also created new challenges, such as the problem of accurately identifying BPL families, and several reports indicated that many eligible households were excluded from the system (Kumar *et.al*, 2015). Additionally, the rationing system remained prone to leakages, and there were concerns about the accuracy of poverty identification. Under the TPDS, the government aimed to target the distribution of food grains more effectively by identifying specific beneficiary categories, primarily below the poverty line (BPL). The focus shifted to addressing the needs of those facing the most acute food insecurity, such as rural poor, urban slum dwellers, and other vulnerable groups. The main features of TPDS includes: Identification of Beneficiaries: Decentralization of Operations and Price Differentiation between APL and BPL categories.

The outcomes of the shift to TPDS were mixed. On the positive side, it helped reduce food wastage by focusing subsidies on those who were most in need. The system also helped to ensure food security for the poorest, especially in rural areas. According to some studies, the introduction of TPDS led to an increase in food grain distribution to the BPL population and improved access to subsidized food in remote areas (Chand, 2003). However, challenges persisted in the implementation of TPDS. One significant issue was the improper identification of beneficiaries, which led to errors of exclusion and inclusion. Many deserving families were left out of the BPL category, while some non-poor families were included (Jha, 2007).

4.1.4 The National Food Security Act (NFSA), 2013:

The government has introduced the National Food Security Act (NFSA), 2013, to ensure that the benefits of the PDS reach the most vulnerable populations, including women, children, and the elderly. The National Food Security Act (NFSA), 2013 represents a milestone in the history of the PDS. It aims to provide food grains at subsidized rates to a larger portion of the population than ever before. Under the NFSA, approximately 67% of India's population is eligible for subsidized food under the PDS. The Act mandates the provision of 5 kilograms of food grains per person per month at highly subsidized prices (Ministry of Law and Justice, 2013). The NFSA also provides for the entitlement of food security to the population through an identification system that divides beneficiaries into two categories: Priority Households and AAY households. However, the successful implementation of the Act faces numerous challenges, including bureaucratic delays, lack of awareness, and local corruption (Puri, 2022). The National Food Security Act, 2013, represents the latest in a series of reforms aimed at ensuring food security for India's poorest citizens. Going forward, continued efforts to refine and strengthen the PDS will be necessary to ensure that it can effectively meet the nutritional needs of the country's growing population.

4.2 Key Policy Changes in the Public Distribution System (PDS) in India

The Public Distribution System (PDS) in India has undergone significant policy changes over the decades to address food security challenges, improve efficiency, and better target the needs of the most vulnerable sections of the population. The evolution of PDS, particularly since the post-independence period, reflects India's dynamic response to issues related to food insecurity, fiscal constraints, and socio-economic disparities. These policy shifts have largely been shaped by the changing economic, political, and social landscape of the country, with major transformations taking place through the introduction of reforms such as the introduction of the Targeted Public Distribution System (TPDS) and the National Food Security Act (NFSA), 2013.

4.2.1 Scarcity to security: PDS as a universal scheme

In the early years following India's independence, the newly formed government faced significant challenges related to food scarcity, especially in the aftermath of the Partition of 1947. India's agricultural sector was weak, and the country was heavily dependent on imports for food. To address these concerns, the government implemented the PDS in the 1950s. In its initial stages, the PDS aimed to be universal, with subsidized food being made available to all citizens, regardless of their income or social status. This approach was grounded in the idea of ensuring food security for every citizen. The system relied heavily on a network of fair price shops that would distribute food grains like wheat, rice, and sugar at below-market prices (George & McKay, 2019). However, this model faced several challenges, including inefficiency in distribution, corruption, and mismanagement of stocks.

One of the major challenges faced by the Universal PDS has been inefficiency in the distribution of food grains, leading to significant leakages. According to a report by the Planning Commission (2014), the PDS system suffers from a leakage rate of 36%, meaning that a substantial portion of the food grains allocated to PDS do not reach the intended beneficiaries. Instead, they are diverted through malpractices such as black marketing or hoarding. The inefficiencies in the system arise due to a variety of factors, including poor monitoring, outdated infrastructure, and inadequate storage facilities. A study by Khera (2011) found that in several states, up to 40% of the food grains allocated to PDS outlets were lost due to improper storage, pilferage, or non-distribution. This inefficiency not only wastes food but also leads to increased fiscal costs for the government. Moreover, the large-scale mismanagement within the system exacerbates the problem. In many areas, fair price shops (FPS) – the primary points of distribution – are understaffed, poorly managed, and often lack the necessary resources to run efficiently. This leads to delays in food grain distribution and contributes to supply shortages at the local level.

While the Universal PDS was designed to be inclusive, the system often fails to target the most vulnerable populations accurately. The identification of beneficiaries, particularly in rural areas, has been problematic. According to Khera (2011), the

absence of a clear and consistent methodology for identifying Below Poverty Line (BPL) households has resulted in both inclusion and exclusion errors in many states. Some households that are not poor are included in the BPL list, while many eligible families are left out. A study by Sood (2016) found that, in certain cases, the identification of beneficiaries was based on outdated or faulty data, leading to widespread errors in the distribution process.

Corruption has been a persistent issue in the Universal PDS. In several states, fair price shops (FPS) have been implicated in corrupt practices, including siphoning off food grains meant for the poor, selling them at higher prices in black markets, and issuing false ration cards to individuals who do not meet the eligibility criteria. A report by the Comptroller and Auditor General (CAG) of India (2012) found that in many states, food grains allocated for PDS were diverted to the open market, where they were sold at higher prices, depriving the poor of their entitlements. The CAG report also highlighted instances of collusion between government officials and private individuals involved in the distribution chain, leading to the pilferage of grains. Corruption has a dual impact: it deprives the intended beneficiaries of food security and undermines public trust in the system, which can further complicate efforts to reform and improve PDS.

Inadequate Infrastructure and Poor Implementation: The infrastructure supporting the Universal PDS has been insufficient to meet the needs of India's large and diverse population. Many parts of the country, particularly rural and remote areas, lack adequate transportation, storage, and communication systems to facilitate the smooth and timely distribution of food grains. A study by Chand (2003) found that the inefficiency of the distribution network was due in part to the lack of a well-developed infrastructure, particularly in interior rural areas where road access is limited. Furthermore, the absence of a robust monitoring system to oversee the distribution process has resulted in inconsistent supply levels across states and even districts. This has made it difficult for the PDS to ensure that the right quantities of food reach the right places at the right time.

Fiscal Burden and Sustainability: The fiscal burden of the Universal PDS has also been a major challenge. According to a study by the Indian Council for Research on International Economic Relations (ICRIER, 2012), the cost of the Universal PDS has been rising steadily due to inefficiencies in the system and the increasing number of beneficiaries. By 2011, the government was spending approximately INR 1.2 lakh crore annually on food subsidies, with a substantial portion of these resources being lost due to leakages and mismanagement. The rising fiscal cost has placed a strain on India's national budget, particularly in the face of other pressing developmental needs. With the government facing a growing fiscal deficit, questions about the sustainability of the Universal PDS have arisen. Critics argue that a more targeted approach, like the Targeted Public Distribution System (TPDS), could be more cost-effective and better focused on those who need it most.

Impact of Urbanization and Migration: Urbanization and migration have also posed significant challenges to the Universal PDS. With increasing numbers of people migrating from rural to urban areas in search of employment, ensuring food security for transient populations has become difficult. Many migrant workers do not have a permanent residence or a stable ration card, and as a result, they are often excluded from the benefits of PDS. A study by Bhatt and Sood (2015) showed that urban poor populations, particularly migrants, face challenges in accessing food grains due to the rigid eligibility criteria and the lack of PDS infrastructure in urban areas.

While the Universal PDS was designed to ensure food security for all, it has faced numerous challenges over the years. Issues such as inefficiency in distribution, targeting errors, corruption, inadequate infrastructure, and the rising fiscal burden have hampered its effectiveness. The PDS has also struggled to keep pace with the rapid changes in the demographic structure of India, particularly urbanization and migration. Moving forward, a more targeted approach, greater investment in infrastructure, and the strengthening of technological reforms will be necessary to make the system more efficient and sustainable. The introduction of the NFSA and technological interventions such as biometric systems and ePOS machines have been

positive steps, but there is still much to be done to address the challenges of the Universal PDS.

4.2.2 RPDS: A Reform initiative

The Revamped Public Distribution System (RPDS) was a significant reform introduced in India in 1992, aimed at improving the accessibility and effectiveness of the PDS, particularly in underserved and economically disadvantaged regions. The RPDS focused on addressing the critical issue of food insecurity among marginalized populations, such as those in remote rural areas, tribal communities, and backward regions. The primary objective was to target food distribution to areas where traditional PDS was either ineffective or underperforming.

The RPDS featured several key components that were designed to enhance food security. A major aspect was its targeted distribution approach, which ensured that food grains were directed specifically to regions facing acute food scarcity. These areas included hilly terrains, tribal districts, and desert regions where access to food supplies was often limited. The system aimed to allocate higher amounts of food grains to these regions, ensuring that the most vulnerable populations had access to subsidized food items. Furthermore, the RPDS placed a greater emphasis on improving infrastructure, such as better storage facilities, transportation networks, and an increased number of fair price shops (FPS), all of which were critical to improving food distribution in remote areas (Khera, 2011).

One of the primary challenges that the RPDS faced was implementation gaps. Despite its targeted nature, the infrastructure in some areas was still inadequate, and food grains did not always reach the intended beneficiaries. The system was also plagued by persistent leakages and corruption, where food grains were diverted to the open market or did not reach the poor due to inefficiencies within the distribution network. This undermined the effectiveness of the reform and led to criticisms about the lack of transparency and accountability in the system (Chand, 2003). Another challenge was the limited coverage of the RPDS, as it focused mainly on rural and backward regions but often neglected other vulnerable groups, such as urban slums and migrant

workers, who also faced food insecurity. As a result, large sections of the population continued to be excluded from the benefits of the reform.

4.2.3 TPDS : New targeting initiative

By the early 1990s, it became evident that the universal model of PDS was unsustainable due to inefficiencies and leakage of benefits to the non-poor. The focus shifted to making the distribution system more targeted, leading to the introduction of the Targeted Public Distribution System (TPDS) in 1997. The TPDS aimed to allocate food grains to those most in need by identifying Below Poverty Line (BPL) households and providing them with highly subsidized food. This policy shift was intended to reduce fiscal burdens while ensuring that the poorest sections of society had access to food security. The TPDS system identified two categories of households: APL and BPL. The BPL households received food at much lower prices, while APL households paid higher rates. The implementation of TPDS gave state governments the authority to identify BPL families, often through a rigorous process of inclusion and exclusion (Khera, 2011). However, the TPDS faced challenges, particularly in terms of the accurate identification of beneficiaries and the quality of food distribution. The introduction of TPDS also marked the decentralization of the PDS, giving more autonomy to state governments in determining the implementation mechanisms. However, issues such as the diversion of food grains, delays in distribution, and poor monitoring of the system persisted, leading to continued calls for reforms.

One of the primary challenges of the TPDS is the identification of genuine beneficiaries. The system relies heavily on the identification of Below Poverty Line (BPL) families, but the criteria for inclusion have been criticized for being either too broad or too narrow, resulting in inaccurate targeting. A 2005 study by the National Council of Applied Economic Research (NCAER) found that the exclusion error, where deserving families were left out, was substantial. According to the study, about 50% of the poor were excluded from the system, while many non-poor families continued to benefit from the subsidies (NCAER, 2005). This has led to leakages and inefficiencies, undermining the very objective of targeted distribution.

Even when beneficiaries are accurately identified, the distribution mechanism of the TPDS often faces significant hurdles. The distribution network relies on fair price shops (FPS), which have been plagued by issues such as inadequate stock, irregular distribution, and poor infrastructure. Research shows that leakages in food grains—i.e., food grains that are diverted from the intended beneficiaries—are a major concern. A report by the Ministry of Consumer Affairs (2014) found that leakages in the PDS were up to 40% in certain states. This percentage highlights the significant inefficiencies in the food distribution process, exacerbated by local corruption and lack of accountability at the ground level.

Corruption has been another longstanding issue within the TPDS. At various levels, from procurement to distribution, corruption has been a major factor leading to leakages, where subsidized food grains are diverted to the open market for profit. Monitoring and enforcement mechanisms at the local level have often been insufficient to prevent such practices. A study by Khera (2011) indicated that a significant proportion of food meant for the poor was either sold off at higher prices or never reached the intended recipients due to local corruption and administrative inefficiencies.

Moreover, the lack of transparency in the distribution process has been a critical factor that limits the effectiveness of the system. Many fair price shops do not display the allocation and pricing details, and beneficiaries often do not have access to information about their entitlements, leading to mistrust in the system (Sannigrahi, 2017).

Although the introduction of technology such as Aadhaar-based identification and electronic point of sale (ePOS) machines has aimed to address some of these issues, infrastructure limitations and technological barriers persist. The lack of internet connectivity, particularly in rural and remote areas, hampers the effectiveness of these technological interventions. The use of Aadhaar for identity verification, although a step toward reducing ghost beneficiaries, has faced challenges related to data errors and technical malfunctions (GoI, 2017). Additionally, the lack of proper storage

facilities and transportation systems has resulted in inefficiencies in the supply chain, leading to delays and deterioration of food grains, particularly in far-flung areas.

The inefficiencies within the TPDS also have a direct impact on food security and nutrition. While the system aims to provide subsidized food grains such as rice, wheat, and sugar, the lack of nutritional diversity in the PDS has raised concerns about its long-term effectiveness. The focus on rice and wheat as staple foods has contributed to malnutrition, especially in the case of children and women who require a more diverse diet. According to a study by the Indian Council for Research on International Economic Relations (ICRIER), the reliance on subsidized wheat and rice has resulted in poor nutritional outcomes, with high rates of stunting and wasting in certain regions (ICRIER, 2016).

While the TPDS was designed to reach the poorest of the poor, accessibility issues continue to hinder its impact. Beneficiaries often face long queues, and the food grains available are not always of the required quality. According to the World Bank (2014), accessibility and availability issues are particularly severe in rural and tribal areas, where beneficiaries may have to travel long distances to access the fair price shops, or where shops themselves are ill-equipped and unreliable.

4.2.4 NFSA 2013 : Food as a legal right

Despite these challenges, the Targeted Public Distribution System (TPDS) remains a crucial policy mechanism for advancing food security in India. To address its limitations, several reforms have been implemented. Among the most significant is the National Food Security Act (NFSA), 2013, which expanded the coverage of the PDS to approximately 67% of the population, encompassing both rural and urban areas. The Act mandates that beneficiaries receive 5 kilograms of food grains per person per month at subsidized prices, categorizing them into Priority Households (PHH) and AAY households. Complementing these provisions are technological advancements like end-to-end computerization, Aadhaar-based seeding of ration cards, and real-time monitoring systems to minimize leakages and improve transparency.

.4.3 The National Food Security Act (NFSA), 2013 and Technological Reforms

The National Food Security Act (NFSA), 2013, is a landmark legislation aimed at ensuring food security to approximately two-thirds of India's population. It guarantees legal access to subsidized food grains for eligible individuals, thereby addressing hunger and malnutrition. The Act provides food entitlements through the Targeted Public Distribution System (TPDS) and aims to reduce the vulnerability of marginalized groups, such as the poor, women, children, and other vulnerable sections of society (Government of India, 2013).

The NFSA holds significant relevance in the context of India's food security challenges. It aligns with the country's commitment to the Sustainable Development Goal (SDG) 2, which seeks to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture. By ensuring that food reaches those who need it the most, the NFSA is a critical component in addressing food insecurity and malnutrition. With approximately 67% of the population being eligible for food grain subsidies under the Act, it plays an indispensable role in social justice and equity (India Spend, 2020).

4.3.1 Objectives and Provisions of the NFSA, 2013

The National Food Security Act (NFSA), 2013, represents a ground-breaking policy initiative in India, aiming to combat food insecurity and ensure equitable access to subsidized food grains for the majority of the population. One of the primary objectives of the NFSA is to eradicate hunger and malnutrition by ensuring the consistent availability of affordable food grains to vulnerable sections of society. By embedding food security as a legal entitlement, the Act transitions from a welfare-based approach to a rights-based framework, reflecting a commitment to reducing hunger and malnutrition in a country with a vast and diverse population. Furthermore, the Act prioritizes marginalized groups, such as women, children, and the elderly, recognizing their heightened vulnerability to food shortages.

The provisions of the NFSA are comprehensive and multifaceted. Eligible individuals in Priority Households are entitled to five kilograms of food grains per month at highly

subsidized rates: ₹3 per kilogram for rice, ₹2 for wheat, and ₹1 for coarse grains. In addition, the AAY households, representing the poorest families, are entitled to 35 kilograms of food grains per month per family at free of cost. These provisions reflect the Act's goal of ensuring not just access to food but also economic relief for the most disadvantaged segments of society.

Another notable feature of the NFSA is its focus on nutritional security. Pregnant women and lactating mothers are entitled to free meals during pregnancy and six months post-delivery, along with a maternity benefit of ₹6,000. Similarly, children aged 6 months to 14 years receive nutritious meals through programs like the Integrated Child Development Services (ICDS) and Mid-Day Meal Scheme. These measures underscore the Act's holistic approach to food security, emphasizing not only caloric intake but also nutritional well-being.

The Act also mandates significant reforms in the Public Distribution System. End-to-end computerization of the PDS aims to minimize leakages, enhance transparency, and prevent duplication of ration cards through Aadhaar seeding. Real-time monitoring systems have been introduced to track the distribution of food grains effectively. These technological interventions are designed to improve the efficiency and accountability of the PDS, ensuring that the intended beneficiaries receive their entitlements.

In addition to operational improvements, the NFSA incorporates several provisions to strengthen governance and accountability. It mandates the establishment of State Food Commissions to oversee implementation, monitor progress, and address grievances related to food distribution. A grievance redressal mechanism at both state and district levels ensures that beneficiaries can report issues and seek timely resolutions.

Women's empowerment is another significant aspect of the NFSA. The Act stipulates that the eldest adult woman in a household should be recognized as the head of the household for issuing ration cards. This provision not only facilitates access to food entitlements but also promotes gender equity by recognizing women's roles in household decision-making.

While the NFSA has made significant strides in enhancing food security, its implementation faces several challenges. Bureaucratic inefficiencies, corruption, and delays in food grain distribution hinder its effectiveness. Additionally, infrastructural issues, such as inadequate storage facilities and transportation networks, continue to impact the smooth functioning of the PDS. According to a report by the NITI Aayog (2022), while states like Chhattisgarh and Odisha have excelled in implementing the NFSA, others, such as Bihar and Uttar Pradesh, lag in operational efficiency.

The NFSA also grapples with the challenge of inaccurate targeting. The exclusion of eligible beneficiaries and the inclusion of ineligible individuals undermine the effectiveness of the Act. Furthermore, the lack of awareness among beneficiaries about their entitlements leads to underutilization of the provisions. However, the National Food Security Act, 2013, is a transformative step toward ensuring food security and reducing hunger in India. By legally entitling millions of people to affordable and nutritious food, the Act addresses one of the most pressing socio-economic issues in the country. However, to realize its full potential, addressing systemic challenges in implementation is imperative. Improved governance, enhanced infrastructure, and increased public awareness are critical to ensuring the NFSA's success in creating a hunger-free India.

4.3.2 Achievements and Benefits of the NFSA

The achievements of the NFSA extend beyond mere access to subsidized food grains. It has introduced systemic reforms in the PDS, including end-to-end computerization, Aadhaar-based authentication, and real-time monitoring to enhance efficiency and transparency. These reforms have helped curb leakages, eliminate duplicate ration cards, and streamline the supply chain. State-level innovations, such as Chhattisgarh's model PDS system and Odisha's food security initiatives, highlight the Act's potential when implemented effectively.

In addition, the NFSA has played a critical role in reducing hunger and malnutrition, with significant improvements in food consumption patterns and household savings. The Act has also strengthened social security by integrating schemes like the Mid-Day Meal Program and the Integrated Child Development Services (ICDS),

addressing the nutritional needs of children and pregnant women. This section investigates into the accomplishments and benefits of the NFSA, backed by statistical data and case studies, showcasing its transformative impact on India's food security situation.

Wider Coverage: As of 2022, over 813 million people were covered under the Act through the PDS, with monthly allocations of 5 kg of food grains per person (GoI, 2022).The National Food Security Act (NFSA), 2013, covers approximately 67% of India's population, ensuring access to subsidized food grains through the PDS. This coverage includes 75% of the rural population and 50% of the urban population, identified as Priority Households and AAY beneficiaries. The Act aims to provide 5 kg of food grains per person per month at highly subsidized prices of ₹3, ₹2, and ₹1 for rice, wheat, and coarse grains, respectively (Ministry of Consumer Affairs, Food & Public Distribution, 2023).

Table 4.1

Statistical Overview of NFSA Beneficiaries (India)

Year	Total Beneficiaries (in Millions)	Rural Beneficiaries (in %)	Urban Beneficiaries (in %)	AAY Coverage (in Millions)
2016	813.5	75	50	243.6
2017	804.6	74	49	242.1
2018	805.9	74	49	241.8
2019	808.0	74	50	242.9
2020	810.0	74.5	49.5	243.0
2021	811.0	74.5	49.5	243.5
2022	813.0	75	50	244.0
2023	813.2	75	50	244.1

Sources: Ministry of Consumer Affairs, Food & Public Distribution, 2023; Economic Survey of India, 2022

The statistical trends in beneficiaries covered under the National Food Security Act (NFSA), 2013, underscore its remarkable achievements in ensuring food security for a large segment of India's population. By 2022, the Act had extended its reach to over 813 million individuals, encompassing 75% of the rural population and 50% of the

urban population. This expansive coverage demonstrates the Act's inclusiveness and its role in addressing disparities in food access across rural and urban areas. The consistent numbers over the years, ranging from 804.6 million beneficiaries in 2018 to 811 million in 2023, reflect the stability and reliability of the Act's implementation despite evolving challenges (Table 4.1).

A key feature of the NFSA is its focus on vulnerable groups, particularly through the inclusion of AAY beneficiaries, which targets the poorest households. Each year, approximately 243 million individuals benefit under this provision, ensuring that the most marginalized populations receive the support they need. Moreover, the Act mandates a monthly allocation of 5 kilograms of food grains per person at highly subsidized prices, with rates fixed at ₹3 for rice, ₹2 for wheat, and ₹1 for coarse grains. This affordability ensures essential food security for low-income households while preventing hunger.

The data also highlight the rural-urban distribution of beneficiaries, with greater emphasis on rural areas where poverty and food insecurity are more prevalent. Covering 74-75% of rural populations compared to 49-50% in urban regions aligns with the higher vulnerability of rural communities. This targeted approach has been critical in mitigating food shortages and improving nutritional outcomes in less developed areas.

The data presented in Table 4.2, which tracks the number of ration cards issued under the AAY and Priority Household (PHH) categories for the year 2024. Throughout the year, there are noticeable fluctuations in the issuance of cards, particularly for the AAY and PHH categories. For AAY, which targets the poorest households, there is a peak in September 2024, with 5,050 cards issued, suggesting an increased effort to reach the most marginalized. In contrast, months like April and May see fewer cards issued, at 1,418 and 1,329, respectively. These variations indicate periodic adjustments in outreach efforts or changes in the identification process. On the other hand, PHH cards, which cover a larger segment of economically vulnerable households, show high issuance numbers in August (610,439) and October (586,532), aligning with seasonal needs and agricultural cycles. These peaks likely reflect a response to demand during critical periods, such as post-harvest months or times of food insecurity.

Table 4.2

Number of Ration Card Issued in 2024

Month	AAY	PHH
Feb-24	6405	430075
Mar-24	4475	226994
Apr-24	1418	91298
May-24	1329	190955
Jun-24	3071	188639
Jul-24	3516	404188
Aug-24	4408	610439
Sep-24	5050	291937
Oct-24	5186	586532
Nov-24	1122	372739

Source: National Food Security Portal, 2024,

https://nfsa.gov.in/public/nfsadashboard/PublicRCDashboard.aspx

Despite the wide coverage and consistent efforts to address food security, the table also highlights potential challenges. The fluctuating numbers may point to administrative hurdles, such as delays in beneficiary verification or regional disparities in distribution. These challenges must be addressed to ensure that the NFSA continues to effectively reduce food insecurity across all regions and communities in India. The statistical trends underscore the NFSA's ongoing role in providing food to the population, with significant attention to ensuring the most vulnerable groups benefit.

4.3.3 Impacts of NFSA on Hunger and Malnutrition.

The National Food Security Act (NFSA), 2013 has made significant contributions towards the reduction of hunger and malnutrition in India by improving access to food for vulnerable populations. The Act's wide coverage, reaching nearly 67% of the Indian population, ensures that millions of people in both rural and urban areas receive food grains at highly subsidized rates. This vast outreach directly impacts food security, particularly for PHH and AAY beneficiaries, who are among the poorest

groups in India. Studies indicate a decline in hunger and malnutrition rates in states with effective NFSA implementation.

One of the key provisions of the NFSA is the entitlement of 5 kg of food grains per person per month, which has helped reduce food insecurity, especially among marginalized sections of society. Studies show that the availability of subsidized grains through the PDS has led to reduced food insecurity in many parts of the country. In particular, it has supported efforts to improve nutrition by ensuring a consistent supply of staple food items, such as rice, wheat, and coarse grains, to households.

Table 4.3

GHI Score Trends of India

Year	Undernourishment (% of population)	Child wasting (% of children under five years old)	Child stunting (% of children under five years old)	Child mortality (% of children under five years old)	Global Hunger Index Score
2000	18.3	17.7	51.0	9.2	38.4
2008	15.6	20.0	47.8	6.5	35.2
2016	11.5	20.8	37.9	4.1	29.3
2024	13.7	18.7	35.5	2.9	27.3
Absolute change since 2016 in Global Hunger Index Score					-2.0
% change since 2016 in Global Hunger Index Score					-6.8

Source: Concern Worldwide and Welthungerhilfe,
www.globalhungerindex.org/india.html

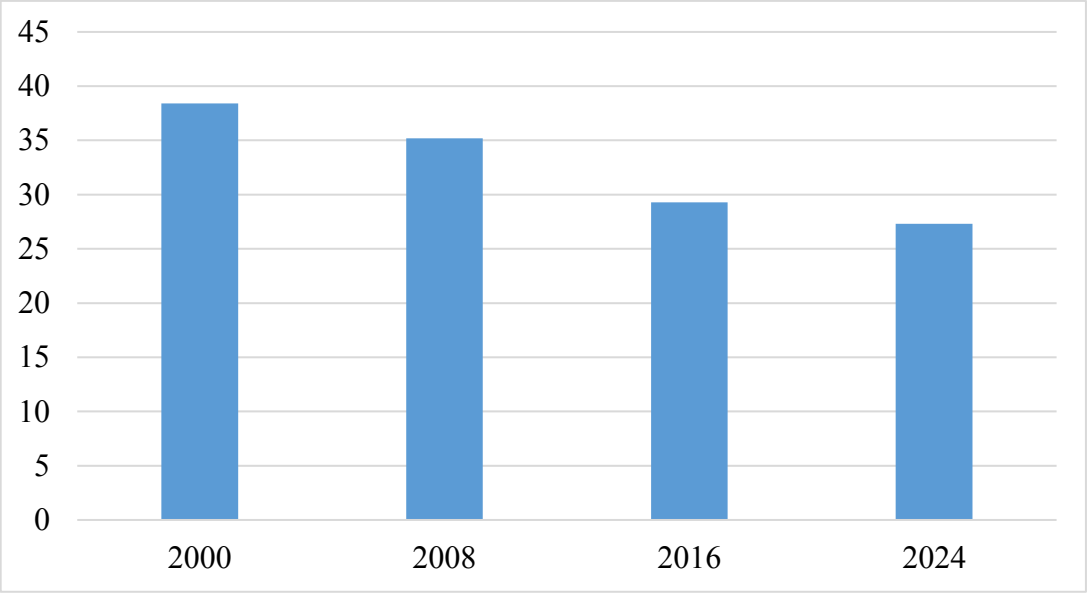
GHI Score Trends of India" (Table 4.3) reflects important indicators of hunger and malnutrition in India from 2000 to 2024. It tracks key measures such as undernourishment, child wasting, child stunting, and child mortality, all of which are essential components of the Global Hunger Index (GHI). In terms of undernourishment, the data shows a positive decline from 18.3% in 2000 to 13.7% in 2024. This decline suggests that a larger portion of the population is gaining better access to food, a key objective of the NFSA. By providing food grains to a significant portion of the population, the Act has played an essential role in reducing hunger and ensuring basic nutrition for the most vulnerable communities. However, the increase

in undernourishment in 2024 compared to previous years may indicate challenges in distribution or access, particularly in certain regions, thus underscoring the ongoing gaps in the implementation of the NFSA (Ministry of Consumer Affairs, Food & Public Distribution, 2023). Regarding child wasting, which indicates the proportion of underweight children, there was a decrease from 20% in 2008 to 18.7% in 2024, but it still remains relatively high. This statistic suggests that, despite significant efforts under the NFSA to address food security, child malnutrition remains a critical issue. Programs aimed at improving nutrition for mothers and children, such as those under the NFSA, have contributed to some improvements, but further progress is needed, particularly in addressing the underlying causes of child wasting like poor healthcare access, sanitation, and feeding practices (Economic Survey of India, 2022). The data on child stunting, which reflects chronic malnutrition, shows a notable improvement, from 51% in 2000 to 35.5% in 2024. This improvement is a positive reflection of policies like the NFSA, which focus on improving nutritional intake among children. However, while the reduction in stunting is encouraging, the rate remains high, highlighting the need for more targeted interventions to address the root causes of stunting, such as inadequate infant and young child feeding practices, poor maternal health, and limited access to clean water and sanitation (Puri, 2022).

One of the most significant improvements is observed in child mortality, which has decreased from 9.2% in 2000 to 2.9% in 2024. This reduction indicates an overall improvement in the health and nutritional status of children, which can be partially attributed to better access to food under the NFSA. The provision of subsidized food grains to vulnerable populations, including pregnant women and children, has helped mitigate malnutrition-related health risks, contributing to better survival rates for children. Nonetheless, child mortality continues to be influenced by factors beyond food security, such as healthcare infrastructure and social determinants of health (Puri, 2022).

Figure 4.1

GHI Score Trends of India



Source: Concern Worldwide and Welthungerhilfe, www.globalhungerindex.org/india.html

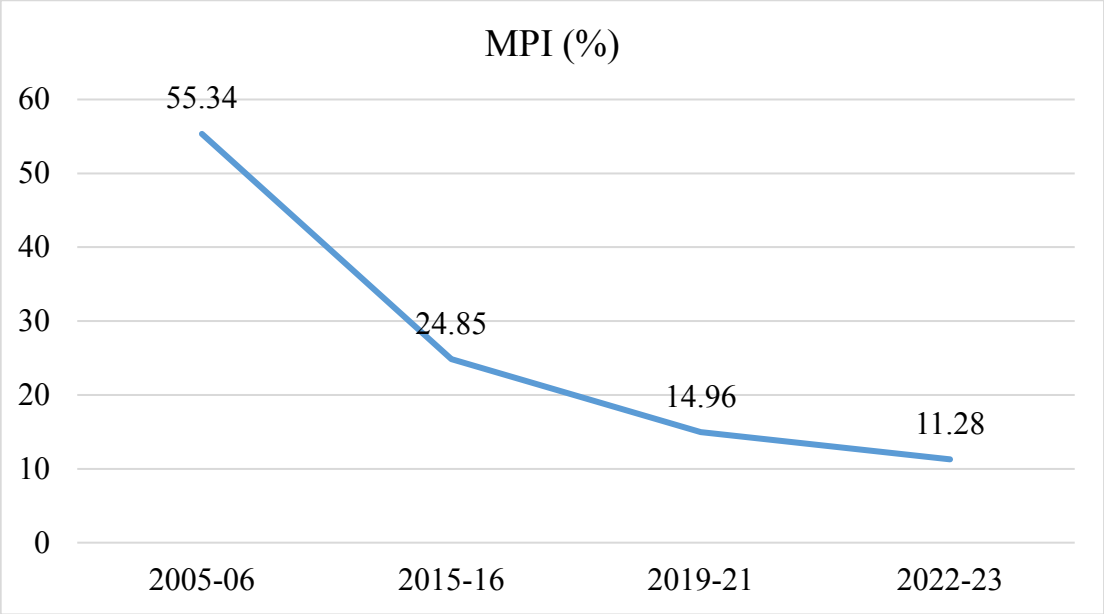
Finally, the Global Hunger Index (GHI) score, which summarizes the severity of hunger in a country, has improved from 38.4 in 2000 to 27.3 in 2024 (Figure 4.1). The absolute change in India's Global Hunger Index (GHI) score since 2016 is -2.0, representing a decline in the severity of hunger in the country. This reflects a 6.8% improvement in India's performance in addressing hunger, as measured by the GHI. Despite this positive trend, India still remains in the "serious" category of hunger, according to the GHI rankings. The continued prevalence of undernourishment and child wasting reflects persistent challenges in the country's food security status. While the NFSA has undoubtedly contributed to improving food access for millions, the ongoing hunger and malnutrition rates indicate that the Act's implementation needs to be more effective in addressing the quality and distribution of food, as well as non-food factors such as healthcare, sanitation, and education (Ministry of Consumer Affairs, Food & Public Distribution, 2023).

In terms of malnutrition, while the Act has played a role in reducing the prevalence of hunger, challenges remain. According to the Global Hunger Index 2022, India still faces issues related to high levels of child malnutrition, undernutrition, and stunting,

despite the large-scale food distribution initiatives under NFSA. The Act has contributed to alleviating hunger, but nutritional quality and diversity of food intake remain critical challenges, as the PDS primarily distributes grains, which may not fully address the nutritional needs of vulnerable groups, especially women and children (Ministry of Consumer Affairs, Food & Public Distribution, 2023).

Figure 4.2

Multidimensional Poverty Index (MPI) of India



Source: NITI Ayog, 2023, https://www.niti.gov.in/sites/default/files/2024-01/MPI-22_NITI-Aayog20254.pdf

The data in Figure 4.2 Multidimensional Poverty Index (MPI) of India highlights India's significant progress in reducing multidimensional poverty over the years, with a sharp decline in MPI scores from 55.34% in 2005-06 to 11.28% in 2022-23. This trend reflects the impact of various poverty alleviation programs, including the implementation of the NFSA2013, which played a critical role in addressing hunger and malnutrition—a major dimension of poverty. The decline in MPI post-2013 is particularly noteworthy. After the NFSA's rollout, the MPI fell significantly, with major reductions observed between 2015-16 (24.85%) and 2019-21 (14.96%). This acceleration coincides with the NFSA's comprehensive coverage of 67% of India's population, ensuring subsidized access to food grains. By tackling undernourishment—a key component of multidimensional poverty—the Act

contributed to improved health and productivity among vulnerable populations. Between 2019-21 and 2022-23, the MPI further declined to 11.28%, despite challenges posed by the COVID-19 pandemic. This improvement highlights the resilience of the NFSA framework in ensuring food security during crises. Subsidized food grains under the PDS enabled households to allocate more resources toward other dimensions of poverty, such as education and healthcare, leading to broader improvements in living standards. The NFSA's provisions, such as empowering women as heads of households for ration cards and prioritizing the needs of vulnerable groups, contributed to these positive outcomes. These measures enhanced the welfare of marginalized communities, helping address systemic inequities. Additionally, the Act complemented other welfare programs like the mid-day meal scheme and Integrated Child Development Services (ICDS), creating a synergistic impact on multidimensional poverty reduction. So, the steady decline in India's MPI score underscores the success of targeted interventions like the NFSA. By focusing on food security and reducing hunger, the Act addressed one of the critical dimensions of poverty, contributing to India's progress toward the Sustainable Development Goals (SDG 1: No Poverty and SDG 2: Zero Hunger). This achievement demonstrates the importance of integrated policies in promotion equitable development and improving quality of life.

4.3.4 Women Empowerment: The inclusion of women as the head of households for ration cards under the National Food Security Act (NFSA), 2013, has been an important step in promoting women's empowerment in India. By recognizing women as the primary beneficiaries of food security programs, the NFSA has strengthened their agency in family welfare decisions, particularly those related to food access, consumption patterns, and overall well-being. This initiative not only improves women's autonomy in managing household resources but also enhances their participation in decision-making processes. Research has shown that when women control household resources, particularly food, it leads to better nutritional outcomes for the family, as they tend to prioritize the well-being of children and other vulnerable members (UN Women, 2018). Moreover, it challenges traditional gender roles by allowing women to take on leadership roles in the family's economic and welfare decisions (Hickey & Du Toit, 2007).

The empowerment of women in this context is further supported by the NFSA's emphasis on equitable distribution of food grains to vulnerable groups, including women, children, and the elderly. With access to subsidized food grains, women are better equipped to fulfill their role as caretakers, ensuring their families receive adequate nutrition. This can positively impact various facets of women's lives, including health, education, and economic participation (Narayan & Kabeer, 2005). The inclusion of women as the head of households under the NFSA is a vital policy change that not only improves food security but also promotes gender equity and empowers women in the household and community. However, challenges such as awareness, implementation delays, and local barriers must be addressed to fully realize the potential of this initiative.

As per the data from the Food Security Portal of India, a total of 20,23,74,794 ration cards were issued under the NFSA till 2024. Of these, 16,39,66,298 are female-headed households (81.02%), which highlights the significant role that women play in household-level decision-making and food security. This shift not only strengthens women's agency but also contributes to greater gender equality in households, as women often make crucial decisions regarding the nutrition and health of family members. It is also a step towards improving women's access to welfare benefits, thus addressing both economic and social inequalities that have historically marginalized them.

4.4 PDS Reforms during the NFSA Era

The National Food Security Act (NFSA), 2013, represents a landmark policy aimed at addressing food insecurity in India by legally entitling eligible households to receive highly subsidized food grains. Enacted on September 10, 2013, this legislation seeks to ensure access to adequate food at affordable prices, thereby upholding the right to food as an essential component of life and dignity as enshrined in Article 21 of the Indian Constitution. Covering approximately 67% of India's population (75% rural and 50% urban), the Act is one of the world's largest food security programs.

The most recent reforms in the PDS system have focused on improving the transparency and efficiency of the system through computerization. The government initiated an end-to-end computerization of the PDS to ensure better monitoring of food grains distribution, from procurement to delivery. This included the digitization of

ration cards, installation of electronic point-of-sale (e-PoS) devices at fair price shops, and the development of a centralized database to track the movement of food grains (Ministry of Consumer Affairs, Food and Public Distribution, 2014). This technological intervention has had a positive impact on reducing leakages, improving accountability, and enabling real-time monitoring of the distribution process. In many states, the introduction of Aadhaar-based biometric authentication for ration cardholders has further helped ensure that the benefits are reaching the intended recipients (PDS Report, 2016). The Aadhaar seeding of ration cards is one such reform that has minimized ghost beneficiaries and duplication in food grain allotment (Vir, 2021). The introduction of ePOS (electronic point of sale) machines at ration shops has streamlined the process of food grain distribution, ensuring real-time tracking and verification (Abraham A, 2021).

Additionally, portability features such as the One Nation One Ration Card (ONORC) system have facilitated the movement of food entitlements across the country, allowing migrant workers and their families to access subsidized food in any state. This system has proven especially beneficial for those migrating for work, a significant demographic in India (Jolad and Shah, 2022). The Geographical Information System (GIS) and GPS-based vehicle tracking have also played crucial roles in ensuring the timely delivery of food grains and maintaining a strong logistics backbone for PDS operations. So, the NFSA, 2013, coupled with technological innovations, has greatly transformed India's food security status. These reforms not only improve food distribution systems but also support broader socio-economic goals by making the process more inclusive, transparent, and responsive to the needs of the population

Table 4.4 highlights the significant advancements made under PDS reforms in India between 2014 and 2021. Digitization of ration cards/beneficiaries' data progressed from 75% in 2014 (completed in 13 States/UTs) to full digitization in all States/UTs by 2016. Aadhaar seeding saw a remarkable leap from 6% ration cards and 3% beneficiaries in 2014 to 92% ration cards and 89% beneficiaries by 2021, enhancing beneficiary identification and minimizing duplication. The installation of electronic Point of Sale (ePoS) devices also scaled up significantly from just 4,350 FPSs across a few States/UTs in 2014 to near-complete coverage of 92% FPSs across 31 States/UTs by 2021. By this time, more than 70% of transactions were biometrically

authenticated using Aadhaar, improving transaction transparency and accountability. The "One Nation One Ration Card" (ONORC) scheme, introduced during this period, extended portability to 32 States/UTs, covering approximately 86% of the National Food Security Act (NFSA) population by the end of 2020.

Table 4.4

Comparative Progress under PDS Reforms During 2014 – 2021

	2014	**2021**
Digitization of ration cards/ beneficiaries' data	75% (100% completed by 13 States/UTs)	100% (Completed in all States/UTs in 2016)
Aadhaar seeding	6% Ration Cards 3%Beneficiaries	92% Ration Cards Beneficiaries 89%
Installation of ePoS devices at FPSs	4,350 FPSs, spread partially across 4-5 States/UTs	92%4.9 of total 5.4 lakh FPSs across 31 States/Uts 100% in 28 States/UTs (near completion
Biometrically authenticated transactions at FPSs	Not implemented in any State/UT	>70% monthly biometrically/ Aadhaar authenticated transactions in States/UTs
One Nation One Ration Card – National Portability	New Scheme	32 States/ Uts covering about 69 Cr. beneficiaries (~86% of NFSA population) as on December 2020
Central Repository of all NFSA ration cards data	New Scheme	Established Data of >90% NFSA ration cards/ beneficiaries in the country is available
Deletion of ineligible / bogus ration cards (w.e.f. 2013)	68 Lakh	4.39 Cr (up to 2020)
Supply Chain Management of food grains	3 States/ UTs	31 States/ Uts (N.A. in Chandigarh, Puducherry and Lakshadweep
Central Dashboards	New Scheme	3 portals established • National Food Security Portal (nfsa.gov.in) • Annavitran (annavitran.nic.in) • IMPDS (impds.nic.in)

Source: Food and Civil Supplies Department, Government of Kerala

Other notable reforms included the establishment of a central repository for NFSA ration card data, which now includes over 90% of the country's beneficiaries, and the elimination of ineligible or bogus ration cards, increasing from 68 lakh removals in 2013 to 4.39 crore by 2020. Supply chain management systems for food grains expanded from three States/UTs in 2014 to 31 by 2021, while central dashboards like NFSA, Annavitran, and IMPDS provided real-time monitoring and transparency. These reforms collectively enhanced operational efficiency, reduced corruption, and significantly improved beneficiary access and service delivery under the PDS, reflecting a robust transition towards a digitized and transparent system.

4.5. Technological Reforms : End-to-End Computerization

To address the challenges associated with the PDS, the government has introduced several technological interventions like End-to-end computerization of the PDS, One Nation One Ration Card (ONORC): Mobile Applications and Grievance Redressal etc. The End-to-end computerization of the PDS is a cornerstone of the National Food Security Act (NFSA), 2013. It aims to enhance transparency, reduce leakages, and improve the efficiency of food grain distribution to beneficiaries. This initiative leverages technology to create a robust and accountable system, ensuring that the right beneficiaries receive the right entitlements. By 2024, over 99.8% of ration cards in India were digitized, allowing for better targeting and minimizing the risks of duplication and ghost beneficiaries. This process ensures that only eligible households access the benefits. The Online Allocation of Food Grains via the Computerized systems allocate food grains to Fair Price Shops (FPS) based on real-time data. This has significantly reduced manual errors and delays in distribution (EMERALD, 2024). As a result of the Fair Price Shop (FPS) Automation, around 90% of FPS across India have been equipped with e-Point of Sale (e-PoS) devices as of 2024. These devices authenticate beneficiaries using Aadhaar-based biometric systems and maintain records of transactions electronically. This prevents diversion of food grains and ensures real-time tracking (EMERALD, 2024). The end to end computerisation improved the efficiency through

- Real-time management System: The digitization of supply chains enables real-time monitoring of stock movements from procurement centres to FPS. This minimizes the chances of pilferage and ensures efficient logistic.

- Reduction in Leakages: Studies estimate a 30% reduction in leakages of food grains since the implementation of the computerization initiative, particularly in states like Chhattisgarh and Andhra Pradesh

- Transparency in entitlement delivery has enhanced trust among beneficiaries. According to a 2023 survey, 85% of PDS users expressed satisfaction with the improved service quality (Ministry of Consumer Affairs, Food & Public Distribution, 2023)

- Enhanced Beneficiary Confidence: The streamlined system has increased trust among the public, as entitlements are delivered more reliably and consistently.

- A centralized system for registering and resolving grievances has been introduced. Through the Grievance Redressal Mechanisms beneficiaries can now use toll-free numbers, mobile apps, and web portals to report issue

4.5.1 Ration Card Digitization in India

Table 4.5 highlights the significant progress achieved in the digitization of ration cards in India by 2023. The complete digitization of over 23 crore ration cards marks a major milestone in modernizing the Public Distribution System (PDS). Nearly 90 per cent of these cards have been linked with Aadhaar, strengthening beneficiary authentication and reducing duplication. Furthermore, the removal of 2.98 crore fake and duplicate ration cards during 2013–2018 reflects improved transparency and targeting efficiency. The widespread adoption of electronic Point of Sale (ePoS) devices in about 95 per cent of Fair Price Shops has enhanced real-time monitoring, accountability, and service delivery within the PDS framework.

Table 4.5

Key Statistics in Ration Card Digitization (2023)

Parameter	Statistic
Total Ration Cards Digitized	23+ crore (100%)
Aadhaar-linked Ration Cards	~90%
Fake Ration Cards Removed	2.98 crore (2013-2018)
FPS with ePoS Devices	~95%

Source: Estimated from National Food Security Portal, 2024

4.5.2 Digitisation and updating of Ration Cards Database

Table 4.6 shows the number of ration cards deleted or cancelled across various states and union territories of India from 2017 to 2021. Over this five-year period, a total of approximately 24 million ration cards were cancelled. This reflects significant progress in the digitization and end-to-end computerization of the PDS under the NFSA2013. The deletion of these cards can be seen as part of a concerted effort to streamline the system, remove duplicate or ineligible cardholders, and improve the overall efficiency of food distribution.

States such as Uttar Pradesh, Madhya Pradesh, and Maharashtra recorded particularly high numbers of cancellations, likely due to concentrated efforts to clean up data, identify ghost beneficiaries, and ensure that only eligible households receive subsidized food. For instance, Uttar Pradesh alone accounted for over 14 million deletions, demonstrating the scale of the effort in larger and more populous states. Other regions like Andaman and Nicobar, Arunachal Pradesh, and Ladakh reported fewer deletions, possibly due to smaller populations or a slower pace of implementing digitization processes.

The cancellation of these ration cards indicates the success of digitization initiatives under the NFSA, which have been instrumental in eliminating inefficiencies and ensuring that the system is more transparent and accountable. The efforts to digitize and computerize the NFSA have significantly helped in identifying discrepancies in ration card distribution, such as ghost cards or duplicate entries, ensuring that food security benefits are directed to those who need them most. This digitization not only increases transparency but also optimizes the delivery of food grains, helping to reach the true beneficiaries and contributing to the overall goal of achieving food security for vulnerable populations in India.

Table 4.6

State/UTs-wise Report of the Ration Cards Deleted/Cancelled from 2017 -21

State/UT	2017	2018	2019	2020	2021	Total
Andhra Pradesh	5449	15209	12762	24523	13128	71071

Andaman and Nicobar	6	47	421	431	NA	905
Arunachal Pradesh	56	NA	NA	NA	NA	56
Assam	42077	135250	22412	21291	11120	232150
Bihar	NA	218051	392713	99404	NA	710168
Chandigarh	88	NA	NA	NA	NA	88
Chhattisgarh	150000	56834	138967	4508	4368	354677
Dadra and Nagar Haveli and Daman and Diu	272	4898	577	5840	1410	12997
Delhi	3969	256987	381	518	NA	261855
Goa	6146	1130	888	148	59	8371
Gujarat	18965	95659	23038	47936	11958	197556
Haryana	29686	291926	NA	NA	NA	321612
Himachal Pradesh	172	56858	367	4376	2538	64311
Jammu and Kashmir	664	3428	13869	13224	NIL	31185
Jharkhand	359793	82394	60333	65234	NA	567754
Karnataka	326382	73675	109312	31753	42558	583680
Kerala	NA	3314	2543	52475	104511	1,62,843
Ladakh	NA	NA	NIL	NIL	614	614
Lakshadweep	NA	5	6	7	33	51
Madhya Pradesh	184673	127441	61265	165829	1424115	1963323
Maharashtra	NA	1281922	653677	131986	36119	2103704
Manipur	336	NA	NA	45321	15541	61198
Meghalaya	NA	2568	10525	16	NA	13109
Mizoram	559	107	156	1443	1637	3902
Nagaland	8521	7723	18552	7304	NA	42100
Odisha	35740	NA	NA	NA	NA	35740
Puducherry	3290	3533	2093	1881	1731	12528
Punjab	69945	34972	94031	179837	3305	382090
Rajasthan	73110	8016	72276	580241	135283	868926
Sikkim	1126	3377	5622	6981	NA	17106
Tamil Nadu	9089	NA	NA	NA	NA	9089
Telangana	41194	3101	40684	12154	NIL	97133
Tripura	NA	18874	552	1099	490	21015
Uttar Pradesh	4441748	4372491	4152273	854025	415259	14235796
Uttarakhand	318718	126268	NA	NA	NA	444986
West Bengal	NA	88593	100151	59666	NA	248410
Grand Total	6131774	7374651	5990446	2419451	2225777	2,41,42,099

Source: Data.gov.in

4.5.3 Aadhar-Seeding of Ration cards in India

Table 4.7 reports the Aadhar-seeded ration cards (RCs) in India as of November 17, 2024, indicating the number of ration cards linked with Aadhar in various states and union territories. It shows both the total number of ration cards under the AAY and Priority Household (PHH) categories, as well as the number of these cards that are successfully Aadhar-seeded. For most states, the percentage of Aadhar-seeded ration cards is extremely high, typically above 99%. For example, Andhra Pradesh, Maharashtra, Bihar, and Uttar Pradesh have 100% Aadhar-seeded RCs across both AAY and PHH categories. These states have achieved near-complete Aadhar integration, showcasing their effective implementation of the Aadhar-based PDS reform, which aims to reduce fraud, ensure accurate distribution, and simplify the verification process. However, some states exhibit lower levels of Aadhar linkage. Meghalaya shows only 72% of its total ration cards are Aadhar-seeded, which may indicate challenges in the implementation process or incomplete data integration. Arunachal Pradesh also has a relatively low percentage, with only 32% of its ration cards linked to Aadhar. This data reflects the continued expansion of digitization in India's PDS, an initiative aimed at improving transparency, reducing ghost beneficiaries, and ensuring that subsidies reach the intended recipients. Aadhar seeding is central to achieving these goals, as it helps link identity verification with welfare schemes, thereby addressing issues like duplicate cards and the inclusion of ineligible individuals. The overall national average of Aadhar-seeded ration cards stands at 99%, highlighting the significant strides made in integrating Aadhar with PDS across the country.

Table 4.7

Aadhar Seeded Ration Cards in India (on 17/11/2024)

State Name	Total Ration Cards			Aadhar Seeded RCs			
	AAY	PHH	Total	AAY	PHH	Total	(%)
Assam	6,72,642	64,47,981	71,20,623	6,71,259	64,36,185	71,07,444	99
Chandigarh	284	84,689	84,973	257	74,892	75,149	88
Dadra, Daman, Diu	5,072	53,791	58,863	5,072	53,791	58,863	100
Goa	11,011	1,17,858	1,28,869	10,988	1,17,459	1,28,447	99
Jammu and Kashmir	2,23,025	14,41,345	16,64,370	2,23,022	14,41,329	16,64,351	99

Ladakh	5,661	24,317	29,978	5,645	24,251	29,896	99
Lakshadweep	1,121	3,523	4,644	1,116	3,510	4,626	99
Maharashtra	24,83,161	1,40,85,349	1,65,68,510	24,83,084	1,40,84,977	1,65,68,061	99
Manipur	64,126	5,11,602	5,75,728	63,873	5,09,471	5,73,344	99
Meghalaya	70,197	3,51,639	4,21,836	51,435	2,55,580	3,07,015	72
Mizoram	25,943	1,50,474	1,76,417	25,897	1,50,132	1,76,029	99
Nagaland	47,460	2,95,640	3,43,100	43,222	2,92,245	3,35,467	97
Punjab	0	0	0	0	0	0	0
Sikkim	16,498	80,512	97,010	16,482	80,502	96,984	99
Tripura	1,10,831	4,96,845	6,07,676	1,10,789	4,96,522	6,07,311	99
Uttarakhand	1,84,106	12,14,499	13,98,605	1,84,071	12,14,461	13,98,532	99
Andaman and Nicobar Island	3,724	13,099	16,823	3,660	13,068	16,728	99
Arunachal Pradesh	37,799	1,39,808	1,77,607	13,620	43,879	57,499	32
Himachal Pradesh	1,65,569	5,87,200	7,52,769	1,65,167	5,86,839	7,52,006	99
Odisha	12,52,845	80,36,496	92,89,341	12,44,450	80,04,466	92,48,916	99
Tamil Nadu	18,03,536	95,57,198	1,13,60,734	18,03,531	95,57,154	1,13,60,685	99
Andhra Pradesh	9,08,000	80,16,640	89,24,640	9,08,000	80,16,640	89,24,640	100
Bihar	22,93,357	1,56,13,962	1,79,07,319	22,66,602	1,56,03,207	1,78,69,809	99
Chhattisgarh	7,18,153	46,68,818	53,86,971	7,17,812	46,66,798	53,84,610	99
Delhi	68,708	17,09,664	17,78,372	68,708	17,09,664	17,78,372	100
Gujarat	8,08,331	70,50,547	78,58,878	8,06,290	70,25,795	78,32,085	99
Haryana	2,92,847	49,08,232	52,01,079	2,92,847	49,08,232	52,01,079	100
Jharkhand	8,92,311	52,15,662	61,07,973	8,82,428	51,79,265	60,61,693	99
Karnataka	10,68,042	1,02,83,246	1,13,51,288	10,67,991	1,02,82,524	1,13,50,515	99
Kerala	5,84,225	36,02,570	41,86,795	5,82,584	36,02,073	41,84,657	99
Madhya Pradesh	14,16,655	1,11,46,979	1,25,63,634	14,16,593	1,11,46,564	1,25,63,157	99
Puducherry	25,464	1,80,763	2,06,227	25,428	1,80,583	2,06,011	99
Rajasthan	6,12,386	1,01,45,951	1,07,58,337	6,11,793	1,01,29,923	1,07,41,716	99
Telangana	5,66,824	49,00,159	54,66,983	5,65,579	48,89,540	54,55,119	99
Uttar Pradesh	40,90,269	3,15,19,545	3,56,09,814	40,89,299	3,15,19,526	3,56,08,825	99
West Bengal	16,17,090	1,24,01,530	1,40,18,620	14,64,543	1,20,15,337	1,34,79,880	96
India	2,31,47,273	17,50,58,133	19,82,05,406	2,28,93,137	17,43,16,384	19,72,09,521	99

Source: Estimated from National Food Security Portal, 2024

4.5.4 Mobile Number Seeding in ration cards Data Base

Table 4.8 presents the Mobile Number Seeding status for ration cards across India as of November 17, 2024, showcasing the number of AAY and PHH ration cards linked to mobile numbers in various states and union territories. The data highlights significant variation in the mobile seeding percentage across states. For example, Tamil Nadu reports an exceptionally high percentage of mobile-seeded ration cards at 99.99%, which suggests a well-implemented system of mobile number linkage for beneficiaries. Similarly, Assam (98.17%) and Telangana (98.33%) show high percentages, indicating effective integration of mobile numbers with the PDS to facilitate notifications, delivery updates, and fraud prevention. However, some states show lower mobile seeding rates. Jammu and Kashmir (42.74%), Maharashtra (44.20%), and Madhya Pradesh (45.32%) display relatively low percentages of mobile-linked ration cards, indicating possible gaps in mobile number registration or barriers related to mobile access. Bihar and Uttar Pradesh have no mobile-seeded ration cards recorded in the data. The national average stands at 53.45%, reflecting the challenges and progress in achieving full mobile number seeding across the country. This mobile seeding process is crucial for enhancing transparency, ensuring better communication with beneficiaries, and improving the efficiency of welfare schemes. Such initiatives form part of India's broader digitization efforts in PDS aimed at improving transparency and service delivery.

Table 4.8

Mobile No. Seeded RCs in India (17/11/2024)

State Name	Mobile No. Seeded RCs			
	AAY	PHH	Total	Percent
Assam	6,58,101	63,31,864	69,89,965	98.17
Chandigarh	188	62,683	62,871	73.99
Dadra and Nagar Haveli and Daman and Diu	4,939	51,803	56,742	96.40
Goa	10,449	1,12,592	1,23,041	95.48
Jammu and Kashmir	84,683	6,26,597	7,11,280	42.74
Ladakh	2,545	12,673	15,218	50.76

Lakshadweep	920	2,544	3,464	74.59
Maharashtra	8,09,466	65,14,054	73,23,520	44.20
Manipur	59,761	4,82,312	5,42,073	94.15
Meghalaya	18,685	1,14,532	1,33,217	31.58
Mizoram	12,987	78,199	91,186	51.69
Nagaland	11,866	1,59,034	1,70,900	49.81
Punjab	0	0	0	#DIV/0!
Sikkim	6,572	36,135	42,707	44.02
Tripura	47,424	2,20,891	2,68,315	44.15
Uttarakhand	81,898	6,00,241	6,82,139	48.77
Andaman and Nicobar Island	2,352	10,378	12,730	75.67
Arunachal Pradesh	0	888	888	0.50
Himachal Pradesh	1,55,315	5,55,465	7,10,780	94.42
Odisha	9,33,166	64,77,780	74,10,946	79.78
Tamil Nadu	18,03,453	95,56,355	1,13,59,808	99.99
Andhra Pradesh	7,65,850	70,68,072	78,33,922	87.78
Bihar	0	0	0	0.00
Chhattisgarh	6,50,804	44,21,894	50,72,698	94.17
Delhi	63,904	16,25,630	16,89,534	95.00
Gujarat	6,33,014	56,72,963	63,05,977	80.24
Haryana	2,89,976	48,66,313	51,56,289	99.14
Jharkhand	4,42,513	32,94,985	37,37,498	61.19
Karnataka	8,46,509	97,44,085	1,05,90,594	93.30
Kerala	**5,74,202**	**35,88,767**	**41,62,969**	**99.43**
Madhya Pradesh	3,49,839	53,43,737	56,93,576	45.32
Puducherry	18,753	1,52,093	1,70,846	82.84
Rajasthan	2,87,737	54,66,320	57,54,057	53.48
Telangana	5,55,655	48,20,145	53,75,800	98.33
Uttar Pradesh	0	0	0	0.00
West Bengal	6,25,664	70,55,917	76,81,581	54.80
India	1,08,09,190	9,51,27,941	10,59,37,131	53.45

Source: Estimated from National Food Security Portal, 2024

4.5.5 Bank Account Seeding in ration cards Data Base

Table 4.9 presents data on Bank Account Seeding for ration cards across India, dated November 17, 2024. The table shows how AAY and PHH ration cards are linked to bank accounts in various states and union territories, highlighting the extent of digitization in welfare distribution systems. This linkage is a crucial step toward ensuring that benefits reach beneficiaries directly and efficiently, particularly through financial inclusion initiatives. A few states have successfully achieved a high rate of bank account seeding. Mizoram stands out with 92.09% of ration cards linked to bank accounts, which is significantly higher than the national average. Odisha and Chhattisgarh also show impressive figures of 95.25% and 95.61%, respectively, suggesting that these states have made considerable progress in integrating digital banking with welfare distribution systems. These high seeding percentages reflect the effectiveness of local infrastructure and policies that promote financial inclusion. However, the data also highlights areas with substantial gaps in seeding rates. For instance, Goa has only 3.27%, and Nagaland shows a mere 0.15% of ration cards seeded with bank accounts. These low figures could point to challenges such as limited banking infrastructure, poor digital literacy, or logistical issues in reaching remote areas. Moreover, states like Punjab, Tamil Nadu, Andhra Pradesh, and Bihar report zero bank-account-seeded ration cards, which could indicate either a lack of implementation or issues related to data reporting. The national average for bank account seeding stands at 23.24%, which underscores the uneven progress across different regions. The slow pace of seeding reflects the challenges of digitizing a large, diverse country like India, where infrastructural differences, digital access, and socio-economic factors can affect the implementation of digital welfare systems. These discrepancies suggest the need for more focused efforts in regions with lower seeding rates to ensure that all beneficiaries can access the intended benefits through their bank accounts.

Table 4.9

Bank A/C Seeded RCs in India (17/11/2024)

State Name	Bank A/C Seeded RCs			
	AAY	PHH	Total	Percent
Assam	6,01,133	50,11,433	56,12,566	78.82
Chandigarh	34,207	34,207	68,414	80.51
Dadra and Nagar Haveli and Daman and Diu	3,554	39,825	43,379	73.69
Goa	2,107	2,107	4,214	3.27
Jammu and Kashmir	6,193	55,495	61,688	3.71
Ladakh	671	2,846	3,517	11.73
Lakshadweep	91	91	182	3.92
Maharashtra	7,10,281	31,06,751	38,17,032	23.04
Manipur	22,990	1,61,262	1,84,252	32.00
Meghalaya	7,988	39,485	47,473	11.25
Mizoram	24,138	1,38,332	1,62,470	92.09
Nagaland	89	415	504	0.15
Punjab	0	0	0	#DIV/0!
Sikkim	7,476	36,668	44,144	45.50
Tripura	1,449	13,034	14,483	2.38
Uttarakhand	1,23,779	7,71,793	8,95,572	64.03
Andaman and Nicobar Island	2,884	12,053	14,937	88.79
Arunachal Pradesh	0	0	0	0.00
Himachal Pradesh	4,755	26,676	31,431	4.18
Odisha	76,30,084	12,18,468	88,48,552	95.25
Tamil Nadu	0	0	0	0.00
Andhra Pradesh	0	0	0	0.00
Bihar	0	0	0	0.00
Chhattisgarh	7,03,196	44,47,192	51,50,388	95.61
Delhi	0	0	0	0.00
Gujarat	6,87,588	55,83,244	62,70,832	79.79
Haryana	0	0	0	0.00
Jharkhand	6,90,178	37,32,774	44,22,952	72.41
Karnataka	0	0	0	0.00
Kerala	4,87,113	29,85,832	34,72,945	82.95
Madhya Pradesh	0	0	0	0.00
Puducherry	9,712	54,058	63,770	30.92
Rajasthan	3,69,663	55,51,474	59,21,137	55.04
Telangana	96,436	7,70,780	8,67,216	15.86
Uttar Pradesh	3,698	28,308	32,006	0.09
West Bengal	0	0	0	0.00
India	1,22,31,453	3,38,24,603	4,60,56,056	23.24

Source: Estimated from National Food Security Portal, 2024

4.5.6 Female Heads of Household under the NFSA 2013

Table 4.10 provides data on Female Heads of Household (HOF) under the NFSA in India as of November 17, 2024. Some states stand out with exceptionally high percentages of female-headed households in the NFSA. Himachal Pradesh (96.65%) and Tamil Nadu (96.57%) have notably high figures, suggesting that these regions have a relatively higher proportion of female-headed households within the welfare system. Odisha (92.77%) and Bihar (94.21%) also have strong representation, highlighting regional differences in the proportion of female-headed households benefiting from food security measures. On the other hand, certain areas have considerably lower figures. For example, Rajasthan (18.14%) and West Bengal (12.90%) have very low percentages of female-headed households under NFSA, possibly reflecting either fewer female heads of households in these regions or challenges related to household registration. Additionally, Jammu and Kashmir (93.48%) and Goa (94.64%) maintain strong figures of female HOF under the NFSA, but such discrepancies in regional data also hint at the diverse socio-economic conditions influencing the representation of female-headed households. The national average of female HOF under the NFSA stands at 83.36%, underscoring a significant presence of women as heads of households in the food security framework across India.

Table 4.10

Female Head of Family (NFSA) in India (17/11/2024)

State Name	Female HOF(NFSA)			
	AAY	PHH	**Total**	**Percent**
Assam	6,23,352	60,07,694	66,31,046	93.12
Chandigarh	241	73,361	73,602	86.62
Dadra and Nagar Haveli and Daman and Diu	321	3,995	4,316	7.33
Goa	10,347	1,11,610	1,21,957	94.64
Jammu and Kashmir	2,05,764	13,50,060	15,55,824	93.48
Ladakh	1,354	7,074	8,428	28.11
Lakshadweep	898	2,948	3,846	82.82

Maharashtra	22,83,352	1,27,65,304	1,50,48,656	90.83
Manipur	49,929	4,17,818	4,67,747	81.24
Meghalaya	66,434	3,38,075	4,04,509	95.89
Mizoram	20,966	1,34,222	1,55,188	87.97
Nagaland	37,711	2,28,160	2,65,871	77.49
Punjab	0	0	0	0
Sikkim	11,727	59,149	70,876	73.06
Tripura	1,04,245	4,63,329	5,67,574	93.40
Uttarakhand	1,58,701	10,63,409	12,22,110	87.38
Andaman and Nicobar Island	2,990	11,696	14,686	87.30
Arunachal Pradesh	31,080	1,25,753	1,56,833	88.30
Himachal Pradesh	1,59,942	5,67,590	7,27,532	96.65
Odisha	11,32,070	74,85,750	86,17,820	92.77
Tamil Nadu	17,57,772	92,13,170	1,09,70,942	96.57
Andhra Pradesh	62,83,141	7,32,816	70,15,957	78.61
Bihar	21,63,848	1,47,06,700	1,68,70,548	94.21
Chhattisgarh	6,67,890	44,77,293	51,45,183	95.51
Delhi	63,575	16,67,580	17,31,155	97.34
Gujarat	6,82,850	63,84,392	70,67,242	89.93
Haryana	2,71,790	46,58,744	49,30,534	94.80
Jharkhand	0	51,82,318	51,82,318	84.85
Karnataka	10,39,201	1,11,28,463	1,21,67,664	107.19
Kerala	5,48,360	34,32,035	39,80,395	95.07
Madhya Pradesh	12,46,181	1,01,04,144	1,13,50,325	90.34
Puducherry	23,910	1,72,810	1,96,720	95.39
Rajasthan	1,70,879	17,80,576	19,51,455	18.14
Telangana	5,33,791	47,58,398	52,92,189	96.80
Uttar Pradesh	33,88,189	3,00,61,714	3,34,49,903	93.93
West Bengal	4,75,848	13,32,543	18,08,391	12.90
India	2,42,18,649	14,10,10,693	16,52,29,342	83.36

Source: Estimated from National Food Security Portal, 2024

4.5.7 Implementation of Electronic Point of Sale systems in Fair Price Shops

Table 4.11 presents data on the number of Operational ePoS (Electronic Point of Sale) systems in Fair Price Shops (FPSs) across India as of November 17, 2024. This table reflects the widespread implementation of ePoS devices under the NFSA to digitize and streamline the distribution of subsidized food grains and ensure transparency in the PDS. From the data, Andhra Pradesh, Bihar, Goa, and several other states and union territories have achieved 100% operational ePoS across their FPSs, indicating the successful integration of technology to enhance PDS services. Notably, Assam and Delhi have not yet implemented any operational ePoS systems, which points to gaps in digitization in those regions. In Kerala, the data from Table 4.10 shows that 14,189 Fair Price Shops (FPSs) were reported, with 14,155 of them having Operational ePoS, which amounts to 99.8% operational coverage. This indicates a high level of digital integration in Kerala's PDS, signalling that most FPSs are equipped with technology for better service delivery, transparency, and efficient management of food distribution under the National Food Security Act (NFSA). The 99.8% operational rate is among the highest in the country, reflecting Kerala's commitment to modernizing its PDS infrastructure. This indicates that most of the state's ration shops are digitized, enabling quick and transparent transactions for beneficiaries, thereby reducing the possibility of corruption or mismanagement. Kerala has been proactive in adopting technology to ensure food security, and this high rate of operational ePoS points to the state's infrastructure and governance being aligned with the national goals of improving the efficiency of food distribution systems. In terms of state-wise performance, Uttarakhand has an exceptional figure of 874.9% operational ePoS, which seems to be an anomaly, likely due to a reporting error or overestimation in the number of operational systems. Similarly, Meghalaya shows a very low percentage (0.2%), with only a small fraction of its FPSs having operational ePoS, reflecting challenges in infrastructure or implementation. Nationally, 90.9% of the total FPSs are equipped with functional ePoS, marking a significant progress towards the modernization of PDS operations across the country. However, disparities in coverage still exist across states, indicating regional challenges in digitization, infrastructure, or the availability of necessary resources.

Table 4.11

ePoS Deployment in India (17/11/2024)

States/UTs	No. of Fair Price Shops (FPSs)	Operational ePoS	Percent of ePoS Operational
Andaman and Nicobar Islands	464	445	95.9
Andhra Pradesh	28,936	28,936	100.0
Arunachal Pradesh	1,640	25	1.5
Assam	38,237	0	0.0
Bihar	47,032	47021	100.0
Chandigarh	NA	NA	
Chhattisgarh	12,304	12004	97.6
Dadra & NH and Daman Diu	114	114	100.0
Delhi	2,018	0	0.0
Goa	456	456	100.0
Gujarat	17,210	17,210	100.0
Haryana	9,526	9,526	100.0
Himachal Pradesh	4,934	4,934	100.0
Jammu & Kashmir	6,002	6,411	106.8
Jharkhand	25,532	25,532	100.0
Karnataka	19,935	19,762	99.1
Kerala	14,189	14,155	99.8
Lakshadweep	39	39	100.0
Madhya Pradesh	25,133	25,103	99.9
Maharashtra	52,532	52,532	100.0
Manipur	2,765	2,157	78.0
Meghalaya	4,735	10	0.2
Mizoram	1,245	1,239	99.5
Nagaland	1,629	1619	99.4
Odisha	12,577	12,577	100.0
Puducherry	NA	NA	
Punjab	17,525	17,525	100.0
Rajasthan	25,682	25,579	99.6
Sikkim	1,362	1,352	99.3

Tamil Nadu	34,776	34,776	100.0
Telangana	17,170	17,170	100.0
Tripura	1,806	1,806	100.0
Uttarakhand	9,200	80,493	874.9
Uttar Pradesh	80,493	7,634	9.5
West Bengal	20,261	20,261	100.0
Total	5,37,459	4,88,403	90.9

Source: Estimated from National Food Security Portal, 2024

4.5.8 ONORC Scheme and Ration Card Portability in India

The digitization efforts under NFSA and TPDS have significantly improved the efficiency of the Public Distribution System. This is evident in the smoother implementation of ONORC and reduction in the systemic errors that plagued manual processes. As these reforms mature, they provide a model for future digitization efforts in other welfare schemes.

Table 4.12 highlights the significant impacts of introducing portability in the PDS in Kerala, focusing on its benefits for beneficiaries, Fair Price Shops (FPS), and the administration. Impact on Short-Term Migrants: Before portability, short-term migrants faced challenges as they lost access to their food grain entitlements when away from their registered locations. During Post-portability, migrating households can now avail their full or partial entitlements at subsidized rates from any FPS at their destination. This ensures food security for migrants and reduces their financial burden.

Impact on Beneficiary Convenience and Satisfaction: Previously, beneficiaries could only access grains from FPS linked to their ration cards, causing issues like longer waiting times, irregular FPS hours, and inconvenient travel distances. Additionally, challenges such as overcharging or incorrect weighments were prevalent. After portability, beneficiaries can choose their FPS based on convenience and service quality, leading to greater satisfaction and empowerment. This flexibility has transformed the system into a beneficiary-centred model.

Impact on FPS Operations: Before portability, FPS operations were limited by the number of tagged ration cards, with no performance incentives. This led to unprofessional behaviour and opportunities for grain diversion. With portability, FPS dealers are incentivized to provide better service to attract more customers, leading to healthy competition. Automated accounting systems also ensure transparency and minimize the risk of diversion.

Impact on Accountability: Previously, dissatisfied beneficiaries had limited avenues to voice grievances, often fearing retaliation from FPS dealers. Portability introduced a built-in feedback mechanism where beneficiaries could switch to alternative FPSs if dissatisfied, effectively reducing the risk of retaliation. This automatic feedback system acts as a performance evaluation tool for FPS dealers.

Impact on Administrative Convenience: The earlier system required extensive top-down monitoring to oversee FPS operations, which acted as monopolies in their regions. Post-portability, the system benefits from bottom-up monitoring driven by market dynamics and beneficiary choice. Increased competition among FPSs has reduced the administrative burden and improved service delivery without extensive government intervention.

Table 4.12

Impacts of portability

		Before Portability	After Portability
1	Impact on short term migrants	Families lose their entitlement during migration and have to purchase grains from open market at higher prices	Migrating households or members can avail their entitlement in full or in part at subsidized rates from the FPS at their destination
2	Impact on beneficiary convenience and satisfaction	Beneficiaries could only avail grains from FPS that their Ration Cards were attached to, leading to: • Longer wait time at the FPS • Delays/denial due to irregular opening/closing hours of FPS • Longer travel distances • Incorrect weighment/ overcharging •	Beneficiaries are empowered with choice of FPS and may now choose to purchase from most convenient FPSs providing high quality and reliable service

		Difficulty in accessing food grains due to suspension/cancellation of FPS	
3	Impact on FPS operations	No incentive to FPS dealer for better performance • Income of FPS limited by number of tagged ration cards • Improper and unprofessional conduct of FPS operators • Scope for diversion of food grains not-lifted by migrant beneficiaries	FPS forced to provide better services to attract more TPDS beneficiaries and thereby increase their incomes • Increased competition amongst the FPS, reduces scope for misbehaviour • The automated accounting system reduces the scope for diversion
4	Impact on Accountability	Dissatisfied beneficiaries have option to register their feedback/ grievance against FPS through PDS toll-free numbers maintained by State Governments Fear/risk of retaliation from FPS on complaint as beneficiary retuned to same FPS for service	Feedback mechanism is also inbuilt in the design of the scheme. As freedom is provided to beneficiaries to avail service from any Fair Price Shop of choice, this serves as an automatic feedback on performance of FPS dealers. Risk of retaliation from FPS dealer minimised
5	Impact on administrative convenience	Higher administrative burden as system performance highly dependent of top down monitoring of shops that act as local monopolies in PDS grain	Enhanced administrative convenience due to operation of bottom-up monitoring led by choice/ free market dynamics Portability infuses competition amongst Fair Price Shops and reduces the regulatory and monitoring role of government

Source: Food and Civil Supplies Department, Government of Kerala

Portability has revolutionized the PDS by addressing critical gaps in access, accountability, and service delivery. It has empowered beneficiaries with choice, improved the operational standards of FPSs through competition, and reduced administrative overheads. The portability system ensures a more equitable and efficient distribution of food grains, making the PDS a robust mechanism for ensuring food security, particularly for vulnerable groups such as migrants.

4.5.9 Inter State Portability of PDS in India

Table 5.13 provides an analysis of interstate portability transactions under the PDS in India from 2022 to 2024. It captures two aspects: the total portability transactions recorded by states and Union Territories (UTs) and the number of transactions utilized by beneficiaries. Portability transactions reflect the effectiveness of the PDS system in catering to migrants who access their entitlements away from their home state. States such as Bihar, Uttar Pradesh, and Madhya Pradesh are standout performers, showing a high number of portability transactions utilized. Bihar recorded 4,674,773 utilized transactions, the highest among all states, followed closely by Uttar Pradesh with 4,290,234. This indicates significant migration patterns from these states, necessitating robust PDS portability to ensure food security for their migrant populations. Madhya Pradesh also showcased notable utilization with 553,183 transactions, reflecting the system's effectiveness in addressing migrant needs.

Table 4.13

Inter State Transaction PDS in India (Portability)

Year	Number of Transactions	Percent Change	Average Transaction per Month
2022	3312023		276002
2023	3581769	8.144	298481
2024	3306704	-7.680	275559

Source: Estimated from National Food Security Portal, 2024

Table 4.14 presents data on interstate portability transactions under the PDS in India, emphasizing trends from 2022 to 2024. The portability feature allows beneficiaries to access their food grain entitlements outside their home state, particularly benefitting

migrant populations. In 2022, a total of 3,312,023 transactions were recorded, with an average of 276,002 transactions per month. This figure increased to 3,581,769 transactions in 2023, representing an 8.14% growth. The average monthly transactions also rose to 298,481, indicating increased utilization of the portability feature. However, in 2024, the total number of transactions dropped to 3,306,704, a 7.68% decrease compared to the previous year. This decline brought the monthly average down to 275,559 transactions, close to the levels seen in 2022. The growth in 2023 suggests that more beneficiaries leveraged the portability system, possibly due to improved infrastructure, increased awareness, and the stabilization of post-pandemic migration patterns. The decline in 2024, however, may reflect a reversal of these trends, including factors such as reduced migration, operational challenges, or diminished outreach efforts. Despite the fluctuations, the relatively consistent monthly transaction averages across the three years highlight the ongoing importance of portability in ensuring food security for migrants. This trend underlines the critical role of interstate portability in the National Food Security Act's broader mission to combat food insecurity and promote equitable access for all citizens.

On the other hand, several states and UTs, such as Nagaland (140 transactions), Sikkim (6 transactions), and Arunachal Pradesh (zero utilization), show negligible portability usage. This could be due to limited interstate migration, poor awareness among beneficiaries, or gaps in the infrastructure required to support portability. For instance, despite having portability transactions recorded, states like Chandigarh and Pondicherry reported zero utilized transactions, raising questions about the operational efficiency of portability services in these regions.

Kerala recorded 38,630 portability transactions, of which only 2,112 were utilized. This low utilization rate highlights potential challenges in implementation or awareness. Kerala's relatively low portability figures might reflect limited migration into the state compared to others or gaps in the outreach and functionality of the portability system.

Delhi presents an intriguing case, with 6,940,206 portability transactions recorded but only 45,440 utilized, pointing to a substantial gap between availability and usage. This

disparity suggests issues such as urban complexities, lack of beneficiary awareness, or administrative bottlenecks. Similar trends are observed in Gujarat, Maharashtra, and Rajasthan, where utilization rates lag behind recorded transactions. It underscores significant regional disparities in PDS portability utilization, emphasizing the need for targeted measures to address gaps in underperforming states. Enhancing awareness among beneficiaries, improving digital infrastructure, and addressing logistical challenges could drive higher portability usage. States with high migration inflows, such as Kerala and Delhi, require focused interventions to align availability with beneficiary needs.

Interstate PDS portability is a critical feature for ensuring food security for India's migrant population. While states like Bihar and Uttar Pradesh demonstrate successful implementation, others lag in utilization, signalling the need for improved policy support and operational enhancements. Strengthening the portability system nationwide could better serve migrants and contribute to the equitable distribution of food security resources.

Table 4.14

Interstate PDS Portability Transactions across Indian States (2022–2024)

Sate	Portability Sold Transactions (inflow)	Portability Transactions Utilized (Number of Transactions) (outflow)
Andaman and Nicobar Islands	551	
Andhra Pradesh	844	18042
Arunachal Pradesh	65	
Assam	235	6741
Bihar	77132	4674773
Chandigarh	678	
Chhattisgarh	6691	30383
Dadar & Nagger Haveli	47713	45
Daman and Diu	96636	137

Delhi	6940206	45440
Goa	19206	90
Gujarat	262887	23230
Haryana	1186896	115749
Himachal Pradesh	164456	1792
Jammu and Kashmir	83765	4182
Jharkhand	24322	91732
Karnataka	18782	27363
Kerala	38630	2112
Ladakh	415	0
Madhya Pradesh	63978	553183
Maharashtra	689347	57526
Manipur	4	153
Meghalaya	268	0
Mizoram	143	0
Nagaland	103	140
Odisha	377	14054
Puducherry	984	0
Punjab	14667	419
Rajasthan	189681	84109
Sikkim	1685	6
Tamil Nadu	8873	20692
Telangana	46114	556
Tripura	11885	247
Uttar Pradesh	16987	4290234
Uttarakhand	158564	92775
West Bengal	26726	44591

Source: Estimated from National Food Security Portal, 2024

Table 4.15 show a detailed account of the distribution of key commodities under the PDS in India, segmented by transaction types: regular, intra-state, and inter-state. A cumulative total of 40,29,801.27 MT of commodities was distributed under PDS until

2024. Among these, regular transactions accounted for the vast majority, contributing 85.1% of the total. Intra-state transactions followed with 14.6%, while inter-state transactions represented a mere 0.4%, reflecting the limited portability of commodities across state borders. Fortified rice emerged as the most widely distributed commodity, totalling 19,79,840.127 MT. It primarily circulated through regular transactions (16,79,151.19 MT) and intra-state transactions (2,99,323.746 MT), with a minimal inter-state distribution of 1,365.191 MT, underlining its emphasis in addressing nutritional needs. Wheat followed with a total distribution of 12,61,684.22 MT, predominantly through regular transactions (10,57,148.664 MT) and intra-state transactions (1,94,916.414 MT). The inter-state distribution of wheat was limited to 9,619.146 MT, signifying a preference for local or regional usage over inter-state portability. Rice contributed 6,71,064.14 MT to the total distribution, with the bulk from regular transactions (5,93,200.041 MT), supplemented by intra-state (73,681.066 MT) and inter-state (4,183.033 MT) transactions. Coarse grains represented the smallest share, with 1,17,212.774 MT distributed, primarily through regular transactions (96,667.169 MT) and some intra-state transactions (20,545.605 MT). Notably, coarse grains had no inter-state transactions, suggesting their distribution is strictly local or regional. Inter-state transactions accounted for only 15,167.37 MT, which is approximately 0.4% of the total distribution. This minimal contribution points to logistical or administrative constraints in implementing effective portability under PDS. The absence of inter-state transactions for coarse grains and their negligible levels for other commodities reflect potential challenges in meeting cross-state demand. The data underscores the strong reliance on regular and intra-state transactions for maintaining food security through the PDS. The prominence of fortified rice distribution highlights a targeted approach toward enhancing nutritional security. However, the limited inter-state portability of commodities calls for further improvements in policy and logistics to enable seamless access across state boundaries.

Table 4.15
Commodity-wise Distribution of Regular, Intra-State, and Inter-State PDS Transactions (2022 - 24) - Distributed Quantity (In MT)

Commodity	Regular	Intra state	Inter State	Total
Wheat	10,57,148.664	1,94,916.414	9,619.146	12,61,684.22
Fortified Rice	16,79,151.19	2,99,323.746	1,365.191	19,79,840.127
Rice	5,93,200.041	73,681.066	4,183.033	6,71,064.14
Coarse Grains	96,667.169	20,545.605	0	1,17,212.774
Total	34,26,167.064	5,88,466.831	15,167.37	40,29,801.27

Source: Estimated from National Food Security Portal, 2024

The National Food Security Act (NFSA), 2013, has been a landmark initiative in India, aiming to ensure food security for all citizens, particularly vulnerable sections of society. Through its provisions, it has achieved several notable outcomes, while also facing some challenges that still need to be addressed.

One of the most significant achievements of the NFSA is the digitization of the PDS, which has led to enhanced transparency, efficiency, and reduced corruption. The widespread adoption of electronic Point of Sale (ePoS) devices in Fair Price Shops (FPSs) has drastically improved the functioning of PDS outlets. As of 2024, 90.9% of FPSs across India are equipped with these devices, with some states like Andhra Pradesh, Bihar, and Kerala achieving near-total coverage. This advancement ensures that food distribution is more transparent and that beneficiaries receive the correct entitlement. The end-to-end computerization also ensures that the entire process—from beneficiary identification to distribution and transaction recording—is monitored, which helps in minimizing errors and leakage of subsidized food grains.

Moreover, the NFSA has made a conscious effort to improve the nutritional status of the population by promoting fortified rice, which has been distributed in large quantities. By the end of 2024, over 19.7 million MT of fortified rice had been distributed, highlighting the government's focus on improving the nutritional value of the grains provided under the PDS. This aligns with the broader goal of not just providing food security but also addressing issues like malnutrition.

Despite these successes, the implementation of the NFSA faces some challenges. While ePoS systems have been widely adopted, there are still discrepancies in the coverage of food grains like coarse grains, which see limited inter-state transactions. Some regions, such as Meghalaya and Arunachal Pradesh, show low utilization of interstate portability, suggesting that the system is still not fully accessible to all sections of society. The disparity in how states manage intra-state versus interstate transactions reflects existing logistical and infrastructural hurdles that need to be addressed. Additionally, while the NFSA has succeeded in increasing transparency and reducing leakages, the system still faces challenges in terms of comprehensive coverage. There are concerns about the exclusion errors where eligible beneficiaries may still be left out due to faulty identification or data issues, as well as the need for better integration of nutrition-centric programs across the PDS network.

So, the National Food Security Act has made substantial strides in modernizing India's food security infrastructure, enhancing both the coverage and quality of food distribution. Through ePoS adoption, interstate portability, and the emphasis on fortified rice, it has tackled some of the key challenges associated with food security, such as inefficiency, leakage, and nutritional inadequacies. However, continued efforts are required to address regional disparities, improve interstate transaction systems, and ensure that the program reaches every intended beneficiary effectively. With the ongoing evolution of the NFSA and its integration of technology, the future of India's food security looks promising, although its full potential can only be realized with ongoing improvements in implementation and monitoring.

4.6 Public Distribution System in Kerala

The PDS in Kerala plays a pivotal role in ensuring food security for the state's population, particularly for its marginalized and vulnerable groups. As part of the National Food Security Act (NFSA), Kerala's PDS has undergone significant reforms, especially in terms of end-to-end computerization, improving transparency and efficiency in food grain distribution. Kerala's focus on achieving universal coverage and its emphasis on fortifying food grains, such as fortified rice, has garnered attention

for its effectiveness in combating malnutrition and ensuring equitable access to essential food items (Masiero, 2015).

The state-run PDS in Kerala has a reputation for its well-established network of Fair Price Shops (FPSs) and its systematic monitoring of transactions, which has led to improved distribution systems, reduced leakage, and enhanced transparency. Notably, the state was one of the first to implement electronic Point of Sale (ePoS) devices, enabling real-time transaction monitoring and inter-state portability of ration cards, thus supporting migrant workers. Furthermore, Kerala has actively aligned its PDS framework with the larger objectives of the NFSA by focusing on nutritional security, with a particular emphasis on providing high-quality, fortified rice to combat widespread malnutrition (Ravi & Nair, 2019).

In examining Kerala's PDS, it is crucial to understand both the successes and challenges faced by the system. While Kerala's model has been lauded for its success in terms of coverage and efficiency, challenges remain in areas such as targeting accuracy, exclusion errors, and inter-state portability utilization, which require continuous reform and innovation (Tharakan, 2020).

4.6.1 Public Distribution System at a glance

Table 4.16 provides a comprehensive overview of the PDS in Kerala, highlighting the scale and reach of the system across the state. Kerala has 14 districts and 81 taluks, supported by a network of 223 interim godowns for food grain storage. The state has a significant number of ration dealers, with 14002 authorized dealers distributing food grains to beneficiaries. The total number of ration cards in Kerala stands at 91.43 lakh, including various categories under the National Food Security Act (NFSA). Among these, 3.81 lakh are portability cards, which allow for inter-state ration transactions, benefiting migrants and those who frequently move between states. Additionally, 3.95 lakh are PMGKAY (*Pradhan Mantri Garib Kalyan Anna Yojana*) cards, aimed at providing free food grains to eligible households, especially during times of crisis. The AAY, which targets the most vulnerable households, covers 5.94 lakh cards. The majority of households fall under the Priority Household (PHH) category, with 33.63 lakh cards issued. The total NFSA cards in the state amount to 39.57 lakh, while Tide Over Cards are provided to households in distress, totalling 50.69 lakh.

Table 4.16

Public Distribution System at a glance

No of districts	14
No of taluks	81
No. of Interim Godowns	223
No. of Authorised Ration Dealers	14002
No. of Ration Cards	91.43 Lakhs
No. of portability Cards	3.81 Lakhs
No. of PMGKAY Cards	3.95 Lakhs
No. of Anthyodaya Anna Yojana (AAY) cards	5.94 Lakhs
No. of Priority House Holds (PHH)Cards	33.63 Lakhs
Total NFSA Cards	39.57 Lakhs
Tide Over Cards	50.69 Lakhs

Source: Civil Supplies and PDS Report, Government of Kerala, Kerala State Planning Board, March 2022

4.6.2 National Food Security Act, 2013: Implementation in Kerala

The National Food Security Act (NFSA), 2013, ensures food access for a substantial section of the population, particularly those from economically disadvantaged backgrounds. The Act aims to cover up to 75% of rural residents and 50% of urban dwellers, targeting beneficiaries under two categories: *AAY* and Priority Households (PHH). While AAY, designated for the most economically vulnerable families, provides 35 kilograms of food grains monthly per household, PHH beneficiaries are allocated 5 kilograms per individual per month. The allocation of coverage percentages for each state was determined using data from the 2011-12 NSS Household Consumption Survey, previously managed by the Planning Commission.

Kerala has effectively integrated NFSA provisions with its existing PDS framework, ensuring equitable distribution of resources. As of March 2022, the state had 39.57 lakh NFSA cards, which include 5.94 lakh *Anthyodaya Anna Yojana* (AAY) cards for the poorest families and 33.63 lakh Priority Household (PHH) cards for economically weaker sections. These figures underscore Kerala's commitment to providing food security to vulnerable sections of society, covering more than 40% of the state's population (Civil Supplies and PDS Report, 2022). Additionally, 50.69 lakh Tide Over Cards were issued to households that did not qualify under NFSA but required

assistance, reflecting the state's proactive approach to address local food security needs. This dual structure has helped ensure inclusivity while maintaining the integrity of the central scheme.

In Kerala, the NFSA covers 52.63% of the rural population and 39.50% of the urban population, emphasizing a tailored approach to food security based on state-specific needs. Officially rolled out in Kerala on November 1, 2016, the NFSA aligns with the objective of "ensuring food and nutritional security through access to affordable and quality food." The state government holds the primary responsibility for implementing and overseeing the Act's provisions, working in coordination with central ministries and departments to ensure the benefits reach the intended population. This collaborative framework reflects Kerala's commitment to safeguarding food access for its residents, thereby reinforcing the Act's broader goals (Civil Supplies and PDS Report, Government of Kerala, Kerala State Planning Board, 2022).

4.6.3 Beneficiaries under NFSA and Non-NFSA Categories in Kerala District-Wise analysis

Table 4.17 presents a comprehensive district-wise distribution of ration cards and beneficiaries under the NFSA and non-NFSA categories in Kerala. It includes AAY, PHH under NFSA, along with NPSS and NPNS cards. Kerala has a total of 9.48 million ration cards serving over 36.1 million beneficiaries. Thiruvananthapuram leads with the highest number of total cards (1,025,961) and beneficiaries (3,397,072), reflecting its large population and urban density. Malappuram has the highest number of beneficiaries (4,772,877), driven by its high population density and extensive coverage under NFSA and non-NFSA categories. In contrast, Wayanad, with a smaller population, reports the lowest figures for total cards (237,599) and beneficiaries (883,874). The AAY category, targeting the poorest households, accounts for 583,681 cards statewide, with significant numbers in districts like Wayanad (55,233) due to its high incidence of poverty. PHH cards, aimed at a broader section of low-income families, dominate the NFSA coverage with over 3.6 million cards, with Malappuram leading with 418,847 cards. In the non-NFSA category, Non-Priority State Subsidy cards (2.26 million) and NPNS cards (3 million) reflect Kerala's effort to provide food security beyond the NFSA framework. These categories

primarily cater to households that do not fall under AAY or PHH but still receive benefits. The variations among districts also reveal tailored strategies to address specific local needs and demographic challenges, highlighting the effectiveness of the NFSA's implementation in the state.

Fair Price Shops (FPS) in Kerala have been modernized through the integration of Electronic Point of Sale (E-PoS) devices. The ration distribution process now relies on Aadhaar-based authentication of beneficiaries, ensuring transparency and accuracy. Transactions are recorded in real-time within a central system, with details made accessible in the public domain. This system enhances accountability and minimizes fraudulent practices, as only genuine beneficiaries can access food grains. Kerala's strong internet connectivity in both urban and rural regions has played a crucial role in the smooth implementation of this system. The high level of connectivity has significantly contributed to the successful completion of Aadhaar-authenticated transactions.

4.6.4 PDS & Aadhaar authentication in Kerala

Table 4.18 on Aadhaar authentication rates under the PDS in Kerala reflects a consistent improvement in digital integration and beneficiary coverage from March 2019 to January 2022. During this period, the total number of beneficiaries availing PDS services increased from approximately 35.3 million in March 2019 to 35.8 million in January 2022. This growth in beneficiary count underscores the expanding reach and accessibility of the PDS in the state. Simultaneously, Aadhaar-based authentication rates demonstrated a remarkable upward trajectory, enhancing system efficiency and transparency. The authentication rate improved from 87.5% in March 2019 to 94.2% by March 2020, reflecting significant strides in incorporating technology into ration distribution processes. Further progress was evident in March 2021, with a 95.1% authentication rate, reaching an impressive 96.35% in January 2022. This system ensures that only legitimate beneficiaries access entitlements, reducing fraud and enhancing accountability. The high success rate in Aadhaar authentication highlights Kerala's effective governance and commitment to modernizing the PDS, ensuring equitable food distribution and reinforcing trust in the system.

Table 4.17

District-Wise Distribution of Ration Cards and Beneficiaries under NFSA and Non-NFSA Categories in Kerala

District Name	Total Cards	Total Beneficiaries	AAY		PHH		NPSS		NPNS		NPI Cards
			Cards	Beneficiaries	Cards	Beneficiaries	Cards	Beneficiaries	Cards	Beneficiaries	
Thiruvananthapuram	1025961	3397072	59771	182288	459047	1513629	173924	615559	332432	1084809	787
Kollam	796827	2792615	47496	153918	335501	1147224	175524	653313	237322	837176	984
Pathanamthitta	364298	1356412	22443	74269	114938	405363	90236	347752	136247	528594	434
Alappuzha	622884	2269964	38555	125331	277660	1010617	121744	462375	183834	670550	1091
Kottayam	556975	2084803	34050	116091	185078	677250	120496	468950	210562	815723	6789
Idukki	321611	1110841	33963	102932	135983	450739	66963	255610	82203	299061	2499
Ernakulam	917118	3340126	35724	115239	282101	994544	254471	970234	338542	1253829	6280
Thrissur	907552	3387584	51705	168453	322882	1174634	246274	971903	281914	1067817	4777
Palakkad	815611	3053782	48928	160507	363541	1356274	154300	618966	247750	916943	1092
Malappuram	1053237	4772877	50105	204696	418847	1853241	298055	1465916	286031	1248825	199
Wayanad	237599	883874	55233	184406	75510	275421	48946	201198	57013	221952	897
Kannur	683234	2811411	36114	129007	189844	756188	204219	915475	251543	1009227	1514
Kozhikode	827768	3368934	37944	128251	318020	1264165	213632	934213	256916	1041049	1256
Kasaragod	348088	1471830	31650	121442	122286	495150	95018	450286	98952	404770	182
Kerala	9478763	36102125	583681	1966830	3601238	13374439	2263802	9331750	3001261	11400325	28781

Source: National Food Security Portal, 2024.

Table 4.18

Aadhaar Authentication Rates under the Public Distribution System in Kerala

Month	Total No. of beneficiaries in the State	Aadhaar Authentication (%)
Mar-2019	353,16,328	87.5
Mar-2020	356,33,758	94.2
Mar-2021	357,02,225	95.10
January2022	357,90,406	96.35

Source: Civil Supplies and PDS Report, Government of Kerala, Kerala State Planning Board, March 2022

4.6.5 Grievance Redressal under the Public Distribution System in Kerala

The department has established an online grievance redressal system to facilitate the registration and monitoring of complaints related to the Targeted Public Distribution System (TPDS). To enhance accessibility, a dedicated toll-free helpline (1967 and 1800-425-1550) operates in collaboration with the Kerala State IT Mission (KSITM). Citizens can also submit grievances through email at rcmskerala@gmail.com. Internally, the department utilizes a customized grievance redressal application developed by the National Informatics Centre (NIC) and adapted from an application originally created for Local Self-Government Departments (LSGD), ensuring compliance with the provisions outlined in the National Food Security Act, 2013. Table 4.19 presents the district-wise status of grievance redressal under the PDS in Kerala, highlighting the total number of grievances, the number pending, and those disposed of up until November 18, 2024. The data reveals that across Kerala, a total of 5,202 grievances have been recorded, with 244 still pending and 4,958 grievances successfully disposed of. District-wise, Kasargod has the highest number of total grievances (2,175), with 90 pending and 2,085 resolved, reflecting a relatively high disposal rate. On the other hand, Pathanamthitta reported the fewest grievances (124), with only 1 pending, and the majority (123) being resolved. In general, most districts show a high resolution rate, with the majority of grievances being disposed of efficiently. Notably, Thiruvananthapuram and Ernakulam also had a significant number of grievances (509 and 327, respectively), but these areas have managed to

resolve a large proportion (460 and 324, respectively). Wayanad had the fewest grievances reported, with 62 total, and only 2 pending, indicating efficient processing in smaller districts. The data suggests that Kerala has a robust grievance redressal system in place, with a high rate of grievance resolution, particularly in urban districts and those with higher total grievance counts. This system includes mechanisms such as call centers and email channels for grievance registration, contributing to the smooth handling of complaints across the state. The successful disposal of a significant majority of grievances reflects the effectiveness of Kerala's PDS grievance redressal framework.

Table 4.19
District-Wise Status of Grievance Redressal under the Public Distribution System in Kerala (till 18/11/2024)

District	Total Grievances	Pending	Disposed
Thiruvananthapuram	509	49	460
Kollam	262	10	252
Pathanamthitta	124	1	123
Alappuzha	232	21	211
Kottayam	160	18	142
Idukki	115	24	91
Eranakulam	327	3	324
Thrissur	208	5	203
Palakkad	265	8	257
Malappuram	331	7	324
Kozhikode	211	3	208
Wayanad	62	2	60
Kannur	221	3	218
Kassargod	2175	90	2085
Kerala	5202	244	4958

Source: Food and Civil Supplies Department, Government of Kerala

4.6.6 One Nation One Ration Card (ONORC) scheme in Kerala

The Electronic Point of Sale (E-PoS) system has been successfully rolled out across Kerala in a timely manner. To encourage participation and enhance the working

conditions of FPS licensees, the government has raised their commission rates following the implementation of E-PoS. and also, the state portability has been introduced, allowing beneficiaries to collect food grains from any Fair Price Shop (FPS) within the state, improving accessibility and convenience. Many beneficiaries have used this option and reported a positive experience, which has encouraged FPS licensees to enhance their service delivery in order to attract more customers. Moreover, the implementation of National Portability began in January 2020, enabling beneficiaries to avail food grains from any participating state or union territory through Aadhaar-authenticated E-PoS transactions. This initiative, part of the "One Nation, One Ration Card" (ONORC) scheme, facilitates migrant workers by allowing them to access their food grain entitlements in any state where they are employed, thus improving the nationwide food distribution system (Civil Supplies and PDS Report, 2022).

Table 4.20 presents data on the usage of ration cards, transactions, and portability features under the PDS in Kerala from 2019 to 2024. One of the key aspects highlighted is the growing importance of portability in ensuring that beneficiaries can access their entitlements from any Fair Price Shop (FPS) within the state, or even across states under the One Nation One Ration Card (ONORC) scheme. Portability in the PDS allows beneficiaries to receive their food grains regardless of their location, providing flexibility for migrant workers and others who may not be in their home districts. This feature has seen a steady increase in usage over the years, as shown by the growing percentage of availed port cards and availed port transactions. From 17.6% in 2019, portability reached 29.2% in 2024 (till August), indicating an upward trend in the adoption and utilization of this facility. The ONORC initiative, launched in 2020, is pivotal in this development. It allows migrant workers and families to avail of food entitlements in any participating state through Aadhaar authentication on the Electronic Point of Sale (ePoS) devices. This is particularly beneficial for migrant laborers who often face challenges in accessing their ration entitlements while working away from their home state. The steady increase in portability percentages reflects the government's ongoing efforts to enhance the efficiency and inclusivity of the PDS system, ensuring that food security is not limited by geographic location. By

2024, the total availed transactions and availed port transactions have also increased significantly, highlighting the effectiveness of portability in improving service delivery and making the system more accessible and responsive to the needs of beneficiaries, especially in the context of Kerala's migrant population. Thus, portability—both within the state and across the nation through ONORC—has become a cornerstone in the modernization of the PDS, ensuring broader access, convenience, and efficiency in the delivery of food security services.

Table 4.20

Ration Card Usage, Portability, and Transactions under the Public Distribution System

Year	Total card	Availed cards	Availed trans	Availed port cards	Availed port transaction	Portability (%)
2018	141038118	122610020	146763770	9500786	10633460	7.7
2019	204606739	178617036	194706167	31371179	33448548	17.6
2020	210799320	200812520	300219132	37095581	48814688	18.5
2021	217385604	196997368	275292102	38367704	50464932	19.5
2022	222113522	184322768	227729970	41464192	50502050	22.5
2023	214675014	168783426	206684090	44455852	53646796	26.3
2024	151029020*	124897212	138661654	36470284	40077936	29.2

*Note: * till August 2024, Source: Food and Civil Supplies Department, Government of Kerala*

Table 4.21 illustrates the district-wise portability percentages under the PDS in Kerala from 2018 to 2024. The portability percentage indicates the extent to which beneficiaries are able to avail themselves of food grains from any fair price shop (FPS) across the state, which is a key feature of the National Portability scheme, designed to enhance the flexibility and accessibility of food distribution. From the data, we observe a steady increase in portability percentages across most districts over the years. The state average has grown from 7.75% in 2018 to 29.20% in 2024, showing significant progress in the implementation of portability. Among the districts, Thiruvananthapuram consistently shows the highest portability percentage, reaching 37.22% in 2024, while Malappuram and Palakkad have the lowest, at 21.37% and 21.66%, respectively, in 2024. This variability reflects regional differences in the adoption and utilization of the portability feature. Districts such as Kollam, Kottayam,

Idukki, and Wayanad have shown a marked improvement in their portability percentages over the years. These districts have moved from the 18-20% range in 2019 to over 30% in 2024, indicating growing acceptance of the portability scheme. On the other hand, Malappuram and Palakkad, despite showing improvement, have lagged in comparison, with portability percentages in 2024 still under 22%. The overall upward trend in portability is a positive indicator of the success of the Public Distribution System reforms and the state's focus on improving service delivery. The increase in portability allows beneficiaries more flexibility in accessing their entitled food grains, particularly benefiting migrant workers and households with shifting residence within the state, as part of Kerala's efforts to improve food security under the National Food Security Act (NFSA).

Table 4.21
District-Wise Portability Percentage of household under the Public Distribution System in Kerala (2018-2024)

District	2018	2019	2020	2021	2022	2023	2024*
Alappuzha	7.43	17.87	18.06	19.41	22.53	26.76	29.85
Ernakulam	8.14	18.76	19.31	20.26	21.85	26.02	29.04
Idukki	8.28	18.42	20.47	21.73	25.01	28.91	32.04
Kannur	6.37	15.66	18.37	19.51	22.99	26.86	29.51
Kasargodu	6.91	17.60	18.63	19.51	22.33	26.22	28.71
Kerala	7.75	17.56	18.47	19.48	22.50	26.34	29.20
Kollam	9.88	21.03	20.93	22.16	24.95	29.17	32.18
Kottayam	7.24	19.10	19.54	21.14	24.84	29.02	32.50
Kozhikkodu	7.68	17.94	18.90	19.49	23.36	27.16	29.96
Malappuram	4.42	12.15	12.10	12.09	15.61	18.69	21.37
Palakkad	4.49	11.92	12.25	12.62	15.89	18.99	21.66
Pathanamthitta	10.76	19.75	20.15	21.05	23.40	27.89	31.53
Thiruvananthapuram	13.77	24.42	25.37	26.83	30.14	34.29	37.22
Thrissur	6.80	16.13	18.32	20.07	22.47	26.03	28.71
Wayanad	7.85	18.27	19.98	22.21	26.12	30.56	33.08
Kerala	7.75	17.56	18.47	19.48	22.50	26.34	29.20

*Note: * till August 2024, Source: Food and Civil Supplies Department, Government of Kerala*

The PDS in Kerala has undergone significant transformation in recent years, with a clear emphasis on enhancing accessibility, efficiency, and service delivery to beneficiaries. Key reforms, such as the implementation of Electronic Point of Sale (E-PoS) devices and state and national portability systems, have played a crucial role in expanding the reach and inclusivity of the PDS. These reforms have made it easier for beneficiaries to access their entitled food grains from any Fair Price Shop (FPS) across the state or even across other participating states, improving convenience, especially for migrant workers. The data shows a consistent increase in the portability percentages, reflecting the growing success of these initiatives. For instance, portability rates have steadily increased from 7.75% in 2018 to 29.20% by 2024, with districts such as Thiruvananthapuram, Kollam, and Idukki witnessing notable improvements. While there are still regional disparities in portability usage, Kerala's efforts to improve service delivery and incorporate technological advancements into the system are commendable. These reforms, underpinned by the state's commitment to food security, have made the PDS more responsive to the changing needs of its population. With continued focus on strengthening these initiatives and addressing the regional variations, Kerala's PDS stands as a model for other states, showing how a strong food distribution system can be made more inclusive, transparent, and effective in addressing food security challenges.

4.7 Conclusion

The PDS in India has undergone a remarkable transformation, evolving from a wartime measure to a cornerstone of national food security policy. Central to this evolution is the NFSA of 2013, which legally entitles approximately two-thirds of India's population to subsidized food grains. This legislation marked a significant shift in food security policy, emphasizing inclusivity, equity, and accountability. The NFSA's implementation has not only expanded the reach of food subsidies but has also aligned the PDS with the broader goals of reducing hunger, malnutrition, and systemic inequities, particularly among vulnerable populations. The technological advancements have been instrumental in addressing long-standing issues in the PDS, such as inefficiencies, corruption, and leakages. Measures like end-to-end

computerization, Aadhaar-based authentication, and the use of electronic Point-of-Sale (ePoS) devices have transformed the system into a more transparent and efficient mechanism. These innovations have ensured that benefits reach the intended recipients while reducing instances of fraud and misuse. Additionally, the introduction of initiatives such as the "One Nation, One Ration Card" (ONORC) scheme has enhanced portability, particularly benefiting migrant workers by allowing them to access entitlements across state boundaries.

Kerala's experience with the PDS is a testament to the potential of effective governance and strategic reforms. The adoption of Aadhaar-seeded ration cards, extensive ePoS coverage, and district-level customization has enabled Kerala to achieve nearly efficient and effective universal coverage under the PDS. Moreover, initiatives like fortified grain distribution and additional subsidies reflect the state's focus on nutritional security alongside food security. Despite these successes, challenges persist. Exclusion errors continue to deprive eligible beneficiaries of their entitlements, while infrastructural limitations and regional disparities undermine the system's uniformity. Kerala's heavy reliance on food imports and its limited agricultural production capacity also pose unique challenges, requiring a balance between external procurement and localized solutions. Additionally, while the ONORC initiative has improved accessibility, its full potential is hindered by infrastructural and logistical constraints in some areas.

The lessons from Kerala's implementation of NFSA, key takeaways include the importance of leveraging technology for transparency, prioritizing local needs through tailored policies, and strengthening grievance redressal mechanisms to enhance accountability. Kerala's high Aadhaar authentication rates, effective use of portability mechanisms, and emphasis on addressing regional disparities underscore the importance of adaptive strategies in ensuring the system's success. Looking forward, the PDS must continue to evolve to address emerging challenges, such as climate-induced vulnerabilities, urban food insecurity, and the need for greater nutritional diversity. Expanding the scope of PDS reforms, enhancing inter-state coordination, and fostering community engagement will be crucial in addressing these

issues. Additionally, periodic evaluations of the system's efficiency and equity, supported by data-driven decision-making, can help refine policies and ensure sustainable food security outcomes. So, the PDS, with its reforms under the NFSA, exemplifies a progressive approach to addressing hunger and malnutrition. While significant progress has been made, ongoing efforts are necessary to overcome existing challenges and adapt to changing socio-economic contexts. By balancing technological innovation, policy refinement, and inclusivity, the PDS can continue to serve as a critical pillar of India's commitment to food security and social equity.

CHAPTER V

ASSESSING EQUITY AND ACCESS: UTILIZATION OF PDS BY PRIORITY AND NON-PRIORITY CARDHOLDERS UNDER THE NFSA IN KERALA

This chapter attempts to examine the availability, access, and use of PDS among priority and non-priority cardholders in Kerala in the post-NFSA period. It examines trends in food grain off-take, perceptions of fairness, experiences of participation and exclusion, and the structural issues affecting access. The analysis attempts to examine the impact of technological reforms, such as the use of electronic Point of Sale (ePoS) machines and Aadhaar-based authentication, on equitable access to food entitlements. By focusing on the real lives of beneficiaries and the functioning of PDS on the ground level, this chapter tries to analyse whether the goal of the NFSA—to create food security a right—has been effectively fulfilled in reality.

5.1 Socio-Economic and Demographic Profile of Sample Households

Understanding the socio-economic and demographic characteristics of the households is essential to contextualize their experience with the PDS under the NFSA in Kerala. This section provides a detailed account of the sampled households, categorized by their ration card status-Priority and Non-Priority-to assess equity in access and utilization of PDS benefits.

The NFSA mandates targeted distribution of subsidized food grains, with priority given to economically and socially disadvantaged groups (Ministry of Consumer Affairs, 2013). Household characteristics such as size and composition, income sources, occupation types, and educational attainment significantly influence food security outcomes and access to welfare programs (Kattumuri, 2011; Dreze & Khera, 2015). Moreover, gender dynamics and the location of households—urban, rural, or semi-urban—play a pivotal role in determining both accessibility and the quality of service received. Female-headed households, for instance, often face additional barriers due to socio-cultural and economic constraints (Agarwal, 2015). Rural and

peri-urban households may also differ in their proximity to Fair Price Shops (FPS), digital connectivity for ePoS systems, and availability of food items. By exploring these socio-demographic attributes, this section sets the foundation for deeper analysis in subsequent parts of the chapter, particularly with regard to disparities in awareness, accessibility, utilization, and satisfaction across the two cardholder categories.

5.1.1 General Characteristics of Sample Households

Table 5.1 presents the socio-economic and demographic profile of the surveyed households. The distribution of ration cards among the sample households shows that a majority, 40.2%, belong to the Priority Household (PHH) category, identified by pink ration cards. This is followed by NPNS cardholders (white cards) at 29.5%, and Non-Priority State Subsidy holders (blue cards) at 22.9%. The AAY (Antyodaya Anna Yojana) households, representing the most vulnerable group, account for only 7.3% of the sample, indicating a relatively smaller segment of the population at the extreme end of poverty. In terms of place of residence, the majority of the households are located in panchayats (43.9%), reflecting a significant rural presence. This is followed by municipalities (31.7%) and corporations (24.4%), indicating that the sample includes a mix of urban, semi-urban, and rural populations. This spatial distribution is essential in understanding access and equity in the PDS across different settlement types. The religious composition of the respondents shows a near balance between Hindus (300 households) and Muslims (227 households), with Christians (18 households) forming a smaller portion. Caste-wise, the majority of the respondents belong to the Other Backward Classes (OBC) category (341 households), followed by Scheduled Castes (78), General category (93), and Economically Weaker Sections (31). Only 2 households belonged to Scheduled Tribes, indicating limited representation of this group in the sample. The average monthly household income based on ration card data is ₹7,554.62, although the high standard deviation (₹21,934.55) suggests significant income disparity among respondents. The average household size is approximately 4.5 members, with around 1.64 earning members and 2.58 dependents per household, which aligns with typical household structures in

Kerala. This implies that, on average, one earning member supports nearly three other members, underlining the importance of food security interventions like the PDS.

Table 5.1

General Characteristics of Sample Households

Variable	Category	N	%
Type of Ration Card	AAY (Antyodaya Anna Yojana)/ Yellow	40	7.3
	NPNS/ White	161	29.5
	Non-Priority State Subsidy/ Blue	125	22.9
	PHH (Priority Household)/ Pink	219	40.2
Place of Residence	Corporation	133	24.4
	Municipality	173	31.7
	Panchayats	239	43.9
Religion	Christian	18	3.3
	Hindu	300	55.0
	Muslim	227	41.7
Cast/ Category	EWS	31	5.7
	General	93	17.1
	OBC	341	62.6
	SC	78	14.3
	ST	2	.4
Total		545	100.0
Descriptive Statistics			
Variable		**Mean**	**SD**
Average Household monthly income as per ration card (in Rs.)		7554.6220	21934.55
Average Number of Members in the Household		4.51	1.575
Average Number of Earning Members		1.640	.9131
Average Number of Dependents		2.58	1.527

Source: Primary Survey, 2024

5.1.2 Socio-Economic and Demographic Characteristics of Sample Households

Table 5.2 presents the socio-economic and demographic characteristics of 2,457 individuals from 545 households surveyed in Kerala. The gender composition is fairly

balanced, with females slightly outnumbering males, accounting for 52.83% of the total population. Only one individual identified as belonging to the "Others" category, indicating limited representation of gender minorities. The age distribution reveals that nearly half of the population (49.74%) falls within the economically active age group of 18 to 50 years. Children and adolescents (0–18 years) make up 19.86%, while older individuals aged 50 and above comprise approximately 18.52%, pointing to a modest dependency ratio. Education levels among the surveyed members show encouraging trends, with 28.33% having pursued higher education and an additional 18.19% completing pre-university or equivalent levels. A small percentage (3.22%) of respondents remain illiterate, suggesting that most members had access to at least basic education. The population also includes a significant number with SSLC (14.33%) and high school (10.26%) qualifications, reflecting diverse educational attainment levels. Occupational data reveal that unemployment is a pressing concern, affecting 30.61% of the surveyed individuals. Students constitute 28.82% of the population, underscoring the youthful character of the sample. Workers in informal or low-income sectors such as farming, daily wage labour, and MGNREGA comprise 12.66%, while self-employed and business individuals make up 11.84%. Employment in professional and government sectors remains low, highlighting limited formal job opportunities for many. The majority of respondents are married (50.83%), with a substantial number of single individuals (44.49%), reflecting the age diversity of the population. Widowed and divorced/separated persons are relatively few. In terms of monthly income, a large proportion of individuals (40.01%) belong to the lowest income bracket of ₹5,000 to ₹15,000, suggesting significant economic vulnerability. Only a small number of individuals earn more than ₹30,000 per month, with just 1.75% reporting incomes above ₹45,000. Overall, the data point to a demographically young and economically challenged population, with varied educational backgrounds and a predominance of informal employment or joblessness. These factors are crucial in understanding the reliance of these households on public welfare schemes like the PDS and provide a solid foundation for analyzing access and utilization disparities under the NFSA in Kerala.

Table 5.2

Socio-Economic and Demographic Characteristics of Sample Households

Variable	Category	N	Percent
Gender	Female	1298	52.83
	Male	1158	47.13
	Others	1	0.04
Age	0-18	488	19.86
	18-50	1222	49.74
	50-70	409	16.65
	Above 70	46	1.87
Education	Illiterate	79	3.22
	Primary	338	13.76
	Upper Primary	293	11.93
	High School	252	10.26
	SSLC	352	14.33
	+2/ Pre-University	447	18.19
	Higher Education	696	28.33
Occupation	Business/Self Employed	291	11.84
	Farmers/Daily Wage/MGNRGE	311	12.66
	Government Employee (other than professional occupation)	63	2.56
	Private Company Employee	142	5.78
	Professional Occupation	50	2.04
	Senior citizens receiving pensions	32	1.30
	Students (currently Studying)	708	28.82
	Unemployed	752	30.61
	Others	10	0.41
Marital Status	Single	1093	44.49
	Married	1249	50.83
	Divorced/Separated	10	0.41
	Widowed	102	4.15
Monthly Income (in Rs.)	5000-15000	983	40.01
	15001-30000	271	11.03
	30001-45000	91	3.70
	Above 45000	43	1.75

Note: The survey covered a total of 2,457 individuals across 545 households. However, some respondents did not provide complete details about all household members; Source: Primary Survey, 2024

5.1.3 Housing Status of Sample Households

Table 5.3 presents the housing status of the sample households surveyed in Kerala. A significant majority of the respondents (90.5%) reported owning land, while only 9.5% did not possess any land. Similarly, a large proportion (87.5%) lived in their own houses, indicating a relatively high level of housing ownership among the population surveyed. However, 12.5% of households lacked ownership of a house and were either living with relatives (10.3%) or residing in rented accommodations (89.7%), highlighting some degree of housing insecurity. Among those who owned houses, nearly half (49.5%) had homes with a built-up area of less than 1,000 square feet, suggesting compact living conditions. Around 43.4% had moderately sized homes between 1,000 and 2,000 square feet, while only a small fraction (7.2%) reported having homes larger than 2,000 square feet. Regarding the physical condition of the owned houses, a vast majority (78.8%) reported their homes to be in good condition, while about 20.5% described them as liveable, and only 0.6% as dilapidated. This suggests that while housing is widely owned, not all structures are equally well-maintained or resilient. The type of roofing materials used further illustrates the mixed quality of housing. Pucca roofs were most common (55.1%), followed by thatched roofs (33.8%) and *kutcha* roofs (11.1%). The flooring materials used also reflect variations in housing quality, with tile or marble floors being predominant (79.2%), and a smaller portion having cement floors (19.5%). Only a few households had mud (1.0%) or granite (0.2%) flooring, indicating that most homes had relatively durable flooring. Finally, the average size of land owned was reported to be approximately 14.72 cents, with a standard deviation of 20.16, indicating wide variability in landholding sizes across the sample. Overall, while the majority of the surveyed households owned land and houses in good condition, there remains a segment of the population facing challenges in terms of landlessness, poor housing, or reliance on rental accommodations.

Table 5.3

Housing Status of Households

Variable	Category	N	%
Land Ownership	Not Own Land	52	9.5
	Own Land	493	90.5
Own House	No Own House	68	12.5
	Own House	477	87.5
Size of House (Among Owned)	Less than 1000	236	49.5
	1000 to 2000	207	43.4
	2000 to 3000	27	5.7
	Above 3000	7	1.5
	Total	477	100.0
Condition of House (Among Owned)	Dilapidated	3	.6
	Liveable	98	20.5
	Good	376	78.8
	Total	477	100.0
Roof (Among Owned)	*Kutcha*	53	11.1
	Pucca	263	55.1
	Thatched	161	33.8
Floor (Among Owned)	Cement	93	19.5
	Granite	1	.2
	Mud	5	1.0
	Tile/ Marble	378	79.2
Currently Living (Among not Owned A House)	Live with relatives	7	10.3
	Rented	61	89.7
	Total	68	100.0
Average Size of Land Owned	14.723 Cents (SD=20.1643)		

Source: Primary Survey, 2024

5.1.4 Facilities and Assets of Sample Household

Table 5.4 and Figure 5.1 presents a detailed overview of the facilities available in the households and the types of assets owned by the surveyed sample of 545 households. The data indicates that a large majority of households have access to essential

amenities and a considerable proportion also own consumer durables, reflecting a moderately comfortable standard of living among the respondents. Basic household facilities such as electricity (96.15%), bathroom and drinking water facilities (93.39% each), gas connection (92.48%), bedrooms (92.84%), and windows (90.28%) are available to most households. The presence of a separate kitchen is reported by 81.47% of households, and about 85.87% indicated that there is adequate space for all family members to stay. A drainage system is present in 83.85% of households, showing decent sanitation coverage. Other structural features like verandas (69.72%) and stores (62.75%) are somewhat less common, and only half (50.83%) of the households had a designated space for storing firewood or tools. A smaller proportion, 21.28%, reported having a cattle shed, indicating that livestock rearing is not a primary activity for most. Regarding asset ownership, a high percentage of households possess modern electronic devices. Smart phones are the most widely owned (92.84%), followed by mixers/grinders (89.91%), refrigerators (76.88%), and televisions (75.41%). Ownership of washing machines is reported by nearly half the households (47.71%), while ownership of computers or laptops with (17.61%) or without (18.72%) internet remains relatively low. Less than one-fourth of the households reported having air conditioners (23.30%) or landline telephones (19.27%). In terms of mobility and transport assets, 70.64% of households own two-wheelers, and 21.65% own four-wheelers. A significant number of households also possess gold (56.33%), but silver (1.65%) and livestock (17.06%) are less commonly owned. The data overall reflects a mixed profile—while most households have access to essential utilities and a variety of consumer goods, the lower levels of ownership of digital devices and vehicles among some households may point to disparities in economic well-being and technological access. These findings are useful in understanding the socio-economic status of the households participating in the survey, which, in turn, provides essential context for analyzing their engagement with the Public Distribution System (PDS).

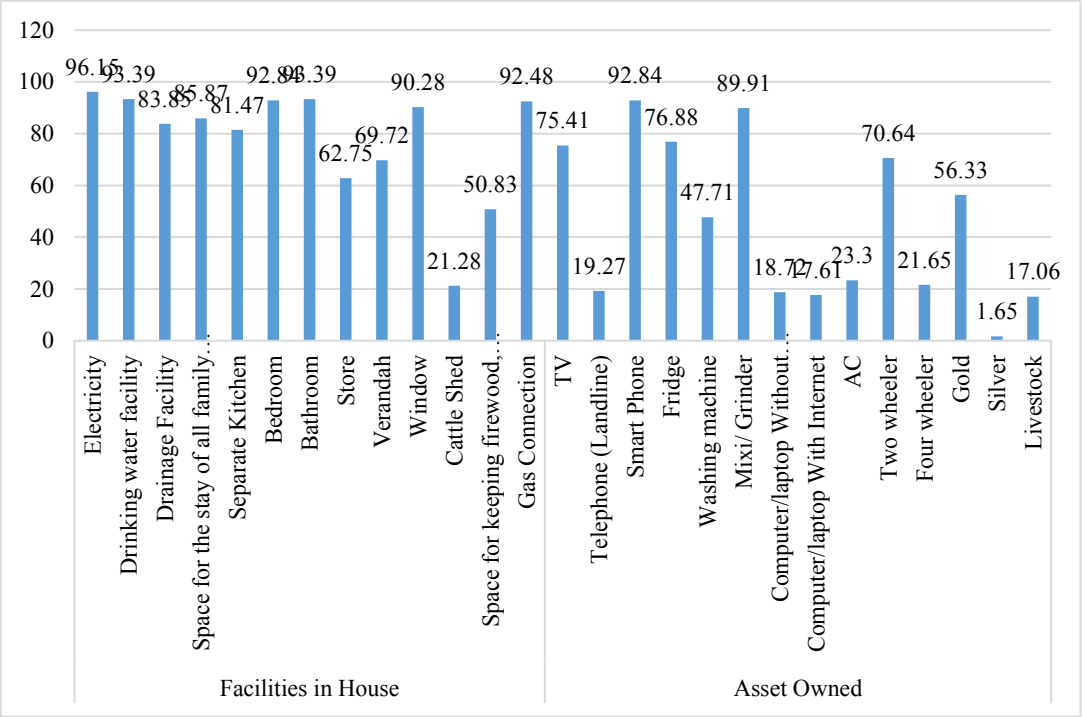
Table 5.4

Facilities in the House and Assets Owned

	Facilities/ Assets	N	Percent
Facilities in House	Electricity	524	96.15
	Drinking water facility	509	93.39
	Drainage Facility	457	83.85
	Space for the stay of all family members	468	85.87
	Separate Kitchen	444	81.47
	Bedroom	506	92.84
	Bathroom	509	93.39
	Store	342	62.75
	Veranda	380	69.72
	Window	492	90.28
	Cattle Shed	116	21.28
	Space for keeping firewood, working tools etc	277	50.83
	Gas Connection	504	92.48
Asset Owned	TV	411	75.41
	Telephone (Landline)	105	19.27
	Smart Phone	506	92.84
	Fridge	419	76.88
	Washing machine	260	47.71
	Mixer/ Grinder	490	89.91
	Computer/laptop Without Internet	102	18.72
	Computer/laptop With Internet	96	17.61
	AC	127	23.30
	Two wheeler	385	70.64
	Four wheeler	118	21.65
	Gold	307	56.33
	Silver	9	1.65
	Livestock	93	17.06

Note: Including all the households (545); Source: Primary Survey 2025

Figure 5.1 Facilities in the House and Assets Owned



Source: Primary Survey 2025

5.1.5 Debt and Savings Status of Sample Households

Table 5.5 presents a detailed account of the debt and savings profile of 545 surveyed households, highlighting the financial vulnerabilities faced by a significant portion of the population. Out of the total households, 40.9% reported having some form of debt, indicating a relatively high level of credit dependence. In contrast, 59.1% of the respondents stated they had no debt at the time of the survey. Among those in debt (n=223), a majority (41.3%) had borrowings below ₹50,000, while 35.9% had debt in the ₹50,000–₹1,00,000 range. About 22.9% of indebted households had larger liabilities exceeding ₹1,00,000, indicating a considerable financial burden on a subset of households. The presence of significant debt levels is compounded by the finding that 70.9% of indebted respondents faced difficulties in repaying their loans. This signals a concerning trend in financial distress among nearly three-fourths of those with outstanding loans. The reasons behind debt repayment challenges were varied and reflect structural economic vulnerabilities. The most cited issue was insufficient

income (77.2%), followed by unexpected expenses (66.5%) and job loss or reduced work hours (48.1%). Health-related expenditures (39.2%), poor financial planning (39.9%), and increased living costs (38%) also contributed significantly to the repayment struggles. These findings underscore the fragile nature of household finances, where even minor disruptions can tip families into financial insecurity. Other factors like lack of access to financial advice (22.8%) and high interest rates (25.9%) further hindered repayment ability. In terms of savings, the data reveal an almost even split, with 50.8% of households reporting no savings and 49.2% having some form of financial buffer. The absence of savings in over half the households further compounds the risk posed by debt, as it reduces the ability to respond to economic shocks or emergencies without external borrowing. The data reflect a precarious financial environment for a significant section of households, where a combination of inadequate income, employment instability, and limited financial planning results in high debt vulnerability.

Table 5.5

Debt and Savings Status of Households

Variable	Category	Frequency	Percent
Debt Status	No Debt	322	59.1
	Have Debt	223	40.9
	Total	545	100.0
Amount of Debt	Less than ₹50000	92	41.3
	/₹50000 - ₹100000	80	35.9
	/₹100001 - ₹200000	24	10.8
	More than ₹200000	27	12.1
	Total	223	100.0
Faced any difficulties in repaying debts	No	65	29.1
	Yes	158	70.9
	Total	223	100.0

Type of Difficulty*	Insufficient Income	122	77.2
	Unexpected Expenses	105	66.5
	Job Loss or Reduced Work Hours	76	48.1
	Health Issues	62	39.2
	Family Obligations	55	34.8
	Poor Financial Planning	63	39.9
	Increased Living Costs	60	38.0
	Lack of Access to Financial Advice	36	22.8
	High Interest Rates	41	25.9
	Others	12	7.6
Savings Status	No Savings	277	50.8
	Have Savings	268	49.2
	Total	545	100.0

** Percent among those faces difficulties in paying debt (N=158); Source: Primary Survey 2025*

5.2 Availability of Items under the PDS in Kerala

The following section examines availability dimensions of food from the Public Distribution System in the context of NFSA 2013.It takes in to account the perceptions and experiences of food item availability, the availability score with respect to type of card, place of residence etc.

5.2.1 Perceptions and Experiences of Food Availability in the PDS

Table 5.6 presents detailed insights into the practical experiences and subjective perceptions of beneficiaries regarding the accessibility and availability of food items under the PDS. The data reveals several key patterns in how households interact with

the system. First, regarding the timing of PDS purchases, most beneficiaries tend to collect their entitlements either at the end of the month (34.7%) or mid-month (30.8%), while 27.5% do so at the beginning of the month. Only a small fraction reported irregular patterns, suggesting that PDS usage is generally tied to routine cycles, possibly aligned with income or distribution schedules. About 35.2% of respondents reported missing a scheduled PDS visit, indicating a notable access gap. Among those who missed their visits, the primary reasons cited include the lack of availability of preferred food items (53.6%), unsatisfactory quality (42.7%), and long waiting times (39.6%). A significant portion also pointed to the inconvenient location of PDS shops (20.8%) and financial constraints (17.2%). These responses highlight both logistical and qualitative barriers to regular access. When asked about the availability of required food items, only 32.7% reported that items were always available, while a larger group, 39.4%, stated that they were frequently available. However, over a quarter (26.1%) noted only occasional availability, and a small but important minority (1.8%) said items were rarely available, suggesting inconsistencies in supply. On the matter of essential item shortages, 20% of respondents experienced shortages, pointing to systemic supply challenges within the PDS. Despite these issues, user satisfaction levels were relatively high, with over 63% reporting they were either satisfied (50.1%) or very satisfied (13.2%) with the availability of items. However, 34.5% remained neutral, possibly reflecting ambivalence or resignation to prevailing service conditions. Lastly, in terms of timely distribution, only 23.5% of respondents always received their entitlements on the scheduled date, while 49% received them most of the time. About 27.6% experienced occasional or rare delays, which may affect food security, particularly for more vulnerable households. So, its highlights the moderate to high dependence on PDS, tempered by concerns around inconsistency in availability, quality issues, and accessibility limitations. While satisfaction levels are generally positive, the prevalence of missed visits and supply gaps suggests that systemic improvements in stock management, distribution scheduling, and quality control are necessary to enhance the efficacy and reliability of the PDS.

Table 5.6

Perceptions and Experiences of Food Item Availability in the PDS System

PDS Access and Availability Indicators		Frequency	Percent
Timing of PDS Purchases	At any time	35	6.4
	At the beginning of the month	150	27.5
	Depends	1	.2
	End of the month	189	34.7
	Mid-month	168	30.8
	Some days when we are free	1	.2
	Varies	1	.2
	Total	545	100.0
Missed Scheduled PDS Visits	No	353	64.8
	Yes	192	35.2
	Total	545	100.0
Reasons for Missing Scheduled PDS Visits*	Lack of availability of preferred food items	103	53.6
	Inconvenient location of PDS shop	40	20.8
	Long waiting times at the PDS shop	76	39.6
	Quality of food items is not satisfactory	82	42.7
	Financial constraints	33	17.2
	Other	25	13.0
Availability of Required Food Items at PDS Shop	Rarely available	10	1.8
	Sometimes available	142	26.1
	Frequently available	215	39.4
	Always available	178	32.7
	Total	545	100.0
Experience of Essential Item Shortages	No	436	80.0
	Yes	109	20.0
	Total	545	100.0
Satisfaction with Availability of Food Items	Very dissatisfied	2	.4
	Dissatisfied	10	1.8
	Neutral	188	34.5
	Satisfied	273	50.1

	Very satisfied	72	13.2
	Total	545	100.0
Timeliness of Receiving Entitled Food Items	Never	2	.4
	Rarely	8	1.5
	Sometimes	140	25.7
	Most of the time	267	49.0
	Always	128	23.5
	Total	545	100.0

** Percent within those missed the scheduled visit (N=192); Source: Primary Survey 2025*

5.3. Construction and Standardization of PDS Availability Score

Table 5.7 outlines a systematic framework for quantifying the availability of food items under the PDS by translating qualitative survey responses into a standardized, numerical score. This scoring model enables the conversion of individual experiences and perceptions into a composite PDS Availability Score, which ranges from 0 to 1, and can be used to categorize availability levels as high, moderate, or low. The scoring system begins with a question on whether the respondent has ever missed a scheduled PDS visit. A "No" response, indicating consistent access, is rewarded with the highest score of 1.00, while a "Yes" response receives a score of 0.00. This binary variable provides a fundamental indicator of access reliability. Next, for those who did miss visits, the reasons for missing are used to impose score deductions. The most critical issue—lack of availability of preferred items—carries a deduction of 0.20. Other reasons such as inconvenient location, long waiting times, and poor quality of food items each reduce the score by 0.10. Financial constraints, while still relevant, are considered a lesser impediment and result in a deduction of 0.05. Importantly, to avoid disproportionate penalization, the maximum cumulative deduction is capped at 0.50 for this component. The third component measures how often the required food items are available at the PDS shop. A gradient scoring system is applied: respondents who report that items are "Always available" receive the full score of 1.00, while "Frequently," "Sometimes," and "Rarely" available responses are assigned scores of 0.75, 0.50, and 0.25, respectively. Those who report that items are "Never available" receive a score of 0.00, reflecting complete unavailability. The survey also captures

whether respondents have faced shortages of essential items, with a "No" answer scoring 1.00 and a "Yes" answer scoring 0.00. This dichotomous variable reflects the adequacy of supply. Satisfaction with the availability of food items is another core variable, where responses are scored on a scale from 0.00 (Very dissatisfied) to 1.00 (Very satisfied), with intermediate options assigned proportionate values. This subjective metric complements the frequency-based questions by capturing how beneficiaries perceive the quality and reliability of supply. Finally, the component assessing timely receipt of entitled food items also follows a scaled structure, ranging from 1.00 for "Always" to 0.00 for "Never." This captures the punctuality of the PDS in fulfilling its distribution obligations. To derive the final Availability Score, the individual scores from each component are averaged. Based on the resulting composite score, availability is classified as High (0.75–1.00), Moderate (0.50–0.74), or Low (below 0.50). This quantitative index provides a holistic and nuanced tool for assessing PDS performance from the beneficiaries' perspective. It is particularly valuable for identifying geographic or demographic disparities in access and guiding targeted policy interventions.

Table 5.7

Construction and Standardization of PDS Availability Score Parameters

Component	Survey Question	Response Options	Score
Missed Scheduled Visit	Have you ever missed your scheduled PDS visit?	No	1.00
		Yes	0.00
Reason for Missing PDS Visit	If yes, specify the reason	Lack of availability of preferred items	-0.20
		Inconvenient location	-0.10
		Long waiting time	-0.10
		Quality of items not satisfactory	-0.10
		Financial constraints	-0.05
		Maximum deduction	*-0.50*
Availability Frequency	How often are the food items you need available?	Always available	1.00
		Frequently available	0.75
		Sometimes available	0.50

		Rarely available	0.25
		Never available	0.00
Shortage of Essential Items	Have you ever faced a shortage of essential items?	No	1.00
		Yes	0.00
Satisfaction with Availability	Satisfaction with food item availability	Very satisfied	1.00
		Satisfied	0.75
		Neutral	0.50
		Dissatisfied	0.25
		Very dissatisfied	0.00
Timely Receipt of Entitlements	How often do you receive entitled food items on time?	Always	1.00
		Most of the time	0.75
		Sometimes	0.50
		Rarely	0.25
		Never	0.00
Availability Index	**Average the Scores of All Components** **Availability Score between 0 and 1** • **0.75–1.00** = High Availability • **0.50–0.74** = Moderate Availability • **Below 0.50** = Low Availability		

Source: Author's Definition. Availability Index was calculated by the researcher from the primary data.

5.3.1 Availability Score & Type of Ration Card

Table 5.8 presents the mean scores for the Availability of Items under the PDS, disaggregated by the type of ration card held by the respondents. The score, which ranges from 0 to 1, is a composite indicator derived from responses on several dimensions of availability, including timeliness, frequency of item availability, satisfaction, and barriers to access. The classification benchmarks are: scores from 0.75 to 1.00 represent high availability, 0.50 to 0.74 represent moderate availability, and scores below 0.50 indicate low availability. Across the full sample of 545 households, the overall mean score for item availability is 0.591, with a standard deviation of 0.157, placing the average experience in the moderate availability category. This suggests that while items are available to a certain extent, there are notable gaps in consistency, satisfaction, or access that still need attention. When analysed by ration card category, notable differences emerge. Households with the

AAY (Antyodaya Anna Yojana)/Yellow cards, which are typically issued to the poorest segments of the population, report the highest mean availability score of 0.640, suggesting that this group receives a relatively better level of service in terms of consistent availability and timely access. The PHH (Priority Household)/Pink card holders and Blue card holders (Non-Priority State Subsidy) also report fairly strong scores of 0.617 and 0.607 respectively. These fall solidly within the moderate availability range, indicating that while PDS access for these categories is functional, there is room for improvement. In contrast, White card holders (NPNS) report the lowest availability score of 0.532, highlighting weaker performance of the PDS for this group. Given that this group is typically less dependent on subsidies, the PDS may not be as responsive to their needs, or this category may face fewer entitlements, which could affect their perceptions of availability. The ANOVA test result ($F = 12.219$, $p = 0.000$) shows that the differences in availability scores across ration card types are statistically significant. This means that the variation observed in the mean scores is not due to random chance, and type of ration card is an important factor influencing perceptions and experiences of item availability in the PDS. In summary, the data underscores moderate overall performance of the PDS in terms of item availability, while also highlighting disparities across socioeconomic groups. Priority and subsidized cardholders generally experience better access, whereas those with white cards face more significant challenges.

Table 5.8

Availability of Items Score (PDS) by Type of Ration Card

Type of Ratio Card	N	Availability of Items Score (Mean)	SD	Std. Error
AAY (Antyodaya Anna Yojana)/ Yellow	40	.640	.171	.027
NPNS/ White	161	.532	.140	.011
Non-Priority State Subsidy/ Blue	125	.607	.145	.013
PHH (Priority Household)/ Pink	219	.617	.161	.011
Total	545	.591	.157	.007
ANOVA	F (3,541) = 12.219, p= 0.000			

Note: 0.75–1.00=High Availability, 0.50–0.74= Moderate Availability, <0.50= Low Availability Source: Primary Survey 2025

5.3.2 Availability Score & Place of Residence

Table 5.9 presents the Availability of Items Score in the PDS, categorized by the respondents' place of residence, namely Corporation, Municipality, and Panchayats areas. The overall mean availability score across all groups is 0.591, which falls within the moderate availability category as per the defined range. This suggests that while most households report access to PDS items with some regularity and satisfaction, the system does not yet consistently deliver high availability across different localities. Households residing in Panchayats areas report the highest average availability score at 0.619. This indicates a relatively more favourable perception of item availability in rural areas compared to other residential settings. This higher score could be attributed to factors such as more stable relationships with local PDS distributors, better community-level monitoring, or possibly fewer alternative market options, which increases reliance and thus responsiveness within the PDS framework. On the other hand, respondents from Municipality areas reflect a slightly lower score of 0.585, suggesting a moderately effective delivery system that may occasionally suffer from stock inconsistencies or service issues, yet still manages to meet a substantial part of demand. The lowest average score of 0.549 is reported among residents of Corporation areas, which are predominantly urban. This comparatively lower score may reflect a range of urban challenges such as higher population density, infrastructural strain, or complex supply logistics. Additionally, urban consumers might have higher expectations or greater access to market alternatives, making them more critical of PDS availability and performance. Despite better infrastructure in cities, the effectiveness of PDS in such areas appears to be constrained, possibly due to administrative burden or logistical inefficiencies. The statistical significance of the differences between these groups is supported by the ANOVA result ($F = 9.124$, $p = 0.000$), confirming that place of residence has a meaningful impact on how availability within the PDS is experienced. This underlines the importance of localized approaches in improving PDS service delivery. Tailored interventions that address the specific logistical, demographic, and administrative challenges of each setting could enhance the overall efficiency and equity of the PDS system.

Table 5.9

Availability of Items Score (PDS) by Place of Residence

Place of Residence	N	Availability of Items Score (Mean)	SD	Std. Error
Corporation	133	.549	.144	.013
Municipality	173	.585	.144	.011
Panchayats	239	.619	.166	.011
Total	545	.591	.157	.007
ANOVA	F (2,542) = 9.124, p= 0.000			

Note: 0.75–1.00=High Availability, 0.50–0.74= Moderate Availability, <0.50= Low Availability Source: Primary Survey 2025

5.3.3 Availability Score & Caste

Table 5.10 presents the Availability of Items Score in the PDS categorized by caste. The overall mean score for all respondents (N=545) is 0.591, which falls within the moderate availability range. Among the caste groups, the Economically Weaker Section (EWS) records the highest mean score at 0.638, suggesting relatively better experiences in terms of item availability. The Scheduled Caste (SC), Other Backward Class (OBC), and General categories have similar mean scores—0.592, 0.588, and 0.586 respectively—indicating a shared experience of moderate availability with minimal variation. The Scheduled Tribe (ST) group, although represented by only two individuals, shows a slightly lower mean score of 0.563, which still lies within the moderate availability category but should be interpreted cautiously due to the very small sample size. Despite these observed differences in mean scores across caste categories, the ANOVA test result ($F(4, 540) = 0.771$, $p = 0.544$) indicates that these differences are not statistically significant. This implies that, based on the data collected, caste does not significantly influence perceived availability of items through the PDS. In other words, while minor variations exist among caste groups, the overall level of item availability in the PDS is largely consistent across them. This suggests a certain degree of uniformity in service delivery.

Table 5.10

Availability of Items Score (PDS) by Caste

Caste	N	Availability of Items Score (Mean)	SD	Std. Error
EWS	31	.638	.162	.029
General	93	.586	.146	.015
OBC	341	.588	.158	.009
SC	78	.592	.161	.018
ST	2	.563	.088	.063
Total	545	.591	.157	.007
ANOVA	F (4,540) = 0.771, p= 0.544			

Note: 0.75–1.00=High Availability, 0.50–0.74= Moderate Availability, <0.50= Low Availability Source: Primary Survey 2025

5.3.4 Availability Score & Number of Earning Members

Table 5.11 provides insights into how the number of earning members in a family relates to the perceived availability of food items through the PDS. The overall mean availability score for all respondents is 0.591, reflecting a moderate level of availability across the sample. Interestingly, families with no earning members reported the highest availability score of 0.673, suggesting that such households, possibly more dependent on PDS, may either prioritize or better utilize available entitlements. Families with a single earner also reported a relatively high score of 0.609, which remains within the moderate range but above the overall average. As the number of earning members increases to two or more, the availability score shows a slight decline. Households with two earning members recorded a lower mean score of 0.559, and similar values were observed for families with three, four, and five earners, indicating that increased income might be associated with reduced reliance on PDS or a more critical evaluation of its adequacy. Notably, the lowest score observed is 0.508 for the household with six earning members, though this value comes from only one respondent and should be interpreted with caution. The ANOVA test result ($F(6, 538) = 2.591$, $p = 0.017$) confirms that the differences in mean availability scores across family income groups are statistically significant. This suggests that the number of

earning members in a household does have a meaningful impact on how the availability of PDS items is perceived. These findings point toward the complex interaction between economic status and reliance on public food systems—families with fewer income sources may place higher value or have more consistent experiences with the PDS, while those with multiple earners might have alternative options or different expectations.

Table 5.11

Availability of Items Score (PDS) by Number of Earning Members in the Family

Number of Earning Members in the Family	N	Availability of Items Score (Mean)	SD	Std. Error
.0	15	.673	.140	.036
1.0	280	.609	.151	.009
2.0	163	.559	.165	.013
3.0	67	.588	.147	.018
4.0	14	.559	.180	.048
5.0	5	.577	.136	.061
6.0	1	.508		
Total	545	.591	.157	.007
ANOVA	F (6,538) = 2.591, p= 0.017			

Note: 0.75–1.00=High Availability, 0.50–0.74= Moderate Availability, <0.50= Low Availability Source: Primary Survey 2025

5.3.5 Availability Score, Type of Ration Card & Place of Residence

Table 5.12 presents a detailed comparison of the Availability of PDS (Public Distribution System) Items Score across different types of ration cards and places of residence. The data show that beneficiaries holding AAY ration cards intended for the poorest households report the highest overall availability score (Mean = 0.640), indicating relatively better access to food items through the PDS. Within this group, residents in municipalities report the highest mean score (0.671), followed by those in panchayats (0.637), and corporations (0.583). However, the small sample size in corporations may limit the reliability of this specific finding. In contrast, beneficiaries with NPNS (White) cards report the lowest overall availability score (Mean = 0.532), particularly among municipality residents (0.512). This suggests that access to PDS items is more limited for those who are not covered under targeted subsidy schemes,

and more so in urban or semi-urban areas. Those with Non-Priority State Subsidy (Blue) cards and PHH (Priority Household/Pink) cards report moderate availability scores (0.607 and 0.617, respectively), with panchayats residents in both groups reporting better access compared to their counterparts in municipalities and corporations. Overall, panchayats residents consistently report higher availability scores across all ration card types (Total = 0.619), while corporation residents report the lowest (Total = 0.549), pointing to rural areas having comparatively better perceived access to PDS items. The Two-Way ANOVA test confirms statistically significant differences in the availability scores based on the type of ration card ($F = 8.648$, $p = .000$), indicating that the type of card significantly influences perceived availability. However, place of residence alone does not show a statistically significant effect ($F = 2.827$, $p = .060$), though it is close to the conventional threshold of significance. The interaction effect between ration card type and place of residence ($F = 1.383$, $p = .219$) is not statistically significant, suggesting that the impact of the ration card type on availability does not differ significantly across residential locations. The model explains around 9.1% of the variance in availability scores ($R^2 = .091$), which is modest, indicating that while ration card type is an important factor, other variables may also play significant roles in determining PDS availability perceptions. In conclusion, the table highlights disparities in PDS access tied more closely to economic entitlements (ration card type) than geographic location, emphasizing the need for targeted interventions to improve PDS access among non-subsidized groups, especially in urban areas.

Table 5.12
Availability of PDS Items by Type of Ration Card and Place of Residence

Type of Ration Card	Place of Residence	Availability of Items Score (Mean)	SD	N
AAY (Antyodaya Anna Yojana)/ Yellow	Corporation	.583	.102	4
	Municipality	.671	.145	10
	Panchayats	.637	.189	26
	Total	.640	.171	40
NPNS/ White	Corporation	.537	.137	66

	Municipality	.512	.136	48
	Panchayats	.543	.148	47
	Total	.532	.140	161
Non-Priority State Subsidy/ Blue	Corporation	.547	.169	27
	Municipality	.593	.119	49
	Panchayats	.653	.142	49
	Total	.607	.145	125
PHH (Priority Household)/ Pink	Corporation	.567	.143	36
	Municipality	.618	.149	66
	Panchayats	.632	.170	117
	Total	.617	.161	219
Total	Corporation	.549	.144	133
	Municipality	.585	.144	173
	Panchayats	.619	.166	239
	Total	.591	.157	545

Tests of Between-Subjects Effects

Dependent Variable: Availability of Items Score

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	1.221[a]	11	.111	4.876	.000
Intercept	87.523	1	87.523	3845.355	.000
Ration Card	.591	3	.197	8.648	.000
Place of Residence	.129	2	.064	2.827	.060
Ration Card* Place of Residence	.189	6	.031	1.383	.219
Error	12.131	533	.023		
Total	203.817	545			
Corrected Total	13.352	544			

a. R Squared = .091 (Adjusted R Squared = .073)

Note: 0.75–1.00=High Availability, 0.50–0.74= Moderate Availability, <0.50= Low Availability Source: Primary Survey 2025

5.4 Accessibility of Public Distribution System in Kerala

The following section examines accessibility dimensions of food from the Public Distribution System in the context of NFSA 2013.It takes in to account the Physical Accessibility, Operational Convenience, Place of Residence, Mode of Travel, 4 Time Taken to Reach FPS, Satisfaction with FPS Operating Hours etc

5.4.1 Physical Accessibility & Operational Convenience of FPSs for Households

Table 5.13 shows how accessible and user-friendly PDS shops are for surveyed households. The data suggests that PDS shops are generally located within reachable distances for most beneficiaries. Nearly 46% of households reported that their nearest PDS shop is located within 1 km, while 48.4% indicated a distance of 1 to 1.9 km. Only a small minority, about 5.7%, travel more than 2 km to access a PDS shop, indicating good physical proximity overall. In terms of mode of transportation, 38.7% of respondents walk to their PDS shops, highlighting the importance of having nearby facilities for those without access to vehicles. Around 32.1% use private vehicles, and 21.8% travel by bicycle. Public transportation is used by a smaller group (7.3%), possibly due to the availability of shops within walkable distances or limited transport infrastructure. Time taken to reach the PDS shop correlates well with the distance and travel modes. Almost 94.3% of households can reach the shop within 20 minutes, while a negligible percentage (0.4%) report needing more than 30 minutes. This reflects positively on the system's spatial efficiency in the surveyed areas. When it comes to the operating hours of the shops, the responses are evenly split. 38.9% of households access shops normally in the evening (after 4 PM), 22.4% normally in the morning (before 12 PM), and 38.7% said the hours vary. The findings reflect a fairly well-functioning and accessible PDS infrastructure in terms of physical location and general convenience. Nevertheless, addressing the needs of the minority who face challenges—whether due to distance, timing, or mobility—could further improve the inclusivity and effectiveness of the system.

Table 5.13

Physical Accessibility and Operational Convenience of PDS Shops for Households

Variable	Category	Frequency	Percent
Nearest PDS shop from home	Less than 1 km	250	45.9
	1-1.9	264	48.4
	2-5	25	4.6
	More than 5 km	6	1.1
Mode of Travel to the PDS shop	Bicycle	119	21.8
	Private Vehicle	175	32.1
	Public Transport	40	7.3
	Walk	211	38.7
Time Taken to Reach PDS shop	Less than 10 minutes	248	45.5
	10-20 minutes	266	48.8
	21-30 minutes	29	5.3
	More than 30 minutes	2	.4
Operating hours of the PDS shop	Prefer Evening (after 4 PM)	212	38.9
	Prefer Morning (before 12 PM)	122	22.4
	Varies (no preference)	211	38.7
Total		**545**	**100.0**

Source: Primary Survey 2025

5.4.2 Rural-Urban Differences in Distance to Nearest FPS Outlet

Table 5.14 presents the distribution of households based on their place of residence and the distance to the nearest PDS outlet. The findings reveal significant spatial variations in access to PDS facilities across urban (Corporation), semi-urban (Municipality), and rural (Panchayats) areas. In municipalities, a higher proportion of households (56.6%) reported that the nearest PDS shop was within 1 kilometre from their homes, indicating relatively better physical accessibility. This was followed by Panchayats, where 47.7% of households reported the same. In contrast, only 28.6% of households in Corporation areas had a PDS shop within 1 km, suggesting that urban households may face greater distance-related challenges, potentially due to denser population distribution and commercial land use patterns. Interestingly, a majority (63.9%) of respondents in Corporation areas indicated that the nearest PDS shop was

between 1 and 1.9 km away, while Panchayats and Municipalities also had sizable proportions in this category (48.5% and 36.4%, respectively). A small fraction of households—ranging from 0.8% to 6%—reported living more than 2 km away from the nearest PDS outlet, with no major difference across areas. The Chi-square test result ($\chi^2 = 27.878$, $p = 0.000$) indicates a statistically significant association between place of residence and the distance to the nearest PDS shop. This confirms that the observed spatial differences in PDS accessibility are not due to random variation but reflect real structural disparities in the distribution of PDS infrastructure. In summary, while most households across Kerala enjoy relatively close access to PDS outlets, the data suggests that residents in municipalities are more likely to live near a PDS outlet than those in urban Corporations. This spatial disparity should be considered in planning for equitable access and service delivery under the National Food Security Act (NFSA).

Table 5.14

Place-Based Differences in Distance to Nearest PDS Outlet

Nearest PDS shop from home		Place of Residence			Total
		Corporation	Municipality	Panchayats	
Less than 1 km	N	38	98	114	250
	%	28.6	56.6	47.7	45.9
1-1.9	N	85	63	116	264
	%	63.9	36.4	48.5	48.4
2-5	N	8	10	7	25
	%	6.0	5.8	2.9	4.6
More than 5 km	N	2	2	2	6
	%	1.5	1.2	0.8	1.1
Total	N	133	173	239	545
	%	100.0	100.0	100.0	100.0
Chi-Square					27.878 (6), p=0.000

Note: Percent within Column; Source: Primary Survey 2025

5.4.3 Place of Residence & Mode of Travel Used to Reach FPS

Table 5.15 explores the mode of transportation used by households in different residential areas—Corporation, Municipality, and Panchayats—to reach the nearest PDS outlet. The data reveals clear variations in mobility patterns across geographic locations, reflecting differences in infrastructure, proximity, and perhaps socio-

economic conditions. Walking was the most common mode of travel overall, with 38.7% of households reaching the PDS shop on foot. This trend was particularly prominent in rural Panchayats (43.1%) and Municipalities (42.8%), compared to Corporations (25.6%). This suggests that PDS outlets in rural and semi-urban areas may be more accessible by foot, likely due to shorter distances or lack of transport alternatives. Private vehicle use was highest in Corporation areas (35.3%), which could be attributed to better ownership rates and urban mobility infrastructure. Panchayats (32.2%) and Municipalities (29.5%) also reported notable levels of private vehicle usage, indicating that motorized access to PDS is relevant across the board, though slightly more common in urban settings. Bicycle use was somewhat evenly distributed across areas, though slightly more prevalent in Corporations (30.8%). This mode of travel may be an accessible alternative in areas where distances are moderate and roads are suitable for cycling. Public transport was the least used overall (7.3%), and especially low in Panchayats (5%). This could reflect limited public transport connectivity in rural regions, while usage was somewhat higher in Municipalities (9.8%) and Corporations (8.3%). The Chi-square test ($\chi^2 = 18.689$, $p = 0.005$) reveals a statistically significant association between place of residence and the mode of transport used, indicating that these differences are meaningful and not due to chance.

Table 5.15

Place of Residence Wise Mode of Travel Used to Reach PDS Shop

Mode of Travel		Place of Residence			Total
		Corporation	Municipality	Panchayats	
Bicycle	N	41	31	47	119
	%	30.8	17.9	19.7	21.8
Private Vehicle	N	47	51	77	175
	%	35.3	29.5	32.2	32.1
Public Transport	N	11	17	12	40
	%	8.3	9.8	5.0	7.3
Walk	N	34	74	103	211
	%	25.6	42.8	43.1	38.7
Total	N	133	173	239	545
	%	100.0	100.0	100.0	100.0
Chi-Square		18.689 (6), p=0.005			

Note: Percent within Column; Source: Primary Survey 2025

5.4.4 Time Taken to Reach FPS & Place of Residence

Table 5.16 presents the distribution of households by the time taken to reach the nearest PDS shop across three types of residential areas—Corporation, Municipality, and Panchayats. The data reveals notable variations in access times that reflect differences in settlement density, infrastructure, and geographic spread. Overall, nearly half of all households (45.5%) reported reaching the PDS outlet in under 10 minutes. This category was most prominent in Panchayats (51.0%) and Municipalities (49.1%), suggesting relatively close proximity of PDS shops in these areas. Interestingly, despite being urban, only 30.8% of households in Corporations reported travel times of less than 10 minutes, which could be due to traffic congestion or spatial mismatch in urban planning. A significant portion of respondents (48.8%) reported travel times of 10–20 minutes, with this being the most common duration among Corporation households (60.2%). This suggests that while PDS shops are not extremely distant, accessing them in cities may take longer due to factors like urban sprawl, traffic, or location of high-rise residences farther from service centers. Longer travel durations—21 to 30 minutes—were less frequent (5.3% overall) and relatively evenly distributed across the three residential categories. Notably, only Panchayats areas had instances of travel times exceeding 30 minutes (0.8%), which could indicate isolated or remote rural pockets underserved by PDS infrastructure. The Chi-square value of 20.691 with a p-value of 0.002 indicates a statistically significant association between place of residence and the time taken to reach the PDS shop. This implies that location has a meaningful impact on access time and should be considered in improving service delivery. Corporation areas might benefit from decongesting traffic near PDS shops or increasing their number, while Panchayats regions may require targeted outreach to households in remote areas.

Table 5.16

Time Taken to Reach PDS Shop by Place of Residence

Time Taken		Place of Residence			Total
		Corporation	Municipality	Panchayats	
Less than 10 minutes	N	41	85	122	248
	%	30.8%	49.1%	51.0%	45.5%
10-20 minutes	N	80	82	104	266
	%	60.2%	47.4%	43.5%	48.8%
21-30 minutes	N	12	6	11	29
	%	9.0%	3.5%	4.6%	5.3%
More than 30 minutes	N	0	0	2	2
	%	0.0%	0.0%	0.8%	0.4%
Total	N	133	173	239	545
	%	100.0%	100.0%	100.0%	100.0%
Chi-Square					20.691 (6), p=0.002

Note: Percent within Column; Source: Primary Survey 2025

5.4.5 Operating Hours preference of FPS & Place of Residence

Table 5.17 analyses the distribution preference of operating hours of PDS across three residential categories—Corporation, Municipality, and Panchayats—and reveals how timing patterns preference vary depending on location. Overall, households reported that PDS shops are open in the evening (after 4 PM), and in the morning (before 12 PM). Among all respondents, evening hours are the most commonly preferred operating schedule, with 38.9% of households. This timing is especially prevalent in municipalities (45.7%), suggesting that evening operations are possibly more convenient or better aligned with the working population's availability in these areas. In contrast, preferring morning operations are least common overall (22.4%), but are more frequently reported in Panchayats areas (27.2%) compared to Municipalities (22.5%) and Corporations (13.5%). This may reflect the rural preference or operational feasibility of conducting transactions during early hours, especially where households tend to begin their day earlier and rely less on evening routines due to limited travel convenience. A substantial proportion of households across all three categories (38.7% overall) reported that operating preference hours vary. This

variability in preference is most prominent in Corporation areas (48.9%). The Chi-square statistic (16.003) with a p-value of 0.003 indicates a statistically significant association between the place of residence and the preference of operating hours of PDS shops. This means that where a household is located significantly influences the time preference during which they can access PDS services.

Table 5.17

Operating Hours preference of PDS Shop by Place of Residence

Operating Hours		Place of Residence			Total
		Corporation	Municipality	Panchayats	
Evening (after 4 PM)	N	50	79	83	212
	%	37.6	45.7	34.7	38.9
Morning (before 12 PM)	N	18	39	65	122
	%	13.5	22.5	27.2	22.4
Varies	N	65	55	91	211
	%	48.9	31.8	38.1	38.7
Total	N	133	173	239	545
	%	100.0	100.0	100.0	100.0
Chi-Square	16.003 (4), p=0.003				

Note: Percent within Column; Source: Primary Survey 2025

5.4.6 Satisfaction with FPS Operating Hours by Place of Residence

Table 5.18 explores whether the preferred operating hours of PDS shops align with the needs of households, broken down by place of residence—Corporation, Municipality, and Panchayats areas. Overall, 72.7% of households across the entire sample (N=545) reported that the operating hours of their local PDS shop do meet their needs, while 27.3% stated variation in preference. However, a closer look at place-based differences reveals significant variation in satisfaction levels. In Panchayats areas, a substantial 87.0% of households expressed satisfaction with PDS shop timings, indicating that rural PDS outlets are largely operating in sync with residents' schedules. Municipalities also show a relatively high satisfaction rate at 68.2%, though slightly lower compared to Panchayats areas. In contrast, Corporation

areas (typically urban settings) report the lowest satisfaction, with only 52.6% saying the timings meet their needs and a notable 47.4% expressing dissatisfaction. This suggests that urban households may be facing challenges related to timing irregularities, overcrowding, or misalignment with work hours. The Chi-square value of 53.425 with a p-value of 0.000 indicates a highly significant association between place of residence and satisfaction with PDS shop operating hours.

Table 5.18

Satisfaction with PDS Shop Operating Hours by Place of Residence

Satisfaction with PDS Shop Operating Hours		Place of Residence			Total
		Corporation	Municipality	Panchayats	
No	N	63	55	31	149
	%	47.4	31.8	13.0	27.3
Yes	N	70	118	208	396
	%	52.6	68.2	87.0	72.7
Total	N	133	173	239	545
	%	100.0	100.0	100.0	100.0
Chi-Square		53.425 (2), p=0.000			

Note: Percent within Column; Source: Primary Survey 2025

5.4.7 PDS Shop Operating Hours & Satisfaction

Table 5.19 examines the relationship between the current operating hours of PDS shops and household satisfaction with these hours. The overall satisfaction rate stands at 72.7%, with 396 households reporting that the current operating hours fully meet their needs. A deeper analysis based on time slots reveals that satisfaction levels vary notably depending on when the PDS shop is operational. Households whose preference of PDS operation in the morning (before 12 PM) report the highest satisfaction, with 91.0% expressing that the timing is suitable. Only 9.0% of these households are dissatisfied. Similarly, among those whose preference to varying hours, 72.5% are satisfied, suggesting that flexible schedules are relatively effective in meeting household needs. However, among households preferring the evening (after 4 PM), satisfaction is considerably lower. Only 62.3% report being satisfied,

while a substantial 37.7% are not. This indicates that evening operation may not align well with household routines or that other factors—like long queues, limited availability, or conflict with other obligations—might affect evening accessibility. The Chi-square statistic of 32.156 with a p-value of 0.000 confirms that there is a statistically significant association between the timing of PDS shop operation and household satisfaction levels. In other words, the timing at which PDS shops operate is a meaningful determinant of whether households feel their needs are being met. The data suggests that morning hours are most effective in ensuring household satisfaction, potentially due to better integration with daily schedules, lower congestion, or ease of access. Conversely, while evening and variable timings may still serve a majority well, they appear less consistent in achieving user satisfaction.

Table 5.19

PDS Shop Operating Hours and Satisfaction

Satisfaction		Current Operating Hours			Total
		Evening (after 4 PM)	Morning (before 12 PM)	Varies	
No	N	80	11	58	149
	%	37.7	9.0	27.5	27.3
Yes	N	132	111	153	396
	%	62.3	91.0	72.5	72.7
Total	N	212	122	211	545
	%	100.0	100.0	100.0	100.0
Chi-Square	32.156 (2), p=0.000				

Note: Percent within Column; Source: Primary Survey 2025

5.4.8 Operating Hours, Satisfaction & Place of Residence

Table 5.20 examines the relationship between the preferred operating hours of PDS shops and the satisfaction levels of households, categorized by their place of residence—Corporation, Municipality, and Panchayats areas In Corporation areas, which represent more urbanized settings, dissatisfaction with PDS shop timings is relatively high. Among respondents accessing shops in the evening, 58% expressed

dissatisfaction. In contrast, satisfaction is much higher (94.4%) among those whose preference in the morning. This suggests that urban households may find morning hours more convenient, likely due to work schedules and commuting patterns. With respect to varying hours in these areas seem to create confusion or inconsistency, with nearly equal levels of satisfaction and dissatisfaction, indicating a need for more standardized or predictable operating times. In Municipality areas, satisfaction is generally higher than in Corporation areas. A notable 62% of evening-time users and 79.5% of morning-time users reported being satisfied with the shop timings. Even shops with varied timings performed reasonably well, with a 69.1% satisfaction rate. These findings imply that semi-urban households may have slightly more flexible routines or better access to PDS services across various times of the day, compared to their urban counterparts. Panchayats areas, representing rural households, exhibit the highest levels of satisfaction with PDS shop operating hours. Among respondents in these areas, 87% were satisfied overall. Morning hours saw a particularly strong satisfaction rate of 96.9%, and even shops with varying hours had a 91.2% satisfaction rate. Dissatisfaction in rural areas is remarkably low, at just 13%, suggesting that PDS services in these locations are well-aligned with household routines, possibly due to less rigid daily schedules or better integration of PDS access into community life. Overall, the table highlights significant place-based differences in satisfaction with PDS shop hours. Urban areas show a preference for morning hours and express dissatisfaction with inconsistent or evening operations. Semi-urban areas fare moderately well across all timings, while rural areas display a high degree of satisfaction regardless of the operating hour format. These findings underscore the importance of tailoring PDS shop timings to local context—introducing more morning hours in urban settings to enhance the effectiveness of the PDS system and ensure better service delivery.

Table 5.20
Operating Hours, and Satisfaction with PDS Shop Timings by Place of Residence

Place of Residence	Satisfaction with PDS Shop Operating Hours			Operating Hours			Total
				Evening (after 4 PM)	Morning (before 12 PM)	Varies	
Corporation	Satisfaction	No	N	29	1	33	63
			%	58.0	5.6	50.8	47.4
		Yes	N	21	17	32	70
			%	42.0	94.4	49.2	52.6
	Total		N	50	18	65	133
			%	100.0	100.0	100.0	100.0
Municipality	Satisfaction	No	N	30	8	17	55
			%	38.0	20.5	30.9	31.8
		Yes	N	49	31	38	118
			%	62.0	79.5	69.1	68.2
	Total		N	79	39	55	173
			%	100.0	100.0	100.0	100.0
Panchayats	Satisfaction	No	N	21	2	8	31
			%	25.3	3.1	8.8	13.0
		Yes	N	62	63	83	208
			%	74.7	96.9	91.2	87.0
	Total		N	83	65	91	239
			%	100.0	100.0	100.0	100.0

Note: Percent within Column; Source: Primary Survey 2025

5.4.9 Reaching FPS & Accessibility

Table 5.21 provides a detailed overview of the various difficulties faced by households in accessing and using PDS services. The data highlights both physical and systemic barriers that affect the smooth functioning of the PDS from the perspective of beneficiaries. The most frequently reported issue is technical problems, such as biometric mismatches, network failures, and device malfunctions, affecting 47.7% of respondents. This indicates a major digital gap in the PDS delivery mechanism, where technology meant to improve efficiency may, in fact, be excluding

vulnerable groups who struggle with authentication or connectivity. Long waiting times (38.3%) and overcrowding (33.2%) are the next most common challenges. These issues reflect operational inefficiencies and possibly a lack of adequate infrastructure or staff to manage demand. These conditions can be especially burdensome for elderly, sick, or working individuals who cannot afford to spend long hours at the shop. Health or physical challenges are another significant barrier, affecting 23.3% of respondents. This suggests that the PDS is not sufficiently inclusive for people with mobility or health issues, and there may be a lack of support mechanisms like home delivery or caregiver access. Environmental and infrastructural issues such as poor road conditions (18.7%) and adverse weather (16.0%) further limit accessibility, particularly in rural or semi-rural areas. Meanwhile, inconvenient shop hours impact 16.7% of households, aligning with earlier findings that satisfaction with timing varies considerably by place of residence. Social and behavioural barriers are also notable: unhelpful staff behaviour was reported by 11.7% of respondents, pointing to a need for better training and accountability of PDS employees. Lack of transportation (11.9%) and distance (8.4%) highlight continued logistical challenges for some users, despite broader improvements in shop distribution. Finally, 7.5% of respondents reported being charged extra—an indicator of possible malpractice or corruption in the system—while a small number (2.6%) cited other unspecified issues. This data underscores that while the PDS has made strides in technological integration and physical outreach, numerous structural, technical, and human challenges persist. The high rate of technical problems suggests that a more user-friendly and resilient digital system is needed. Operational inefficiencies and infrastructural gaps further marginalize the most vulnerable users, including the elderly, disabled, and rural poor. Additionally, behavioural aspects—such as staff conduct and irregular pricing—point to governance and accountability issues within the system.

Table 5.21
Difficulties in Reaching the PDS Shop/Purchasing/ Issues with PDS Accessibility

Difficulties	Frequency	Percent
Distance	46	8.4
Lack of transportation	65	11.9
Weather conditions	87	16.0
Health or physical challenges	127	23.3
Behaviour of Staffs/ Unhelpful or uncooperative staff	64	11.7
Overcrowding	181	33.2
Long Waiting Times	209	38.3
Poor road conditions	102	18.7
Inconvenient shop hours	91	16.7
Technical Issues (Biometric, Network Problem, Device Problem, etc.)	260	47.7
Charging Extra Price	41	7.5
Others	14	2.6

Note: Percent within 545 responses; Source: Primary Survey 2025.

5.4.10 Accessing PDS & Type of Ration Card

Table 5.22 presents a detailed analysis of the types of difficulties experienced by PDS (Public Distribution System) users, disaggregated by the type of ration card held—AAY (Yellow), NPNS (White), Non-Priority State Subsidy (Blue), and PHH (Priority Household/Pink) reveal differing levels of vulnerability to various forms of access-related barriers, with each group exhibiting distinct patterns of reported difficulties. Among AAY cardholders, who represent the most economically disadvantaged households, a higher proportion reported significant barriers related to distance (17.5%), lack of transportation (32.5%), and physical health challenges (35%). These findings highlight the compounded physical and socioeconomic barriers this group faces in reaching PDS shops. Notably, technical issues (57.5%) and long waiting times (45.0%) were also frequently reported, indicating both infrastructural and procedural gaps. In contrast, White cardholders, who are generally better off and do not receive subsidies, reported fewer difficulties in terms of distance and transportation (5.6% and

5.0%, respectively), but faced more service-related issues such as long waiting times (45.3%), staff misbehaviour (45.3%), and inconvenient shop hours (28%). This suggests that their challenges are more reflective of inefficiencies within the service system rather than access-related hardships. Blue cardholders, representing non-priority but state-subsidized households, reported moderate difficulties across most categories. Their key concerns were technical issues (41.6%), overcrowding (25.6%), and weather conditions (20%). Interestingly, very few (only 3.2%) cited distance as a barrier, and only 1.6% experienced staff-related issues, indicating a relatively more stable access pattern compared to the other groups. PHH (Pink cardholders), who form the bulk of the subsidized ration beneficiaries, reported widespread issues across nearly all categories. Over 50% faced technical issues, and close to 40% reported long waiting times, with additional concerns about overcrowding (35.6%), health-related difficulties (24.7%), and poor road conditions (18.3%). These figures point toward a combination of physical, logistical, and systemic obstacles in PDS access for this group. The Chi-square test results provide statistical validation for these patterns. Significant associations (* at the 1% level)** were observed for challenges such as distance, lack of transportation, staff behaviour, long waiting times, and inconvenient shop hours, indicating that these difficulties vary meaningfully by ration card type. For instance, the disproportionate reporting of distance and transportation barriers by AAY cardholders, and service-related issues by White cardholders, reflect the differing socioeconomic and infrastructural realities of these groups. Additionally, charging of extra prices showed a significant difference at the 5% level (**), suggesting possible exploitation among certain card categories. On the other hand, challenges such as technical issues, overcrowding, health-related difficulties, and poor road conditions were found to be statistically insignificant (#), indicating these are systemic challenges affecting all categories, irrespective of economic classification. In conclusion, the Chi-square analysis confirms that while some PDS access issues are card-type-specific, many others are systemic and require broad-based reforms. Improving technical infrastructure, reducing waiting times, and enhancing staff responsiveness could benefit all groups, whereas targeted solutions such as transport assistance for AAY households could address inequalities in access.

Table 5.22

Distribution of Reported Difficulties in Accessing PDS by Type of Ration Card

Difficulties in Reaching the PDS Shop		AAY (Antyodaya Anna Yojana)/ Yellow	NPNS/ White	Non-Priority State Subsidy/ Blue	PHH (Priority Household)/ Pink	Total
Distance***	N	7	9	4	26	46
	%	17.5	5.6	3.2	11.9	8.4
Lack of transportation***	N	13	8	11	33	65
	%	32.5	5.0	8.8	15.1	11.9
Weather conditions#	N	8	19	25	35	87
	%	20.0	11.8	20.0	16.0	16.0
Health or physical challenges#	N	14	35	24	54	127
	%	35.0	21.7	19.2	24.7	23.3
Behaviour of Staffs/ Unhelpful or uncooperative staff***	N	6	29	2	27	64
	%	15.0	18.0	1.6	12.3	11.7
Overcrowding#	N	16	55	32	78	181
	%	40.0	34.2	25.6	35.6	33.2
Long Waiting Times***	N	18	73	32	86	209
	%	45.0	45.3	25.6	39.3	38.3
Poor road conditions#	N	9	49	4	40	102
	%	22.5	30.4	3.2	18.3	18.7
Inconvenient shop hours***	N	7	45	3	36	91
	%	17.5	28.0	2.4	16.4	16.7
Technical Issues (Biometric, Network Problem, Device Problem, etc.)#	N	23	74	52	111	260
	%	57.5	46.0	41.6	50.7	47.7
Charging Extra Price**	N	6	13	2	20	41
	%	15.0	8.1	1.6	9.1	7.5
Others#	N	1	4	0	9	14
	%	2.5	2.5	0.0	4.1	2.6

*Note: Chi-Square Test (Degrees of Freedom = 3). Significance levels are indicated as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level, and # denotes statistical insignificance. These results are based on comparisons between respondents who reported difficulties in accessing the PDS and those who did not; percent are within ration card; Source: Primary Survey 2025*

5.4.11 Accessing PDS & Place of Residence

Table 5.23 highlights the spatial variations in difficulties faced by PDS beneficiaries across three types of residential areas: Corporation (urban), Municipality (semi-urban), and Panchayats (rural). A closer look at the data reveals that Panchayats

residents report more physical access-related issues, particularly in terms of distance (12.6%) and lack of transportation (19.2%). These figures are substantially higher than those for Corporation (3.8% and 5.3%) and Municipality (6.4% and 6.9%) residents, respectively. The disparity underscores the challenges of last-mile delivery and inadequate public infrastructure in rural areas. The Chi-square test results confirm these differences as statistically significant at the 1% level (*), indicating a strong association between rural residence and transportation-related difficulties. In contrast, urban residents (Corporation areas) face more system-related and infrastructural difficulties, particularly with poor road conditions (38.3%), inconvenient shop hours (36.8%), and overcrowding (36.8%). Notably, long waiting times (47.4%) are also most acute in urban areas, reflecting possible congestion and service delays due to a larger beneficiary base per outlet. The behaviour of staff is also a more pronounced issue in Corporation areas (21.8%) than in Panchayats (10%) or Municipalities (6.4%), which may be a reflection of strained urban administrative capacities or impersonal service delivery mechanisms. Interestingly, technical issues such as biometric failures and device/network problems affect all areas significantly, but are most frequently reported in rural Panchayats (52.7%), followed by Municipalities (48%) and Corporations (38.3%). While these differences are statistically significant at the 5% level (**), they point to a system-wide problem that worsens with decreasing levels of urbanization, likely due to weaker digital infrastructure in rural areas. Other issues such as health or physical challenges (reported fairly evenly across the three locations) and weather conditions (slightly more in urban and semi-urban areas) were statistically insignificant (#), indicating that these factors may not vary much with location but affect all segments of the population to some extent. A notable concern is charging of extra prices, which appears to be more prevalent in Panchayats (9.2%) and Corporation (12.0%) areas, and less so in Municipalities (1.7%). The Chi-square test indicates statistical significance at the 1% level (*), suggesting a strong association between geography and reported overpricing—potentially linked to local oversight or enforcement gaps. The Chi-square test results confirm that several key barriers to PDS access—especially distance, transportation, staff behavior, shop hours, and pricing—vary significantly by place of residence. Urban residents are more likely to encounter system inefficiencies and staff issues, while rural populations face more severe logistical and infrastructural hurdles. These findings highlight the need for context-specific policy interventions. Urban areas would benefit from streamlining

service delivery and improving staff training, while rural areas require investments in transportation, decentralized outlets, and digital infrastructure to ensure inclusive access to the PDS.

Table 5.23

Distribution of Reported Difficulties in Accessing PDS by Place of Residence

Difficulties in Reaching the PDS Shop		Corporation	Municipality	Panchayats	Total
Distance***	N	5	11	30	46
	%	3.8	6.4	12.6	8.4
Lack of transportation***	N	7	12	46	65
	%	5.3	6.9	19.2	11.9
Weather conditions#	N	23	33	31	87
	%	17.3	19.1	13.0	16.0
Health or physical challenges#	N	39	36	52	127
	%	29.3	20.8	21.8	23.3
Behaviour of Staffs/ Unhelpful or uncooperative staff***	N	29	11	24	64
	%	21.8	6.4	10.0	11.7
Overcrowding#	N	49	51	81	181
	%	36.8	29.5	33.9	33.2
Long Waiting Times**	N	63	61	85	209
	%	47.4	35.3	35.6	38.3
Poor road conditions***	N	51	21	30	102
	%	38.3	12.1	12.6	18.7
Inconvenient shop hours***	N	49	18	24	91
	%	36.8	10.4	10.0	16.7
Technical Issues (Biometric, Network Problem, Device Problem, etc.)**	N	51	83	126	260
	%	38.3	48.0	52.7	47.7
Charging Extra Price***	N	16	3	22	41
	%	12.0	1.7	9.2	7.5
Others#	N	4	2	8	14
	%	3.0	1.2	3.3	2.6

*Note: Chi-Square Test (Degrees of Freedom = 2). Significance levels are indicated as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level, and # denotes statistical insignificance. These results are based on comparisons between respondents who reported difficulties in accessing the PDS and those who did not; percent are within place of Residence; Source: Primary Survey 2025*

5.4.12 Accessing PDS & Caste/ Category

Table 5.24 presents the distribution of reported difficulties in accessing the PDS across various caste and category groups, including EWS, General, OBC, SC, and ST. The data reflects how socio-economic and social stratification influences the accessibility and experience of availing food rations. Among the most striking patterns is the higher prevalence of difficulties among SC and ST respondents. For instance, 50% of STs and 19.2% of SCs reported issues related to the distance to PDS shops, in contrast to only 4.3% among the General category and 7.3% among OBCs. This indicates that marginalized groups, particularly STs and SCs, are disproportionately affected by geographic barriers. Lack of transportation similarly shows higher incidence among SCs (23.1%) and EWS (12.9%), while no ST respondent reported this issue—possibly due to sample size constraints. Weather conditions, health problems, and physical challenges also showed moderate concern across all castes, with SC and OBC respondents registering the highest percentages, although these differences were not statistically significant. Staff behaviour, a crucial determinant of accessibility, was more problematic for SCs (17.9%) and STs (50%), compared to just 7.5% among General respondents, indicating potential systemic discrimination or differential treatment based on caste. Overcrowding and long waiting times were common across all caste groups but were most pronounced among SCs (47.4% and 44.9%, respectively) and STs (both 50%), suggesting that PDS outlets in areas with higher SC/ST populations may be more congested or inefficient. Technical issues such as biometric failures and network problems were prevalent across all categories, with minimal variation—though none were reported by ST respondents, again possibly due to small sample size or underreporting. Charging of extra prices was another critical issue with strong caste-based disparities. SC respondents (19.2%) faced this the most, followed by OBCs and General category at much lower rates. This finding, confirmed by the chi-square test at the 1% level of significance, underscores the exploitation faced by disadvantaged groups. Similarly, distance and lack of transportation were also statistically significant at the 1% and 5% levels, respectively, reinforcing the structural barriers that affect SC and ST populations more acutely. In summary, the chi-square test results reveal that caste plays a statistically significant role in influencing several dimensions of PDS access. The variables of distance, lack of transportation, behaviour of staff, overcrowding,

and extra pricing showed significant variation across caste groups, pointing to systemic inequities.

Table 5.24

Distribution of Reported Difficulties in Accessing PDS by Caste/ Category

Difficulties in Reaching the PDS Shop		EWS	General	OBC	SC	ST	Total
Distance***	N	1	4	25	15	1	46
	%	3.2	4.3	7.3	19.2	50.0	8.4
Lack of transportation**	N	4	11	32	18	0	65
	%	12.9	11.8	9.4	23.1	0.0	11.9
Weather conditions#	N	4	9	59	15	0	87
	%	12.9	9.7	17.3	19.2	0.0	16.0
Health or physical challenges#	N	5	21	82	19	0	127
	%	16.1	22.6	24.0	24.4	0.0	23.3
Behaviour of Staffs/ Unhelpful or uncooperative staff*	N	5	7	37	14	1	64
	%	16.1	7.5	10.9	17.9	50.0	11.7
Overcrowding**	N	12	26	105	37	1	181
	%	38.7	28.0	30.8	47.4	50.0	33.2
Long Waiting Times#	N	12	31	130	35	1	209
	%	38.7	33.3	38.1	44.9	50.0	38.3
Poor road conditions#	N	9	12	61	20	0	102
	%	29.0	12.9	17.9	25.6	0.0	18.7
Inconvenient shop hours#	N	8	11	57	15	0	91
	%	25.8	11.8	16.7	19.2	0.0	16.7
Technical Issues (Biometric, Network Problem, Device Problem, etc.)#	N	18	44	159	39	0	260
	%	58.1	47.3	46.6	50.0	0.0	47.7
Charging Extra Price***	N	1	5	20	15	0	41
	%	3.2	5.4	5.9	19.2	0.0	7.5
Others#	N	0	1	8	5	0	14
	%	0.0	1.1	2.3	6.4	0.0	2.6

*Note: Chi-Square Test (Degrees of Freedom = 4). Significance levels are indicated as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level, and # denotes statistical insignificance. These results are based on comparisons between respondents who reported difficulties in accessing the PDS and those who did not; percent are within caste; Source: Primary Survey 2025*

5.4.13 Accessing PDS & Gender

Table 5.25 presents the distribution of reported difficulties in accessing the PDS based on the gender of the household head. The data compares the experiences of female-headed households with those led by males, revealing gender-based differences in challenges faced. Within the gender category, female-headed households reported significantly more issues related to distance, with 7.8% noting this difficulty compared to 20.7% among male-headed households. Interestingly, although the percentage appears higher among male-headed households, this variable was statistically significant at the 5% level, indicating a notable difference in reported experiences despite females constituting the majority of respondents. In terms of lack of transportation, 11.8% of female-headed households and 13.8% of male-headed households reported difficulties. However, this difference was not statistically significant. Similarly, weather-related problems were noted by 15.5% of female-headed and 24.1% of male-headed households, again with no significant gender-based distinction. Health or physical challenges were reported by 22.7% of female-headed households compared to a much higher 34.5% among male-headed ones. Although the percentage is notably different, the variable did not show statistical significance, possibly due to the smaller number of male respondents. Uncooperative staff behaviour, overcrowding, long waiting times, and poor road conditions were reported at comparable levels across genders, with no statistically significant disparities observed. Interestingly, technical issues, including biometric or network problems, showed a statistically significant difference at the 10% level. Almost half (48.6%) of female-headed households reported facing such issues, compared to only 31.0% of male-headed households. This suggests that households led by women are disproportionately affected by technological barriers in accessing PDS services, possibly due to less familiarity with or access to digital tools. Other challenges, including being charged extra prices and encountering inconvenient shop hours, did not show significant gender-based differences, though the percentage of females affected was consistently higher. For instance, 17.2% of female-headed households faced inconvenient shop hours compared to just 6.9% of male-headed ones. In conclusion, the chi-square test results suggest that gender does play a role in shaping the experience of accessing PDS, particularly in the areas of distance and technical difficulties, which were statistically significant at the 5% and 10% levels,

respectively. These findings highlight the need for gender-sensitive improvements in the PDS system, ensuring that barriers specific to female-headed households are addressed through better accessibility and support services.

Table 5.25
Distribution of Reported Difficulties in Accessing PDS by Gender of the Household Head

Difficulties in Reaching the PDS Shop		Female	Male	Total
Distance**	N	40	6	46
	%	7.8	20.7	8.4
Lack of transportation#	N	61	4	65
	%	11.8	13.8	11.9
Weather conditions#	N	80	7	87
	%	15.5	24.1	16.0
Health or physical challenges#	N	117	10	127
	%	22.7	34.5	23.3
Behaviour of Staffs/ Unhelpful or uncooperative staff#	N	60	4	64
	%	11.6	13.8	11.7
Overcrowding#	N	171	10	181
	%	33.1	34.5	33.2
Long Waiting Times#	N	197	12	209
	%	38.2	41.4	38.3
Poor road conditions#	N	98	4	102
	%	19.0	13.8	18.7
Inconvenient shop hours#	N	89	2	91
	%	17.2	6.9	16.7
Technical Issues (Biometric, Network Problem, Device Problem, etc.)*	N	251	9	260
	%	48.6	31.0	47.7
Charging Extra Price#	N	40	1	41
	%	7.8	3.4	7.5
Others#	N	13	1	14
	%	2.5	3.4	2.6

*Note: Chi-Square Test (Degrees of Freedom = 1). Significance levels are indicated as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level, and # denotes statistical insignificance. These results are based on comparisons between respondents who reported difficulties in accessing the PDS and those who did not; percent are within gender; Source: Primary Survey 2025*

5.4.14 Accessing PDS & Education

The relationship between educational attainment in a household and difficulties in accessing the PDS reveals nuanced patterns. This analysis categorizes households based on the number of members who have completed Secondary School Leaving Certificate (SSLC) or higher levels of education, ranging from zero to eight. The data suggests that education does have a moderating effect on the experience of access-related challenges in the PDS. Households with no SSLC-qualified members report relatively high percentages of difficulties across several categories. For instance, 8.7% faced distance-related issues, 23.9% cited lack of transportation, 34.8% experienced health or physical challenges, and 63.0% encountered technical issues such as biometric or network problems. These figures are generally higher than those reported by more educated households, indicating that educational disadvantage can compound access barriers, possibly due to limited awareness of entitlements, less confidence in navigating digital systems, or reduced mobility and resources. However, as the number of educated members in a household increases, a trend of decreasing difficulty is observed in several categories, though not uniformly. For example, households with five or more SSLC-educated members generally report lower instances of distance, poor road conditions, inconvenient shop hours, and challenges related to uncooperative staff. Interestingly, households with a moderate number (2–3 members) of SSLC-qualified individuals still report significant difficulties, particularly in categories such as long waiting times (up to 41.5%), overcrowding, and technical issues, which seem to persist regardless of education level. This might indicate that systemic or infrastructural factors are overriding individual household capabilities in those domains. In certain categories, such as lack of transportation and weather-related challenges, the association with education is statistically significant (** at the 5% level), while others like distance, behavior of staff, and long waiting times are significant at the 10% level. More strikingly, health or physical challenges and inconvenient shop hours show significance at the 1% level, indicating a robust association with education. These findings reinforce the idea that more educated households are better equipped to mitigate or avoid certain types of difficulties, perhaps due to better planning, knowledge of entitlements, or ability to communicate and advocate for their needs. However, it's worth noting that even in households with high educational attainment (six or more SSLC-qualified members), some challenges

like technical issues still persist, although at a slightly lower rate (around 33–38%). This suggests that while education plays a protective role, it cannot entirely offset systemic issues like malfunctioning biometric devices, server errors, or unresponsive service models that are common in PDS operations across regions. Overall, the chi-square results suggest that the number of SSLC or above-qualified members in a household is a statistically relevant factor in several dimensions of PDS access. These insights point toward the importance of literacy and digital literacy programs that can empower households, especially those with lower educational backgrounds, to better navigate and utilize public welfare systems like the PDS (Table 5.26).

Table 5.26
Distribution of Reported Difficulties in Accessing PDS by Education (Number of SSLC or Above Qualified Members in Household)

Difficulties in Reaching the PDS Shop		Number SSLC or Above Holders in HH									Total
		0	1	2	3	4	5	6	7	8	
Distance*	N	4	11	13	8	3	5	0	1	1	46
	%	8.7	13.1	12.9	8.5	3.4	5.7	0.0	16.7	33.3	8.4
Lack of transportation**	N	11	11	12	9	9	4	7	1	1	65
	%	23.9	13.1	11.9	9.6	10.1	4.5	20.6	16.7	33.3	11.9
Weather conditions#	N	12	10	21	13	15	8	5	2	1	87
	%	26.1	11.9	20.8	13.8	16.9	9.1	14.7	33.3	33.3	16.0
Health or physical challenges***	N	16	23	35	15	14	18	3	2	1	127
	%	34.8	27.4	34.7	16.0	15.7	20.5	8.8	33.3	33.3	23.3
Behaviour of Staffs/ Unhelpful or uncooperative staff*	N	7	17	15	12	6	5	2	0	0	64
	%	15.2	20.2	14.9	12.8	6.7	5.7	5.9	0.0	0.0	11.7
Overcrowding#	N	13	34	32	36	27	29	9	1	0	181
	%	28.3	40.5	31.7	38.3	30.3	33.0	26.5	16.7	0.0	33.2
Long Waiting Times*	N	16	44	36	39	32	32	8	2	0	209
	%	34.8	52.4	35.6	41.5	36.0	36.4	23.5	33.3	0.0	38.3
Poor road conditions#	N	11	30	23	17	9	9	3	0	0	102
	%	23.9	35.7	22.8	18.1	10.1	10.2	8.8	0.0	0.0	18.7
Inconvenient shop hours***	N	10	30	22	14	7	7	1	0	0	91
	%	21.7	35.7	21.8	14.9	7.9	8.0	2.9	0.0	0.0	16.7
Technical Issues (Biometric,	N	29	48	50	50	35	32	13	2	1	260

Network Problem, Device Problem, etc.)**	%	63.0	57.1	49.5	53.2	39.3	36.4	38.2	33.3	33.3	47.7
Charging Extra Price#	N	4	9	11	5	4	7	1	0	0	41
	%	8.7	10.7	10.9	5.3	4.5	8.0	2.9	0.0	0.0	7.5
Others#	N	1	5	3	3	1	1	0	0	0	14
	%	2.2	6.0	3.0	3.2	1.1	1.1	0.0	0.0	0.0	2.6

*Note: Chi-Square Test (Degrees of Freedom = 8). Significance levels are indicated as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level, and # denotes statistical insignificance. These results are based on comparisons between respondents who reported difficulties in accessing the PDS and those who did not; percent are within Number of SSLC or Above Qualified Members in Household; Source: Primary Survey 2025*

5.4.15 Perceived Accessibility, Persons with Disabilities, Place of Residence & Type of Ration Card

The data presented in Table 5.27 provides an insightful look into how people perceive the accessibility of PDS shops for individuals with disabilities and the elderly, segmented by place of residence and type of ration card. The chi-square tests highlight statistically significant differences in perceptions across both variables, suggesting that accessibility is not perceived uniformly across demographic and geographic groups. Looking first at place of residence, the perception of accessibility is most positive among respondents living in Panchayats areas, where 61.5% of respondents agreed that PDS shops were accessible for people with disabilities or the elderly. This was notably higher than in Corporation areas, where only 53.4% felt the shops were accessible, and significantly better than in Municipality areas, where just 42.8% responded positively. Notably, Municipality respondents also had the highest proportion of uncertainty, with 32.9% selecting "Not Sure" about accessibility. This could point to a lack of clarity or variability in infrastructure or service experience in urban peripheries. Meanwhile, a significant portion (39.8%) of respondents in Corporation areas outright stated that the shops were not accessible, the highest among all three residence categories. The chi-square test result for this variable, $\chi^2 = 47.758$ with $p = 0.000$, indicates a statistically significant association between place of residence and perceived accessibility, confirming that where someone lives

meaningfully shapes how they experience or perceive PDS access for vulnerable groups.

Turning to type of ration card, which acts as a proxy for socioeconomic status, disparities also emerge. Households with the AAY (Yellow card), typically the most economically vulnerable, reported relatively high levels of perceived accessibility (60%), comparable to those with Non-Priority State Subsidy/Blue cards (60.8%). This suggests that government initiatives targeted at the poorest may have been somewhat effective in ensuring physical access to the PDS. On the other hand, holders of the NPNS/White card were less likely to perceive accessibility (only 45.3% responded "Yes"), and more likely to say "No" (34.2%), suggesting disparities in service delivery or expectations based on economic classification. Interestingly, PHH (Priority Household)/Pink card holders fall in the middle, with 54.3% perceiving accessibility. The chi-square statistic for this category is $\chi^2 = 17.818$ with $p = 0.007$, which again confirms a statistically significant association between the type of ration card and perceived accessibility. So, both residential location and socioeconomic classification (through ration card type) are significantly associated with how households perceive the accessibility of PDS shops for elderly and disabled individuals.

Table 5.27
Perceived Accessibility of PDS Shops for Persons with Disabilities and the Elderly by Place of Residence and Type of Ration Card

Variable	Category		Perceived Accessibility of PDS Shops for Persons with Disabilities			Total	Chi-Square Result
			No	Not Sure	Yes		
Place of Residence	Corporation	N	53	9	71	133	47.758 (4), p=0.000
		%	39.8	6.8	53.4	100.0	
	Municipality	N	42	57	74	173	
		%	24.3	32.9	42.8	100.0	
	Panchayats	N	42	50	147	239	
		%	17.6	20.9	61.5	100.0	
	Total	N	137	116	292	545	
		%	25.1	21.3	53.6	100.0	

Type of Ration Card	AAY (Antyodaya Anna Yojana)/ Yellow	N	6	10	24	40	17.818 (6), p=0.007
		%	15.0	25.0	60.0	100.0	
	NPNS/ White	N	55	33	73	161	
		%	34.2	20.5	45.3	100.0	
	Non-Priority State Subsidy/ Blue	N	18	31	76	125	
		%	14.4	24.8	60.8	100.0	
	PHH (Priority Household)/ Pink	N	58	42	119	219	
		%	26.5	19.2	54.3	100.0	
	Total	N	137	116	292	545	
		%	25.1	21.3	53.6	100.0	

Note: Percent within Row Source: Primary Survey 2025

5.5 Construction and Standardization of PDS Accessibility Score Parameters

Data reveal that out of a total of 545 respondents, a significant majority—440 individuals, representing 80.7%—indicated that they do not prefer alternative delivery options and would rather continue accessing PDS items through the conventional system. In contrast, only 105 respondents, or 19.3%, expressed a preference for such alternative modes of distribution. This finding suggests that while there is some interest in more convenient or flexible delivery mechanisms, the current PDS infrastructure remains the preferred mode of access for the vast majority of beneficiaries. Possible reasons for this preference could include familiarity with existing systems, limited awareness of alternative options, or skepticism regarding the efficiency, reliability, or cost-effectiveness of new delivery models. On the other hand, the nearly one-fifth who do favor alternative delivery might include elderly, differently-abled individuals, or those facing challenges such as long distances, overcrowding, or poor shop accessibility—factors highlighted in previous tables.

Table 5.28 outlines the construction and standardization process used to develop a PDS Accessibility Index. This index is a composite measure that translates subjective and categorical responses into a standardized numerical scale, allowing for

meaningful comparison of accessibility levels across different households or geographical areas. It takes into account various dimensions of access—physical, operational, and social—and assigns scores based on predefined criteria for each parameter. The first dimension, Physical Proximity, includes two key variables: distance to the PDS shop and travel time. Both are standardized using the min-max method, which ensures that values are normalized between 0 and 1 based on their relative position within the given range. For example, respondents living within 1 km or taking less than 10 minutes to reach the shop receive the highest score, while those farther away or taking longer receive lower scores. This reflects the intuitive assumption that closer and faster access implies better physical accessibility. Next, Transport Accessibility is considered by assessing the usual mode of transportation. Walking or cycling is assigned a higher score (1), assuming these modes imply better proximity or fewer mobility constraints, while those relying on motorized transport (public or private) are scored 0, suggesting they may face greater access challenges. Operational Accessibility is measured through two variables: the predictability of PDS shop operating hours and whether those hours meet household needs. Fixed schedules (morning or evening) and a positive response to convenience are scored as 1, indicating reliable and accessible service. In contrast, variable schedules and unmet timing needs are scored 0, reflecting operational limitations in access. The Barriers to Access parameter captures structural and situational impediments, such as poor road conditions, overcrowding, or staff behaviour. Here, a household that reports no barriers scores 1, while any reported difficulty results in a score of 0, highlighting an adverse impact on accessibility. Inclusive Accessibility assesses whether the PDS shop is easily accessible for the elderly or people with disabilities. A 'Yes' response scores 1, while 'No' or uncertainty is scored 0. This parameter underscores the importance of inclusivity in public service delivery. Lastly, the Preference for Alternative Delivery Methods acts as an indirect indicator of current system shortcomings. Respondents preferring home delivery or mobile distribution are scored 0, suggesting dissatisfaction with current access, while those who do not express such preference score 1, indicating adequacy in existing services. All these parameters are equally weighted and averaged to compute a final Accessibility Score, which is

categorized into high (0.75–1), moderate (0.5–0.74), or low (<0.5) accessibility. This scoring framework facilitates data-driven policy decisions by identifying gaps and prioritizing improvements in the delivery of essential food services through the PDS.

Table 5.28
Construction and Standardization of PDS Accessibility Score Parameters

Parameter	Variable	Coding/ Standardization Procedure
Physical Proximity	Distance to PDS shop	$(X-X_{min})/(X_{max}-X_{Min})$ • <1 km = 3 • 1–2 km = 2 • 2–5 km = 1 • 5 km = 0
	Travel time	$(X-X_{min})/(X_{max}-X_{Min})$ • <10 min = 3 • 10–20 min = 2 • 20–30 min = 1 • 30 min = 0
Transport Accessibility	Mode of transport	Walk/Bicycle=1 ((assumes good proximity) Public and Private = 0
Operational Accessibility	Operating hours	Fixed morning/evening = 1 Varies = 0
	Do the hours meet needs	Yes = 1 No = 0
Barriers to Access	Difficulties faced (all)	No = 1 Yes = 0
Inclusive Accessibility	Is it accessible for elderly/disabled	Yes = 1 No = 0
Preferred Alternatives	Prefer alternative delivery?	Yes = 0 (could indicate poor accessibility) No = 1
Accessibility Score	Weighted Average of All Parameters (Equal) • High Accessibility (Score: 0.75–1) • Moderate Accessibility (0.5–0.74) • Low Accessibility (<0.5)	

Source: Author, 2024

5.5.1. PDS Accessibility Score & Type of Ration Card

Table 5.29 presents the average PDS accessibility scores calculated for different categories of ration cardholders, namely: AAY (Yellow), NPNS (White), Non-Priority State Subsidy (Blue), and PHH (Priority Household/Pink). The accessibility score, as previously defined, ranges from 0 to 1, with higher values indicating better accessibility. From the data, it is observed that beneficiaries holding the Blue card (Non-Priority State Subsidy) have the highest average accessibility score of 0.791, indicating relatively better access to PDS services compared to other groups. This group also shows the lowest standard deviation (SD = 0.085), suggesting less variability and more uniform accessibility experiences among its members. On the other hand, AAY cardholders, who typically represent the most economically vulnerable households, have the lowest average score (0.710) and a higher standard deviation (SD = 0.159), pointing to greater inconsistency and relatively lower accessibility. This finding could be a cause for concern, as these beneficiaries are the ones most in need of reliable and convenient PDS access. The pink cardholders (PHH) have a moderate accessibility score (0.745), and the white cardholders (NPNS) score slightly lower at 0.723, both showing some variability in experiences. To statistically assess whether these differences in accessibility scores across ration card types are significant, an ANOVA test was performed. The test yields an F-value of 6.103 with a p-value of 0.000, indicating that the differences in mean accessibility scores among the four ration card groups are statistically significant at the 1% level. In other words, type of ration card is a significant determinant of how accessible the PDS system is perceived by beneficiaries. The table suggests a disparity in PDS accessibility based on ration card type, with Non-Priority State Subsidy (Blue) cardholders experiencing the best access and AAY beneficiaries facing the most challenges.

Table 5.29
Average PDS Accessibility Scores by Type of Ration Card

Type of Ration Card	N	Average Accessibility Score	SD	Std. Error
AAY (Antyodaya Anna Yojana)/ Yellow	40	0.710	0.159	0.025
NPNS/ White	161	0.723	0.141	0.011
Non-Priority State Subsidy/ Blue	125	0.791	0.085	0.008
PHH (Priority Household)/ Pink	219	0.745	0.173	0.012
Total	545	0.746	0.149	0.006
ANOVA	F (3, 541) = 6.103, p=0.000			

Source: Primary Survey 2025

5.5.2. PDS Accessibility Scores & Place of Residence

Table 5.30 illustrates the average accessibility scores of the PDS across three types of residential settings: Corporation (urban centers), Municipality (semi-urban areas), and Panchayats (rural areas). These scores reflect how easily beneficiaries can access PDS services, based on standardized parameters such as distance, travel time, transport mode, shop hours, and barriers to access. From the table, it is evident that beneficiaries residing in Panchayats report the highest average accessibility score of 0.763, indicating better overall access to PDS services. This is followed closely by Municipality residents, with a score of 0.755. Interestingly, Corporation areas, which are typically considered more developed, show the lowest accessibility score of 0.706. This somewhat counterintuitive finding suggests that despite better infrastructure, factors such as congestion, overcrowding, or bureaucratic inefficiencies might reduce perceived accessibility in urban settings. In terms of variability, Municipality residents have the lowest standard deviation (SD = 0.124), indicating more consistent experiences with PDS accessibility among that group. In contrast, Panchayats residents show slightly more variability (SD = 0.160), suggesting a wider range of experiences even though the average access is better. The ANOVA test result—F (2, 542) = 6.847, p = 0.001—confirms that the differences in accessibility scores across

place of residence are statistically significant. This means the type of locality a person lives in has a measurable impact on how accessible the PDS system is to them. Contrary to expectations, rural and semi-urban residents report better access to PDS services than those in urban Corporation areas. This is due to more community-oriented service delivery in rural regions or fewer logistical barriers.

Table 5.30
Average PDS Accessibility Scores by Place of Residence

Place of Residence	N	Average Accessibility Score	SD	Std. Error
Corporation	133	0.706	0.151	0.013
Municipality	173	0.755	0.124	0.009
Panchayats	239	0.763	0.160	0.010
Total	545	0.746	0.149	0.006
ANOVA	F (2, 542) = 6.847, p=0.001			

Source: Primary Survey 2025

5.5.3 PDS Accessibility Scores & Caste or Category

Table 5.31 presents the average accessibility scores for the PDS disaggregated by caste or social category. From the table, we observe that Scheduled Tribes (ST) report the highest average accessibility score at 0.842, though this finding should be interpreted with caution due to the small sample size (N=2). Among the larger groups, individuals from the General category report the next highest score of 0.774, indicating relatively better access to PDS facilities. This is followed closely by Other Backward Classes (OBC) at 0.750, and Economically Weaker Sections (EWS) at 0.743. In contrast, Scheduled Castes (SC) report the lowest accessibility score at 0.697, suggesting comparatively poorer access to PDS services. This may reflect deeper systemic issues such as marginalization, discrimination, or geographic disadvantage. The standard deviation (SD) is notably high among the SC group (SD = 0.200), indicating greater variability in their experiences with PDS accessibility. On the other hand, the General and OBC categories show lower standard deviations (0.120 and 0.139, respectively), suggesting more consistent access across individuals in these groups. The ANOVA test result, F (4, 540) = 3.244, p = 0.012, confirms that

the differences in average accessibility scores among the caste categories are statistically significant. This suggests that caste does play a meaningful role in shaping access to the PDS. The findings underscore the persistent disparities in access to public services across caste lines. While some categories like General and OBC have better and more consistent access, marginalized groups such as SCs appear to face more challenges.

Table 5.31

Average PDS Accessibility Scores by Caste or Category

Caste	N	Average Accessibility Score	SD	Std. Error
EWS	31	.743	.162	.029
General	93	.774	.120	.012
OBC	341	.750	.139	.008
SC	78	.697	.200	.023
ST	2	.842	.075	.053
Total	545	.746	.149	.006
ANOVA	F (4, 540) = 3.244, p=0.012			

Source: Primary Survey 2025

5.5.4 PDS Accessibility Scores& Education

Table 5.32 explores the relationship between household educational attainment—measured by the number of members who have completed the SSLC (Secondary School Leaving Certificate) or higher—and PDS accessibility scores. The data reveals a positive trend between educational attainment and accessibility. Households with no SSLC-qualified members have the lowest average accessibility score at 0.703, while those with 4 to 6 qualified members record the highest scores (0.779, 0.770, and 0.789 respectively). This suggests that higher educational attainment within a household is associated with better access to PDS services. Educated households may be more informed about entitlements, better at navigating bureaucratic processes, and more proactive in addressing access issues. Interestingly, households with only one qualified member report a slightly lower score (0.695) than even those with none, which may reflect socioeconomic disparities not solely linked to education. However,

as the number of educated members increases beyond two, the accessibility score generally improves, peaking at six educated members with an average score of 0.789. The standard deviation (SD) tends to decrease with a higher number of educated members, indicating that access is more consistently good in highly educated households. The ANOVA test result (F (8, 536) = 2.983, p = 0.003) confirms that these differences are statistically significant, reinforcing the idea that education plays a meaningful role in shaping PDS accessibility. This table clearly highlights a correlation between education and accessibility, suggesting that household literacy and awareness levels significantly affect engagement with the PDS system. It underscores the importance of educational empowerment, not just as a social good but also as a factor in ensuring fair and equitable access to essential public services.

Table 5.32
Average PDS Accessibility Scores by Number of SSLC or Above Qualified Members in Household

Number of SSLC or Above Qualified Members in Household	N	Average Accessibility Score	SD	Std. Error
0	46	.703	.159	.023
1	84	.695	.171	.019
2	101	.743	.173	.017
3	94	.749	.150	.015
4	89	.779	.110	.012
5	88	.770	.126	.013
6	34	.789	.110	.019
7	6	.743	.067	.027
8	3	.748	.086	.050
Total	545	.746	.149	.006
ANOVA	F (8, 536) = 2.983, p=0.003			

Source: Primary Survey 2025

5.5.5 PDS Accessibility Scores & Chronic Disease or Disability

Table 5.33 examines the impact of chronic illness or disability within households on their accessibility to the PDS. The analysis compares the average accessibility scores between households with and without such vulnerabilities. The results show a notable disparity: households without members affected by chronic disease or disability have

an average accessibility score of 0.755, while those with affected members report a significantly lower score of 0.676. This suggests that health-related vulnerabilities may act as barriers to accessing PDS services, potentially due to mobility challenges, dependency on caregivers, or the inability to navigate long wait times and infrastructure issues. The standard deviation is slightly higher for households with chronic illness or disability (0.174) compared to those without (0.143), indicating greater variability in access among the vulnerable group. This could reflect differing levels of support systems, geographic access, or local infrastructural conditions. The Independent Sample t-test results ($t(65.187) = 3.268$, $p = 0.002$) indicate that the difference in accessibility scores between the two groups is statistically significant. Since the assumption of equal variances is not met (as noted in the footnote), a more robust version of the t-test was applied, strengthening the validity of the finding. Households with members suffering from chronic illness or disability face greater challenges in accessing PDS services. This underscores the need for more inclusive, accessible delivery mechanisms, such as home delivery or mobile distribution units, especially targeted toward vulnerable populations. The findings advocate for policy adjustments that accommodate the special needs of such households to ensure equity and fairness in food distribution systems.

Table 5.33
Average PDS Accessibility Scores by Family Have Chronic Disease or Disability

Chronic Disease or Disability	N	Average Accessibility Score	SD	Std. Error
No	488	.755	.143	.006
Yes	57	.676	.174	.023
Total	545	.746	.149	.006
Independent Sample t-test	t (65.187)* = 3.268, p=0.002			

Note: Equal variances not assumed; Source: Primary Survey 2025

5.5.6 Accessibility Scores & Household Economic and Demographic Characteristics

Table 5.34 explores the relationship between PDS (Public Distribution System) accessibility scores and certain household economic and demographic characteristics

using Pearson correlation coefficients. The variables examined include the number of earning members in the household, the monthly household income (as recorded on the ration card), and the number of dependents (children, elderly, etc.). The correlation between the number of earning members and accessibility score is positive but very weak (r = 0.058) and statistically not significant (p = 0.173). This suggests that an increase in the number of earning members in a household does not have a meaningful association with better or worse PDS accessibility. Similarly, household monthly income shows a slightly weaker positive correlation (r = 0.044) with the accessibility score, which is also not statistically significant (p = 0.306). This implies that income levels, as per ration card classification, are not strongly related to perceived accessibility to PDS facilities. In contrast, the number of dependents shows a slightly negative correlation (r = -0.069) with the accessibility score, meaning households with more dependents may face marginally more challenges in accessing PDS services. However, this relationship is also not statistically significant (p = 0.107), indicating that this observed pattern could be due to chance.

Table 5.34
Correlation of PDS Accessibility Scores with Household Economic and Demographic Characteristics

		Accessibility Score
Number of Earning Members	Pearson Correlation	.058
	Sig. (2-tailed)	.173
	N	545
Household monthly income as per ration card (in Rs.)	Pearson Correlation	.044
	Sig. (2-tailed)	.306
	N	545
Number of Dependents (Children, Elderly, etc.)	Pearson Correlation	-.069
	Sig. (2-tailed)	.107
	N	543

Source: Primary Survey 2025

5.6 Utilization of Public Distribution System in Kerala

This section examines the people's dependence on PDS, frequency of utilization, coverage ratio, Monthly utilization etc. It also examines the intensity of requirement, actual allotment of different commodities with respect to different categories.

5.6.1 Dependence on PDS for Food Items by Type of Ration Card

Table 5.35 presents the distribution of household dependence on the PDS based on the type of ration card held. The analysis reveals that a substantial majority of households across all ration card categories rely on PDS for food items, though the degree of dependence varies. Among AAY (Antyodaya Anna Yojana) cardholders—who are typically the most economically vulnerable—92.5% of respondents reported depending on the PDS, indicating a very high level of reliance. Similarly, 96% of households holding the Non-Priority State Subsidy (Blue) card and 90.9% of Priority Household (PHH/Pink) cardholders reported dependence, reinforcing the essential role the PDS plays in supporting low- and middle-income households. In contrast, only 74.5% of NPNS (White) cardholders—typically representing relatively better-off households—reported depending on the PDS, suggesting lesser reliance possibly due to greater access to alternative food sources or higher purchasing power. Overall, 87.3% of the 545 surveyed households indicated that they depend on the PDS for their food needs, demonstrating the system's continuing relevance in ensuring food security. The results of the Chi-square test ($\chi^2 = 35.782$, df = 3, p = 0.000) confirm that there is a statistically significant association between the type of ration card held and a household's dependence on the PDS. This statistical significance implies that the observed variation in dependence is not random but meaningfully linked to the economic and policy-based categorization of ration cards. These findings emphasize the importance of maintaining and improving PDS accessibility and efficiency, particularly for vulnerable populations that heavily rely on this system for basic sustenance.

Table 5.35
Dependence on PDS for Food Items by Type of Ration Card

Dependence on PDS for Food Items		Type of Ration Card				Total
		AAY (Antyodaya Anna Yojana)/ Yellow	NPNS/ White	Non-Priority State Subsidy/ Blue	PHH (Priority Household)/ Pink	
No	N	3	41	5	20	69
	%	7.5	25.5	4.0	9.1	12.7
Yes	N	37	120	120	199	476
	%	92.5	74.5	96.0	90.9	87.3
Total	N	40	161	125	219	545
	%	100.0	100.0	100.0	100.0	100.0
Chi-Square		35.782 (3), p=0.000				

Note: Percent within Column; Source: Primary Survey 2025

5.6.2 Frequency of PDS Utilization and Type of Ration Card

Table 5.36 presents the frequency of PDS utilization among households based on their type of ration card. The data reveals significant variation in usage patterns across the different cardholder groups. A substantial majority of AAY cardholders (77.5%) reported "always" using the PDS, indicating a high level of dependence on the system among the most economically vulnerable. Similarly, 71.7% of PHH (Priority Household) cardholders also reported always utilizing the PDS, showing strong reliance on subsidized food supplies. In contrast, only 28% of NPNS (White card) holders reported always using the PDS, while 34.8% of them used it only "sometimes," and 11.8% rarely used it. This group appears to be less dependent on PDS, possibly due to their relatively better economic status or lack of subsidies. Blue cardholders (Non-Priority State Subsidy) show moderately high usage, with 56.8% always using the system, and 20% using it sometimes. Interestingly, the "never" category was extremely low across all groups (only 2 households), indicating widespread engagement with the PDS overall. The Chi-Square value of 104.933 with a significance level of p = 0.000 indicates a statistically significant association between the type of ration card and the frequency of PDS utilization. This suggests

that card type—largely reflecting economic status and entitlement level—plays a significant role in how frequently households engage with the PDS. Overall, the findings reinforce the idea that PDS usage is highest among those with greater entitlements or economic vulnerability, while others may rely on it less regularly or selectively.

Table 5.36
Frequency of PDS Utilization by Type of Ration Card

Frequency of PDS Utilization		Type of Ration Card				Total
		AAY (Antyodaya Anna Yojana)/ Yellow	NPNS/ White	Non-Priority State Subsidy/ Blue	PHH (Priority Household)/ Pink	
Never	N	1	1	0	0	2
	%	2.5	0.6	0.0	0.0	0.4
Rarely	N	0	19	2	3	24
	%	0.0	11.8	1.6	1.4	4.4
Sometimes	N	7	56	25	27	115
	%	17.5	34.8	20.0	12.3	21.1
Often	N	1	40	27	32	100
	%	2.5	24.8	21.6	14.6	18.3
Always	N	31	45	71	157	304
	%	77.5	28.0	56.8	71.7	55.8
Total	N	40	161	125	219	545
	%	100.0	100.0	100.0	100.0	100.0
Chi-Square		104.933 (12), p=0.000				

Note: Percent within Column; Source: Primary Survey 2025

5.6.3 Household PDS Coverage Ratio

Table 5.37 presents the Household PDS Coverage Ratio across different types of ration cards, providing insights into how comprehensively the PDS supports household members. The PDS Coverage Ratio is defined as the proportion of household members who benefit from the PDS out of the total household size. From the data, households with PHH (Priority Household/Pink) cards report the highest average coverage ratio of 0.904, followed closely by AAY (Antyodaya Anna Yojana/Yellow) cardholders at 0.898. This indicates that nearly 90% or more of

household members in these categories are benefiting from the PDS, which is expected as both categories are targeted at economically vulnerable populations. Blue cardholders (Non-Priority State Subsidy) report a slightly lower ratio at 0.850, while White cardholders (NPNS) show the lowest average ratio at 0.836, reflecting relatively lower reliance or eligibility for PDS benefits in this group. The overall average coverage ratio across all households is 0.871, suggesting that on average, about 87% of household members in the surveyed population benefit from the PDS. The standard deviations indicate some variation in household coverage, with White and Blue cardholders showing slightly more variability in their ratios compared to the AAY and PHH groups. The ANOVA result ($F(3, 541) = 3.625$, $p = 0.013$) indicates that the differences in household coverage ratios across ration card categories are statistically significant at the 5% level. This implies that the type of ration card a household holds meaningfully influences the extent to which the PDS benefits all its members.

Table 5.37

Household PDS Coverage Ratio

Type of Ratio Card	**N**	**Household PDS Coverage Ratio (Mean)**	**SD**	**Std. Error**
AAY (Antyodaya Anna Yojana)/ Yellow	40	0.898	0.212	0.034
NPNS/ White	161	0.836	0.234	0.018
Non-Priority State Subsidy/ Blue	125	0.850	0.235	0.021
PHH (Priority Household)/ Pink	219	0.904	0.197	0.013
Total	545	0.871	0.220	0.009
ANOVA	F (3,541) = 3.625, p= 0.013			

Note: Household PDS Coverage Ratio (calculated by the author) = Number of Household Members Benefiting from PDS/ Total Number of Household Members; Source: Primary Survey 2025.

5.6.4 Monthly Utilization of PDS Food Items & Type of Ration Card

Table 5.38 presents the distribution of regular purchases of specific food items from ration shops by households, categorized according to the type of ration card they hold. The key food items examined include rice, wheat, sugar, kerosene, atta (flour), and other items. The data clearly shows variations in utilization patterns across ration card categories, and Chi-square tests assess whether these differences are statistically significant. Rice is the most universally utilized item across all ration card holders, with 79.81% of all households reporting regular purchase. Utilization is nearly complete regardless of ration card type, and the Chi-square test ($\chi^2 = 2.389$, $p = 0.496$) indicates no significant variation, suggesting rice is a staple accessed equally by all groups. For wheat, stark disparities are evident. Only 9.9% of white card holders regularly purchase wheat, compared to 84.5% of PHH and 75% of AAY cardholders. The difference is highly significant ($\chi^2 = 250.75$, $p = 0.000$), indicating a clear relationship between ration card type and wheat utilization, likely reflecting the subsidy structure and purchasing needs of lower-income households. Similar patterns emerge for sugar, with significantly lower utilization among white (1.9%) and PHH cardholders (3.7%), while 22.5% of AAY cardholders still purchase it, indicating somewhat greater access or preference in this group ($\chi^2 = 29.256$, $p = 0.000$). Kerosene shows moderate overall use (9.2%), with AAY households (15%) and PHH (12.8%) reporting higher utilization than white cardholders (1.9%), again with significant variation ($\chi^2 = 15.609$, $p = 0.001$). Atta usage is highest among AAY (65%) and PHH (61.2%) cardholders, whereas it is minimal among white cardholders (8.1%), highlighting another sharp contrast supported by a significant Chi-square value ($\chi^2 = 137.817$, $p = 0.000$). In contrast, the category "Others" reflects very low and statistically insignificant usage across all card types ($\chi^2 = 3.850$, $p = 0.278$). Overall, the table suggests that the type of ration card held by a household strongly influences the types of food items regularly purchased from ration shops, particularly for items like wheat, sugar, atta, and kerosene. These differences are likely driven by entitlement levels and affordability, with AAY and PHH cardholders exhibiting the highest levels of utilization, consistent with the purpose of these schemes to support low-income and food-insecure households.

Table 5.38

Monthly Utilization of PDS Food Items by Type of Ration Card

Items	Utilization		Type of Ration Card				Total	Chi-Suqre Result
			AAY (Antyodaya Anna Yojana)/ Yellow	NPNS/ White	Non-Priority State Subsidy/ Blue	PHH (Priority Household)/ Pink		
Rice	No	N	4	39	19	48	110	2.54 (4), p=0.162
		%	10	24.22	15.2	21.9	20.18	
	Yes	N	36	122	106	171	435	
		%	90	75.77	84.8	78.08	79.81	
Wheat	No	N	10	145	95	34	284	250.75 (3), p=0.000
		%	25.0	90.1	76.0	15.5	52.1	
	Yes	N	30	16	30	185	261	
		%	75.0	9.9	24.0	84.5	47.9	
Sugar	No	N	31	158	115	211	515	29.256 (3), p=0.000
		%	77.5	98.1	92.0	96.3	94.5	
	Yes	N	9	3	10	8	30	
		%	22.5	1.9	8.0	3.7	5.5	
Kerosene	No	N	34	158	112	191	495	15.609 (3), p=0.001
		%	85.0	98.1	89.6	87.2	90.8	
	Yes	N	6	3	13	28	50	
		%	15.0	1.9	10.4	12.8	9.2	
Atta	No	N	14	148	97	85	344	137.817 (3), p=0.000
		%	35.0	91.9	77.6	38.8	63.1	
	Yes	N	26	13	28	134	201	
		%	65.0	8.1	22.4	61.2	36.9	
Others	No	N	39	161	122	214	536	3.850 (3), p=0.278
		%	97.5	100.0	97.6	97.7	98.3	
	Yes	N	1	0	3	5	9	
		%	2.5	0.0	2.4	2.3	1.7	
Total		N	40	161	125	219	545	
		%	100.0	100.0	100.0	100.0	100.0	

Note: Percent within Column; Source: Primary Survey 2025

5.6.5 Assessment of Supply-Demand Gap for PDS Commodities

Table 5.39, titled Assessment of Supply-Demand Gap for PDS Commodities, presents a paired t-test analysis comparing the average quantities of essential PDS items

required by households and the actual quantities received. The results clearly highlight significant discrepancies between household needs and government-provided rations, pointing to critical gaps in the efficiency and adequacy of the public distribution system. For rice, the average household requirement stands at 24.32 kg per month, while the average amount received is only 13.37 kg, resulting in a statistically significant shortfall as indicated by the t-value of 21.034 and a p-value of 0.000. This suggests that households are receiving nearly 11 kg less rice than they require, even though rice is one of the most widely consumed staples. In the case of wheat, the gap is even more concerning. Although the average required quantity is 12.02 kg, the actual average received is just 0.60 kg. The high standard deviation in required wheat (46.49) indicates significant variability among households, yet the paired t-test confirms a significant supply deficit with a t-value of 5.741 and a p-value of 0.000. Sugar shows the most extreme disparity. While the average household requires about 9.02 kg monthly, the received quantity is a mere 0.01 kg. The t-value of 66.734 and the extremely low p-value suggest that this gap is both large and statistically undeniable. Similarly, for kerosene, households require an average of 0.16 lr, but receive only 0.05 lr. Although the absolute quantities are small, the difference remains statistically significant, indicating inadequate access to a potentially crucial fuel source, especially for households without LPG connections. The situation is also concerning for atta, with a required average of 2.98 kg and received average of 0.77 kg. The large t-value of 23.098 confirms that even this relatively less emphasized commodity is under-supplied through PDS channels. Overall, the findings from this table strongly emphasize the presence of a widespread and statistically significant supply-demand mismatch across all major PDS commodities. Every t-test result shows a p-value of 0.000, underscoring that these gaps are not due to random chance but reflect systemic inadequacies in distribution. The implications of this analysis are serious, as they call into question the ability of the PDS to meet basic household needs, especially among vulnerable and low-income populations. These findings highlight the need for targeted reforms in policy, including improved rationing mechanisms, increased commodity quotas, and better monitoring systems to ensure more equitable and sufficient distribution of essential items.

Table 5.39
Assessment of Supply-Demand Gap for PDS Commodities

Items		Mean (in Kg)	Std. Deviation	Std. Error Mean	Paired t-test
Pair 1	Rice (Required)	24.32	11.062	0.474	t (544)= 21.034, p=0.000
	Rice (Received)	13.37	8.159	0.349	
Pair 2	Wheat (Required)	12.02	46.491	1.991	t (544)= 5.741, p=0.000
	Wheat (Received)	0.60	0.961	0.041	
Pair 3	Sugar (Required)	9.02	3.151	0.135	t (544)= 66.734, p=0.000
	Sugar (Received)	0.01	0.104	0.004	
Pair 4	Kerosene (Required)	0.16	0.478	0.020	t (544)= 5.625, p=0.000
	Kerosene (Received)	0.05	0.169	0.007	
Pair 5	Atta (Required)	2.98	2.159	0.092	t (544)= 23.098, p=0.000
	Atta (Received)	0.77	1.149	0.049	

Source: Primary Survey 2025

5.6.6 Monthly Household Rice Requirement, Receipt, and Utilization

Table 5.40 presents a detailed comparative analysis of household rice consumption and PDS coverage by type of ration card, along with aggregate totals across all groups. It highlights four key variables: monthly rice required, rice received, the gap between required and received rice, and the utilization ratio (received ÷ required). These are analysed across four cardholder categories: AAY , NPNS (White), Non-Priority State Subsidy (Blue), and PHH (Priority Household or Pink). ANOVA test results for each variable assess whether observed differences across groups are statistically significant. The monthly rice requirement among households is fairly uniform across all groups, with a total average of 24.3 kg. AAY households report the highest requirement (25.7 kg), while White cardholders report the lowest (23.8 kg). However, the ANOVA result ($F = 0.606$, $p = 0.612$) indicates that this variation is not

statistically significant. This suggests that rice consumption needs are relatively similar regardless of the type of ration card held. A sharp contrast emerges in the amount of rice received from the PDS. AAY cardholders receive an average of 30.0 kg, while White cardholders receive only 6.0 kg. Blue and Pink cardholders receive 10.0 kg and 17.7 kg respectively. The overall average rice received by households is 13.4 kg. The ANOVA test ($F = 422.035$, $p = 0.000$) shows a highly significant difference in rice receipt across groups, indicating that the amount of rice distributed through the PDS is strongly influenced by ration card type. The gap between requirement and receipt further highlights this disparity. AAY households receive more than their stated requirement, resulting in a negative gap of -4.3 kg, while White and Blue cardholders face large positive gaps of 17.8 kg and 15.1 kg, respectively, meaning their needs are largely unmet. Pink cardholders also experience a smaller gap of 6.3 kg. The total average gap across all households is 11.0 kg, demonstrating that most households are receiving significantly less rice than they require. The ANOVA result ($F = 75.791$, $p = 0.000$) confirms that these differences are statistically significant. Finally, the utilization ratio, which reflects the proportion of rice received relative to required, is highest for AAY households at 1.5, indicating they receive 50% more rice than they report needing. In contrast, White cardholders have a utilization ratio of only 0.3, while Blue and Pink cardholders show ratios of 0.5 and 0.8, respectively. The overall average utilization ratio is 0.6, suggesting that, on average, households receive just 60% of their rice requirement from the PDS. The significant ANOVA value ($F = 137.507$, $p = 0.000$) underscores the inequitable distribution of rice. In conclusion, the total averages in this table reflect broader trends of disparity in PDS rice distribution. Although rice requirements are similar across household types, the quantity received through the PDS and the extent to which these needs are met varies greatly by ration card. AAY and PHH households benefit most from the system, while Non-Priority households, especially those with White cards, are significantly underserved. These findings point to structural inequalities in PDS provisioning that could have serious implications for food security and nutrition outcomes.

Table 5.40
Monthly Household Rice Requirement, Receipt, and Utilization by Ration Card Type

Rice	Type of Ration Card	Mean (in Kg)	SD	Std. Error	ANOVA
Required	AAY (Antyodaya Anna Yojana)/ Yellow	25.7	12.5	2.0	F (3,541) = 0.606, p= 0.612
	NPNS/ White	23.8	10.0	0.8	
	Non-Priority State Subsidy/ Blue	25.1	11.4	1.0	
	PHH (Priority Household)/ Pink	24.0	11.4	0.8	
	Total	24.3	11.1	0.5	
Received	AAY (Antyodaya Anna Yojana)/ Yellow	30.0	0.0	0.0	F (3,541) = 422.035, p= 0.000
	NPNS/ White	6.0	0.5	0.0	
	Non-Priority State Subsidy/ Blue	10.0	4.8	0.4	
	PHH (Priority Household)/ Pink	17.7	6.0	0.4	
	Total	13.4	8.2	0.3	
Gap (Required-Received)	AAY (*Antyodaya Anna Yojana)*/ Yellow	-4.3	12.5	2.0	F (3,541) = 75.791, p= 0.000
	NPNS/ White	17.8	10.1	0.8	
	Non-Priority State Subsidy/ Blue	15.1	11.8	1.1	
	PHH (Priority Household)/ Pink	6.3	8.8	0.6	
	Total	11.0	12.2	0.5	
Utilization Ration (Received/ Required)	AAY (*Antyodaya Anna Yojana*)/ Yellow	1.5	0.9	0.1	F (3,541) = 137.507, p= 0.000
	NPNS/ White	0.3	0.2	0.0	
	Non-Priority State Subsidy/ Blue	0.5	0.3	0.0	
	PHH (Priority Household)/ Pink	0.8	0.4	0.0	
	Total	0.6	0.5	0.0	

Source: Primary Survey 2025

5.6.7 Monthly Household Wheat Requirement, Receipt, and Utilization

Table 5.41 shows the Monthly Household Wheat Requirement, Receipt, and Utilization by Ration Card Type provides a comparative analysis of the wheat consumption dynamics across different ration cardholder categories. In terms of wheat requirement, the average monthly household need varies across ration card types, with AAY (Antyodaya Anna Yojana) households reporting the highest requirement at 25.9 kg, compared to around 10–11 kg for all other groups. However, the variation in requirement is not statistically significant as indicated by the ANOVA result (F=1.296, p=0.275), suggesting that the differences may be due to random variation rather than systemic differences between card types. The very high standard deviation for AAY (71.5) also reflects substantial intra-group variability in reported need. When examining actual wheat receipt through the PDS, a stark difference is observed. AAY households receive an average of 2.3 kg per month, while white cardholders receive none at all, and blue and pink cardholders receive negligible amounts (0.4 kg and 0.8 kg respectively). These differences are highly significant (F=104.270, p=0.000), indicating substantial disparities in wheat distribution across ration card types. The total average wheat received by all households is only 0.6 kg, far below the required level. The supply-demand gap further highlights these disparities. AAY households face the largest average shortfall of 23.7 kg, though this is partly due to their higher reported needs. Other groups report smaller gaps of around 10–11 kg. Despite the clear differences, the ANOVA test for the gap (F=1.042, p=0.374) suggests that these are not statistically significant. This might again reflect the large within-group variance overshadowing the between-group effects. The utilization ratio, which captures the proportion of wheat needs met through PDS (received/required), reinforces the picture of inadequate coverage. AAY households show a slightly higher average utilization ratio of 0.7, but all other groups fall well below 0.5, with white cardholders at zero. The differences in utilization ratio are statistically significant (F=65.077, p=0.000), revealing a clear inequity in access to wheat through the public distribution system. Overall, the table underscores the widespread shortfall in wheat distribution via PDS, especially for non-AAY cardholders. While the requirement figures may not differ significantly, the quantities received and utilization ratios reveal

marked disparities, pointing to systemic limitations in the accessibility and targeting of wheat distribution within the current framework.

Table 5.41
Monthly Household Wheat Requirement, Receipt, and Utilization by Ration Card Type

Wheat	Type of Ration Card	Mean (in Kg)	SD	Std. Error	ANOVA
Required	AAY (Antyodaya Anna Yojana)/ Yellow	25.9	71.5	11.3	F (3,541) = 1.296, p= 0.275
	NPNS/ White	11.4	48.0	3.8	
	Non-Priority State Subsidy/ Blue	11.1	41.1	3.7	
	PHH (Priority Household)/ Pink	10.5	42.3	2.9	
	Total	12.0	46.5	2.0	
Received	AAY (*Antyodaya Anna Yojana*)/ Yellow	2.3	1.3	0.2	F (3,541) = 104.270, p= 0.000
	NPNS/ White	0.0	0.0	0.0	
	Non-Priority State Subsidy/ Blue	0.4	1.3	0.1	
	PHH (Priority Household)/ Pink	0.8	0.4	0.0	
	Total	0.6	1.0	0.0	
Gap (Required-Received)	AAY (*Antyodaya Anna Yojana*)/ Yellow	23.7	71.3	11.3	F (3,541) = 1.042, p= 0.374
	NPNS/ White	11.4	48.0	3.8	
	Non-Priority State Subsidy/ Blue	10.7	41.1	3.7	

	PHH (Priority Household)/ Pink	9.6	42.3	2.9	
	Total	11.4	46.4	2.0	
Utilization Ration (Received/ Required)	AAY (*Antyodaya Anna Yojana*)/ Yellow	0.7	0.8	0.1	F (3,541) = 65.077, p= 0.000
	NPNS/ White	0.0	0.0	0.0	
	Non-Priority State Subsidy/ Blue	0.1	0.4	0.0	
	PHH (Priority Household)/ Pink	0.4	0.3	0.0	
	Total	0.2	0.4	0.0	

Source: Primary Survey 2025

5.6.8 Monthly Household Sugar Requirement, Receipt, and Utilization

Table 5.42 presents a comprehensive overview of the monthly household sugar requirement, actual receipt, and utilization across different types of ration cardholders. It reveals stark disparities between the demand and supply of sugar through the PDS, reflecting significant inefficiencies in the system. Households holding Non-Priority State Subsidy (Blue) cards reported the highest average sugar requirement at 9.6 kg, followed by NPNS (White) at 9.0 kg, PHH (Priority Household or Pink) at 8.8 kg, and AAY (Yellow) cardholders at 8.2 kg. The total average requirement across all households is 9.0 kg. The ANOVA result (F=2.659, p=0.048) indicates a statistically significant difference in sugar requirements among the different ration card groups, though the variation is modest. In terms of actual sugar received, the scenario is extremely poor. Only AAY cardholders reported receiving any sugar at all, and that too a meagre average of 0.2 kg per month. All other groups—White, Blue, and Pink cardholders—reported receiving no sugar whatsoever. The total average receipt is effectively zero (0.0 kg), pointing to a near-complete collapse or discontinuation of sugar distribution through the PDS for most beneficiaries. This is statistically significant, as evidenced by the ANOVA result (F=29.488, p=0.000), underscoring systemic inequities in the distribution process. The supply-demand gap, calculated as

the difference between the required and received sugar quantities, is substantial. AAY cardholders faced an average gap of 8.1 kg, while the remaining groups—who received no sugar—faced full deficits equivalent to their reported needs. The total average gap stands at 9.0 kg. Although all groups experienced high deficits, the ANOVA (F=3.027, p=0.029) again shows a statistically significant difference, primarily due to minor differences in reported requirements. The utilization ratio, which measures the proportion of sugar received to what was required, further exposes the system's failure. AAY cardholders had a minuscule average utilization ratio of 0.017, while all other groups had a utilization of zero. The total average utilization ratio is 0.001, highlighting that households across the board received almost none of their required sugar. This finding is statistically significant as well (F=26.979, p=0.000), though the practical implications point uniformly toward negligible access to sugar via PDS channels. Overall, the table paints a grim picture of sugar provisioning under the PDS, particularly for non-AAY households who seem to have been entirely excluded from sugar distribution. Even among AAY beneficiaries, access is extremely limited, resulting in high unmet demand and poor utilization. The results suggest an urgent need to reevaluate the inclusion of sugar in PDS entitlements or to explore alternative delivery mechanisms for this essential commodity.

Table 5.42
Monthly Household Sugar Requirement, Receipt, and Utilization by Ration Card Type

Sugar	Type of Ration Card	Mean (in Kg)	SD	Std. Error	ANOVA
Required	AAY (*Antyodaya Anna Yojana*)/ Yellow	8.2	3.9	0.6	F (3,541) = 2.659, p= 0.048
	NPNS/ White	9.0	3.1	0.2	
	Non-Priority State Subsidy/ Blue	9.6	3.1	0.3	
	PHH (Priority Household)/ Pink	8.8	3.0	0.2	

	Total	9.0	3.2	0.1	
Received	AAY (*Antyodaya Anna Yojana*)/ Yellow	0.2	0.4	0.1	F (3,541) = 29.488, p= 0.000
	NPNS/ White	0.0	0.0	0.0	
	Non-Priority State Subsidy/ Blue	0.0	0.0	0.0	
	PHH (Priority Household)/ Pink	0.0	0.0	0.0	
	Total	0.0	0.1	0.0	
Gap (Required-Received)	AAY (*Antyodaya Anna Yojana*)/ Yellow	8.1	3.8	0.6	F (3,541) = 3.027, p= 0.029
	NPNS/ White	9.0	3.1	0.2	
	Non-Priority State Subsidy/ Blue	9.6	3.1	0.3	
	PHH (Priority Household)/ Pink	8.8	3.0	0.2	
	Total	9.0	3.2	0.1	
Utilization Ration (Received/ Required)	AAY (*Antyodaya Anna Yojana*)/ Yellow	0.017	0.042	0.007	F (3,541) = 26.979, p= 0.000
	NPNS/ White	0.000	0.000	0.000	
	Non-Priority State Subsidy/ Blue	0.000	0.000	0.000	
	PHH (Priority Household)/ Pink	0.000	0.000	0.000	
	Total	0.001	0.012	0.001	

Source: Primary Survey 2025

5.6.9 Monthly Household Kerosene Requirement, Receipt, and Utilization

Table 5.43 presents the monthly household kerosene requirement, actual receipt, and utilization by different types of ration cardholders, offering insight into the extent of kerosene distribution and unmet demand across socio-economic categories. The data reveals relatively low overall kerosene requirements, with minor differences across groups, but a substantial gap between demand and supply. Among the different card types, households with Non-Priority State Subsidy (Blue) cards reported the highest average kerosene requirement at 0.22 litres, followed closely by AAY (Yellow) and PHH (Pink) cardholders at 0.18 litres each. NPNS (White) cardholders showed the lowest average requirement at 0.07 litres. The total average requirement stood at 0.16 litres. The ANOVA result (F=2.626, p=0.050) indicates a marginally significant variation in kerosene demand across groups, suggesting that some differentiation in need exists, possibly based on cooking or lighting alternatives used by different socioeconomic strata. In terms of actual receipt, the figures are considerably lower. AAY households received the highest quantity at 0.09 litres on average, while other groups received far less — 0.07 litres for PHH, 0.06 litres for Blue cardholders, and just 0.01 litres for White cardholders. The overall average kerosene receipt across all households was 0.05 litres. This distribution gap is statistically significant (F=5.016, p=0.002), pointing toward inequitable or insufficient allocation across groups. The supply-demand gap shows that unmet needs persist across the board. AAY households had a gap of 0.09 litres, PHH 0.11 litres, Blue cardholders 0.16 litres, and White cardholders 0.07 litres. The total average gap was 0.11 litres. However, the ANOVA result (F=1.097, p=0.350) suggests that the gap across different groups is not statistically significant, indicating that the shortfall in supply is relatively uniform. Utilization ratios further highlight the inefficiencies in kerosene provisioning. AAY cardholders showed the highest utilization ratio at 0.333, followed by Blue cardholders at 0.179, PHH households at 0.083, while White cardholders had no utilization at all. The overall average utilization ratio stood at just 0.119. While utilization is generally low, the ANOVA result (F=2.698, p=0.053) borders on statistical significance, pointing to some degree of variation, albeit limited, in how much of the requirement is met across groups. In conclusion, the table highlights that

while kerosene requirements among households are relatively low, actual provisioning is even lower, resulting in a consistent supply-demand mismatch. Though the differences in requirement and utilization across ration card types are marginally significant, the overall picture reflects limited access to kerosene under the PDS system. This could be due to a decline in kerosene dependence owing to the promotion of LPG and electricity in rural and semi-urban areas.

Table 5.43
Monthly Household Kerosene Requirement, Receipt, and Utilization by Ration Card Type

Kerosene	Type of Ration Card	Mean (in Litre)	SD	Std. Error	ANOVA
Required	AAY (*Antyodaya Anna Yojan*a)/ Yellow	.18	.55	.09	F (3,541) = 2.626, p= 0.050
	NPNS/ White	.07	.35	.03	
	Non-Priority State Subsidy/ Blue	.22	.58	.05	
	PHH (Priority Household)/ Pink	.18	.48	.03	
	Total	.16	.48	.02	
Received	AAY (Antyodaya Anna Yojana)/ Yellow	.09	.22	.04	F (3,541) = 5.016, p= 0.002
	NPNS/ White	.01	.07	.01	
	Non-Priority State Subsidy/ Blue	.06	.20	.02	
	PHH (Priority Household)/ Pink	.07	.19	.01	
	Total	.05	.17	.01	
Gap (Required-Received)	AAY (*Antyodaya Anna Yojana*)/ Yellow	.09	.48	.08	F (3,541) = 1.097, p= 0.350
	NPNS/ White	.07	.35	.03	
	Non-Priority State Subsidy/ Blue	.16	.52	.05	
	PHH (Priority Household)/ Pink	.11	.45	.03	
	Total	.11	.45	.02	
Utilization Ration (Received/ Required)	AAY (*Antyodaya Anna Yojana*)/ Yellow	.333	.425	.190	F (3,541) = 2.698, p= 0.053
	NPNS/ White	.000	.000	.000	
	Non-Priority State Subsidy/ Blue	.179	.322	.072	
	PHH (Priority Household)/ Pink	.083	.174	.030	
	Total	.119	.251	.031	

Source: Primary Survey 2025

5.6.10Monthly Household Atta Requirement, Receipt, and Utilization

Table 5.44 illustrates the monthly household *atta* (wheat flour) requirement, actual receipt, and utilization across different ration card types, reflecting disparities in supply under the PDS. The data reveals both significant variation in demand and a consistent supply-demand gap, particularly affecting households holding Non-Priority cards.. Among the ration card categories, AAY (Antyodaya Anna Yojana) households reported the highest average requirement for atta at 3.8 kg, while other groups—NPNS (White), Non-Priority State Subsidy (Blue), and PHH (Priority Household/Pink)—reported requirements between 2.8 kg and 3.1 kg. The total average requirement stood at 3.0 kg. The ANOVA result for *atta* requirement (F=3.048, p=0.028) is statistically significant, suggesting that demand differs meaningfully across ration card types, likely due to differences in household size and dependency on subsidized food. Despite this demand, the actual receipt of *atta* is disproportionately low across all categories. AAY households received an average of 1.4 kg, PHH households 1.3 kg, and Blue and White cardholders received even less at 0.4 kg and 0.1 kg, respectively. The total average receipt was 0.8 kg. This stark shortfall is confirmed by a highly significant ANOVA result (F=55.539, p=0.000), indicating large disparities in atta distribution among cardholders. The gap between atta requirement and receipt is substantial, with all groups experiencing a shortfall of around 2 kg or more. NPNS and Blue cardholders both had a gap of 2.6 and 2.4 kg respectively, while AAY households had a gap of 2.4 kg and PHH households slightly less at 1.8 kg. The total average gap was 2.2 kg. The statistically significant ANOVA value (F=5.366, p=0.001) reinforces the idea that the shortfall is not evenly distributed, with some groups worse off than others. Utilization ratio, defined as the proportion of *atta* received to that required, further highlights inefficiencies and inequality in the PDS system. AAY households had the highest utilization ratio at 0.547, followed by PHH households at 0.466. In contrast, Blue and White cardholders had much lower utilization ratios at 0.130 and 0.044, respectively. The overall utilization stood at 0.271. The ANOVA result for utilization (F=48.001, p=0.000) is highly significant, indicating substantial disparities in atta accessibility relative to need. In essence, the data reveals a notable and statistically significant mismatch

between *atta* demand and supply across different ration card categories. While AAY and PHH cardholders benefit more from PDS provisioning, non-priority households are largely underserved. This suggests the need for a reassessment of distribution priorities to ensure more equitable and effective coverage, especially for vulnerable groups dependent on the public distribution system for basic nutrition.

Table 5.44
Monthly Household Atta Requirement, Receipt, and Utilization by Ration Card Type

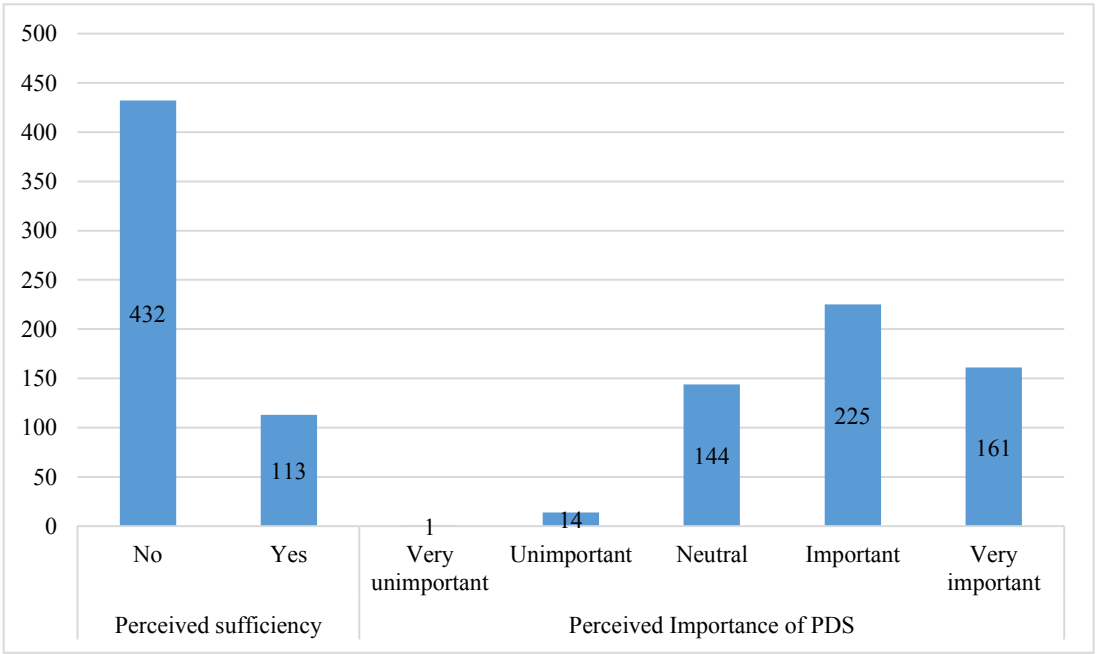
Atta	Type of Ration Card	Mean (in Kg)	SD	Std. Error	ANOVA
Required	AAY (Antyodaya Anna Yojana)/ Yellow	3.8	3.2	0.5	F (3,541) =3.048, p= 0.028
	NPNS/ White	2.8	2.1	0.2	
	Non-Priority State Subsidy/ Blue	2.8	1.9	0.2	
	PHH (Priority Household)/ Pink	3.1	2.0	0.1	
	Total	3.0	2.2	0.1	
Received	AAY (Antyodaya Anna Yojana)/ Yellow	1.4	0.9	0.1	F (3,541) = 55.539, p= 0.000
	NPNS/ White	0.1	0.5	0.0	
	Non-Priority State Subsidy/ Blue	0.4	0.8	0.1	
	PHH (Priority Household)/ Pink	1.3	1.3	0.1	
	Total	0.8	1.1	0.0	
Gap (Required-Received)	AAY (Antyodaya Anna Yojana)/ Yellow	2.4	3.2	0.5	F (3,541) = 5.366, p= 0.001
	NPNS/ White	2.6	2.0	0.2	
	Non-Priority State Subsidy/ Blue	2.4	2.0	0.2	
	PHH (Priority Household)/ Pink	1.8	2.2	0.1	
	Total	2.2	2.2	0.1	
Utilization Ration (Received/ Required)	AAY (Antyodaya Anna Yojana)/ Yellow	0.547	0.448	0.071	F (3,541) = 48.001, p= 0.000
	NPNS/ White	0.044	0.168	0.013	
	Non-Priority State Subsidy/ Blue	0.130	0.278	0.025	
	PHH (Priority Household)/ Pink	0.466	0.531	0.036	
	Total	0.271	0.440	0.019	

Source: Primary Survey 2025

5.6.11 Perceived Sufficiency on PDS by Type of Ration Card

Figure 5.4 presents the perceptions of PDS beneficiaries regarding the sufficiency and importance of the PDS in meeting their household needs. The data reveals that a significant majority of respondents—79.3% (432 individuals)—perceive the supplies received through the PDS as insufficient. Only 20.7% (113 individuals) feel that the provisions are adequate to meet their requirements. This indicates a considerable gap between demand and supply, reflecting limitations in either the quantity, frequency, or consistency of distributed goods. Despite concerns about sufficiency, the data on perceived importance shows that the PDS is still highly valued by most beneficiaries. A combined 70.8% of respondents rate the PDS as either important (41.3%) or very important (29.5%). Only a small fraction—2.8% (unimportant or very unimportant)—believe that the PDS lacks relevance, while 26.4% remain neutral in their views. This contrast suggests that although many households are dissatisfied with the quantity or quality of rations received, they still recognize the PDS as a critical support system, likely due to its role in providing at least some relief from food insecurity. The high perceived importance may also indicate reliance on the system, especially among economically vulnerable groups.

Figure 5.2 Beneficiary Perspectives on PDS Sufficiency and Value



Source: Primary Survey 2025

Table 5.45 provides a comparative analysis of perceived sufficiency of PDS supplies among beneficiaries, segmented by the type of ration card they hold. The results indicate significant variation in satisfaction levels based on ration card type, with a Chi-Square value of 30.341 (df = 3, p = 0.000), suggesting a statistically significant association between the type of ration card and the perceived sufficiency of PDS commodities. Among all cardholders, 79.3% of respondents reported that the PDS rations were not sufficient, while only 20.7% considered the supplies sufficient. The disaggregation by card type reveals that dissatisfaction is highest among NPNS (White card) holders, where 91.3% expressed insufficiency. This may reflect the limited or no entitlement to subsidized commodities under this category. In contrast, AAY cardholders, who represent the most economically vulnerable groups, reported the highest perceived sufficiency at 45.0%, though a slight majority (55.0%) still found the support inadequate. Similarly, among PHH (Priority Household) cardholders, 75.8% perceived insufficiency, while 24.2% found the distribution adequate. For Non-Priority State Subsidy (Blue card) holders, 22.4% expressed satisfaction, with the remaining 77.6% dissatisfied. Overall, while there is a general sentiment of insufficiency across all categories, the differences between groups are statistically significant. These findings underscore the disparities in access and satisfaction across different segments of the PDS, suggesting that targeting and allocation mechanisms need to be strengthened to improve equity and effectiveness in the delivery of essential commodities.

Table 5.45

Perceived Sufficiency on PDS by Type of Ration Card

Perceived sufficiency		Type of Ration Card				Total
		AAY (Antyodaya Anna Yojana)/ Yellow	NPNS/ White	Non-Priority State Subsidy/ Blue	PHH (Priority Household)/ Pink	
Not Sufficient	N	22	147	97	166	432
	%	55.0	91.3	77.6	75.8	79.3
Sufficient	N	18	14	28	53	113
	%	45.0	8.7	22.4	24.2	20.7
Total	N	40	161	125	219	545
	%	100.0	100.0	100.0	100.0	100.0
Chi-Square		30.341 (3), p=0.000				

Note: Percent within Column; Source: Primary Survey 2025

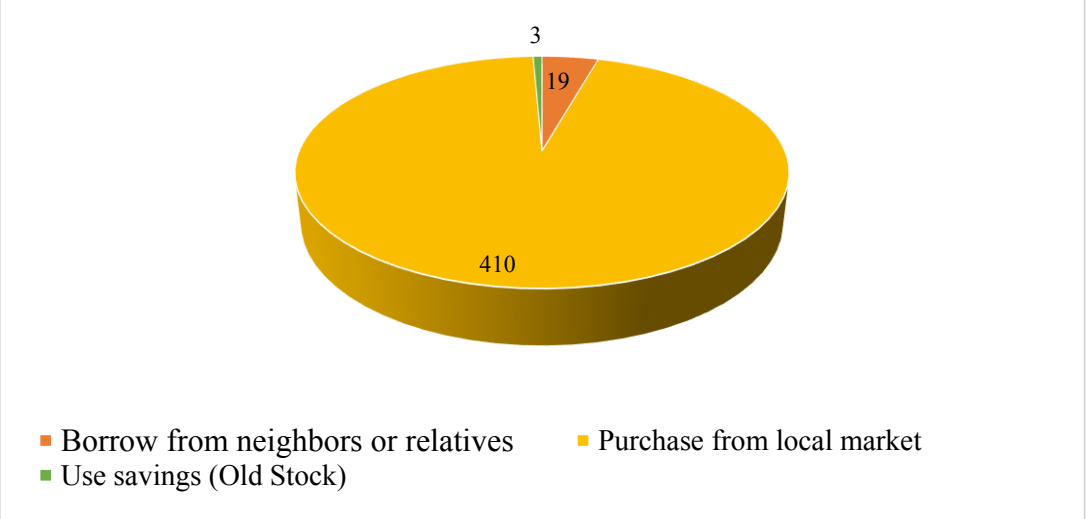
5.6.12 Perceived Importance of PDS by Type of Ration Card

Figure 5.5 illustrates how households respond when their food requirements are not fully met through the PDS. Among the 432 households that reported PDS insufficiency, a majority (94.9%) coped by purchasing additional food items from the local market, indicating a high level of dependence on private sources to bridge the gap. This finding suggests that even subsidized food provisions under PDS are often inadequate, compelling most families to rely on the open market, where food prices are typically higher. A small fraction (4.4%) of households reported borrowing from neighbours or relatives, highlighting a reliance on social networks during periods of food shortage. This form of informal support system serves as a secondary safety net but is not a sustainable or guaranteed solution for many.

Only 0.7% mentioned the use of old stock or savings, which may reflect the limited capacity of low-income households to store food in bulk or rely on reserves due to economic constraints. The data clearly underscore the continued significance of market dependency, even among households eligible for government food subsidies.

It also raises concerns about the affordability and accessibility of food for vulnerable groups.

Figure 5.3 Household Coping Mechanisms for Food Gaps in the PDS



Source: Primary Survey 2025

Table 5.46 explores how beneficiaries across different ration card types perceive the importance of the PDS in their household lives. The results, reinforced by a statistically significant Chi-square value of 103.480 (df = 12, p = 0.000), reveal strong associations between ration card type and perceived importance of the PDS. Among AAY cardholders, nearly 80% view the PDS as either important (32.5%) or very important (47.5%). This is expected given that this group represents the most economically vulnerable households, for whom the PDS serves as a vital source of food security. Only 20% of AAY cardholders are neutral, and none rated it as unimportant. In contrast, perceptions among NPNS (White card) holders are notably less positive. Although a significant portion—41.6%—still considers the PDS important, only 11.8% see it as very important, and 9.3% (including one very unimportant and 14 unimportant) expressed outright dissatisfaction. A large segment—37.3%—remains neutral, which may reflect their relatively limited entitlements under the system. For Non-Priority State Subsidy (Blue card) holders, nearly 49% perceive the PDS as important, and 18.4% rate it very important. While a considerable portion (32.8%) hold a neutral stance, none consider it unimportant.

Meanwhile, PHH (Priority Household) cardholders show a favourable outlook, with a combined 84.1% expressing that the PDS is either important (38.4%) or very important (45.7%), and just 16% remaining neutral. The findings highlight that perceived importance is closely tied to the level of benefit received from the PDS. The more reliant a household is on subsidized provisions, the more likely they are to value the system. The highly significant chi-square statistic indicates that this relationship is not due to chance, suggesting that reforms or enhancements to the PDS should be sensitive to card type and benefit level, as these strongly influence beneficiary perspectives.

Table 5.46
Perceived Importance of PDS by Type of Ration Card

Perceived Importance of PDS		Type of Ration Card				Total
		AAY (Antyodaya Anna Yojana)/ Yellow	NPNS/ White	Non-Priority State Subsidy/ Blue	PHH (Priority Household)/ Pink	
Very unimportant	N	0	1	0	0	1
	%	0.0	0.6	0.0	0.0	0.2
Unimportant	N	0	14	0	0	14
	%	0.0	8.7	0.0	0.0	2.6
Neutral	N	8	60	41	35	144
	%	20.0	37.3	32.8	16.0	26.4
Important	N	13	67	61	84	225
	%	32.5	41.6	48.8	38.4	41.3
Very important	N	19	19	23	100	161
	%	47.5	11.8	18.4	45.7	29.5
Total	N	40	161	125	219	545
	%	100.0	100.0	100.0	100.0	100.0
Chi-Square		103.480 (12), p=0.000				

Note: Percent within Column; Source: Primary Survey 2025

5.7 Construction and Standardization of PDS Utilization Score

Table 5.47 outlines a systematic framework for evaluating the extent and quality of PDS utilization at the household level, using a multi-dimensional scoring system. This composite score is developed from various indicators that reflect both objective usage and subjective perceptions of the PDS. Each parameter is assigned a normalized or scaled score, and all components are equally weighted in the final Utilization Score. This standardized scoring model enables comparative analysis across households, helping policymakers and researchers assess variations in PDS effectiveness, accessibility, and reliance. The utilization categories (high, moderate, low) provide a clear, interpretable scale to track performance and identify households in need of greater support or system improvements

Table 5.47

Construction and Standardization of PDS Utilization Score Parameters

Question	Concept	Scoring
Dependence on PDS	Basic reliance	Yes = 1, No = 0
Frequency of utilization	Regularity	Always = 1, Often = 0.75, Sometimes = 0.5, Rarely = 0.25, Never = 0
Household members benefiting	Coverage	Normalize the value based on household size (e.g., members benefiting / total household members)
Items purchased	Breadth of usage	Score based on number of items regularly purchased (e.g., out of 5 items, assign 1 point per item, scaled to 1)
Quantity received vs. required	Adequacy of supply	(Actual / Required) per item (then average)
Sufficiency	Perceived sufficiency	Yes = 1, No = 0
Importance of PDS	Perceived value	$(X-X_{min})/(X_{max}-X_{Min})$
Market substitution	Alternative sourcing	No = 1 (i.e., fully relies on PDS), Yes = 0
Utilization Index		Weighted Average (equal weighting) • 0.75–1.00 High Utilization • 0.50–0.74 Moderate Utilization • <0.50 Low Utilization

Source: Author's Definition. Index calculated by the author based on primary data.

5.7.1Utilization Score & Type of Ration Card

Table 5.48 presents the PDS utilization score by type of ration card, offering insights into how effectively households with different entitlements engage with and benefit from the Public Distribution System. The utilization score, constructed from a composite of indicators like frequency of use, number of items received, quantity sufficiency, and perceived importance, ranges from 0 to 1, with higher values indicating greater reliance and benefit from PDS services. Households holding the AAY yellow cards have the highest average utilization score at 0.6586, indicating moderate utilization. This suggests that AAY beneficiaries, who represent the most economically vulnerable, are making substantial use of the PDS, likely due to their greater need and higher subsidy entitlement. PHH (Priority Household) pink cardholders also show relatively high engagement, with a mean score of 0.5592, reflecting their moderate reliance on subsidized food provisions. These two categories highlight how the PDS functions effectively as a social safety net for the intended target groups. In contrast, households with white ration cards (NPNS), who are generally economically better off and receive little to no subsidy, show a much lower utilization score of 0.3180. Blue cardholders (Non-Priority State Subsidy) fall in between with a mean score of 0.4165, suggesting limited but not negligible interaction with the system. The overall mean score across all card types is 0.4625, reflecting low to moderate utilization on average. The ANOVA results reinforce the significance of these differences. With $F(3,541) = 215.016$ and a p-value of 0.000, the variation in mean utilization scores among ration card types is statistically significant. This implies that the level of benefit drawn from the PDS is not random but is closely linked to the type of ration card a household holds, which in turn is determined by their socio-economic status. These findings indicate that the PDS is generally functioning as intended for targeted groups like AAY and PHH households. However, the relatively low scores among non-priority households suggest either reduced need or barriers to access and utilization.

Table 5.48

Utilization Score (PDS) by Type of Ration Card

Type of Ratio Card	N	Utilization Score (Mean)	SD	Std. Error
AAY (Antyodaya Anna Yojana)/ Yellow	40	.6586	.1475	.0233
NPNS/ White	161	.3180	.0777	.0061
Non-Priority State Subsidy/ Blue	125	.4165	.1144	.0102
PHH (Priority Household)/ Pink	219	.5592	.1094	.0074
Total	545	.4625	.1561	.0067
ANOVA	F (3,541) = 215.016, p= 0.000			

Note: 0.75–1.00=High Utilization, 0.50–0.74= Moderate Utilization, <0.50= Low Utilization Source: Primary Survey 2025

5.7.2 Utilization Score & Place of Residence

Table 5.49 provides a comparison of PDS utilization scores across different places of residence—Corporation, Municipality, and Panchayats areas. The results show clear spatial variations in how effectively households engage with the Public Distribution System. On average, households in Panchayats areas have the highest mean utilization score of 0.4962, nearing the threshold for moderate utilization. This suggests that rural households tend to rely more on the PDS, possibly due to fewer market alternatives and greater economic vulnerability. In contrast, households residing in Corporation areas, typically urban zones, have the lowest mean utilization score of 0.4056, indicating low utilization. This could be due to better access to market resources, a higher income profile among urban residents, or a perceived inefficiency or inadequacy of PDS in urban centers. Households in Municipality areas show intermediate utilization with a mean score of 0.4597, again reflecting relatively lower dependence compared to rural Panchayats regions. The ANOVA test result—F(2,542) = 15.176 with a p-value of 0.000—indicates that these differences in utilization scores by place of residence are statistically significant. This means that where a household

is located does have a measurable impact on how much they depend on and benefit from the PDS. Overall, the findings suggest that the PDS remains a more critical source of food security for rural households compared to urban counterparts.

Table 5.49

Utilization Score (PDS) by Place of Residence

Place of Residence	N	Utilization Score (Mean)	SD	Std. Error
Corporation	133	.4056	.1373	.0119
Municipality	173	.4597	.1612	.0123
Panchayats	239	.4962	.1534	.0099
Total	545	.4625	.1561	.0067
ANOVA	F (2,542) = 15.176, p= 0.000			

Note: 0.75–1.00=High Utilization, 0.50–0.74= Moderate Utilization, <0.50= Low Utilization Source: Primary Survey 2025

5.7.3 Utilization Score & Caste

Table 5.50 presents the variation in PDS utilization scores across different caste groups. The data reveals notable disparities, suggesting that caste identity may influence the extent to which households rely on and benefit from the PDS. Among the groups, Scheduled Caste (SC) households recorded the highest mean utilization score of 0.5363, indicating moderate utilization. This suggests a relatively higher dependence on PDS among SC communities, possibly due to historical socio-economic disadvantages and greater need for state support in ensuring food security. Other caste groups show lower mean scores. Households from the Other Backward Classes (OBC) category, which represent the largest group in the sample (N=341), recorded a mean score of 0.4547, falling within the low utilization category. Similarly, the General category recorded a mean utilization score of 0.4289, slightly lower than the OBC group. Economically Weaker Sections (EWS), though fewer in number (N=31), had a mean score of 0.4666, closely aligned with the overall sample mean of 0.4625. Scheduled Tribes (ST), while represented by only two households in the sample, had a relatively low score of 0.4127, but the small sample size limits the reliability of this finding. The ANOVA result—F(4,540) = 5.914 with a p-value of

0.000—indicates statistically significant differences in utilization scores across caste groups. This confirms that caste remains a relevant factor in shaping household engagement with the PDS. The findings may reflect varying levels of awareness, access, entitlement, and reliance on government-supported food distribution, and they underscore the importance of caste-sensitive policy interventions. Ensuring equitable access to the PDS for all communities—particularly those who are structurally disadvantaged—remains a critical area for continued focus and reform.

Table 5.50

Utilization Score (PDS) by Caste

Caste	N	Utilization Score (Mean)	SD	Std. Error
EWS	31	.4666	.1336	.0240
General	93	.4289	.1524	.0158
OBC	341	.4547	.1564	.0085
SC	78	.5363	.1490	.0169
ST	2	.4127	.0811	.0574
Total	545	.4625	.1561	.0067
ANOVA	F (4,540) = 5.914, p= 0.000			

Note: 0.75–1.00=High Utilization, 0.50–0.74= Moderate Utilization, <0.50= Low Utilization Source: Primary Survey 2025

5.7.4 Utilization Score & Number of Dependents in the Family

Table 5.51 explores the relationship between the number of dependents in a household and their level of PDS utilization. The mean utilization scores vary across family sizes, indicating some patterns in how family composition may influence the use of PDS services. Households with no dependents reported a relatively high mean score of 0.5135, suggesting moderate utilization, while those with one dependent also showed a moderately high score of 0.4978, nearing the threshold for moderate utilization. Interestingly, households with two and three dependents recorded lower scores—0.4322 and 0.4521 respectively—falling into the low utilization category. This dip could point to challenges in accessing sufficient PDS provisions to meet the needs of

growing families or possibly indicate a greater tendency to rely on market-based alternatives due to inadequacies in PDS coverage. However, as the number of dependents increases beyond three, the scores begin to rise again, with households having five or more dependents generally exhibiting moderate utilization levels. The highest utilization score (0.5273) was observed in households with seven dependents, though this group only includes five households, and the standard error is relatively high. The ANOVA results, F(8,534) = 2.171 with a p-value of 0.028, indicate that the differences in utilization scores based on the number of dependents are statistically significant. This implies that family size does have a meaningful impact on PDS utilization, although the relationship is not linear. These findings suggest that while larger families may eventually depend more on PDS due to higher aggregate needs, there may be a threshold at which PDS inadequacies prompt families to either supplement or bypass the system temporarily.

Table 5.51

Utilization Score (PDS) by Number of Dependents in the Family

Number of Dependents in the Family	N	Utilization Score (Mean)	SD	Std. Error
0	47	.5135	.1763	.0257
1	80	.4978	.1662	.0186
2	136	.4322	.1425	.0122
3	154	.4521	.1437	.0116
4	76	.4547	.1561	.0179
5	26	.4735	.1815	.0356
6	16	.4917	.1570	.0392
7	5	.5273	.1671	.0747
8	3	.5143	.2211	.1277
Total	543	.4628	.1558	.0067
ANOVA	F (8, 534) = 2.171, p= 0.028			

Note: 0.75–1.00=High Utilization, 0.50–0.74= Moderate Utilization, <0.50= Low Utilization Source: Primary Survey 2025

5.7.5 Correlation between Utilization & Physical Accessibility of PDS

Table 5.52, which presents the correlation between PDS Utilization Score and Physical Accessibility Score, reveals a very weak and statistically insignificant relationship between the two. The Pearson correlation coefficient is 0.021, and the p-value is 0.623, which is well above the standard significance level of 0.05. This suggests that physical accessibility of PDS services does not have a meaningful impact on how much households actually utilize PDS benefits. The results highlight that utilization of the PDS is influenced more by socio-economic and household factors than by physical accessibility alone. Table 5.36, which analyzes utilization by type of ration card, shows significant differences. Households with AAY cards had the highest mean utilization score (0.6586), indicating moderate to high utilization, while those with NPNS (white) cards had the lowest score (0.3180), representing low utilization. The ANOVA result was highly significant ($p = 0.000$), reinforcing that card type strongly affects PDS use. Table 5.49 further demonstrates that place of residence plays a role, with households in Panchayat areas having the highest utilization score (0.4962) compared to Corporation areas (0.4056). Again, this difference is statistically significant ($p = 0.000$), suggesting rural beneficiaries may rely more on the PDS than their urban counterparts. Caste-based differences (Table 5.50) were also significant, with Scheduled Castes (SC) recording the highest mean utilization score (0.5363) and General Category households the lowest (0.4289). The significant ANOVA ($p = 0.000$) points to systemic disparities in how different social groups use the PDS, likely tied to economic dependence on subsidized goods. Additionally, Table 5.51, which analyses utilization by number of dependents in a household, reveals some variability. Households with zero to one dependent had relatively higher scores (0.5135 and 0.4978), while those with two to four dependents had lower scores (around 0.43–0.45). The relationship was statistically significant ($p = 0.028$), though the pattern was less linear, indicating that household composition has a modest but notable influence. These findings suggest that utilization of the PDS is more sensitive to socio-economic vulnerability, ration card entitlements, and demographic factors than it is to physical access issues. While accessibility might still affect convenience or satisfaction, it does not significantly determine actual usage

behaviour, as confirmed by the correlation in Table 5.45. This implies that policy efforts aimed at increasing PDS utilization should prioritize inclusion, adequacy, and awareness, especially among under-served and non-priority cardholders, rather than focusing only on access infrastructure.

Table 5.52
Correlation between Utilization of PDS and Physical Accessibility of PDS

		Utilization Score	Accessibility Score
Utilization Score	Pearson Correlation	1	.021
	Sig. (2-tailed)		.623
	N	545	545
Accessibility Score	Pearson Correlation	.021	1
	Sig. (2-tailed)	.623	
	N	545	545

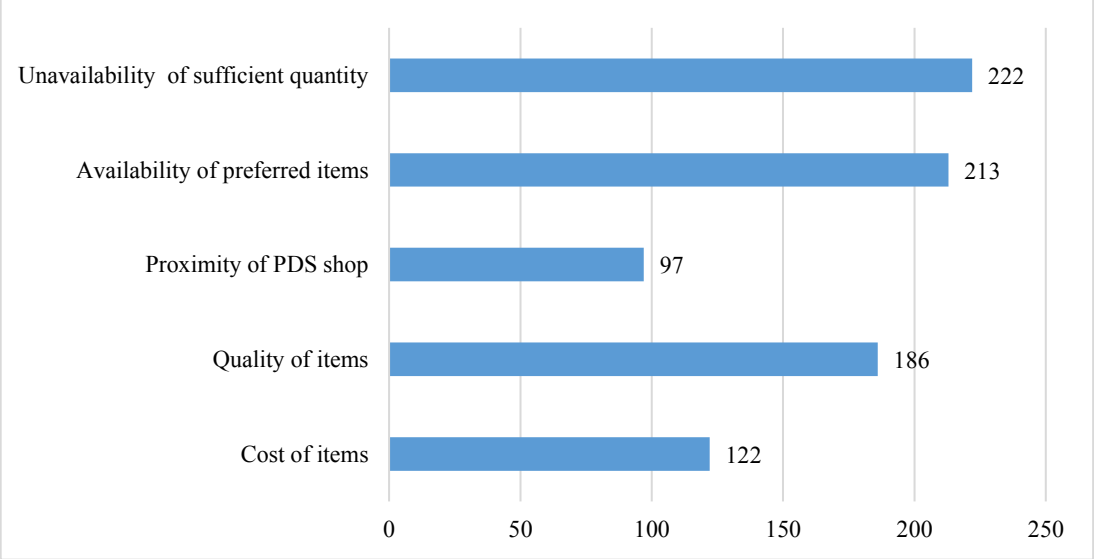
Source: Primary Survey 2025

5.7.6 Market Substitution of PDS: Reasons among Households & Type of Ration Card

The data presented in Figure 5.6 reveals that a significant proportion of households—66.6%—have had to purchase food items from the open market instead of availing them through the PDS. This indicates that despite being enrolled in the PDS, two-thirds of the surveyed beneficiaries were compelled to seek alternatives outside the system. Only 33.4% of respondents stated they never had to substitute market purchases for PDS supplies, highlighting a substantial reliance on external sources. Among those who answered "yes," the reasons reflect multiple and overlapping challenges within the PDS delivery mechanism. The most frequently cited reason was unavailability of sufficient quantity (61.2%), suggesting that the quantity of rations supplied often falls short of household needs. The availability of preferred items was also a major concern, with 58.7% indicating that they turned to the market to obtain specific food items not offered through PDS. Additionally, quality concerns were reported by over half (51.2%) of the respondents, pointing to dissatisfaction with the standard of goods distributed. This highlights a critical area for improvement, as

substandard products can undermine trust and participation in welfare schemes. Cost-related issues also played a role, with 33.6% noting that PDS prices or related costs made them consider market alternatives. Moreover, 26.7% of respondents identified the distance or inconvenient location of the PDS outlet as a barrier to access, reinforcing the importance of accessibility in utilization, even though previous correlation analysis showed it was not a strong predictor of utilization scores. In sum, the findings suggest that while PDS plays a vital role in food security, systemic issues—particularly those related to adequacy, quality, preference, and proximity—still push many households toward the market. This underlines the need for reforms focusing on enhancing supply reliability, improving product quality, and tailoring offerings to household preferences, alongside better geographical distribution of PDS outlets.

Figure 5.4 Market Substitution of PDS: Frequency and Underlying Reasons among Households



Note: two-thirds of the surveyed beneficiaries were compelled to seek alternatives outside the system (363/545); Source: Primary Survey 2025

Table 5.53 provides a nuanced understanding of why households across different ration card categories resort to purchasing food items from the market rather than relying solely on the PDS. Although all groups face challenges, the intensity and type of barriers vary by ration card type, reflecting the broader socio-economic positioning and entitlement levels associated with each card. The most cited reason across all

categories is the unavailability of sufficient quantity, with 66.7% of AAY and 66.1% of white cardholders (NPNS) indicating this as a reason, followed by 63.2% of PHH (Priority Household) cardholders. This issue was statistically significant at the 10% level, suggesting a widespread perception of inadequacy in the quantity of rationed food provided. It underscores a systemic supply-side constraint in the PDS that cuts across income groups. The availability of preferred items also emerged as a statistically significant factor at the 5% level. 67.8% of white cardholders and 59.6% of pink cardholders cited this reason, implying a demand-side mismatch between what the PDS offers and what households actually need or want. For blue cardholders (Non-Priority State Subsidy), 45.1% raised this concern, showing comparatively lower dissatisfaction on this front. Quality concerns, although not statistically significant, were still prominent, especially among AAY cardholders, where 70.8% mentioned poor quality as a reason for turning to the market. This may reflect their greater dependency on the PDS and thus higher sensitivity to product quality. Across all card types, more than half of the households expressed concerns about quality (overall 51.2%), reinforcing the importance of not just quantity but also the standard of goods delivered. Proximity of PDS shops was a relatively less frequent issue, cited by 26.7% overall and ranging from 23.2% (blue cardholders) to 28.1% (white cardholders). Though statistically insignificant, its consistent presence suggests that accessibility—both physical and logistical—still plays a background role in utilization decisions. Cost of items in the market, cited by 33.6% overall, did not show a statistically significant difference between groups. This implies that price, while an important factor, may be uniformly burdensome across income levels, or alternatively, that households prioritize other issues such as adequacy and quality over cost when opting out of the PDS. In summary, it reveals a multi-layered rationale for market substitution that is both structural (inadequate quantity, limited product range) and perceptual (quality, preferences). It also highlights how ration card status acts as a proxy for household vulnerability, shaping both their expectations from and experiences with the PDS.

Table 5.53

Market Substitution of PDS: Underlying Reasons among Households by Type of Ration Card

Reasons		AAY (Antyodaya Anna Yojana)/ Yellow	NPNS/ White	Non-Priority State Subsidy/ Blue	PHH (Priority Household)/ Pink	Total
Cost of items#	N	10	40	28	44	122
	%	41.7	33.1	34.1	32.4	33.6
Quality of items#	N	17	63	39	67	186
	%	70.8	52.1	47.6	49.3	51.2
Proximity of PDS shop#	N	6	34	19	38	97
	%	25.0	28.1	23.2	27.9	26.7
Availability of preferred items**	N	13	82	37	81	213
	%	54.2	67.8	45.1	59.6	58.7
Unavailability of sufficient quantity*	N	16	80	40	86	222
	%	66.7	66.1	48.8	63.2	61.2

*Note: Chi-Square Test (Degrees of Freedom = 3). Significance levels are indicated as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level, and # denotes statistical insignificance; percent are within ration card; Source: Primary Survey 2025*

5.7.7 Correlation between Availability, Utilization, and Accessibility Scores in the PDS

Table 5.54 presents the Pearson correlation coefficients between three key components of the PDS experience: Availability Score, Utilization Score, and Accessibility Score. The correlation analysis helps to understand how these dimensions are related and whether changes in one are associated with changes in another. The results show that the Availability Score is positively and significantly correlated with both the Utilization Score ($r = 0.290$, $p < 0.01$) and the Accessibility Score ($r = 0.276$, $p < 0.01$). These moderate yet statistically significant correlations indicate that households that perceive higher availability of PDS items also tend to use the services more effectively and perceive them as more accessible. This suggests that the presence of food items in PDS shops plays a critical role in shaping both their actual usage and the perceived ease of accessing these services. On the other hand,

the correlation between Utilization Score and Accessibility Score is very weak (r = 0.021) and statistically not significant (p = 0.623). This implies that even if people find the PDS accessible, it does not necessarily translate into higher utilization, possibly due to other factors like food preferences, satisfaction, or household needs not being met by the available items. Overall, it highlights that availability is a key driver of both utilization and accessibility perceptions in the PDS, whereas the direct relationship between accessibility and utilization may be minimal.

Table 5.54
Correlation between Availability, Accessibility and Utilization Scores in the PDS System"

		Availability Score	**Utilization Score**	**Accessibility Score**
Availability Score	Pearson Correlation	1	.290**	.276**
	Sig. (2-tailed)		.000	.000
	N	545	545	545
Utilization Score	Pearson Correlation	.290**	1	.021
	Sig. (2-tailed)	.000		.623
	N	545	545	545
Accessibility Score	Pearson Correlation	.276**	.021	1
	Sig. (2-tailed)	.000	.623	
	N	545	545	545
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: Primary Survey 2025

5.8 Influence of Socio-Economic Status on Availability, Access &Utilization of PDS of Kerala

The following section examines the relation between socio economic variables and different variables related to Public Distribution System. It examines the relation

among SES Index, Type of ration card, Place of residence, different dimensions of PDS etc.

5.8.1Construction of Socio-Economic Status Index (SES Index)

Table 5.55 outlines a comprehensive framework for constructing a Socio-Economic Status (SES) Index by incorporating multiple dimensions of household characteristics. The variables selected for the index reflect various components of socio-economic well-being, including education, income, employment, health, assets, housing, and financial security. Each variable is transformed using appropriate methods to standardize the scale and ensure comparability across households. The proportion of higher-educated members and earning members in a household are treated as ratio variables, transformed by dividing the number of such individuals by the total number of household members. This transformation yields a continuous scale between 0 and 1, offering a normalized indicator of human capital and labor force participation. Similarly, the number of members in salaried or fixed-income jobs is used as a proxy for income stability, also expressed as a proportion to reflect household-level security. Household monthly income, which often has high variability and skewness, is normalized using either Min-Max scaling transformation, allowing it to be combined meaningfully with other variables in the index. Chronic disease status is a binary categorical variable, capturing whether any household member suffers from a long-term illness, thus reflecting economic and caregiving burdens. Asset ownership and access to household facilities are treated as binary or count-based indicators, capturing material wealth and quality of life. These are often derived from lists of essential household items and infrastructure components, coded as 1 if present and 0 if absent. A cumulative score or index is then calculated based on the number of assets or facilities available. Housing characteristics, including land and house ownership, along with the physical condition of the house, are essential markers of long-term socio-economic security. Ownership is coded as binary, while housing condition is ordinally categorized into dilapidated, livable, or good, with corresponding scores of 0, 0.5, and 1. This adds nuance to the understanding of living conditions beyond simple ownership status. Finally, debt and savings status provide insight into a

household's financial vulnerability or resilience. Debt is an indicator of economic stress, while savings represent a safety net during times of crisis. Both are treated as binary variables. The overall SES Index is constructed by assigning equal weights to all transformed variables and computing their average. This method ensures that each component contributes equally to the final index score. The framework draws on methodologies proposed by Filmer and Pritchett (2001)—widely used in wealth index construction—and the Alkire & Foster (2011) multidimensional poverty framework, ensuring methodological robustness.

Table 5.55
Construction of Socio-Economic Status Index (SES Index)

Variable	Type	Transformation Method	Transformed Scale	Notes
Number of Higher-Educated Members per Total Members	Ratio	Divide higher-educated by total members	Continuous (0 to 1)	Reflects proportion of educated individuals
Number of Earning Members per Total Members	Ratio	Divide earners by total members	Continuous (0 to 1)	Proxy for employment level and income dependency
Household Monthly Income	Continuous	Normalize (Min-Max)	Normalized (0–1)	Helps reduce skew due to income variation
Chronic Disease Status (in household)	Categorical	0 = No disease, 1 = Presence of chronic disease	Binary	Indicates potential economic and care burden
Members in Salaried/Fixed Jobs per Total Members	Ratio	Divide salaried members by total members	Continuous (0 to 1)	Represents income stability
Land Ownership	Categorical	0 = No, 1 = Yes	Binary	

House Ownership	Categorical	0 = Not Owned 1=Owned	Binary	Home ownership reflects asset security
Condition of House	Categorical	0 = Dilapidated, 0.5 = Liveable, 1 = Good	Ordinal (0 to 1)	
Number of Assets Owned (e.g., TV, fridge, vehicles)	Count/Categorical	0 = No, 1 = Yes	Index	Use asset list with binary coding (owned = 1, not owned = 0)
Facilities Available in House (toilet, electricity etc.)	Count/Categorical	0 = No, 1 = Yes	Index	Reflects housing quality and living standard
Debt Status	Categorical	0 = In debt, 1 = No debt,	Binary	Indicates economic stress
Savings Status	Categorical	0 = No savings, 1 = Has savings	Binary	Indicates financial resilience
Scoring System		**Assign Weights Equally**		
Index Construction		**Average of All Components**		

Source: Author's Estimation based on Filmer and Pritchett (2001) and Alkire & Foster (2011)

5.8.2 Socio-Economics Index & Type of Ration Card

Table 5.56 presents the Socio-Economic Status (SES) Index across different types of ration card holders, reflecting the variation in economic well-being among these groups. The SES Index, which ranges from 0 to 1, was constructed using multiple indicators such as income, education, employment, asset ownership, and housing quality. Based on the classification used in the study, index values below 0.50 indicate low SES, values from 0.50 to 0.74 suggest moderate SES, and values from 0.75 to 1.00 reflect high SES. The table shows that households with AAY /Yellow cards, which are intended for the poorest and most vulnerable populations, have the lowest mean SES score (0.4641). This value places them squarely in the low socio-economic status category, and it is supported by a standard deviation of 0.1872, indicating a

relatively broad spread in their economic conditions. In contrast, NPNS (White card) holders have the highest SES score (0.6498), placing them in the moderate SES range. This group typically consists of more economically stable households that are not eligible for subsidized rations. Similarly, Non-Priority State Subsidy (Blue card) holders also fall within the moderate range, with a mean SES score of 0.6263. PHH (Priority Household/Pink card) holders have a mean score of 0.5512, which also falls in the moderate SES range, though lower than that of the Blue and White card groups. This suggests that while they are economically disadvantaged compared to the non-priority groups, they are not as vulnerable as the AAY cardholders. The overall mean SES score across all households is 0.5912, indicating that the general population falls into the moderate SES category. The ANOVA results ($F(3,541) = 22.844$, $p = 0.000$) indicate that these differences in SES across ration card types are statistically significant. This confirms that ration card type, which is already a proxy for economic need in Public Distribution Systems, aligns closely with broader indicators of socio-economic status. In summary, the table effectively demonstrates the socio-economic stratification among ration card holders and reinforces the validity of using ration card type as a rough indicator of household well-being within public policy and welfare distribution frameworks.

Table 5.56
Socio-Economics Index by Type of Ration Card

Type of Ratio Card	N	Socio-Economics Index (Mean)	SD	Std. Error
AAY (Antyodaya Anna Yojana)/ Yellow	40	.4641	.1872	.0296
NPNS/ White	161	.6498	.1679	.0132
Non-Priority State Subsidy/ Blue	125	.6263	.1693	.0151
PHH (Priority Household)/ Pink	219	.5512	.1358	.0092
Total	545	.5912	.1669	.0071
ANOVA	F (3,541) = 22.844, p= 0.000			

Note: 0.75–1.00=High SES, 0.50–0.74= Moderate SES, <0.50= Low SES; Source: Primary Survey 2025

5.8.3 Socio-Economics Index & Place of Residence

Table 5.57 presents the Socio-Economic Status (SES) Index across different places of residence, specifically distinguishing between Corporation areas, Municipalities, and Panchayats. From the data, households residing in Municipalities have the highest mean SES index at 0.610, closely followed by those in Panchayats areas at 0.602, both of which fall within the moderate SES category. This suggests a relatively balanced and moderately favorable economic condition among these groups. On the other hand, households in Corporation areas have a lower SES score of 0.546, still in the moderate category but significantly lower compared to the other two groups. This finding may seem counterintuitive since urban areas are often associated with better economic conditions. However, Corporation areas can also include urban slums or densely populated neighbourhood where economic deprivation persists despite urban infrastructure. The standard deviation is highest in Corporation areas (0.183), indicating greater variability in socio-economic conditions within this group, while Panchayats show a slightly more homogeneous socio-economic profile. The ANOVA result ($F(2,542) = 6.658$, $p = 0.001$) confirms that the differences in SES across these residential categories are statistically significant. In summary, the table highlights notable differences in socio-economic conditions based on place of residence, with Municipality and Panchayats areas faring slightly better than Corporation regions. This finding underscores the importance of geographical targeting in social welfare policies, as economic disadvantage may not always align neatly with urban-rural classifications.

Table 5.57
Socio-Economics Index by Place of Residence

Place of Residence	N	Socio-Economics Index (Mean)	SD	Std. Error
Corporation	133	.546	.183	.016
Municipality	173	.610	.162	.012
Panchayats	239	.602	.157	.010
Total	545	.591	.167	.007
ANOVA	F (2,542) = 6.658, p= 0.001			

Note: 0.75–1.00=High SES, 0.50–0.74= Moderate SES, <0.50= Low SES; Source: Primary Survey 2025

5.8.4 Socio-Economics Index, Type of Ration Card & Place of Residence

Table 5.58 presents a two-way comparison of the Socio-Economic Status (SES) Index across categories of ration cards and places of residence. The SES index, constructed using a composite of household-level indicators such as education, income, employment, health, and housing, provides a quantifiable measure of economic well-being, scaled from 0 to 1, where values below 0.50 indicate low SES, 0.50–0.74 indicate moderate SES, and above 0.75 indicate high SES. Households possessing AAY cards, which are meant for the poorest, report the lowest mean SES across all residence types. The lowest SES score is seen in AAY cardholders residing in Corporation areas (0.169), reflecting deep deprivation, while even the best-performing AAY group—those in Municipalities—only score 0.522, just above the threshold for low SES. Conversely, NPNS (White Card) households show the highest SES levels, especially in Panchayat areas (0.711), approaching the threshold of high SES. This suggests that a significant portion of white cardholders in rural Panchayat enjoy relatively strong economic conditions. These findings indicate that ration card type is strongly reflective of socio-economic stratification, and this stratification persists across geographic areas. Non-Priority State Subsidy (Blue Card) holders exhibit moderate SES across locations, with scores ranging from 0.576 in Corporation areas to 0.649 in Municipalities. This reflects relatively stable but not affluent conditions. PHH (Priority Household) cardholders also demonstrate moderate SES, with higher means in Panchayats areas (0.572) and slightly lower means in Corporation areas (0.492), suggesting rural households in this category may be slightly better off than their urban counterparts. The ANOVA test confirms that these differences are statistically significant. The main effects of both Ration Card Type ($F(3,533)=32.093, p=.000$) and Place of Residence ($F(2,533)=18.530, p=.000$) significantly influence SES. Additionally, the interaction effect between Ration Card and Place of Residence is also statistically significant ($F(6,533)=2.132, p=.048$), though the effect size is modest. This means that while ration card and residence individually affect SES, the combination of the two further nuances the socio-economic variation. The R-squared value of 0.188 indicates that about 18.8% of the

variance in SES is explained by these combined factors, which is a considerable proportion in social research.

Table 5.58

Socio-Economics Index by Type of Ration Card and Place of Residence

Type of Ration Card	Place of Residence	Socio-Economics Index (Mean)	SD	N
AAY (Antyodaya Anna Yojana)/ Yellow	Corporation	.169	.156	4
	Municipality	.522	.118	10
	Panchayats	.487	.176	26
	Total	.464	.187	40
NPNS/ White	Corporation	.586	.145	66
	Municipality	.678	.187	48
	Panchayats	.711	.150	47
	Total	.650	.168	161
Non-Priority State Subsidy/ Blue	Corporation	.576	.224	27
	Municipality	.649	.136	49
	Panchayats	.631	.162	49
	Total	.626	.169	125
PHH (Priority Household)/ Pink	Corporation	.492	.158	36
	Municipality	.546	.137	66
	Panchayats	.572	.123	117
	Total	.551	.136	219
Total	Corporation	.546	.183	133
	Municipality	.610	.162	173
	Panchayats	.602	.157	239
	Total	.591	.167	545

Tests of Between-Subjects Effects

Dependent Variable: Socio-Economics Index (Mean)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.853[a]	11	.259	11.235	.000
Intercept	76.207	1	76.207	3301.327	.000
Ration Card	2.222	3	.741	32.093	.000

Place of Residence	.855	2	.428	18.530	.000
Ration Card* Place of Residence	.295	6	.049	2.132	.048
Error	12.304	533	.023		
Total	205.615	545			
Corrected Total	15.156	544			
a. R Squared = .188 (Adjusted R Squared = .171)					

Note: 0.75–1.00=High SES, 0.50–0.74= Moderate SES, <0.50= Low SES; Source: Primary Survey 2025

5.8.5 Correlation between Socio-Economic Status Index and PDS Dimensions

Table 5.59 presents the correlation between the Socio-Economic Status (SES) Index and the three core dimensions of the PDS—availability, utilization, and accessibility—based on the data collected during the implementation period of the NFSA in Kerala. The table reveals statistically significant relationships between SES and each PDS component, highlighting important trends in how different socio-economic groups interact with and benefit from the PDS. The analysis indicates a weak but statistically significant negative correlation between SES and availability of PDS items ($r = -0.128$, $p = 0.003$). This suggests that lower SES households report higher levels of availability, which is consistent with the targeted design of the NFSA that prioritizes economically disadvantaged groups, particularly *AAY* and Priority Household (PHH) cardholders. These groups are more reliant on PDS entitlements and are likely to report better availability due to consistent use and engagement with the system. Similarly, the utilization of the PDS also shows a stronger negative correlation with SES ($r = -0.276$, $p = 0.000$), implying that lower socio-economic households make significantly greater use of the PDS than those in higher socio-economic strata. This reinforces the notion that the PDS is playing a critical role as a food security mechanism for the most vulnerable segments of the population, who depend heavily on subsidized food grains and essential items provided through the system. In contrast, the relationship between SES and accessibility is positively correlated ($r = 0.130$, $p = 0.002$), albeit weakly. This indicates that higher SES households generally report better access to PDS outlets, which is influenced by their geographical location, availability of transport, or greater awareness and ease in

navigating administrative processes. Even though these households access PDS facilities more easily, their lower dependency on subsidized provisions results in relatively lower levels of utilization and perceived availability. These findings support the broader objective of examining how PDS access, availability, and utilization differ between priority and non-priority cardholders in Kerala under the NFSA. The data confirms that priority cardholders, often with lower socio-economic status, are benefiting from the system in terms of both availability and usage, though slight gaps in accessibility still remain. This calls for policy attention to improve outreach, infrastructure, and service delivery especially for the poorest households residing in more remote areas, ensuring equitable access alongside targeted provisioning.

Table 5.59
Correlation between Socio-Economic Status Index and PDS Dimensions (Availability, Utilization, and Accessibility)

		Socio-Economics Index
Availability Score	Pearson Correlation	-.128**
	Sig. (2-tailed)	.003
	N	545
Utilization Score	Pearson Correlation	-.276**
	Sig. (2-tailed)	.000
	N	545
Accessibility Score	Pearson Correlation	.130**
	Sig. (2-tailed)	.002
	N	545

***. Correlation is significant at the 0.01 level (2-tailed); Source: Primary Survey 2025*

5.8.6 Socio-Economic and Demographic Predictors of PDS Item Availability in Kerala

The results presented in Table 5.60 provide a multiple linear regression analysis that examines the influence of socio-economic and demographic factors on the Availability of PDS Items Score among households in Kerala during the implementation period of the National Food Security Act (NFSA). The model shows a statistically significant overall fit, with an R Square value of 0.086, indicating that

approximately 8.6% of the variance in PDS item availability is explained by the included predictor variables. Although this value is modest, the model is statistically significant ($F = 8.396$, $p < 0.001$), suggesting that the predictors collectively have a meaningful impact on availability. In terms of specific predictors, socio-economic status (SES) is negatively associated with the availability of PDS items ($\beta = -0.100$, $p = 0.027$). This inverse relationship suggests that households with higher socio-economic standing tend to experience lower levels of PDS item availability. This could imply that PDS services are more oriented toward meeting the needs of economically disadvantaged groups, consistent with the pro-poor objective of the NFSA. Among ration card categories, all three groups—AAY, PHH (Priority Household), and Non-Priority State Subsidy—show statistically significant positive relationships with PDS availability when compared to the reference group (NPNS/White cardholders). The strongest effects are observed for PHH ($\beta = 0.196$, $p < 0.001$) and Non-Priority State Subsidy cardholders ($\beta = 0.174$, $p < 0.001$), while AAY cardholders also report better availability ($\beta = 0.121$, $p = 0.012$). These findings indicate that targeted and subsidized ration card categories benefit from improved access to PDS commodities, reflecting the intended design of the NFSA to prioritize food security among vulnerable populations. With respect to place of residence, households located in Corporation areas have a significantly lower availability score ($\beta = -0.154$, $p = 0.001$) compared to those in Panchayats areas (reference category). This could point to inefficiencies or supply gaps in urban settings, possibly due to higher demand and administrative complexities. The coefficient for Municipality is negative as well ($\beta = -0.084$), but only marginally significant ($p = 0.064$), indicating a weaker and less certain difference from Panchayats areas. The Durbin-Watson statistic of 1.461 suggests some degree of positive autocorrelation in the residuals, which might need further diagnostic checking, although it does not invalidate the overall findings. Overall, the regression analysis confirms that both the type of ration card and geographic location significantly affect the availability of PDS items, with priority beneficiaries and rural residents generally reporting better access. The negative association with socio-economic status further highlights the PDS's targeting

efficacy, suggesting that the system functions as a compensatory mechanism for lower-income households in Kerala.

Table 5.60
Multiple Linear Regression Analysis of Socio-Economic and Demographic Predictors of PDS Item Availability in Kerala

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.293	.086	.075	.1506424	1.461

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.143	6	.191	8.396	.000
	Residual	12.209	538	.023		
	Total	13.352	544			

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
		B	Std. Error	Beta			
1	(Constant)	.624	.033		18.777	.000	
	SES	-.094	.042	-.100	-2.216	.027	1.203
	AAY	.073	.029	.121	2.525	.012	1.347
	PHH	.063	.017	.196	3.684	.000	1.669
	Non Priority State Subsidy	.065	.018	.174	3.534	.000	1.421
	Corporation	-.056	.018	-.154	-3.211	.001	1.359
	Municipality	-.028	.015	-.084	-1.858	.064	1.204

Note: Dependent Variable= Availability of Items Score; Reference Category for Type of Ration Card is NPNS/ White; Reference Category for Place of Residence is Panchayats; Source: Primary Survey 2025

5.8.7 Socio-Economic and Demographic Predictors of PDS Item Utilization of PDS

Table 5.61 presents the results of a multiple linear regression analysis examining how socio-economic and demographic factors influence the utilization of PDS items among households in Kerala during the implementation period of the National Food Security Act (NFSA). The model shows a strong overall fit, with an R Square of 0.547,

indicating that about 54.7% of the variance in PDS utilization is explained by the predictor variables in the model. This is a substantial amount, suggesting that the model effectively captures key factors influencing PDS utilization. The ANOVA results confirm the model's statistical significance ($F = 108.270$, $p < 0.001$), and the Durbin-Watson statistic of 1.728 suggests an acceptable level of autocorrelation in the residuals. Among the independent variables, ration card type is the strongest and most significant predictor. Households with AAY cards report the highest positive association with PDS utilization ($\beta = 0.546$, $p < 0.001$), followed by PHH (Priority Household) cardholders ($\beta = 0.730$, $p < 0.001$), and Non-Priority State Subsidy cardholders ($\beta = 0.254$, $p < 0.001$). These findings confirm that the type of ration card held—particularly those that provide subsidized food grains under the NFSA—is a major determinant of how extensively households utilize the PDS. This aligns with the design of the PDS, which prioritizes vulnerable groups through targeted entitlements. On the other hand, socio-economic status (SES) does not emerge as a statistically significant predictor of PDS utilization ($\beta = -0.052$, $p = 0.105$), although the negative sign suggests a tendency for lower SES households to utilize the PDS more. However, this effect is not strong enough to be conclusive in this model. Likewise, place of residence—whether a household is located in a Corporation or Municipality area compared to a Panchayats (the reference category)—does not significantly influence utilization. The coefficients for Corporation ($\beta = -0.046$, $p = 0.178$) and Municipality ($\beta = -0.005$, $p = 0.876$) are not statistically significant, implying that geographic location, in this case, does not substantially alter the extent to which households make use of PDS provisions. Overall, the results underscore the effectiveness of ration card-based targeting in driving PDS utilization in Kerala. Households with AAY and PHH cards—who are meant to be the most vulnerable beneficiaries—are not only accessing the system but doing so at significantly higher rates. The lack of significant variation by SES and geography in this model may indicate a relatively equitable distribution infrastructure across regions.

Table 5.61
Multiple Linear Regression Analysis of Socio-Economic and Demographic Predictors of PDS Item Utilization of PDS

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.740	.547	.542	.1056588	1.728

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.252	6	1.209	108.270	.000
	Residual	6.006	538	.011		
	Total	13.258	544			

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
		B	Std. Error	Beta			
1	(Constant)	.357	.023		15.303	.000	
	SES	-.048	.030	-.052	-1.626	.105	1.203
	AAY	.326	.020	.546	16.203	.000	1.347
	PHH	.232	.012	.730	19.479	.000	1.669
	Non Priority State Subsidy	.094	.013	.254	7.345	.000	1.421
	Corporation	-.017	.012	-.046	-1.349	.178	1.359
	Municipality	-.002	.011	-.005	-.157	.876	1.204

Note: Dependent Variable=Utilization Score; Reference Category for Type of Ration Card is NPNS/ White; Reference Category for Place of Residence is Panchayats; Source: Primary Survey 2025

5.8.8 Socio-Economic and Demographic Predictors of Physical Accessibility of PDS

Table 5.62 presents a multiple linear regression analysis aimed at identifying the socio-economic and demographic predictors of physical accessibility to the PDS in Kerala during the implementation period of the National Food Security Act. The

model reveals a relatively weak explanatory power, with an R Square of 0.063, indicating that only about 6.3% of the variance in accessibility scores is explained by the included predictors. The Adjusted R Square value of 0.053 confirms this modest effect, though the model remains statistically significant overall, as indicated by the F value of 6.045 ($p < 0.001$). The Durbin-Watson statistic of 1.627 suggests that there is no serious issue of autocorrelation in the residuals. Among the independent variables, socio-economic status (SES) shows a positive and statistically significant effect on accessibility ($\beta = 0.098$, $p = 0.032$). This suggests that households with higher SES report slightly better physical access to PDS outlets, possibly due to factors like better transportation or living in well-connected areas. In contrast, ration card types exhibit varied and mostly non-significant relationships. For instance, AAY cardholders do not significantly differ from the reference group (NPNS/White) in terms of accessibility ($\beta = -0.023$, $p = 0.642$), nor do PHH households ($\beta = 0.061$, $p = 0.259$). However, Non-Priority State Subsidy cardholders show a positive and significant association with accessibility ($\beta = 0.175$, $p < 0.001$), indicating that these households experience better physical access compared to the reference group. Geographical location, particularly residing in Corporation areas, emerges as a significant negative predictor of PDS accessibility ($\beta = -0.142$, $p = 0.004$), implying that urban households in Corporation areas might face more challenges in physically accessing PDS services. This could be due to congestion, distance to fair price shops, or population pressure on distribution points. However, Municipality residence does not have a statistically significant effect on accessibility ($\beta = -0.040$, $p = 0.382$), suggesting that the difference in accessibility between Municipality and Panchayats areas is negligible. In summary, the model indicates that SES and certain ration card categories have a modest yet significant influence on PDS accessibility, while residing in urban Corporation areas negatively impact access.

Table 5.62
Multiple Linear Regression Analysis of Socio-Economic and Demographic Predictors of Physical Accessibility of PDS

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.251	.063	.053	.144745	1.627

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.760	6	.127	6.045	.000
	Residual	11.272	538	.021		
	Total	12.032	544			

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
		B	Std. Error	Beta			
1	(Constant)	.690	.032		21.606	.000	
	SES	.088	.041	.098	2.146	.032	1.203
	AAY	-.013	.028	-.023	-.465	.642	1.347
	PHH	.018	.016	.061	1.129	.259	1.669
	Non Priority State Subsidy	.062	.018	.175	3.526	.000	1.421
	Corporation	-.049	.017	-.142	-2.922	.004	1.359
	Municipality	-.013	.015	-.040	-.875	.382	1.204

Note: Dependent Variable=Accessibility Score; Reference Category for Type of Ration Card is NPNS/ White; Reference Category for Place of Residence is Panchayats; Source: Primary Survey 2025

5.9 Hypothesis Testing

Null Hypothesis (H_0): There is no significant effect of geographic location, socio-economic status, and infrastructure development on the availability, accessibility, and utilization of the PDS among priority and non-priority cardholders in Kerala during the implementation of the National Food Security Act (NFSA).

The results from the multiple linear regression analyses clearly indicate that geographic location, socio-economic status (SES), and type of ration card — a proxy for PDS prioritization — significantly influence the availability, accessibility, and

utilization of PDS services in Kerala during the implementation of the National Food Security Act (NFSA).

For availability of items (Table 5.60), the regression model was statistically significant ($F = 8.396$, $p < 0.001$), although the overall variance explained was modest, with an R^2 value of 0.086. SES showed a significant negative effect ($p = 0.027$), suggesting that individuals with lower socio-economic status had slightly better availability of PDS items, possibly reflecting targeted provisioning. Priority cardholders (AAY, PHH, and Non-Priority State Subsidy) reported significantly higher availability compared to non-priority white cardholders, indicating that the system is catering more to the needs of lower-income households. Additionally, those residing in Corporation areas reported lower availability compared to those in Panchayats areas ($p = 0.001$), pointing to geographical disparities possibly driven by administrative inefficiencies or urban logistical challenges.

In the case of utilization of PDS (Table 5.61), the model demonstrated strong explanatory power with an R^2 of 0.547, and was highly significant ($F = 108.270$, $p < 0.001$). Here, SES did not show a statistically significant effect ($p = 0.105$), indicating that utilization may not be directly linked to socio-economic status when controlling for other variables. However, all types of priority cardholders (AAY, PHH, Non-Priority State Subsidy) were significantly more likely to utilize PDS items compared to the reference group ($p < 0.001$ for all), affirming the NFSA's focus on prioritizing the food security of vulnerable groups. Geographic location did not significantly affect utilization, implying that once access is granted, beneficiaries are likely to use the system regardless of urban or rural setting.

For accessibility (Table 5.62), the regression model was again significant ($F = 6.045$, $p < 0.001$), though with a relatively low R^2 of 0.063. SES had a significant positive influence on accessibility ($p = 0.032$), suggesting that higher socio-economic status individuals found it slightly easier to physically access PDS services. Only the Non-Priority State Subsidy cardholders showed a significant positive effect on accessibility ($p < 0.001$), while AAY and PHH cardholders did not differ significantly from the reference group. Residence in Corporation areas was associated with lower

accessibility ($p = 0.004$), reflecting potential issues related to urban congestion, administrative coordination, or distance from fair price shops.

Taken together, these findings provide empirical support for rejecting the null hypothesis, which posited no significant effect of SES, geographic location, or infrastructure on PDS outcomes. The significant relationships observed in all three regression models — especially in utilization — affirm the alternative hypothesis that these factors do in fact shape disparities in PDS service delivery. This highlights the need for regionally nuanced and demographically responsive policy interventions to ensure equitable access to essential food provisions under the NFSA framework.

5.10 Conclusion

This chapter provides an in-depth evaluation of Kerala's PDS within the framework of the National Food Security Act (NFSA), highlighting the complexities and contradictions inherent in a targeted welfare model. The transition from Kerala's historically universal PDS to the NFSA-mandated categorization into Priority (PHH) and Non-Priority (NPHH) households has reshaped access to food entitlements in profound and often inequitable ways. Drawing on a robust dataset encompassing 545 households across diverse socio-economic and geographic contexts, the analysis illuminates both the structural strengths and operational deficiencies of the system.

The socio-economic profile of the sampled households paints a dual picture: on one hand, there is evidence of moderate material comfort in terms of amenities and consumer durables; on the other, widespread financial fragility persists, marked by high indebtedness, low savings, and inconsistent income. This precariousness renders the PDS not merely a supplementary mechanism but an essential pillar of food security, particularly for AAY and PHH cardholders. While the physical infrastructure of the PDS in Kerala remains largely accessible—especially in rural Panchayats—systemic barriers such as biometric failures, shop-level inefficiencies, and discriminatory practices disproportionately affect marginalized groups, including SC/ST populations and households with elderly or disabled members.

Education emerges as a significant enabler of better access, improving households' capacity to navigate procedural challenges and advocate for entitlements. However, it cannot fully compensate for structural inefficiencies such as inconvenient shop timings, stock shortages, and supply-demand mismatches, particularly in urban Corporation areas. The importance of localized service adaptation—especially in operational timings and grievance redressal—is underscored by significant location-wise differences in user experience and satisfaction.

The construction of the PDS Accessibility Index, Utilization Score, and Availability Score provides a multi-dimensional framework to assess how different households engage with and benefit from the system. These indices reveal that while AAY and PHH cardholders demonstrate higher utilization and availability rates, they often do so under conditions of necessity rather than adequacy. White cardholders, though theoretically less vulnerable, express widespread dissatisfaction due to insufficient entitlements and logistical hurdles. The stark disparity between high usage and low satisfaction underscores a systemic misalignment between household needs and the provisioning structure.

Regression and correlation analyses further validate these trends: ration card type is the most consistent predictor of PDS utilization, while socio-economic status (SES) and geographic location significantly influence accessibility and availability. The NFSA's targeting strategy appears successful in directing resources toward the most economically disadvantaged, yet it fails to fully account for urban poverty and procedural inequities. Notably, urban residents—especially those in Corporation areas—face the most pronounced deficits in accessibility and satisfaction, despite better infrastructure and proximity on paper. In essence, while Kerala's PDS remains a vital social safety net, its effectiveness is uneven and mediated by a confluence of identity, geography, and institutional design. The system functions best where physical access aligns with responsive service delivery and is bolstered by higher levels of education and awareness. However, systemic inefficiencies, under-provisioning of key commodities, and social inequities continue to undermine its potential.

CHAPTER VI

GAPS IN PDS USE: EXCLUSION ERRORS, ACCESS, AND DIGITAL EXPERIENCES IN KERALA

India's PDS, reformed under the NFSA of 2013, was conceived as a rights-based food security system. While Kerala is historically known to have had a relatively better-implemented PDS, there remain enormous inequalities in access to and utilization of the system among various socio-economic groups. One of the most sensitive issues in the PDS errors of exclusion is addressed in this chapter, where intended beneficiary households, particularly those belonging to weaker sections, are excluded from the system or are inadequately served. These errors not only reflect failures of identification and targeting but also point to the wide issues of inequality inherent in the distribution system.

Apart from exclusion, this chapter also explores the nature and extent of access and use of PDS benefits by both priority and non-priority cardholders. Although the NFSA was meant to streamline the entitlements of priority households, early evidence suggests that portability issues, low awareness, infrastructural limitations, and technological changes such as the adoption of ePOS (electronic Point of Sale) systems have affected actual take-up and quality of the experience of the beneficiaries. Particularly, the introduction of digitized PDS services, while intended to enhance transparency and accountability, has created new types of digital exclusion, especially among the elderly, illiterates, and technologically illiterates. Moreover, this chapter investigates into intersections between the gaps in digital access and participation and food security outcomes. Through investigating use patterns, conceptions of service delivery, and portability and ePOS effects, the study seeks to give a grounded explanation of how the desired positive effects of PDS are created or averted.

6.1 Portability, Digitalization and ePOS Experience of PDS

Table 6.1 provides a comprehensive overview of respondent's awareness, usage patterns, challenges, and perceived benefits associated with the portability of the PDS

under the One Nation One Ration Card (ONORC) system in Kerala. The data reflects the level of awareness and actual engagement with the ONORC facility among both priority and non-priority cardholders. A significant majority of respondents (76.9%) reported being aware of the ONORC system, indicating relatively high awareness levels across the surveyed population. However, despite this awareness, actual usage of the portability feature remains limited. More than half of the respondents (57.8%) reported that they never use a different PDS shop to collect their entitlements, and only 5.7% use it regularly. This gap between awareness and usage suggests that while people know about the system, various barriers—be they logistical, behavioural, or systemic—may prevent them from utilizing it frequently. Among those who have used the portability option (230 respondents), only 8.3% reported facing challenges. This low percentage reflects positively on the implementation of ONORC in Kerala. Nevertheless, among the small group that encountered issues, the most commonly cited difficulty was the unavailability of certain materials (68.4%), followed by technical issues and long waiting times (15.8% each). These challenges, although not widespread, can impact the reliability and consistency of the service, potentially discouraging more frequent use. In terms of perceived ease of use, the majority of respondents either did not use the portability feature or found it relatively easy to use. Of the total sample, 21.7% rated the process as "Easy" and 7.2% as "Very Easy." Only a negligible percentage (0.2%) found it difficult, while 13.2% considered it neither easy nor difficult. This reflects a generally positive user experience among those who did engage with the system, which is encouraging for future scale-up and awareness campaigns. When asked whether they found the ONORC portability feature beneficial for their households, 61.5% responded affirmatively. This suggests that the system, when used, delivers value—particularly in enhancing convenience and food security for mobile and migrant populations. However, a notable 38.5% did not perceive a benefit, possibly due to either lack of use or minimal relevance in their specific household context. The data highlights a promising foundation for the ONORC system in Kerala, with high awareness and positive user experience among those who utilize it. Yet, the disparity between awareness and actual usage, as well as the specific challenges faced, point to the need for further interventions—such as

improving stock availability across outlets, strengthening last-mile delivery mechanisms, and raising awareness about the practical benefits—to increase adoption and maximize the system's potential.

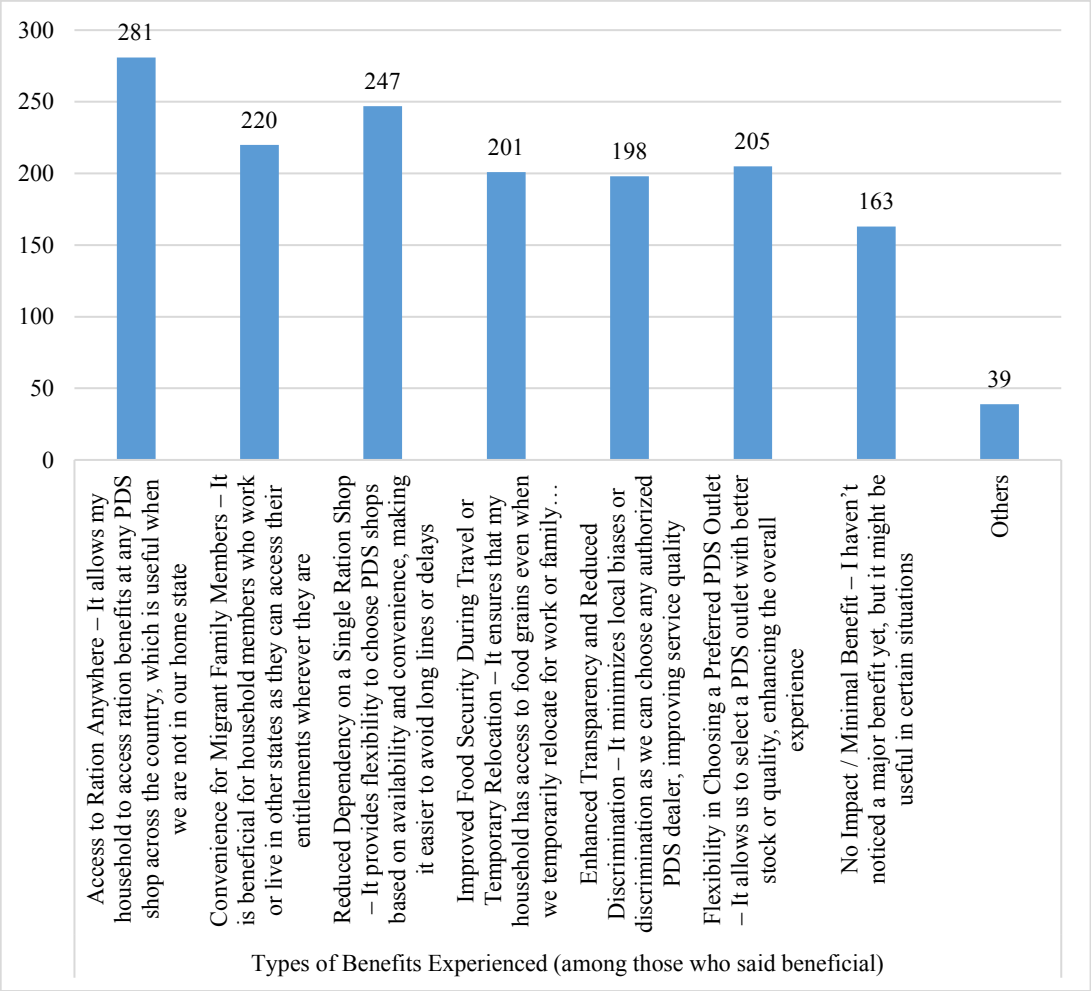
Table 6.1
Awareness, Usage, and Perceived Benefits of PDS Portability under the ONORC System in Kerala

Variable	Category	N	%
Awareness of ONORC System	Not Aware	126	23.1
	Aware	419	76.9
	Total	545	100.0
Frequency of Portability Usage	Never	315	57.8
	Occasionally	126	23.1
	Only in emergencies	73	13.4
	Regularly	31	5.7
	Total	545	100.0
Challenges in Using PDS Portability (among whose used)	No Challenges Faced	211	91.7
	Challenges Faced	19	8.3
	Total	230	100.0
Types of Challenges Experienced (among whose faced challenges)	Long waiting times	3	15.8
	Technical issues	3	15.8
	Unavailability of certain materials	13	68.4
	Total	19	100.0
Perceived Ease of Accessing Entitlements from Different Shops	Not Used	315	57.8
	Difficult	1	.2
	Neither Easy nor Difficult	72	13.2
	Easy	118	21.7
	Very Easy	39	7.2
	Total	545	100.0
Perceived Benefits of ONORC System	No	210	38.5
	Yes	335	61.5
	Total	545	100.0

Source: Primary Survey, 2025

Figure 6.1 illustrates the various types of benefits experienced by respondents who found the ONORC system beneficial. The data reflects the perceived value of portability in improving access, convenience, and service quality in the PDS, especially for mobile populations in Kerala. The most widely cited benefit, reported by 83.9% of respondents, is the ability to access ration entitlements from any PDS shop across the country. This indicates that portability is especially helpful for households that temporarily relocate or travel, ensuring continued access to food grains outside their home state. Convenience for migrant family members emerged as the second most recognized advantage, with 65.7% acknowledging its importance. This underscores the system's significance for Kerala's large migrant worker population, whose members often reside in other districts or states due to employment. Another key advantage identified by 73.7% of respondents is the reduced dependency on a single ration shop. This flexibility helps avoid queues, delays, and service inconsistencies, offering households the freedom to choose outlets that are better stocked or more efficient. Over 60% also noted improved food security during travel or temporary relocation (60.0%) and enhanced transparency or reduced discrimination (59.1%). These findings point to the ONORC system's role in strengthening equitable service delivery and offering dignity of choice. 61.2% of users highlighted flexibility in choosing a preferred PDS outlet, which may reflect growing consumer expectations around quality and service even in welfare systems. However, it is important to note that 48.7% of respondents also said the system had minimal or no noticeable benefit to them. This likely reflects the experiences of those who are either static in their residence or face barriers to accessing portability options effectively. A smaller group (11.6%) cited other benefits, suggesting room for more nuanced, individualized outcomes not captured by the listed categories.

Figure 6.1 Types of Benefits Received



Source: Primary Survey, 2025

6.1.1 Portability Usage by Type of Ration Card

Table 6.2 examines how frequently beneficiaries from different ration card categories in Kerala utilize the portability feature under the ONORC system. The data highlights key differences in usage patterns between priority and non-priority groups, offering insights into how socio-economic status and entitlement levels influence engagement with the scheme. Overall, a majority of respondents (57.8%) reported never using portability, which suggests that while awareness of ONORC may be high, regular utilization is still relatively low across the board. However, clear variations emerge across ration card types. Among Priority Households (PHH), which form the largest

category in the sample (219 respondents), 63.9% never used portability, and only 5.5% reported regular use. This indicates moderate but underutilized engagement despite their eligibility and potential need for flexible access. AAY cardholders, representing the poorest households, showed a lower non-usage rate (47.5%) and higher regular use (10.0%) compared to other groups. This suggests that AAY families may rely more on portability due to greater vulnerability and the necessity to access rations across different locations, possibly linked to migration or temporary displacement. Among Non-Priority State Subsidy (Blue card) holders, 60.8% never used portability, with minimal regular use (6.4%). A similar trend appears in NPNS (White card) users, of whom 49.7% never used portability, though this group had a relatively higher share using portability in emergencies (21.7%)—perhaps reflecting occasional disruptions in their access to the home ration shop.

The Chi-square test result ($\chi^2 = 21.459$, $p = 0.011$) indicates a statistically significant association between type of ration card and frequency of portability usage. This confirms that card type, which is closely linked to entitlement level and socio-economic status, significantly influences the likelihood of using the portability feature. In summary, AAY beneficiaries show the highest relative engagement with portability, while PHH and Non-Priority groups exhibit lower but varied usage, likely driven by perceived necessity, migration status, and local service accessibility. These findings suggest the need for targeted awareness efforts and support mechanisms to boost usage among eligible but underutilizing groups, especially within the PHH category.

Table 6.2

Frequency of Portability Usage by Type of Ration Card

Type of Ration Card		Frequency of Portability Usage				Total
		Never Used	Occasionally	Only in emergencies	Regularly	
AAY (Antyodaya Anna Yojana)/ Yellow	N	19	12	5	4	40
	%	47.5	30.0	12.5	10.0	100
NPNS/ White	N	80	39	35	7	161
	%	49.7	24.2	21.7	4.3	100
Non-Priority State Subsidy/ Blue	N	76	32	9	8	125
	%	60.8	25.6	7.2	6.4	100
PHH (Priority Household)/ Pink	N	140	43	24	12	219
	%	63.9	19.6	11.0	5.5	100
Total	N	315	126	73	31	545
	%	57.8	23.1	13.4	5.7	100
Chi-Square		21.459 (9), p= 0.011				

Note: Percent within row; Source: Primary Survey, 2025

6.1. 2 Residence locality and the usage of PDS portability under the ONORC

Table 6.3 analyses how the place of residence (Corporation, Municipality, Panchayats) influences the frequency of usage of PDS portability under the ONORC system in Kerala. The table presents both the number and percentage of respondents who reported various levels of use—never, occasionally, only in emergencies, and regularly. The findings show that urban residents in Corporations demonstrate the highest engagement with portability. Only 49.6% of them reported never using the service, which is notably lower than the corresponding figures for Municipalities (59.5%) and Panchayats (61.1%). This suggests that urban households may have better access to information and infrastructure, making it easier for them to switch between PDS outlets when necessary. Additionally, 20.3% of Corporation

respondents used portability in emergencies—a higher percentage than in rural areas. In contrast, rural Panchayats residents reported the lowest levels of regular usage (5.9%) and the highest rate of non-use (61.1%). This reflects potential barriers such as lower digital literacy, limited awareness of ONORC services, or fewer available PDS outlets with ePOS systems in remote areas. Municipality respondents fell in between, with a moderate frequency of portability use. Interestingly, their rate of regular use (6.4%) is slightly higher than that of Corporation areas, which may be influenced by migrant populations or semi-urban mobility patterns. Despite these differences, the Chi-square test result ($\chi^2 = 10.576$, $p = 0.102$) indicates that the association between place of residence and portability usage frequency is not statistically significant at the conventional 0.05 level. This suggests that while there are visible trends, they are not strong enough to confirm a meaningful association between location and usage behaviour. In summary, although urban areas exhibit higher engagement with PDS portability, the statistical evidence does not support a significant difference across residential categories.

Table 6.3
Frequency of Portability Usage by Place of Residence

Place of Residence		Frequency of Portability Usage				Total
		Never Used	Occasionally	Only in emergencies	Regularly	
Corporation	N	66	34	27	6	133
	%	49.6	25.6	20.3	4.5	100
Municipality	N	103	36	23	11	173
	%	59.5	20.8	13.3	6.4	100
Panchayats	N	146	56	23	14	239
	%	61.1	23.4	9.6	5.9	100
Total	N	315	126	73	31	545
	%	57.8	23.1	13.4	5.7	100
Chi-Square		10.576 (6), p= 0.102				

Note: Percent within row; Source: Primary Survey, 2025

6.1.3 The gender of the household head and the portability usage under the ONORC

Table 6.4 examines how the gender of the household head influences the frequency of using the portability feature of the PDS under the ONORC system in Kerala. The data show that female-headed households make up the overwhelming majority of the sample (516 out of 545), with 58.1% of them having never used the portability feature. A smaller share of female-headed households used the portability occasionally (22.5%), only in emergencies (14%), and regularly (5.4%). Among the male-headed households, which are a much smaller group (n = 29), the usage pattern shows slightly higher occasional (34.5%) and regular use (10.3%), and lower emergency-only use (3.4%), although 51.7% still reported never using it. This suggests a slightly greater tendency toward active use of portability among male-headed households. However, the Chi-Square test result ($\chi^2 = 5.336$, df = 3, p = 0.149) indicates that the association between gender of the household head and frequency of portability usage is not statistically significant at the 5% level.

Table 6.4

Frequency of Portability Usage by Gender of the Household Head

Gender of the Household Head		Frequency of Portability Usage				Total
		Never Used	Occasionally	Only in emergencies	Regularly	
Female	N	300	116	72	28	516
	%	58.1	22.5	14.0	5.4	100
Male	N	15	10	1	3	29
	%	51.7	34.5	3.4	10.3	100
Total	N	315	126	73	31	545
	%	57.8	23.1	13.4	5.7	100
Chi-Square		5.336 (3), p= 0.149				

Note: Percent within row; Source: Primary Survey, 2025

6.1.4 Higher Education and PDS portability

Table 6.5 presents the frequency of PDS portability usage in relation to the number of higher educated members in the household. The results show that households with

zero higher educated members accounted for a substantial portion of the total sample, with 55.2% reporting that they never used portability, 26% using it occasionally, 12.5% only during emergencies, and 6.3% regularly. As the number of higher educated members increases, there is no consistent upward trend in the regular use of portability. For instance, households with two educated members had a slightly higher proportion of regular use (5.6%) compared to those with one educated member (3.8%), but still below the highest figure of 14.8% observed among households with four higher educated members. Interestingly, the frequency of portability usage fluctuates without a clear linear correlation as education increases. Households with three educated members reported a relatively high proportion of emergency-only use (20.4%) but low regular use (3.7%), while those with six or seven educated members had extremely small sample sizes, making the percentages less reliable and generalizable. For example, only four households had six educated members, and just two had seven, limiting any robust interpretation from these cases. Despite some variation in the usage patterns across different education levels, the Chi-square test reveals that the association between the number of higher educated household members and portability usage is not statistically significant (Chi-square = 25.752, p = 0.216). This implies that education, while potentially linked to awareness and digital literacy, may not independently drive the decision to use portability under the ONORC system. Factors such as need, trust in the system, stability of residence, or logistical convenience likely play a more dominant role in influencing behaviour than education level alone. This data suggests that higher education within the household does not necessarily translate into greater utilization of portability features. Even among better-educated households, many continue to rely on their regular PDS shop, possibly due to habitual usage, convenience, or limited exposure to actual necessity. This finding underscores the need for policymakers to look beyond educational interventions and consider more comprehensive strategies that address perceived utility, systemic trust, and user experience to promote effective uptake of the ONORC portability system.

Table 6.5

Frequency of Portability Usage by Number of Higher Educated Members in the Household

Number of Higher Educated Members in the Household		Frequency of Portability Usage				Total
		Never Used	Occasionally	Only in emergencies	Regularly	
.00	N	106	50	24	12	192
	%	55.2	26.0	12.5	6.3	100
1.00	N	81	29	17	5	132
	%	61.4	22.0	12.9	3.8	100
2.00	N	74	28	16	7	125
	%	59.2	22.4	12.8	5.6	100
3.00	N	31	10	11	2	54
	%	57.4	18.5	20.4	3.7	100
4.00	N	16	5	2	4	27
	%	59.3	18.5	7.4	14.8	100
5.00	N	5	2	1	1	9
	%	55.6	22.2	11.1	11.1	100
6.00	N	2	2	0	0	4
	%	50.0	50.0	0.0	0.0	100
7.00	N	0	0	2	0	2
	%	0.0	0.0	100.0	0.0	100
Total	N	315	126	73	31	545
	%	57.8	23.1	13.4	5.7	100
Chi-Square		25.752 (21), p= 0.216				

Note: Percent within row; Source: Primary Survey, 2025

6.1.5 Occupation and the usage of portability usage under the ONORC

Table 6.6 explores the relationship between the primary occupation of the main earning member in a household and the frequency of portability usage under the ONORC system. Among all occupational groups, unemployed households showed the highest usage of portability features, with 28.8% using it occasionally, 17.3% only in emergencies, and 8.3% regularly. This suggests that households without stable

income may have a greater reliance on ration flexibility, likely due to increased vulnerability and the need to secure entitlements wherever possible. On the other end, government employees and professionals reported limited engagement with the system. For example, no regular usage was recorded among government employees or professionals, and 66.7% of both groups had never used portability. This may reflect less economic dependency on PDS or greater stability in their place of residence, reducing the need for portability. Self-employed and business households had relatively higher regular use at 10%, which is among the highest in the sample, indicating a certain segment within this group likely benefits from the flexibility of choosing different outlets based on business mobility or travel. Similarly, private company employees also showed moderate use with 7% reporting regular usage and 25.6% occasional usage. Interestingly, students and those in professional occupations displayed very low participation, possibly due to their limited involvement in household-level ration decisions or reduced dependence on PDS support altogether. The farming and daily wage segment, which constitutes a significant portion of the sample, revealed limited regular use at only 3.7%, despite being economically vulnerable. This may indicate either limited awareness, difficulties in accessing alternate shops, or practical barriers despite eligibility. Meanwhile, those classified under "Others" exhibited no regular use and relatively high percentages of non-use (62.3%), showing low engagement with portability. Despite the observable variations across occupational categories, the Chi-square test result ($\chi^2 = 23.317$, $p = 0.161$) indicates that the relationship between occupation and frequency of portability usage is not statistically significant. This means that although occupation may appear to influence usage patterns descriptively, it does not hold a strong predictive.

Table 6.6
Frequency of Portability Usage by
Occupation of Main Earing Members in the Household

Occupation		Frequency of Portability Usage				Total
		Never Used	Occasionally	Only in emergencies	Regularly	
Business/Self Employed	N	46	11	6	7	70
	%	65.7	15.7	8.6	10.0	100
Farmers/Daily Wage/MGNRGE	N	120	37	26	7	190
	%	63.2	19.5	13.7	3.7	100
Government Employee (other than professional occupation)	N	10	4	1	0	15
	%	66.7	26.7	6.7	0.0	100
Private Company Employee	N	24	11	5	3	43
	%	55.8	25.6	11.6	7.0	100
Professional Occupation	N	5	3	1	0	9
	%	55.6	33.3	11.1	0.0	100
Students (currently Studying)	N	6	2	0	1	9
	%	66.7	22.2	0.0	11.1	100
Unemployed	N	71	45	27	13	156
	%	45.5	28.8	17.3	8.3	100
Others	N	33	13	7	0	53
	%	62.3	24.5	13.2	0.0	100
Total	N	315	126	73	31	545
	%	57.8	23.1	13.4	5.7	100
Chi-Square		23.317 (21), p= 0.161				

Note: Percent within row; Source: Primary Survey, 2025

6.1.6 Accessibility, Utilization, and Availability of PDS and Portability Usage

Table 6.7 presents the mean scores and standard deviations for three key dimensions of the PDS—Accessibility, Utilization, and Availability—across different categories of portability usage: never, occasionally, only in emergencies, and regularly. The results are based on ANOVA tests to examine whether the differences in these mean scores are statistically significant depending on how frequently respondents used the portability feature under the ONORC system. In terms of Accessibility, respondents who never used portability reported the highest mean score (M = 0.781, SD = 0.115),

followed by regular users (M = 0.745), while occasional and emergency-only users had lower accessibility scores. The ANOVA result is statistically significant, F(3, 541) = 16.281, p = 0.000, indicating a strong difference in perceived accessibility among the different groups. Interestingly, those who never used portability perceived the system as most accessible, which could reflect their proximity or dependency on a single, convenient PDS outlet. Meanwhile, those using the system only in emergencies or occasionally may have encountered challenges that reduced their perception of accessibility. For the Utilization dimension, all groups reported similar scores with only minor variation. Regular users reported a slightly higher utilization score (M = 0.480), while those using the system only in emergencies reported the lowest (M = 0.430). However, these differences were not statistically significant (F(3, 541) = 1.565, p = 0.197), suggesting that the frequency of portability usage does not meaningfully affect how well users are able to utilize their entitlements from the PDS. When it comes to Availability, the overall ANOVA result is significant (F(3, 541) = 4.791, p = 0.003), suggesting notable differences across user groups. Those who never used portability reported the highest availability score (M = 0.611), followed by regular users (M = 0.589). On the other hand, users who accessed the system occasionally or only in emergencies reported lower mean scores. This suggests that availability issues may be more prominent for users relying on portability sporadically, perhaps due to stock inconsistencies or lack of familiarity with alternative PDS outlets. In summary, while the accessibility and availability dimensions of the PDS appear to be significantly influenced by how frequently respondents use portability, utilization does not vary significantly across usage groups. The findings suggest that while regular use may somewhat improve perceptions of availability and utilization, the highest perceived accessibility and availability is still among those who consistently rely on a single PDS shop, potentially highlighting persistent logistical or informational gaps in portable access.

Table 6.7
Differences in Perceived Accessibility, Utilization, and Availability of PDS across Portability Usage Frequencies

PDS Dimensions		N	Mean	Std. Deviation	ANOVA
Accessibility Score	Never	315	.781	.115	F (3,541)= 16.281, p=0.000
	Occasionally	126	.699	.178	
	Only in emergencies	73	.679	.170	
	Regularly	31	.745	.165	
	Total	545	.746	.149	
Utilization Score	Never	315	.471	.152	F (3,541)= 1.565, p=0.197
	Occasionally	126	.457	.160	
	Only in emergencies	73	.430	.171	
	Regularly	31	.480	.135	
	Total	545	.462	.156	
Availability Score	Never	315	.611	.145	F (3,541)= 4.791, p=0.003
	Occasionally	126	.571	.173	
	Only in emergencies	73	.543	.162	
	Regularly	31	.589	.163	
	Total	545	.591	.157	

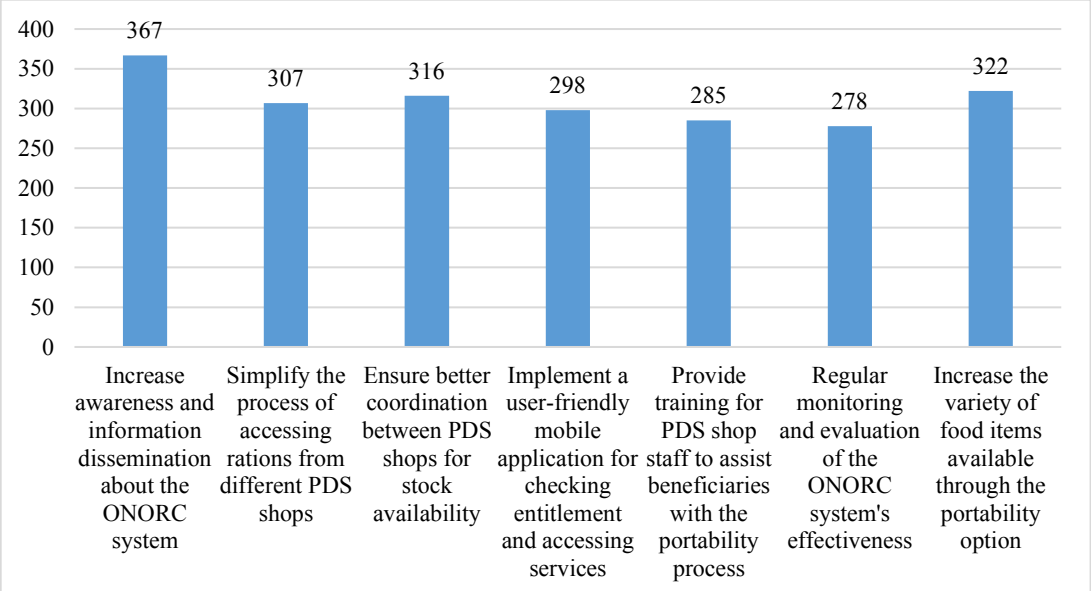
Source: Primary Survey, 2025

6.1.7 Enhancing the Portability of PDS Services under the ONORC System: Suggestions

Figure 6.2 presents the suggested improvements proposed by respondents to enhance the effectiveness and user experience of the PDS under the One Nation One Ration Card (ONORC) scheme in Kerala. A significant majority of respondents (67.34%) emphasized the need to increase awareness and dissemination of information about the ONORC system. This suggests that despite fairly high awareness levels (as indicated in previous data), there is still a perceived gap in communication, especially regarding practical aspects and benefits of the system. The second most recommended measure, supported by 59.08% of respondents, is to increase the variety of food items available through portability. This highlights a concern that while access may be technically possible across locations, the limited range of items discourages more

frequent or regular use. Similarly, ensuring better coordination between PDS shops for stock availability (57.98%) is a clear call for improving the backend logistics of the ONORC framework to prevent service disruptions or shortages. Over half of the participants (56.33%) suggested simplifying the portability process, indicating that bureaucratic or procedural complexity remains a barrier. Linked to this is the recommendation by 54.68% to implement a user-friendly mobile application for checking entitlements and accessing services, pointing to a demand for greater technological integration that empowers beneficiaries directly. The need for training PDS shop staff was also noted by 52.29% of respondents, emphasizing the importance of human interaction in the system's efficiency. Lastly, regular monitoring and evaluation of the ONORC system's performance was highlighted by 51.01% of participants, suggesting that beneficiaries want to see greater accountability and responsiveness in policy implementation.

Figure 6.2 Suggested Improvements to Enhance the Portability of PDS Services under the ONORC System (Frequency of Response)



Source: Primary Survey, 2025

6.2 Computerized/ePOS PDS Services: Beneficiary Experience

Table 6.8 highlights the beneficiary's experiences with the computerized and ePOS (electronic Point of Sale) features integrated into Kerala's PDS. The data indicates a

generally high level of satisfaction and engagement with the digital services associated with ration distribution. An overwhelming 84.59% of respondents confirmed that they receive timely updates about their PDS entitlements through SMS or messages, reflecting a well-functioning communication channel that helps in keeping beneficiaries informed about their rights and allocations. Moreover, 83.30% of respondents agreed that the information conveyed via messages is clear and easy to understand, suggesting effective content design and language use in these messages. Furthermore, 80.18% noted that the messages adequately inform them about ration distribution schedules, which is critical for planning and ensuring timely collection of entitlements—especially in households with limited mobility or tight work schedules. On the transaction side, 84.22% of beneficiaries reported receiving an ePOS-generated bill or receipt after making purchases at the ration shop. This not only improves transparency but also offers tangible proof of transaction, enhancing user confidence. Additionally, 84.77% of respondents stated that the bills clearly itemize the products and their respective costs, reinforcing the perception of accountability and reducing chances of malpractice or overcharging.

Table 6.8
Experience with Computerized/ePOS PDS Services

Experience	N	%
Receive timely updates about my PDS entitlements through SMS or messages	461	84.59
Information receive via messages regarding PDS is clear and easy to understand	454	83.30
The messages you receive adequately inform me of the schedules for ration distribution.	437	80.18
Receive a bill or receipt (epos bill) after purchasing items from the PDS	459	84.22
The bills received clearly itemize the products purchased and their costs.	462	84.77

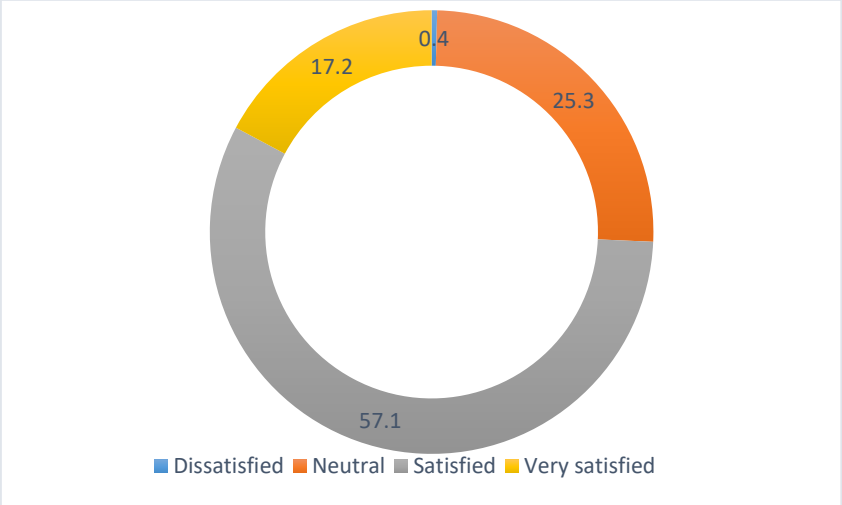
Source: Primary Survey, 2025

6.2.1 Satisfaction of Computerized/ePOS PDS Services

Figure 6.3 presents the levels of satisfaction expressed by respondents regarding the computerized and ePOS-enabled PDS services in Kerala. The results indicate a

generally high degree of satisfaction among users, reinforcing the effectiveness of digital integration in public distribution. Out of a total of 545 respondents, 311 individuals (57.1%) reported being "satisfied" with the computerized/ePOS system, which is the most frequently selected response. Additionally, 94 respondents (17.2%) indicated that they were "very satisfied," suggesting a substantial portion of the population holds a strongly positive perception of the system. In contrast, 138 respondents (25.3%) remained "neutral," which may indicate either indifference or mixed experiences with the digital services, pointing to a potential area for further improvement in user engagement or education. A very small number, just 2 respondents (0.4%), expressed being "dissatisfied" with the computerized services, highlighting that negative experiences are extremely rare among the sample. Overall, the data shows that nearly three-quarters of the respondents (74.3%) are either satisfied or very satisfied, illustrating a broad approval of the ePOS infrastructure. This suggests that the digital reforms under the ONORC system have been largely successful in enhancing transparency, accountability, and user convenience within the PDS framework in Kerala.

Figure 6.3 Rate of Satisfaction with Computerized/ePOS PDS Services



Source: Primary Survey, 2025

6.2.2 Challenges During Computerization in PDS

Table 6.9 outlines the various challenges experienced by beneficiaries due to the computerization of the PDS in Kerala. While digitalization has brought notable improvements, a significant proportion of respondents continue to face barriers that affect their access to entitlements. The most commonly reported challenge was technical issues, such as system downtime or errors, with 335 respondents (61.47%) indicating this problem. This suggests that despite modernization, infrastructural weaknesses persist, especially in ensuring consistent and reliable digital service delivery. Another major issue identified was network connectivity problems, reported by 314 respondents (57.61%). This reflects the limitations in internet infrastructure, particularly in rural or remote areas, which can hinder real-time access to digital PDS services. These connectivity issues directly impact the efficiency of ePOS machines and real-time data transmission, delaying or obstructing access to rations. Furthermore, 130 respondents (23.85%) reported a lack of understanding of the digital process, indicating a digital literacy gap among beneficiaries. This issue is more likely to affect elderly users or those with limited formal education. In addition, 87 individuals (15.96%) mentioned that assistance was not available when needed, which highlights the need for more frontline support at ration shops to guide users through the computerized system. Although less frequent, language barriers were cited by 52 respondents (9.54%), which may reflect the interface or communication of digital tools not being localized or accessible in languages comfortable for all users. Lastly, 20 respondents (3.67%) mentioned other unspecified challenges, pointing to additional contextual factors that may need further qualitative exploration. Together, the data shows that while the move toward digital PDS is largely appreciated, substantial technical and user-related issues remain. These findings emphasize the importance of investing not only in strong technology infrastructure but also in user training, multilingual interfaces, and ongoing on-ground assistance to ensure inclusive access to entitlements.

Table 6.9
Challenges faced due to Computerization in PDS

Challenges	N	%
Technical issues (e.g., system downtime, errors)	335	61.47
Lack of understanding of the digital process	130	23.85
Network connectivity problems	314	57.61
Language barrier	52	9.54
Assistance not available	87	15.96
Other	20	3.67

Source: Primary Survey, 2025

6.2.3 Perceptions on Efficiency and Impact of Computerization

Table 6.10 presents respondents' perceptions of the efficiency and impact of computerization and the use of electronic Point of Sale (ePoS) systems in Kerala's PDS. The overall mean score across all statements is 3.69 with a standard deviation of 0.722, indicating a general agreement with the positive impacts of digital interventions in PDS. The high Cronbach's Alpha value (0.964) reflects excellent internal consistency, suggesting that the items reliably measure the underlying construct of perceived effectiveness. Among the highest-rated statements, "The computerization of the PDS system has made ration distribution more efficient" received a mean of 3.89, indicating strong agreement from beneficiaries. Similarly, respondents affirmed that ePoS has improved transparency (mean = 3.83) and reduced fraudulent practices (mean = 3.78). These findings highlight the perceived success of digitization in enhancing accountability and operational integrity. Respondents also acknowledged improvements in fairness and convenience: "The ePoS system provides a fairer and more accessible experience" (mean = 3.70) and "Computerization in PDS has brought positive changes" (mean = 3.70) both scored highly. Additionally, the belief that the ePoS system reduces the need for manual paperwork (mean = 3.70) and enhances service quality (mean = 3.69)** indicates that operational burdens on staff and beneficiaries alike may have eased. While the general sentiment is positive, certain areas show relatively lower agreement. For example, technical and connectivity issues were flagged, with "Technical issues occur

frequently" (mean = 3.44) and "Connectivity issues negatively impact effectiveness" (mean = 3.52). These suggest that while digital reforms have largely succeeded, infrastructural gaps still challenge full optimization of the system. The statement about training for PDS staff (mean = 3.65), though positively rated, also hints at room for improvement to ensure sustained user support and smooth functioning of ePoS operations. Moreover, biometric authentication was deemed fairly reliable (mean = 3.66), which reinforces trust in the system's identity verification process. The findings illustrate a predominantly positive perception of the computerized and ePoS-enabled PDS among beneficiaries. Respondents view the system as efficient, transparent, and more equitable, though lingering challenges such as technical faults and network disruptions must be addressed to maximize the benefits of digital governance in food security delivery.

Table 6.10
Perceptions on Efficiency and Impact of Computerization and ePoS in PDS

Statements	Mean	SD
The computerization of the PDS system has made ration distribution more efficient.	3.89	.940
The ePoS system has improved transparency in tracking the distribution of food grains.	3.83	.888
Using the ePoS system has significantly reduced the risk of fraudulent practices in PDS.	3.78	.921
The introduction of ePoS has helped reduce errors in ration allocation and distribution.	3.73	.919
I believe that ePoS technology has enhanced the overall accountability of PDS operations.	3.74	.913
The ePoS system has simplified the process of verifying beneficiaries' identities.	3.73	.960
Since the implementation of ePoS, I feel more confident that I am receiving the correct amount of ration.	3.73	.938
The ePoS system has reduced waiting times at the PDS shop.	3.59	.989
Technical issues with the ePoS system (e.g., connectivity, device malfunctions) occur frequently.	3.44	.980
Biometric authentication (e.g., fingerprint scanning) in the ePoS system is reliable and accurate.	3.66	.973
The ePoS system provides a fairer and more accessible experience for all beneficiaries.	3.70	.908

End-to-end computerization has made it easier to monitor and manage stock levels at PDS shops.	3.64	.907
The use of ePoS in PDS has minimized the need for manual record-keeping and paperwork.	3.70	.921
I believe that the ePoS system has helped in reducing the leakage and diversion of food grains.	3.65	.913
The ePoS system has improved the quality of service provided by the PDS shop staff.	3.69	.883
Training provided to PDS shop operators for using the ePoS system is sufficient and effective.	3.65	.930
Connectivity issues (e.g., internet or network) have not negatively impacted the effectiveness of the ePoS system.	3.52	.970
Computerization and ePoS have made the PDS more convenient and user-friendly for beneficiaries.	3.66	.942
I feel that computerization in PDS has brought about positive changes in the overall system.	3.70	.949
I am satisfied with the performance of the ePoS system in the PDS shop I use.	3.70	.959
Overall	3.69	.722
Cronbach's Alpha=0.964		

Note: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree; Source: Primary Survey, 2025

6.2.4 Perceptions on Efficiency and Impact of Computerization and ePoS in PDS by Type of Ration Card and Place of Residence

Table 6.11 presents the overall average perceptions of beneficiaries on the efficiency and impact of computerization and the use of ePoS systems in the PDS, analyzed by type of ration card and place of residence. The findings indicate that perceptions are generally positive across all groups, with only minor variations in the mean scores, and none of the differences are statistically significant based on ANOVA results. When grouped by type of ration card, beneficiaries holding NPNS (White) and PHH (Pink) cards report the highest average score of 3.71, suggesting a slightly more favourable view of computerization and ePoS impacts. In contrast, Non-Priority State Subsidy (Blue) cardholders report the lowest average at 3.63, though the difference is marginal. AAY cardholders, who are among the most vulnerable groups, have an average score of 3.69, closely aligning with the total population average. The ANOVA

result, F(3,541) = 0.359, p = 0.783, confirms that the differences in perceptions across card types are not statistically significant, implying relatively uniform experiences and satisfaction levels with digitized PDS services among all ration card groups. Similarly, perceptions analyzed by place of residence—Corporation, Municipality, and Panchayats—show minimal variation. Residents in Municipal areas report the highest mean perception score of 3.74, followed by those in Panchayats (3.67) and Corporations (3.65). The slightly more positive perception in municipalities could reflect relatively better infrastructure or digital literacy levels. However, the ANOVA test result, F(2,542) = 0.766, p = 0.465, again indicates that these differences are not statistically significant. In summary, the data reflects a broad and consistent level of satisfaction with the computerization and ePoS-enabled reforms in Kerala's PDS across both socio-economic (ration card) and geographic (residence) categories. The absence of significant differences implies that the benefits of digitization have been equitably distributed among various beneficiary groups, though localized improvements and outreach could still help optimize the system further.

Table 6.11
Overall Average Perceptions on Efficiency and Impact of Computerization and ePoS in PDS by Type of Ration Crad and Place of Residence

		N	Overall Average	SD	Std. Error	ANOVA
Type of Ration Card	AAY (Antyodaya Anna Yojana)/ Yellow	40	3.69	0.92	0.15	F (3,541)= 0.359, p= 0.783
	NPNS/ White	161	3.71	0.69	0.05	
	Non-Priority State Subsidy/ Blue	125	3.63	0.72	0.06	
	PHH (Priority Household)/ Pink	219	3.71	0.70	0.05	
	Total	545	3.69	0.72	0.03	
Place of Residence	Corporation	133	3.65	0.61	0.05	F (2,542)= 0.766, p= 0.465
	Municipality	173	3.74	0.68	0.05	
	Panchayats	239	3.67	0.80	0.05	
	Total	545	3.69	0.72	0.03	

Source: Primary Survey, 2025

6.3 Exclusion Errors in PDS in Kerala

Exclusion error in the PDS refers to the phenomenon where eligible beneficiaries are either unintentionally left out of welfare schemes or unable to access the intended benefits. This undermines the core objective of social protection programs such as the National Food Security Act (NFSA), 2013, which seeks to ensure food and nutritional security for the most vulnerable sections of society. Exclusion errors can be broadly classified into two types: (1) exclusion of eligible households, where genuinely poor or entitled families do not receive benefits, and (2) inclusion of ineligible households, where relatively well-off or non-entitled individuals are wrongly included in the beneficiary list (Drèze & Khera, 2013; Kundu & Sinha, 2020).

Among the two, exclusion of the eligible is considered more serious, as it directly affects the welfare of the poor and can exacerbate poverty and food insecurity. Several studies have shown that despite reforms like Aadhar-linked biometric authentication and the introduction of ePoS devices, exclusion persists due to issues such as documentation problems, biometric mismatches, or technological glitches (Ramaswami et al., 2019). Additionally, there are administrative challenges in updating beneficiary lists and categorizing households under the correct priority group.

The extent of exclusion varies between priority households (PHH) and non-priority households (NPHH). While PHH are supposed to be covered under NFSA entitlements, several eligible families have either been misclassified as NPHH or excluded due to outdated socio-economic data or rigid identification criteria. In contrast, inclusion errors are more prevalent among NPHH, where relatively better-off households may continue receiving subsidized rations (Kattumuri & Karthik, 2018). A study by Himanshu and Sen (2021) noted that exclusion rates could be as high as 20% among the poorest deciles, especially in states with weaker targeting mechanisms.

The socio-economic and demographic profile of excluded households typically includes landless labourers, scheduled castes and tribes, female-headed households, persons with disabilities, and those living in remote or marginalized areas. These

groups often face multiple barriers in accessing welfare schemes, such as lack of awareness, poor digital literacy, or discrimination. Women-headed households, for instance, may lack necessary documentation or face difficulties navigating male-dominated administrative systems, contributing to their exclusion (Aggarwal, 2016; Jain, 2020). Moreover, migrant households frequently get excluded due to rigid domicile-based ration card systems, although reforms like the One Nation One Ration Card (ONORC) aim to address this gap.

6.3.1 Utilization of PDS Services by Type of Ration Card

Table 6.12 presents the utilization patterns of PDS services across different types of ration cardholders, highlighting the near-universal reach of the system among surveyed households. Among the AAY or yellow cardholders, 97.5% (39 out of 40 households) reported utilizing PDS services, with only 2.5% not doing so. This high level of usage underscores the system's effectiveness in reaching the most vulnerable groups who are eligible for maximum food security benefits under the NFSA. Interestingly, 100% of the Non-Priority State Subsidy (Blue) and Priority Household (PHH/Pink) cardholders reported using PDS services, indicating complete coverage within these categories. The NPNS (White) card group also exhibited very high utilization, with 99.4% (160 out of 161) of households using the services, and only 0.6% not doing so. Overall, out of the total 545 households surveyed, 543 (99.6%) reported using PDS services, while only 2 (0.4%) had not utilized them. These findings suggest minimal exclusion in terms of service utilization, particularly among both the priority and non-priority groups. It demonstrates the strong implementation of the PDS under the ONORC framework, possibly due to widespread coverage, streamlined digital systems like ePoS, and enhanced awareness.

Table 6.12
Utilization of PDS Services by Type of Ration Card

Type of Ration Card		Utilization Status		Total
		Not Used	Used	
AAY (Antyodaya Anna Yojana)/ Yellow	N	1	39	40
	%	2.5	97.5	100.0
NPNS/ White	N	1	160	161
	%	0.6	99.4	100.0
Non-Priority State Subsidy/ Blue	N	0	125	125
	%	0.0	100.0	100.0
PHH (Priority Household)/ Pink	N	0	219	219
	%	0.0	100.0	100.0
Total	N	2	543	545
	%	0.4	99.6	100.0

Source: Primary Survey, 2025

6.3.2 Inclusion and Exclusion Error of AAY

In the implementation of targeted food security programs such as the AAY under the PDS, ensuring that benefits reach the most vulnerable sections of society is critical. However, operational challenges often result in two primary types of errors: inclusion error and exclusion error. These errors directly affect the efficiency, equity, and credibility of the food security system.

Inclusion error refers to the presence of ineligible households among AAY beneficiaries—those who do not meet any of the established eligibility criteria but still possess AAY ration cards. Conversely, exclusion error indicates the omission of eligible households—those who satisfy one or more inclusion criteria but are not part of the AAY beneficiary list. According to the official guidelines, the eligibility criteria for AAY differ across rural and urban areas but are generally centered on indicators of socio-economic vulnerability. In rural areas, households that are homeless, destitute, landless, headed by minors or widows, or dependent on manual labour are considered eligible. Similarly, in urban areas, residential vulnerability (e.g. house-lessness, *kutcha* housing), occupational vulnerability (e.g., irregular wages, sanitation workers), and social vulnerability (e.g., households headed by women or the disabled)

are key determinants. Inclusion errors occur when AAY cards are issued to households that do not exhibit any of these conditions. For instance, a household with multiple earning members in stable, formal-sector employment or possessing durable housing and landholding should not qualify under AAY. Yet, due to administrative errors, political pressure, or outdated data, such households might be included in the beneficiary list. This not only diverts resources from the truly needy but also undermines public trust in the targeting mechanism.

Exclusion errors, on the other hand, represent a more severe policy concern. These occur when households that clearly fall within the eligibility framework—such as landless labourers, houseless families, or those headed by single elderly women—are left out of the AAY coverage. Such exclusion can result from poor identification processes, lack of awareness among beneficiaries, bureaucratic inefficiencies, or documentation gaps. The impact of exclusion is particularly grave, as it denies essential food entitlements to those who are already at the margins of subsistence. Analysing inclusion and exclusion errors requires a rigorous comparison between the households' profiles and the official eligibility parameters. For example, in a household survey, researchers must identify which respondents meet the inclusion criteria based on their housing conditions, occupation, age structure, educational background, and income sources. Subsequently, they can determine whether these households are holding an AAY card (to identify inclusion error) or not (to measure exclusion error). Ultimately, minimizing these errors is vital for the success of targeted welfare schemes. It calls for improved data systems, periodic verification, transparent beneficiary selection, and effective grievance redressal mechanisms. Only then, the AAY truly serve its intended purpose of reaching the poorest of the poor in both rural and urban India.

6.3.3 Eligibility Criteria for A.A.Y. Inclusion

The inclusion parameters for Rural areas are:

1. Homeless Households and Households without shelter
2. Destitute Households which are dependent predominantly on alms for survival

3. Manual Scavengers
4. Legally released bonded labourers
5. Households with only one room, Kucha walls and Kucha roof
6. All household headed by Minor
7. All Households with no adult member between age 15 and 59 including all households headed by a person of 60 years of age or more with no assured means of subsistence or-social support
8. Household headed by disabled member and with no able bodied adult member
9. Landless households deriving a major part of their income from manual casual labour
10. Any member of the household who is a bonded labourer
11. All household headed by a widow or a single woman
12. Households with no literate adult above 25 years

The inclusion parameters for urban areas are:

1. Residential Vulnerability

1. If the household is 'houseless' [Households who do not live in buildings or census houses (Structure with roof) but live in the open on roadside, pavements, in hume pipes, under fly-overs and staircases, or in the open in places of worship, *mandals*, railway platforms, etc. are treated as Houseless households (The Census of India, 2001).]

2. If the household has a house of roof and wall made of plastic/polythene.

3. If the household has a house of only one room or less with the material of wall being grass, thatch, bamboo, mud, un-burnt brick or wood and the material of roof being grass, thatch, bamboo, wood or mud.

2. Occupational Vulnerability

1. If the household has no income from any source, then that household will be automatically included.

2. Any household member (including children) who is engaged in a vulnerable occupation like beggar/rag picker, domestic worker (who are actually paid wages) and sweeper/sanitation worker/*mali*) should be automatically included.

3. If all earning adult members in a household are daily wagers or irregular wagers, then that household should be automatically included.

3. Social Vulnerability

1. Child-headed household i.e. if there is no member of the household aged 18 years and above.

2. If all earning adult members in a household are either disabled, chronically ill or aged more than 65 years then that household should be automatically included.

3. Single women (including widows, unmarried and separated and deserted women), living in household as dependent or as head of household.

4. Households with no literate adult above 25 years.

Exclusion Error for AAY = (No. of eligible households without AAY card) / (Total number of households eligible for AAY based on criteria) *100

Inclusion Error for AAY = (No. of ineligible households with AAY card) / (Total number of AAY Card Holder) *100

6.3.4 Exclusion Error for AAY

Table 6.13 presents the exclusion error for the AAY scheme, disaggregated by place of residence. The exclusion error refers to the proportion of households that meet the official eligibility criteria for AAY but do not actually possess an AAY ration card. According to the data, in rural areas (Panchayats), a total of 21 households were found to be eligible for AAY based on the defined vulnerability parameters. However, out of these, only 14 households had received the AAY card, leaving 7 eligible households

excluded. This results in an exclusion error of 33 percent for rural areas. In urban areas, which include municipalities and corporations, 26 households met the eligibility requirements for AAY. Of these, 8 households were not included in the scheme, resulting in an exclusion error of 31 percent. When the data from both rural and urban areas are combined, it is observed that a total of 47 households qualify for AAY benefits, but 15 of them have been left out of the system. This translates to an overall exclusion error of 32 percent. The figures indicate a significant gap between policy intent and implementation. A large proportion of the poorest and most vulnerable households, who should have been covered under the AAY scheme, are not receiving the benefits they are entitled to. The exclusion is particularly pronounced in urban areas, where systemic inefficiencies in identification and outreach might be more acute. Such high levels of exclusion suggest the need for improved targeting mechanisms, updated beneficiary databases, and proactive efforts to identify and include eligible households. Without addressing these issues, the core objective of AAY—to ensure food security for the most marginalized—remains unfulfilled.

Table 6.13

Exclusion Error for AAY

Place of Residence	No. of eligible households without AAY card	Total number of households eligible for AAY based on criteria	Exclusion Error for AAY
Rural (Panchayats)	7	21	33
Urban (Municipality or Corporation)	8	26	31
Total	15	47	32

Source: Primary Survey, 2025

6.3.5 Inclusion Error for AAY

Table 6.14 illustrates the inclusion error associated with the AAY scheme, categorized by place of residence. Inclusion error refers to the proportion of households that possess an AAY card despite not fulfilling the official eligibility criteria established for the scheme. In rural areas (Panchayats), among the 17 households holding AAY cards, 12 were found to be ineligible based on the defined socio-economic and demographic parameters. This results in an inclusion error of 29 percent, indicating that a significant share of benefits intended for the poorest are being availed by those who do not qualify. In urban areas, including municipalities and corporations, the extent of the inclusion error is even more severe. Out of 23 AAY cardholders identified in these areas, 8 households were found to be ineligible, leading to a high inclusion error rate of 35 percent. When both rural and urban figures are combined, the total number of AAY cardholders is 40, of which 13 households are ineligible. This brings the overall inclusion error for AAY to 33 percent. These findings highlight serious lapses in the targeting accuracy of the AAY scheme. The presence of a large number of ineligible households within the AAY beneficiary list undermines the program's intended focus on the most vulnerable segments of the population. This misallocation of resources not only dilutes the impact of the scheme but also contributes to the exclusion of genuinely eligible households. The data thus underscores the urgent need for rigorous beneficiary identification and verification processes, as well as regular audits and data validation exercises to ensure that the benefits of AAY reach the right households.

Table 6.14
Inclusion Error for AAY

Place of Residence	No. of ineligible households AAY card	Total number of AAY Card Holder	Inclusion Error for AAY
Rural (Panchayth)	5	17	29
Urban (Municipality or Corporation)	8	23	35
Total	13	40	33

Source: Primary Survey, 2025

6.3.6 Inclusion and Exclusion Error of PHH (Priority Households)

Inclusion and exclusion errors are critical indicators of the effectiveness and precision of beneficiary targeting under welfare schemes like the National Food Security Act (NFSA), 2013. Specifically, in the context of Priority Households (PHH), inclusion error refers to the share of ineligible households that have been wrongly included as PHH beneficiaries, while exclusion error denotes the proportion of eligible households that have been left out of the scheme.

The eligibility and exclusion parameters for PHH vary across rural and urban areas. In urban areas, households possessing high-value assets such as four-wheeler vehicles, air conditioning units, or computers with internet are deemed ineligible. Similarly, if a household possesses three of the following assets—refrigerator, landline telephone, washing machine, or two-wheeler—it is excluded. Households with four or more well-constructed rooms or with any government employee as a member are also automatically excluded.

In rural areas, the criteria are slightly different but equally stringent. Households are excluded if they own more than three pucca rooms, run registered non-agricultural enterprises, have members earning above ₹10,000 per month, or pay income or professional tax. Ownership of mechanized farming equipment, fishing boats, multiple vehicles, high-value landholdings, or even certain consumer durables like refrigerators and landlines also disqualifies them. Additionally, any household owning 2.5 acres or more of irrigated land or 7.5 acres of any land with irrigation equipment is also excluded from being classified as a PHH.

Inclusion error in PHH arises when households that meet any of these exclusion criteria still receive PHH ration cards, thereby consuming subsidized food grains meant for the economically vulnerable. This misallocation strains the system and reduces the availability of resources for truly deserving households. On the other hand, exclusion error occurs when households that do not meet any exclusion criteria—thus qualifying for PHH status—are left out of the beneficiary list. These errors can result from poor survey methods, lack of awareness, bureaucratic inefficiencies, or outdated data, depriving eligible families of food security benefits.

6.3.7 Exclusion Parameters to identify the Priority Households under National Food Security Act 2013:

The exclusion parameters for urban areas are:

- If the number of dwelling rooms exclusively in possession of household in 4 and above (dwelling rooms with wall of concrete or burnt bricks or stone packed with mortar, roof of concrete or burnt bricks or machine made tiles), that household will be excluded.
- Households possessing any one of the following assets will be excluded:
    - 4-wheeler motorized vehicle
    - A.C. set
    - Computer/laptop with internet
- Households possessing any 3 of the following assets will be excluded:
    - Refrigerator
    - Telephone (landline)
    - Washing machine
    - 2-wheeler motorized vehicle
- Apart from the parameters defined by the Hashim Committee, Government has also excluded any household with any member as Government employee to fall under National Food Security Act 2013.

The exclusion parameters for rural areas are as below:

A household with any of the following will be excluded automatically:

- Three or more rooms with all rooms having pucca walls and roof
- Households with non-agricultural enterprises registered with the Government
- Household with any member as Government employee
- Any member of the family earning more than Rs. 10,000 per month
- Paying income tax

- Paying professional tax
- Two/three/four wheeler or fishing boat
- Mechanised three/four wheeler agricultural equipment
- Kisan Credit Card with credit limit of Rs. 50,000 and above
- Own a refrigerator
- Own a landline phone
- Own 2.5 acres or more of irrigated land with at least 1 irrigation equipment
- 5 acres or more irrigated land for two or more crop seasons
- Owning at least 7.5 acres of land or more with at least one irrigation equipment

Exclusion Error for PHH= (No. of eligible households without PHH card) / (Total number of households eligible for PHH based on criteria) *100

Inclusion Error for PHH = (No. of ineligible households PHH card) / (Total number of PHH Card Holder) *100

6.3.8 Exclusion Error for PHH

Table 6.15 presents the Exclusion Error for Priority Households (PHH) under the National Food Security Act (NFSA), specifically excluding those who already possess AAY (Antyodaya Anna Yojana) cards. The exclusion error is calculated as the percentage of households that are eligible for PHH benefits based on defined socio-economic criteria but do not possess a PHH ration card. In rural areas (Panchayats), out of 104 households identified as eligible for PHH, 24 households did not have a PHH card, resulting in an exclusion error of 23%. Similarly, in urban areas (Municipality or Corporation), 29 out of 123 eligible households were excluded, leading to a nearly identical exclusion error of 24%. The combined exclusion error across both rural and urban regions is 23%, indicating that almost one-third of the deserving PHH-eligible households are not receiving benefits under this category. This level of exclusion is significant and highlights a key implementation challenge within the PDS framework—namely, that despite meeting the eligibility criteria, many vulnerable households remain unrecognized or improperly classified during the

identification and ration card issuance process. Such exclusion undermines the intent of NFSA to ensure food security for economically and socially disadvantaged groups, and it calls for more accurate targeting mechanisms, periodic reviews, and strong grievance redressal systems to minimize such errors in future..

Table 6.15

Exclusion Error for PHH

Place of Residence	No. of eligible households without PHH card	Total number of households eligible for PHH based on criteria	Exclusion Error for PHH
Rural (Panchayth)	24	104	23
Urban (Municipality or Corporation)	29	123	24
Total	53	227	23

Note: Excluding AAY Card Holders; Source: Primary Survey, 2025

Table 6.16 shows the inclusion error, which measures the proportion of ineligible households that were wrongly issued PHH cards. The data reveals a serious concern in rural areas, where 31 out of 96 PHH cardholders were actually ineligible, resulting in an alarming inclusion error of 32%. In urban areas, 26 out of 123 PHH cardholders were found to be ineligible, yielding an inclusion error of 21%. Collectively, the inclusion error across all regions stands at 26%, pointing to significant flaws in the targeting mechanism. This means a large number of undeserving households are availing subsidized benefits intended for economically vulnerable sections, which not only undermines the objective of the scheme but also diverts essential resources away from the genuinely needy. The combination of a high exclusion rate in rural areas and a high inclusion rate across both rural and urban areas underscores the pressing need for revisiting and refining the beneficiary identification process. This could be addressed by improving the quality of socio-economic data collection, ensuring regular updates to the beneficiary list, enhancing transparency, and leveraging technology like Aadhaar and ePoS systems to eliminate manual errors. Without

corrective action, these errors threaten the equity and efficiency of the food security system envisioned under the NFSA.

Table 6.16
Inclusion Error for PHH

Place of Residence	No. of ineligible households with PHH card	Total number of PHH Card Holder	Inclusion Error for PHH
Rural (Panchayth)	31	96	32
Urban (Municipality or Corporation)	26	123	21
Total	57	219	26

Source: Primary Survey, 2025

Table 6.17 presents a detailed account of the number of households currently holding NPNS (White) and Non-Priority State Subsidy (Blue) ration cards who are, based on eligibility criteria, actually qualified for the more subsidized AAY and Priority Household (PHH) categories. The data highlights the extent of misclassification or targeting inefficiencies within the PDS. Among white card holders, 15 households were found eligible for AAY, with a slightly higher number in urban areas (9) compared to rural areas (6). Similarly, among blue card holders, 15 households were also identified as eligible for AAY, with the majority coming from rural areas (11). This indicates a significant level of under coverage among those most in need, as these households qualify for the highest level of PDS support but are currently categorized under non-priority groups. When examining eligibility for PHH, a total of 17 households from the white and blue cardholder groups were found eligible—9 from white card holders and 8 from blue. A noteworthy observation is the skew toward urban households, particularly among white card holders, where 8 out of 9 eligible households are from urban areas. This could point to urban vulnerabilities being underrepresented in PHH allocations. Overall, the table underlines a substantial inclusion error in non-priority categories and the simultaneous exclusion of deserving households from receiving appropriate entitlements. Such misclassifications reduce the efficiency and equity of the PDS, suggesting the need for regular verification and

dynamic updating of beneficiary lists to ensure that vulnerable households are not overlooked.

Table 6.17
Number of Households Eligible for AAY and PHH among NPSS and NPNS(White and Blue) Ration Card Holders

Eligibility	Place	Type of Ration Card Holders	
		NPNS/ White	Non-Priority State Subsidy/ Blue
Eligible for AAY	Rural	6	11
	Urban	9	4
	Total	15	15
Eligible for PHH	Rural	1	2
	Urban	8	6
	Total	9	8

Note: Total Number of NPNS/ White Holders = 161, Total Number of Non-Priority State Subsidy/ Blue Holders= 125 Source: Primary Survey, 2025

Table 6.18 presents an in-depth analysis of beneficiaries' perspectives regarding exclusion errors in the PDS, using a series of attitudinal statements measured on a Likert scale. The high Cronbach's Alpha value of 0.905 indicates strong internal consistency and reliability among the items included in the survey, suggesting that respondents' perceptions are coherent across various dimensions of exclusion. In the awareness of eligibility criteria, the mean scores—ranging from 3.66 to 3.72—suggest that respondents generally agree they have adequate information and confidence in understanding their PDS eligibility. The highest mean (3.72) under this category reflects a relatively strong sense of self-awareness regarding qualification for benefits, though the slightly lower means for information adequacy and appeals understanding point to minor gaps in communication or outreach. With regard to the application process accessibility, respondents also show moderate agreement (means between 3.66 and 3.69) that local authorities are helpful and the documentation is understandable. However, the noticeably lower mean of 3.06 for barriers such as language or literacy indicates a neutral to slightly negative experience for a segment of respondents, highlighting ongoing accessibility challenges for some vulnerable groups. The section on perception of being excluded shows more variability, with

means ranging from 3.09 to 3.70. While many believe expanding eligibility would benefit more people (mean = 3.70), there is a general uncertainty or neutrality about systemic exclusion and the clarity of redressal mechanisms (means around 3.09 to 3.30). This suggests that while exclusion is recognized as an issue, its systemic nature or the process for correction may not be clearly understood by the general public. Under information availability, responses were moderately positive, with mean scores between 3.62 and 3.67, suggesting that most respondents find PDS-related information accessible and reasonably well-communicated. Still, there's room for improvement in terms of clarity and proactive dissemination of updates in local languages and through community channels. Finally, in terms of overall satisfaction with the PDS, the means (ranging from 3.27 to 3.51) indicate a neutral to slightly positive stance. While beneficiaries largely value the PDS as a critical resource for food security (mean = 3.51), the adequacy of benefits to meet household needs remains a concern (lowest mean = 3.27).

Table 6.18

Perspectives about Errors of Exclusion

Parameter	Statements	Mean	SD
Awareness of Eligibility Criteria	I have received adequate information about the eligibility criteria for the PDS	3.66	.974
	I understand the process to appeal if I am deemed ineligible for PDS benefits	3.67	.973
	I feel confident that I can determine whether I qualify for PDS assistance	3.72	.917
Application Process Accessibility	Local authorities are helpful in guiding applicants through the PDS application process	3.66	.930
	The forms and documentation required for PDS applications are easy to understand	3.69	.925
	I have encountered barriers (e.g., language, literacy) when trying to apply for PDS benefits	3.06	1.181

Perception of Being Excluded	I have heard of cases where eligible individuals were incorrectly denied PDS benefits	3.30	1.127
	In my community, there is a perception that certain groups are systematically excluded from the PDS	3.09	1.152
	There are no clear mechanisms in place to rectify any errors in eligibility determinations for PDS	3.21	1.075
	I believe that more people would benefit from the PDS if the eligibility criteria were expanded.	3.70	.942
Information Availability	Information about the PDS is regularly updated and available in my local language	3.67	.926
	I can easily access information about changes to the PDS program through community resources	3.63	.927
	The government provides clear communication regarding the rights of PDS beneficiaries.	3.62	.900
Satisfaction with the PDS	Overall, I am satisfied with the quality of food items provided through the PDS	3.48	1.007
	I believe the benefits received through the PDS are sufficient to meet my family's needs	3.27	1.078
	I feel that the PDS is an essential resource for my household's food security	3.51	1.038
Cronbach's Alpha = 0.905			

Note: Strongly Agree= 5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1; Source: Primary Survey, 2025

Table 6.19 provides a comparative overview of how beneficiaries across different ration card categories perceive various aspects related to exclusion errors in the PDS. The parameters examined include awareness of eligibility criteria, accessibility of the application process, perception of exclusion, availability of information, and satisfaction with the PDS. These perspectives are measured using mean scores,

standard deviations, and standard errors, with statistical significance tested through ANOVA. In terms of awareness of eligibility criteria, the highest mean score is observed among NPNS (White card) holders (3.81), indicating relatively better awareness compared to other categories. AAY (Yellow card) holders have the lowest score (3.43), suggesting lower levels of awareness among the most vulnerable group. The ANOVA result ($F(3,541) = 3.326$, $p = 0.019$) indicates that the difference in awareness among groups is statistically significant. For application process accessibility, scores are fairly uniform across all card types, with White card holders again reporting slightly better accessibility (3.55) and AAY holders scoring the lowest (3.24). However, the ANOVA ($F(3,541) = 2.243$, $p = 0.082$) shows that these differences are not statistically significant, although they approach significance. The parameter perception of being excluded shows some notable variation, with White card holders again scoring highest (3.48), indicating greater awareness or concern about exclusion in their communities. AAY holders report the lowest mean score (3.11), possibly reflecting limited awareness or fewer means to perceive systemic exclusion. The ANOVA ($F(3,541) = 3.568$, $p = 0.014$) confirms significant differences among the groups. With regard to information availability, mean scores are relatively high across all groups, especially among White card holders (3.70). The scores suggest moderate to high satisfaction with the availability of PDS-related information. The ANOVA result here ($F(3,541) = 0.926$, $p = 0.428$) indicates that these differences are not statistically significant. Finally, for satisfaction with the PDS, the scores are fairly balanced, with PHH (Pink card) holders expressing slightly higher satisfaction (3.51), and Blue card holders reporting the lowest (3.33). However, the variation is not statistically significant ($F(3,541) = 1.349$, $p = 0.258$). Overall, the data reflect that while there are differences in perceptions and experiences among different ration card holders, particularly in areas of awareness and perceived exclusion, the overall satisfaction and access to information appear relatively consistent.

Table 6.19
Perspectives about Errors of Exclusion Type of Ration Card

Parameter	Type of Ratio Card	N	Mean	SD	Std. Error	ANOVA
Awareness of Eligibility Criteria	AAY (Antyodaya Anna Yojana)/ Yellow	40	3.43	1.10	0.17	F(3,541) =3.326, p= 0.019
	NPNS/ White	161	3.81	0.74	0.06	
	Non-Priority State Subsidy/ Blue	125	3.59	0.82	0.07	
	PHH (Priority Household)/ Pink	219	3.69	0.77	0.05	
	Total	**545**	**3.68**	**0.81**	**0.03**	
Application Process Accessibility	AAY (Antyodaya Anna Yojana)/ Yellow	40	3.24	0.91	0.14	F(3,541) =2.243, p= 0.082
	NPNS/ White	161	3.55	0.68	0.05	
	Non-Priority State Subsidy/ Blue	125	3.41	0.72	0.06	
	PHH (Priority Household)/ Pink	219	3.48	0.76	0.05	
	Total	**545**	**3.47**	**0.74**	**0.03**	
Perception of Being Excluded	AAY (Antyodaya Anna Yojana)/ Yellow	40	3.11	0.90	0.14	F(3,541) =3.568, p= 0.014
	NPNS/ White	161	3.48	0.71	0.06	
	Non-Priority State Subsidy/ Blue	125	3.24	0.79	0.07	
	PHH (Priority Household)/ Pink	219	3.30	0.86	0.06	
	Total	**545**	**3.32**	**0.81**	**0.03**	

Information Availability	AAY (Antyodaya Anna Yojana)/ Yellow	40	3.48	0.99	0.16	F(3,541) =0.926, p= 0.428
	NPNS/ White	161	3.70	0.71	0.06	
	Non-Priority State Subsidy/ Blue	125	3.63	0.80	0.07	
	PHH (Priority Household)/ Pink	219	3.62	0.84	0.06	
	Total	**545**	**3.64**	**0.81**	**0.03**	
Satisfaction with the PDS	AAY (Antyodaya Anna Yojana)/ Yellow	40	3.43	1.01	0.16	F(3,541) =1.349, p= 0.258
	NPNS/ White	161	3.37	0.90	0.07	
	Non-Priority State Subsidy/ Blue	125	3.33	0.87	0.08	
	PHH (Priority Household)/ Pink	219	3.51	0.84	0.06	
	Total	**545**	**3.42**	**0.88**	**0.04**	

Note: Average of each parameters based on Table 7.18; Source: Primary Survey, 2025

6.4 NFSA and Income Transfer

The National Food Security Act (NFSA) facilitates income transfer to beneficiaries through the PDS, providing subsidized food grains to various socio-economic groups. This income transfer essentially represents the monetary benefit that households receive by purchasing essential commodities such as rice and wheat from PDS outlets at subsidized rates instead of paying the higher open market prices. The quantum of this benefit depends on three main factors: the quantity of the item purchased, the open market price (OMP) of the item, and the price charged under the PDS (PP).Mathematically, income transfer (IT) is expressed as:

$$\mathbf{IT = (OMP - PP) \times Q,}$$

where OMP is the open market price, PP is the PDS issue price, and Q is the quantity of goods purchased by the household from fair price shops. This calculation reflects the savings—or income support—that accrues to households as a result of government subsidies through the PDS. For analytical purposes, the sample households are categorized into four groups: AAY, which represents the extremely poor; Priority Households (PHH), which include the moderately poor; NPSS and NPNS household who purchase food grains at market or near-market rates. Among these, AAY households receive the maximum income transfer, since they purchase staple grains at the lowest subsidized rates and often in larger quantities. Priority households also benefit from substantial income transfers, although to a lesser extent than AAY. Non-priority subsidy households receive moderate support, while NPNS households experience little or no income transfer, as their access to subsidized goods is limited or non-existent.

6.4.1 Income Transfer (per household)

Table 6.20 presents the income transfer received by households through the PDS in Kerala, disaggregated by type of ration card. Income transfer is calculated by taking the difference between the open market price and the subsidized PDS price, multiplied by the quantity of the commodity purchased. This reflects the monetary benefit households derive by accessing goods from fair price shops rather than the open market. The table shows that different categories of ration cardholders—namely AAY (Antyodaya Anna Yojana), Priority Household (PHH), Non-Priority State Subsidy (Blue card), and NPNS (White card)—experience significantly different levels of income transfer. Among all groups, AAY households receive the highest total income transfer, averaging ₹1597.8 per household per month. This is primarily driven by rice, which alone accounts for ₹1470 of the transfer, with no variation, indicating that all AAY households uniformly receive this benefit. Other commodities such as wheat, *atta*, sugar, and kerosene also contribute marginally to the income transfer for AAY households. PHH households also benefit substantially, receiving an average total transfer of ₹963.6, mostly through rice and *atta.* Wheat and kerosene also provide minor support to PHH beneficiaries. The Non-Priority State Subsidy (Blue card)

group receives a comparatively lower transfer of ₹453.5, largely limited to subsidized rice. Similarly, the NPNS (White card) group receives only ₹227.6, reflecting minimal state support. In fact, they receive income transfers only through rice and kerosene, while their access to other commodities remains non-existent. These figures highlight the prioritization embedded in the ration card system, where more vulnerable households receive greater financial relief. The statistical significance of these differences is confirmed through ANOVA results, all of which show p-values below 0.05, indicating that the variations in income transfers between groups are not due to random chance. The most pronounced differences are observed in rice, which is the primary staple distributed through PDS. This structure underlines the highly targeted nature of the National Food Security Act (NFSA) and Kerala's PDS, ensuring that those identified as extremely or moderately poor receive maximum support. However, it also brings attention to the stark contrast in benefits received by non-priority households, raising concerns about inclusion errors and the adequacy of the current classification system.

Table 6.20
Income Transfer (per household)

	Type of Ration Card	Mean (In Rs.)	SD	Std. Error	ANOVA
Income Transfer through Rice	AAY (Antyodaya Anna Yojana)/ Yellow	1470.0	0.0	0.0	F (3, 541)= 510.749, p=0.000
	NPNS/ White	227.2	18.0	1.4	
	Non-Priority State Subsidy/ Blue	450.7	215.6	19.3	
	PHH (Priority Household)/ Pink	866.3	296.0	20.0	
	Total	626.5	419.0	17.9	
Income Transfer through Wheat	AAY (Antyodaya Anna Yojana)/ Yellow	49.5	28.9	4.6	F (3, 541)= 412.345, p=0.000
	NPNS/ White	0.0	0.0	0.0	
	Non-Priority State Subsidy/ Blue	0.0	0.0	0.0	
	PHH (Priority Household)/ Pink	18.6	8.0	0.5	
	Total	11.1	16.8	0.7	
Income Transfer	AAY (Antyodaya Anna Yojana)/ Yellow	2.3	5.4	0.9	F (3, 541)=
	NPNS/ White	0.0	0.0	0.0	

through Sugar	Non-Priority State Subsidy/ Blue	0.0	0.0	0.0	29.488, p=0.000
	PHH (Priority Household)/ Pink	0.0	0.0	0.0	
	Total	0.2	1.6	0.1	
Income Transfer through Atta	AAY (Antyodaya Anna Yojana)/ Yellow	72.3	59.0	9.3	F (3, 541)= 99.720, p=0.000
	NPNS/ White	0.0	0.0	0.0	
	Non-Priority State Subsidy/ Blue	0.0	0.0	0.0	
	PHH (Priority Household)/ Pink	75.7	75.9	5.1	
	Total	35.7	63.0	2.7	
Income Transfer through Kerosene	AAY (Antyodaya Anna Yojana)/ Yellow	3.8	9.6	1.5	F (3, 541)= 5.016, p=0.002
	NPNS/ White	0.4	2.9	0.2	
	Non-Priority State Subsidy/ Blue	2.8	8.6	0.8	
	PHH (Priority Household)/ Pink	2.9	8.0	0.5	
	Total	2.2	7.3	0.3	
Total Income Transfer	AAY (Antyodaya Anna Yojana)/ Yellow	1597.8	79.9	12.6	F (3, 541)= 603.176, p=0.000
	NPNS/ White	227.6	18.3	1.4	
	Non-Priority State Subsidy/ Blue	453.5	214.1	19.2	
	PHH (Priority Household)/ Pink	963.6	311.2	21.0	
	Total	675.7	465.3	19.9	

Note: IT = (OMP-PP) Q; where OMP is the open market price, PP is the PDS issue price, and Q is the quantity of goods purchased by the household from fair price shops, Here-Purchased Quantity (Q) at the surveyed month; Source: Primary Survey, 2025

6.5 Determinants of PDS Utilization in Kerala

Table 6.21 presents the results of a multiple linear regression analysis conducted to identify the key determinants influencing the utilization score of the PDS. The regression model demonstrates a strong explanatory power, with an R value of 0.761 and an R^2 of 0.579, indicating that approximately 58% of the variation in PDS utilization can be explained by the independent variables included in the model. The adjusted R^2 value of 0.562 suggests that the model is well-fitted, even after accounting for the number of predictors. The Durbin-Watson statistic of 1.495 falls within an acceptable range, suggesting that there is no significant autocorrelation in the residuals. The ANOVA results show that the regression model is statistically

significant, with an F-value of 35.967 and a p-value of 0.000, indicating that the set of predictors, taken together, significantly explains the variation in PDS utilization scores. Among the independent variables, several were found to have a statistically significant influence. Most notably, type of ration card plays a critical role. Compared to the reference category (NPNS), households with AAY cards ($\beta = 0.521$, $p < 0.001$), PHH cards ($\beta = 0.686$, $p < 0.001$), and Non-Priority State Subsidy cards ($\beta = 0.232$, $p < 0.001$) show significantly higher utilization scores. This highlights the extent to which entitlement level influences active engagement with PDS services—those receiving greater subsidies are far more likely to utilize the system. Among other continuous variables, Availability Score ($\beta = 0.124$, $p < 0.001$) and Satisfaction with the PDS ($\beta = 0.131$, $p = 0.001$) are both positively and significantly associated with PDS utilization. This suggests that when commodities are reliably available and users are satisfied with the quality and quantity of food grains, utilization is significantly enhanced. Interestingly, the Perception of Being Excluded has a negative impact on utilization ($\beta = -0.089$, $p = 0.030$), indicating that individuals who believe that exclusion errors are common in the system are less likely to make full use of PDS services. This aligns with the idea that trust in the system and perceived fairness are key factors influencing engagement. On the other hand, variables such as Accessibility Score, Socio-Economic Status, technical issues, digital literacy barriers, language issues, and even awareness of eligibility criteria did not have a statistically significant effect on utilization. This may suggest that while these factors might contribute to broader perceptions of the system, they do not directly translate into usage behaviour in a measurable way within the current model. In summary, the regression results highlight that type of ration card, availability of commodities, satisfaction with services, and perceptions of exclusion are the primary factors influencing the utilization of PDS services. The model underscores the importance of improving supply-side reliability, targeting, and beneficiary experience to enhance the impact of the PDS on household food security.

Table 6.21

Determinants of PDS Utilization; Regression Result

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.761	.579	.562	.1032638	1.495

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.671	20	.384	35.967	.000
	Residual	5.588	524	.011		
	Total	13.258	544			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	.303	.045		6.699	.000	
Availability Score	.124	.033	.124	3.786	.000	1.334
Accessibility Score	-.006	.038	-.006	-.166	.868	1.609
SES (Scio-Economic Status Index)	-.020	.030	-.021	-.654	.514	1.305
AAY (dummy)	.312	.021	.521	15.194	.000	1.462
PHH_(dummy)	.218	.012	.686	18.042	.000	1.800
Non-priority state subsidy (dummy)	.086	.013	.232	6.569	.000	1.554
Corporation (Dummy)	-.018	.013	-.050	-1.402	.162	1.586
Municipality (Dummy)	-.013	.011	-.040	-1.175	.240	1.410
Technical issues (e.g., system downtime, errors)	-.013	.011	-.040	-1.129	.259	1.585
Lack of understanding of the digital process	.022	.013	.059	1.618	.106	1.673

Network connectivity problems	.000	.011	.001	.042	.966	1.540
Language barrier	-.001	.018	-.001	-.041	.968	1.366
Assistance not available	-.019	.015	-.044	-1.288	.198	1.474
Frequency of Usage of Portability	.002	.005	.009	.300	.764	1.108
Perception on Efficiency and Impact of Computerization and ePoS	-.003	.009	-.012	-.294	.769	2.089
Awareness of Eligibility Criteria	-.010	.009	-.053	-1.163	.245	2.591
Application Process Accessibility	.004	.010	.019	.405	.685	2.591
Perception of Being Excluded	-.017	.008	-.089	-2.183	.030	2.081
Information Availability	-.001	.009	-.006	-.139	.890	2.637
Satisfaction with the PDS	.023	.007	.131	3.371	.001	1.886

Note: Dependent variable= Utilization Score, Reference Category for Ration Card= Non-priority Non subsidy, Reference Category for Place of Residence= Panacyath; Source: Primary Survey, 2025

6.6 Food Security Outcome in Kerala

Food security is broadly defined as a condition wherein all individuals, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary requirements and food preferences for an active and healthy life (FAO, 2006). This widely accepted definition encompasses four key dimensions: food availability, food access, food utilization, and stability over time (Barrett, 2010). Availability refers to the presence of adequate food through production, distribution, and trade. Access concerns the resources (economic, physical, and social) individuals have to obtain appropriate foods. Utilization relates to how the body uses the food consumed, depending on the nutritional quality, food safety, and individual health.

Lastly, stability reflects the consistency of these factors over time, even during adverse conditions such as economic downturns or natural disasters.

Food security outcomes are the tangible and measurable results of interventions, systems, or policies designed to ensure food security. These outcomes assess whether individuals or households are successfully meeting their food needs through mechanisms like state-supported food assistance programs. Outcomes are typically measured through indicators such as dietary diversity, frequency of meals, anthropometric data (e.g., stunting, wasting), food expenditure patterns, or subjective well-being surveys (Carletto et al., 2013; Webb et al., 2006).

In programs like India's PDS, food security outcomes can be assessed using household perceptions on food quantity, quality, accessibility, nutritional adequacy, and financial relief provided by the system. For instance, Likert-scale responses on whether food from the PDS is sufficient, nutritionally adequate, or accessible without barriers can provide strong evidence of how well the system is functioning from the beneficiaries' perspective. This subjective assessment complements quantitative indicators such as caloric intake or expenditure share on food (Coates, Swindale, & Bilinsky, 2007).

Furthermore, outcome indicators such as reduced household financial stress due to subsidized food, increased resilience during crises, and improved nutritional diversity are vital for evaluating the effectiveness of food assistance systems. These outcomes not only reflect current well-being but also signal the long-term sustainability and impact of food security programs.

Table 6.22 presents a detailed analysis of household perceptions on food security outcomes under the PDS, based on responses to various statements related to availability, quality, accessibility, and overall impact of the PDS. Each item was rated on a five-point Likert scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (5), and the high Cronbach's Alpha value of 0.947 suggests strong internal consistency among the items measured. In terms of food availability, the average responses however slightly above the neutral point (mean values around 3.03 to 3.17), indicating a moderate level of satisfaction among households. While some

respondents feel that the food received is sufficient and meets their needs, the relatively low means and relatively high standard deviations (e.g., SD = 1.261 for sufficiency) suggest variability in experiences, with a significant number of households possibly feeling underserved or only marginally satisfied. The food quality dimension reflects slightly better perceptions, with mean scores ranging from 3.24 to 3.35. Respondents appear more confident in the freshness, safety, and nutritional value of food distributed through the PDS. This is an encouraging sign, as it implies that while quantity may sometimes fall short, quality is maintained at a more acceptable level. The lower standard deviations in this section, such as 0.948 for freshness and 1.019 for safety and hygiene, indicate more consensus among households on these positive aspects. Responses regarding food accessibility show the highest levels of satisfaction among all parameters, with mean values consistently above 3.69. This includes ease of reaching distribution centres, convenience of operational hours, and lack of major barriers in obtaining food. These high scores (means of 3.69 to 3.77) highlight the success of the logistical and infrastructural aspects of the PDS, suggesting that geographic and procedural access to food is not a major obstacle for most households. Under the household food security domain, average responses are moderately positive, with means ranging from 3.39 to 3.46. These responses reflect that the PDS plays a supportive role in maintaining food security, especially in challenging times.

Table 6.22
Household Perceptions on Food Security Outcomes under the Public Distribution System (PDS)

Parameter	Statements	Mean	SD
Food Availability	I always have enough food to meet my household's needs.	3.09	1.244
	The food I receive through the PDS is sufficient for my household's monthly consumption	3.03	1.261
	The variety of food items provided through the PDS meets the preferences of my household.	3.17	1.111
Food Quality	The quality of food provided through the PDS is acceptable for my household	3.27	1.031
	The nutritional value of the food items received from the PDS meets my household's needs	3.24	1.030

	The food items received from the PDS are fresh and not expired.	3.32	.948
	I trust the safety and hygiene of the food provided through the PDS.	3.35	1.019
Food Accessibility	I can easily reach my designated PDS distribution centre.	3.77	.999
	The hours of operation at the PDS distribution centre are convenient for me	3.77	.943
	I can access food from the PDS without any significant barriers	3.69	.948
	The process of obtaining food from the PDS is straightforward and convenient	3.71	.901
Household Food Security	I feel confident that my household can obtain enough food even in difficult times	3.43	.983
	The PDS has significantly improved my household's overall food security.	3.46	1.016
	I have access to sufficient food resources even during emergencies.	3.39	.957
	The assistance provided by the PDS has reduced my household's financial stress related to food purchases.	3.41	.976
Nutritional Outcomes	The PDS food items have positively impacted the nutritional intake of my household members	3.34	.972
	My household maintains a balanced diet due to the food received from the PDS	3.29	.962
Perceived Impact of PDS	The PDS plays a crucial role in ensuring food security for low-income households like mine.	3.47	1.007
	I believe the PDS should expand to include more food items to enhance food security.	3.67	.992
Awareness and Information	I am well-informed about my entitlements under the PDS.	3.60	.924
	Information regarding changes in PDS policies is communicated effectively	3.51	.932
	The information I receive through messages helps me plan my purchases from the PDS effectively.	3.59	.993
	I find it helpful to receive reminders about my PDS entitlement and upcoming distribution dates.	3.58	.982
Cronbach's Alpha= 0.947			

Note: Strongly Agree= 5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1; Source: Primary Survey, 2025

The perception that the PDS has eased financial burdens related to food purchases (mean = 3.41) is particularly noteworthy, demonstrating its role as a social safety net. With regard to nutritional outcomes, the mean values are modest (around 3.29 to

3.34), suggesting that while PDS foods contribute to dietary intake, there may be gaps in achieving a balanced diet. This may reflect the limited diversity of items provided, a sentiment also echoed in the responses related to food variety under the availability dimension. Perceptions of the overall impact of the PDS are slightly more favourable, with means of 3.47 and 3.67. Many respondents recognize the PDS as crucial for low-income households and support the idea of expanding the basket of goods to better ensure food security. This points to an overall positive valuation of the system, while also signalling demand for improvements. Lastly, the awareness and information dimension reflects relatively high levels of satisfaction, with mean scores ranging from 3.51 to 3.60. Respondents generally feel well-informed about their entitlements and appreciate the information and reminders provided, which helps them manage their food procurement effectively. In summary, the table illustrates that the PDS is generally well-received by the surveyed households, particularly in terms of accessibility, information dissemination, and perceived financial support. However, there remain areas for improvement in food availability and dietary balance, which could be addressed by increasing variety and quantity of rations. The high internal reliability across all measured items further strengthens the credibility of these findings.

Table 6.23 presents the results of a Confirmatory Factor Analysis (CFA) conducted to validate the structure of household perceptions regarding food security outcomes under the PDS. The analysis encompasses a range of parameters including food availability, food quality, food accessibility, household food security, nutritional outcomes, perceived impact of the PDS, and awareness and information. Each construct is represented by several survey items, and the CFA results are detailed through factor loadings (estimates), standard errors, Z-values, and p-values. The findings show that all factor loadings are statistically significant at the 1% level ($p < .001$), suggesting that each item contributes meaningfully to its corresponding latent construct. In the food availability category, statements such as “I always have enough food to meet my household’s needs” and “The food I receive through the PDS is sufficient for my household’s monthly consumption” yielded high estimates, with the latter reaching a value of 1.012. This demonstrates that food sufficiency is a critical

determinant in shaping the perception of availability. Similarly, the quality dimension exhibited strong loadings, ranging from 0.742 to 0.860, indicating that households are attentive to both the freshness and nutritional value of PDS supplies. Items related to food safety and hygiene also received strong support, reinforcing the role of trust in evaluating food quality.

In terms of accessibility, the statements measuring convenience, proximity, and ease of the process had consistently high loadings, all above 0.73. This indicates that physical and procedural access to food through the PDS is an integral part of food security perceptions. The dimension of household food security also showed robust estimates, particularly for the item stating that the PDS has significantly improved the household's overall food security, which had one of the highest loadings at 0.892. These results suggest that the PDS is perceived as a stabilizing force, particularly during times of economic hardship or emergency.

The nutritional outcomes domain, although represented by only two items, showed strong standardized estimates, indicating that beneficiaries associate PDS assistance with maintaining a balanced diet and improved nutritional intake. The perceived impact of the PDS, while slightly lower in factor loadings compared to other domains, still maintained statistical significance. This reflects a recognition among respondents of the PDS's importance, while also implying that there is room for expansion and enhancement in the types and variety of food items offered.

Awareness and information, an important enabling factor, showed high factor loadings across all four items. Respondents indicated that they are well-informed about their entitlements and benefit from timely communication regarding policy changes and distribution schedules. The highest estimate in this category was for the statement about planning purchases based on messages received, highlighting the increasing role of digital communication in the functioning of the PDS.

The overall model yielded a chi-square value of χ^2 (209) = 794 with a p-value less than 0.001, indicating a statistically significant model. While a significant chi-square value is common in large samples and does not by itself denote poor model fit, the strength and consistency of the factor loadings across all domains—combined with

earlier reliability measures such as a Cronbach's Alpha of 0.947—suggest that the measurement model is robust. In conclusion, the CFA validates that household perceptions of food security outcomes under the PDS are multidimensional and internally consistent, with clear contributions from aspects of availability, quality, access, nutrition, and information.

Table 6.23
Household Perceptions on Food Security Outcomes under the Public Distribution System (PDS): Confirmatory Factor Anlaysis

Parameter	Statements	Estimate	SE	Z	P
Food Availability	I always have enough food to meet my household's needs.	0.944	0.0477	19.8	< .001
	The food I receive through the PDS is sufficient for my household's monthly consumption	1.012	0.0474	21.3	< .001
	The variety of food items provided through the PDS meets the preferences of my household.	0.928	0.0407	22.8	< .001
Food Quality	The quality of food provided through the PDS is acceptable for my household	0.855	0.0369	23.1	< .001
	The nutritional value of the food items received from the PDS meets my household's needs	0.860	0.0369	23.3	< .001
	The food items received from the PDS are fresh and not expired.	0.742	0.0351	21.1	< .001
	I trust the safety and hygiene of the food provided through the PDS.	0.776	0.0383	20.3	< .001
Food Accessibility	I can easily reach my designated PDS distribution centre.	0.802	0.0364	22.0	< .001
	The hours of operation at the PDS distribution centre are convenient for me	0.816	0.0329	24.8	< .001

	I can access food from the PDS without any significant barriers	0.777	0.0341	22.8	< .001
	The process of obtaining food from the PDS is straightforward and convenient	0.732	0.0326	22.4	< .001
Household Food Security	I feel confident that my household can obtain enough food even in difficult times	0.798	0.0352	22.7	< .001
	The PDS has significantly improved my household's overall food security.	0.892	0.0347	25.7	< .001
	I have access to sufficient food resources even during emergencies.	0.812	0.0334	24.3	< .001
	The assistance provided by the PDS has reduced my household’s financial stress related to food purchases.	0.843	0.0337	25.0	< .001
Nutritional Outcomes	The PDS food items have positively impacted the nutritional intake of my household members	0.816	0.0351	23.3	< .001
	My household maintains a balanced diet due to the food received from the PDS	0.777	0.0352	22.0	< .001
Perceived Impact of PDS	The PDS plays a crucial role in ensuring food security for low-income households like mine.	0.682	0.0431	15.8	< .001
	I believe the PDS should expand to include more food items to enhance food security.	0.692	0.0425	16.3	< .001
Awareness and Information	I am well-informed about my entitlements under the PDS.	0.750	0.0334	22.4	< .001
	Information regarding changes in PDS policies is communicated effectively	0.761	0.0336	22.7	< .001
	The information I receive through messages helps me plan my purchases from the PDS effectively.	0.830	0.0354	23.4	< .001

	I find it helpful to receive reminders about my PDS entitlement and upcoming distribution dates.	0.829	0.0348	23.8	< .001
Test for Exact Fit	**χ^2 (209)= 794, p<0.001**				

Note: Strongly Agree= 5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1; Source: Primary Survey, 2025

Table 6.24 presents a comparative analysis of household perceptions on food security outcomes under the PDS across different types of ration cardholders in Kerala. In terms of food availability, PHH and AAY households reported relatively higher mean scores (3.18 and 3.23 respectively), suggesting that subsidized households generally perceive a higher level of food availability through the PDS than non-subsidized groups. However, the ANOVA result (F = 2.238, p = 0.083) indicates that the variation across groups is not statistically significant at the 5% level. When examining food quality, the PHH category again reported the highest satisfaction (mean = 3.37), while AAY households reported the lowest (mean = 3.17). However, the difference was not statistically significant (F = 1.312, p = 0.270), implying general parity across groups in quality perceptions. Food accessibility received high mean scores across all categories, with both PHH and NPNS households rating it at 3.78. AAY households, despite being highly dependent on PDS, reported slightly lower accessibility (3.63), possibly due to logistical or infrastructural constraints. Nevertheless, ANOVA results (F = 1.146, p = 0.330) again suggest that differences are not statistically significant. A more distinct pattern emerged in the domain of household food security. PHH households reported the highest mean score (3.58), indicating a strong sense of food security enhancement due to PDS, while other groups scored lower. Importantly, this difference is statistically significant (F = 3.848, p = 0.010), suggesting that the type of ration card significantly influences the perceived impact on household food security.

Table 6.24
Household Perceptions on Food Security Outcomes across Ration Card Categories under the Public Distribution System (PDS)

Parameters	Type of Ration Card	Mean	SD	SE	ANOVA
Food Availability	AAY (Antyodaya Anna Yojana)/ Yellow	3.23	1.12	0.18	F (3,541) = 2.238, p= 0.083
	NPNS/ White	3.11	1.10	0.09	
	Non-Priority State Subsidy/ Blue	2.90	1.01	0.09	
	PHH (Priority Household)/ Pink	3.18	1.02	0.07	
	Total	3.10	1.05	0.05	
Food Quality	AAY (Antyodaya Anna Yojana)/ Yellow	3.17	1.09	0.17	F (3,541) = 1.312, p= 0.270
	NPNS/ White	3.31	0.87	0.07	
	Non-Priority State Subsidy/ Blue	3.20	0.81	0.07	
	PHH (Priority Household)/ Pink	3.37	0.84	0.06	
	Total	3.30	0.86	0.04	
Food Accessibility	AAY (Antyodaya Anna Yojana)/ Yellow	3.63	1.07	0.17	F (3,541) = 1.146, p= 0.330
	NPNS/ White	3.78	0.66	0.05	
	Non-Priority State Subsidy/ Blue	3.64	0.85	0.08	
	PHH (Priority Household)/ Pink	3.78	0.87	0.06	
	Total	3.74	0.83	0.04	
Household Food Security	AAY (Antyodaya Anna Yojana)/ Yellow	3.38	1.05	0.17	F (3,541) = 3.848, p= 0.010
	NPNS/ White	3.32	0.87	0.07	
	Non-Priority State Subsidy/ Blue	3.30	0.82	0.07	
	PHH (Priority Household)/ Pink	3.58	0.86	0.06	

	Total	3.42	0.88	0.04	
Nutritional Outcomes	AAY (Antyodaya Anna Yojana)/ Yellow	3.25	1.04	0.16	F (3,541) = 1.877, p= 0.132
	NPNS/ White	3.26	0.92	0.07	
	Non-Priority State Subsidy/ Blue	3.22	0.84	0.07	
	PHH (Priority Household)/ Pink	3.42	0.85	0.06	
	Total	3.32	0.89	0.04	
Perceived Impact of PDS	AAY (Antyodaya Anna Yojana)/ Yellow	3.70	1.13	0.18	F (3,541) = 1.623, p= 0.183
	NPNS/ White	3.50	0.78	0.06	
	Non-Priority State Subsidy/ Blue	3.49	0.84	0.07	
	PHH (Priority Household)/ Pink	3.64	0.86	0.06	
	Total	3.57	0.86	0.04	
Awareness and Information	AAY (Antyodaya Anna Yojana)/ Yellow	3.40	1.11	0.18	F (3,541) = 0.613, p= 0.607
	NPNS/ White	3.58	0.75	0.06	
	Non-Priority State Subsidy/ Blue	3.57	0.83	0.07	
	PHH (Priority Household)/ Pink	3.59	0.84	0.06	
	Total	3.57	0.84	0.04	

Note: Strongly Agree= 5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1; Source: Primary Survey, 2025

In relation to nutritional outcomes, PHH households again rated the highest (mean = 3.42), with the lowest rating coming from the Blue card group (3.22). The differences, however, were not statistically significant (F = 1.877, p = 0.132). This suggests that although there is a perceived improvement in nutrition among PHH households, the variation is not pronounced enough across all categories. On the perceived overall impact of PDS, AAY cardholders reported the highest score (3.70), reflecting their dependence on and appreciation for the scheme. Nonetheless, the observed

differences were not statistically significant (F = 1.623, p = 0.183). Finally, regarding awareness and information, perceptions were consistently high across all groups, with mean scores ranging between 3.40 (AAY) and 3.59 (PHH). The ANOVA value (F = 0.613, p = 0.607) indicates that differences in awareness are negligible across ration card types. Overall, while most indicators show positive perceptions of the PDS among all ration card groups, statistically significant differences are observed only in the domain of household food security. PHH households consistently reported more favorable outcomes, highlighting the scheme's relative success in targeting and benefiting priority households. This suggests that while the PDS is broadly effective, its impact varies depending on the extent of entitlements associated with each ration card category.

Table 6.25 presents the results of a Pearson correlation analysis examining the relationship between PDS (Public Distribution System) utilization and various dimensions of household food security based on responses from 545 households. The analysis reveals that PDS utilization has a statistically significant positive correlation with several key aspects of food security. Most notably, there is a moderate and significant positive correlation between PDS utilization and household food security ($r = .166$, $p < .001$), suggesting that households that more frequently or effectively use the PDS tend to report greater overall food security. Similarly, there is a significant positive correlation with food availability ($r = .127$, $p = .003$), indicating that better utilization of PDS services is linked to improved access to sufficient quantities of food. Nutritional outcomes also show a statistically significant and positive correlation ($r = .142$, $p = .001$), implying that increased use of the PDS may be contributing to better dietary health or adequacy among beneficiaries. A weaker but still significant correlation is found between PDS utilization and the perceived impact of the PDS ($r = .089$, $p = .039$), reflecting a slight tendency for higher users to view the PDS more favourably in terms of its effect on their household wellbeing. On the other hand, the correlation between PDS utilization and food quality ($r = .066$, $p = .125$) is positive but not statistically significant, indicating no clear association. Furthermore, there is virtually no correlation between utilization and food accessibility ($r = .009$, $p = .840$), nor with awareness and information about the PDS

(r = –.009, p = .835), both of which show non-significant results. These findings suggest that while the PDS may be making a measurable contribution to food availability, security, and nutrition at the household level, it is not necessarily improving people's access to food in practical terms or enhancing their understanding of the system. The overall correlation with a composite food security score (r = .108, p = .012) also supports the idea that PDS utilization modestly but meaningfully contributes to better household food security outcomes. Thus, the results point to both the effectiveness and the limitations of the PDS, showing that while it plays a supportive role in strengthening food-related outcomes, gaps remain in accessibility and public awareness that could be addressed through more targeted interventions.

Table 6.25
Correlation between PDS Utilization on Household and Food Security Dimensions

		Utilization Score
Food Availability	Pearson Correlation	.127**
	Sig. (2-tailed)	.003
	N	545
Food Quality	Pearson Correlation	.066
	Sig. (2-tailed)	.125
	N	545
Food Accessibility	Pearson Correlation	.009
	Sig. (2-tailed)	.840
	N	545
Household Food Security	Pearson Correlation	.166**
	Sig. (2-tailed)	.000
	N	545
Nutritional Outcomes	Pearson Correlation	.142**
	Sig. (2-tailed)	.001
	N	545
Perceived Impact of PDS	Pearson Correlation	.089*
	Sig. (2-tailed)	.039
	N	545
Awareness and Information	Pearson Correlation	-.009
	Sig. (2-tailed)	.835

	N	545
Food Security (all)	Pearson Correlation	.108*
	Sig. (2-tailed)	.012
	N	545

Source: Primary Survey, 2025

The results presented in Table 6.26 provide a comprehensive multivariate analysis of how the utilization of the PDS influences various dimensions of household food security. This includes food availability, food quality, accessibility, household food security, nutritional outcomes, perceived impact of PDS, and awareness and information. The Multivariate Tests section assesses whether there is a statistically significant overall effect of the independent variable (Utilization Score) on the combined set of dependent variables. All four test statistics—Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root—show statistically significant results ($p < 0.001$) for the utilization score, indicating that PDS utilization has a significant multivariate effect on the combined food security outcomes. The Pillai's Trace value of 0.055, while modest in magnitude, confirms a significant effect, suggesting that even though the overall impact may not be very strong, it is consistent across multiple outcomes.

Moving to the Tests of Between-Subjects Effects, this part breaks down the multivariate significance into individual dependent variables to identify where the significant differences lie. The analysis reveals that PDS utilization has a statistically significant effect on several individual outcomes. Specifically, food availability ($F = 8.896$, $p = .003$), household food security ($F = 15.395$, $p < .001$), nutritional outcomes ($F = 11.094$, $p = .001$), and perceived impact of PDS ($F = 4.295$, $p = .039$) show significant associations with PDS utilization. These results suggest that greater or more effective use of the PDS is positively associated with improvements in these areas.

However, the effects on food quality ($F = 2.357$, $p = .125$), food accessibility ($F = 0.041$, $p = .840$), and awareness and information ($F = 0.044$, $p = .835$) are not statistically significant. This implies that PDS utilization does not have a discernible

impact on how households perceive the quality or accessibility of food, nor on their level of awareness and information regarding the PDS. The R-squared values indicate the proportion of variance in each dependent variable explained by PDS utilization. These values are relatively low, ranging from 0.000 to 0.028, suggesting that while the effects are statistically significant in some areas, the practical impact or explanatory power of the utilization score is limited. So, it highlights that effective utilization of the PDS significantly contributes to improvements in food availability, household food security, nutritional outcomes, and the perceived impact of the PDS. However, its influence is not significant on food quality, accessibility, or awareness, indicating a need for targeted policy interventions in these dimensions to enhance the overall effectiveness of the PDS.

Table 6.26
PDS Utilization on Household Food Security Dimensions

Multivariate Tests						
Effect		**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**
Intercept	Pillai's Trace	.732	209.656	7	537	.000
	Wilks' Lambda	.268	209.656	7	537	.000
	Hotelling's Trace	2.733	209.656	7	537	.000
	Roy's Largest Root	2.733	209.656	7	537	.000
Utilization Score	Pillai's Trace	.055	4.484	7	537	.000
	Wilks' Lambda	.945	4.484	7	537	.000
	Hotelling's Trace	.058	4.484	7	537	.000
	Roy's Largest Root	.058	4.484	7	537	.000

Tests of Between-Subjects Effects					
Source	Dependent Variable	Type III Sum of Squares	df	F	Sig.
Corrected Model	Food Availability	9.745[a]	1	8.896	.003
	Food Quality	1.756[b]	1	2.357	.125
	Food Accessibility	.028[c]	1	.041	.840
	Household Food Security	11.491[d]	1	15.395	.000

	Nutritional Outcomes	8.553[e]	1	11.094	.001
	Perceived Impact of PDS	3.140[f]	1	4.295	.039
	Awareness and Information	.031[g]	1	.044	.835
Intercept	Food Availability	406.144	1	370.765	.000
	Food Quality	544.573	1	731.012	.000
	Food Accessibility	785.616	1	1148.137	.000
	Household Food Security	498.975	1	668.501	.000
	Nutritional Outcomes	482.726	1	626.185	.000
	Perceived Impact of PDS	622.264	1	851.044	.000
	Awareness and Information	718.266	1	1023.073	.000
Utilization Score	Food Availability	9.745	1	8.896	.003
	Food Quality	1.756	1	2.357	.125
	Food Accessibility	.028	1	.041	.840
	Household Food Security	11.491	1	15.395	.000
	Nutritional Outcomes	8.553	1	11.094	.001
	Perceived Impact of PDS	3.140	1	4.295	.039
	Awareness and Information	.031	1	.044	.835
Error	Food Availability	594.814	543		
	Food Quality	404.512	543		
	Food Accessibility	371.549	543		
	Household Food Security	405.300	543		
	Nutritional Outcomes	418.599	543		
	Perceived Impact of PDS	397.030	543		
	Awareness and Information	381.222	543		
Total	Food Availability	5834.778	545		
	Food Quality	6328.125	545		
	Food Accessibility	7977.625	545		
	Household Food Security	6809.125	545		
	Nutritional Outcomes	6421.750	545		

	Perceived Impact of PDS	7341.500	545		
	Awareness and Information	7327.938	545		
Corrected Total	Food Availability	604.559	544		
	Food Quality	406.268	544		
	Food Accessibility	371.577	544		
	Household Food Security	416.791	544		
	Nutritional Outcomes	427.151	544		
	Perceived Impact of PDS	400.170	544		
	Awareness and Information	381.253	544		

a. R Squared = .016 (Adjusted R Squared = .014), b. R Squared = .004 (Adjusted R Squared = .002), c. R Squared = .000 (Adjusted R Squared = -.002), d. R Squared = .028 (Adjusted R Squared = .026), e. R Squared = .020 (Adjusted R Squared = .018), f. R Squared = .008 (Adjusted R Squared = .006), g. R Squared = .000 (Adjusted R Squared = -.002)

The regression analysis presented in Table 6.21 reveals that both food availability and the type of ration card held significantly influence PDS utilization. Availability has a positive and statistically significant coefficient (B = .124, p < .001), indicating that greater availability of food items through the PDS is a key factor driving higher levels of utilization. This suggests that when beneficiaries perceive the PDS as a reliable and sufficient source of food, they are more likely to use it consistently. On the other hand, accessibility does not show a significant impact (B = –.006, p = .868), implying that physical or procedural access alone is not a strong predictor of PDS usage in this context. More notably, the type of ration card held plays a decisive role. Households with AAY cards and PHH cards report significantly higher utilization scores (B = .312 and B = .218 respectively, both p < .001), compared to non-priority cardholders. This indicates that entitlement level is a strong determinant of usage, reflecting the greater quantity and/or subsidy benefits tied to these card types. Additionally, those receiving non-priority state subsidies also exhibit higher utilization (B = .086, p < .001), underscoring the importance of card-based access to entitlements in influencing PDS dependence.

The findings from Table 6.26 further strengthen this interpretation by showing that higher PDS utilization leads to better household food security outcomes. The multivariate test statistics, particularly Wilks' Lambda ($\lambda = .945$, $F = 4.484$, $p < .001$), confirm a significant overall effect of utilization on multiple food security dimensions. Between-subjects effects indicate that utilization significantly improves food availability ($F = 8.896$, $p = .003$), household food security ($F = 15.395$, $p < .001$), nutritional outcomes ($F = 11.094$, $p = .001$), and perceived impact of the PDS ($F = 4.295$, $p = .039$). These findings suggest that effective and frequent use of the PDS contributes not just to having more food, but to having better-quality food and an improved sense of food-related well-being and nutritional sufficiency at the household level.

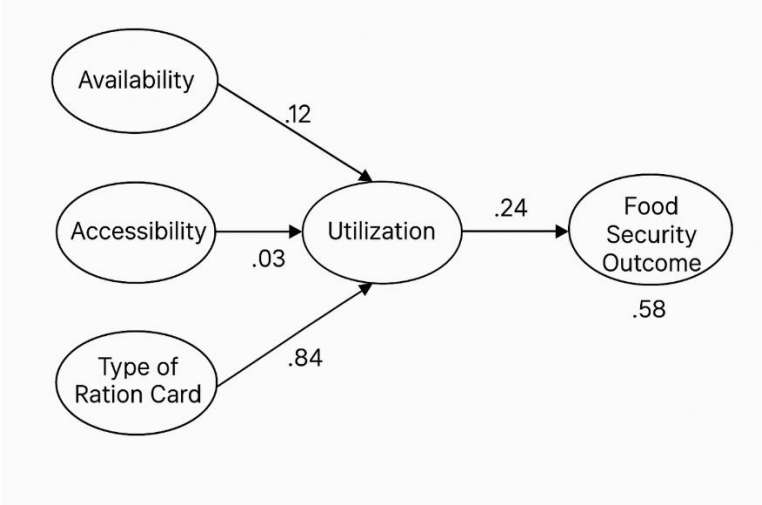
Taken together, these two tables establish a clear pathway: food availability and the type of ration card held determine how much and how effectively households utilize the PDS, while utilization in turn leads to improved outcomes in food security and nutrition. This relationship underscores the importance of ensuring reliable food supply within the PDS and equitable access through well-targeted ration card categories. Enhancing availability and refining the targeting of subsidies could therefore be key policy levers to strengthen the role of the PDS in promoting food security, especially for vulnerable groups. (see Figure 6.4)

The numerical values in Figure 6.4 were derived primarily from multiple regression analysis and supported by correlation analysis. The value 0.12 represents the standardized regression coefficient showing the positive effect of Availability of PDS commodities on Utilization, indicating that better availability leads to higher utilization. The value 0.03 represents the (small but positive) standardized effect of Accessibility on Utilization, suggesting that easier access slightly improves PDS use. The value 0.84 represents the strength of the relationship between Type of Ration Card and Utilization, derived from regression coefficients comparing AAY/PHH households with non-priority households, showing that entitlement type is a major determinant of utilization. The value 0.24 reflects the Pearson correlation coefficient between Utilization and Food Security Outcome, indicating that higher PDS

utilization is associated with better household food security. Finally, the value 0.58 represents the R^2 for Food Security Outcome, meaning that about 58% of the variation in household food security is explained by PDS utilization in the model.

The analysis of exclusion and inclusion errors in the identification of beneficiaries under the AAY and PHH categories reveals significant implications for household food security outcomes. As previously established through regression and multivariate analysis, households possessing AAY and PHH ration cards exhibit the highest levels of PDS utilization, which in turn is significantly associated with improvements in food availability, household food security, and nutritional outcomes. However, the prevalence of exclusion errors within these targeted categories indicates a major policy concern, as eligible households are being denied access to these vital entitlements.

Figure 6.4 Influence of PDS Determinants on Utilization and Household Food Security Outcomes



Source: Primary Survey, 2025

For AAY beneficiaries, the exclusion error is notably high, with 33% in rural areas and an even higher 31% in urban areas, resulting in an overall exclusion error of 32%. This means that around 1/3 of household that meet the eligibility criteria for AAY are not receiving the associated ration card. Given that AAY households—typically the most vulnerable segment—benefit from highly subsidized food grains and exhibit

strong utilization patterns, their exclusion directly translates to reduced access to affordable food, heightened food insecurity, and poorer nutritional outcomes. This is particularly critical, as these households are the most dependent on PDS support for basic sustenance.

In the case of PHH, although the exclusion error is comparatively lower—at 23% in rural areas and 24% in urban settings—the impact remains significant. PHH cardholders, too, show strong PDS utilization, and being excluded from this category implies diminished access to essential subsidized provisions. As a result, the households unjustly left out are likely to experience a shortfall in food availability and dietary adequacy, undermining overall food security.

Moreover, the inclusion error data further complicates the equity and efficiency of the system. A substantial proportion of ineligible households continue to hold AAY and PHH cards, thereby crowding out the resources intended for genuinely deserving households. For instance, 29% of rural and 35% of urban AAY cardholders were found to be ineligible, while an alarming 32% of rural and 21% of urban PHH cardholders were similarly misclassified. This misallocation not only reflects administrative inefficiencies but also aggravates exclusion-induced deprivation among eligible households.

The consequences of such exclusion are underscored by earlier findings from the multivariate analysis, where utilization scores—most strongly influenced by AAY and PHH card possession—were significantly related to better household food security and nutritional outcomes. Therefore, exclusion from these categories does not merely reflect a failure in targeting but results in tangible, adverse outcomes for food security. In other words, the lack of proper inclusion into the system obstructs vulnerable families from reaping the full benefits of the PDS, widening gaps in welfare access and perpetuating food insecurity among those most in need.

6.7 Hypothesis Testing

Null Hypothesis (H_0): Errors of exclusion and the type of ration card held do not significantly influence the level of PDS utilization among both priority and non-priority households.

The research hypothesis centres on whether errors of exclusion and the type of ration card significantly affect the level of PDS utilization. The null hypothesis (H_0) posits that these factors do not significantly influence PDS utilization among both priority and non-priority households, while the alternative hypothesis (H_1) suggests that they do. The objective of this study is to test these hypotheses using data from regression and multivariate analyses.

The regression results from Table 6.21 show that both the type of ration card and exclusion errors significantly affect PDS utilization. Specifically, households holding AAY and PHH ration cards exhibit higher levels of PDS utilization, with AAY cardholders demonstrating a significant positive impact ($B = 0.312$, $p < 0.001$), and PHH cardholders also showing a notable positive relationship ($B = 0.218$, $p < 0.001$). Additionally, the perception of exclusion was found to negatively impact PDS utilization, with a statistically significant coefficient ($B = -0.017$, $p = 0.030$), highlighting the detrimental effect of exclusion errors on the accessibility and effectiveness of the PDS.

The multivariate analysis results from Table 6.26 further underscore the critical role of PDS utilization in improving various food security outcomes. The tests for PDS utilization reveal significant effects on dimensions such as food availability, household food security, and nutritional outcomes. Specifically, food availability and household food security are significantly influenced by PDS utilization, with p-values of 0.003 and less than 0.001, respectively. Nutritional outcomes are also positively impacted by PDS utilization, with a p-value of 0.001, reinforcing the importance of ensuring that eligible households fully benefit from the PDS.

To test the hypothesis, we examine the p-values associated with the regression coefficients and multivariate tests. The results show that both the type of ration card

and the perception of exclusion have statistically significant p-values, confirming their substantial impact on PDS utilization. Given these findings, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1), concluding that errors of exclusion and the type of ration card held do indeed significantly influence the level of PDS utilization among both priority and non-priority households.

In conclusion, the analysis provides strong evidence that the type of ration card, particularly AAY and PHH, plays a key role in determining the level of PDS utilization, with these households utilizing PDS services at higher rates. Furthermore, exclusion errors—such as the perception of being excluded from the system—negatively affect PDS utilization, highlighting the need for more accurate targeting and reduction of exclusion errors to enhance the effectiveness of the PDS. These findings emphasize the importance of addressing exclusion errors and improving the targeting mechanisms to ensure that vulnerable populations benefit from the system, ultimately contributing to better food security outcomes.

6.8 Conclusion

This explores critical gaps in Kerala's PDS, specifically focusing on exclusion, access, and the effects of digitalization. While Kerala's PDS has been more successful than many other states, disparities still exist in both access to and utilization of the system. A key issue discussed in the chapter is exclusion errors, where marginalized groups are either omitted or inadequately served. This section also delves into the One Nation One Ration Card (ONORC) system, which aims to improve portability across states, but has faced challenges like underuse, especially among rural and less tech-savvy populations. While awareness of the ONORC system is relatively high at 76.9%, its actual use remains limited due to factors such as logistical difficulties, technical glitches, and a lack of material availability at distribution centers. The chapter highlights that, despite the ONORC system offering greater convenience and flexibility, especially for migrant workers, its effectiveness is uneven across different demographic groups. AAY (Antyodaya Anna Yojana) cardholders, who represent the most vulnerable groups, show higher usage of portability features, while Priority Household (PHH) and non-priority cardholders have lower engagement. The chapter

concludes that the ONORC system in Kerala has potential but faces clear barriers to widespread implementation. Addressing these challenges requires more targeted interventions, improved awareness campaigns, and system upgrades to ensure equitable access for all beneficiaries, particularly socio-economically disadvantaged ones.

The chapter further investigates how various factors such as place of residence, gender, education, and occupation influence PDS utilization. Table 6.3 reveals that urban residents in corporation areas show the highest frequency of ONORC portability use, while rural Panchayth residents report the lowest. However, Chi-square test results indicate no statistically significant correlation between place of residence and portability use, suggesting that while patterns exist, the relationship is not strong. In terms of gender, Table 6.4 shows that female-headed households report higher non-use rates compared to male-headed households. Nonetheless, gender did not significantly impact portability usage, as indicated by Chi-square test results. Table 6.5 looks at education levels, revealing no clear relationship between household education and PDS portability use. Similarly, Table 6.6 shows that occupation does not significantly determine portability use, although unemployed households report higher usage compared to government employees and professionals. These findings suggest that while place of residence, gender, education, and occupation may influence how often people use the system, none of these factors showed statistically significant effects on PDS usage.

Chapter summarizes respondents' suggestions for improving the PDS under the ONORC system. A large proportion of respondents (67.34%) emphasized the need for increased awareness of the ONORC system. Other recommendations include expanding the range of food items available through portability (59.08%), improving coordination between PDS shops to ensure stock availability (57.98%), simplifying the portability process (56.33%), implementing a mobile app for checking entitlements (54.68%), training PDS staff (52.29%), and establishing regular monitoring and evaluation systems (51.01%). Chapter analyze beneficiaries' experiences with computerized and ePOS-enabled services in Kerala's PDS. Most

respondents (84.59%) reported receiving timely updates about their entitlements, with 83.30% finding the information clear and easy to understand. Furthermore, 84.22% of respondents received ePOS-generated receipts, promoting transparency. Satisfaction levels were generally high, with 57.1% of respondents reporting being satisfied with the computerized system and 17.2% being very satisfied. However, challenges such as technical issues (61.47%) and network connectivity problems (57.61%) persist, highlighting the need for better infrastructure to optimize the digital services.

The chapter also discusses exclusion errors in the PDS, which occur when eligible beneficiaries are left out or unable to access the system. Exclusion errors particularly affect marginalized groups such as landless labourers, scheduled castes, and female-headed households. Despite reforms like Aadhaar-linked biometric systems and ONORC, exclusion remains due to problems like poor documentation, biometric mismatches, and outdated data. The AAY, which aims to serve the most vulnerable, also experiences exclusion and inclusion errors. Surveys show high exclusion rates in both rural (33%) and urban (31%) areas, indicating a significant gap between policy intent and actual implementation. Additionally, inclusion errors, where ineligible households receive benefits, further exacerbate the issue. The chapter calls for better targeting, data management, and periodic reviews to ensure that only eligible households benefit from the system.

The section on the NFSA and income transfer discusses how the PDS facilitates income transfer by providing subsidized food. The difference between the open market price and the PDS price, multiplied by the quantity of goods purchased, represents the income transfer. Households under AAY and PHH receive higher subsidies, while non-priority households receive little or no support. The chapter emphasizes the unequal distribution of benefits, with AAY households receiving the highest income transfer, primarily from subsidized rice.

In the section on determinants of PDS utilization, a multiple linear regression analysis identifies factors influencing PDS usage. The analysis shows that the type of ration card, availability of commodities, satisfaction with the PDS, and perceptions of

exclusion significantly affect utilization. Households with AAY, PHH, and NPSS cards showed higher utilization, indicating that greater subsidies lead to increased engagement. The reliable availability of commodities and satisfaction with PDS services were also associated with higher usage. However, perceptions of exclusion negatively impacted PDS utilization. The chapter concludes that improving supply reliability, targeting, and beneficiary satisfaction is crucial for enhancing PDS effectiveness.

The chapter also examines food security outcomes, using indicators such as dietary diversity, meal frequency, food expenditure patterns, and subjective well-being. It finds that while households generally report adequate food accessibility and food quality, there is room for improvement in food variety and nutritional outcomes. Households, particularly those under PHH and AAY categories, perceive the PDS as an essential resource, but many express a desire for more diverse food items. The chapter concludes that while the PDS effectively provides food security, interventions are needed to enhance dietary diversity and better meet the nutritional needs of households.

Finally, the chapter investigates the correlation between PDS utilization and food security outcomes. It finds positive correlations between PDS usage and food availability, food security, and nutritional outcomes, suggesting that more frequent use of the PDS leads to better food security. However, no significant correlation was found between PDS utilization and food quality or accessibility. The regression analysis further supports the finding that PDS utilization improves food availability, security, and nutrition but has little impact on food quality or accessibility.

The analysis of exclusion and inclusion errors in the AAY and PHH categories highlights significant implications for household food security. AAY and PHH households, which exhibit high levels of PDS utilization, benefit from improved food availability, security, and nutrition. However, high exclusion errors—especially among AAY households, where 32% are excluded, and PHH households, with exclusion rates of around 23% mean that eligible households are being denied essential food provisions. This exclusion exacerbates food insecurity and poor

nutritional outcomes, particularly for the most vulnerable groups. Additionally, inclusion errors, where ineligible households hold AAY and PHH cards, further strain resources and worsen inequities within the system. Misclassification and administrative inefficiencies prevent eligible households from fully benefiting from the PDS, perpetuating food insecurity and welfare gaps.

CHAPTER VII
FINDINGS AND CONCLUSION

7.1 Introduction

The National Food Security Act 2013 reframed food security as a legal entitlement and pushed large reforms in targeting, digitalization and grievance redressal. Kerala, despite relatively high human development indicators, depends heavily on imported food grains and faces structural production deficits; therefore, the effective functioning of the PDS is central to household food security in the state. This study situates the post-NFSA PDS reforms within Kerala's agrarian and administrative realities and traces both historical evolution and contemporary implementation challenges. Anchored in the context of the National Food Security Act (NFSA), 2013, the study examined how legal entitlements, administrative reforms, and digitalization of the PDS have shaped availability, accessibility, and utilization of subsidized food grains, and how these, in turn, influence household food security outcomes in a state characterized by high social development yet persistent food dependency. Despite Kerala's strong welfare orientation, the study was motivated by persistent concerns regarding targeting errors, exclusion of eligible households, regional disparities in access, and uncertainties about whether improved delivery mechanisms necessarily translate into better nutritional and food security outcomes at the household level. Recognizing the policy and academic significance of these issues, the study sought to contribute evidence-based facts that can inform more equitable and effective food distribution policies while also enriching theoretical understandings of welfare provisioning and rights-based social policy. Guided by objectives that included assessing the evolution of PDS under NFSA, analyzing trends in food grain availability, examining patterns of utilization across ration card categories, and identifying determinants of access and exclusion, the study employed a mixed-methods approach combining a structured household survey, key-informant interviews, and secondary data analysis. Quantitatively, the analysis utilized descriptive statistics, regression models, factor analysis, MANOVA, and structural

equation modelling, while qualitative evidence provided contextual depth to interpret statistical relationships. Theoretically, the study was framed within welfare economics, capability approaches, and rights-based perspectives on food security, emphasizing that food access is not merely a market outcome but a matter of social justice and state responsibility. Conceptually, the research modelled a pathway from institutional design and PDS determinants to utilization, and further to household food security and nutritional outcomes, while accounting for socio-economic and demographic variations. Building on this framework, the present chapter synthesizes the empirical results across previous chapters and details their policy implications.

7.2 Major Findings

7.2.1 Trends in Food Grain Production in Kerala and the Role of PDS in Meeting Household Food Requirements

The study reveals that Kerala has undergone a significant structural transformation in its agricultural economy over the past several decades, marked by a persistent decline in the area and production of staple food grains, particularly rice. Historically, paddy cultivation formed the backbone of Kerala's agrarian system and played a central role in household food consumption patterns. However, empirical evidence from secondary data analysis indicates a steady contraction in paddy acreage, accompanied by stagnation or decline in yield growth in many districts. This shift has been driven by multiple interrelated factors, including rising labour costs, scarcity of agricultural workers, declining profitability of paddy cultivation, urbanization, fragmentation of landholdings, and a growing preference among farmers for high-value commercial crops such as rubber, coconut, spices, arecanut, and plantation crops. Policy incentives, market forces, and climatic vulnerabilities have further reinforced this transition away from subsistence-oriented food grain production. Consequently, Kerala has gradually moved from a relatively food-secure state in terms of rice production to one that is structurally dependent on external food supplies to meet its basic consumption needs.

A critical finding of the study is that Kerala's internal food grain production now satisfies only a small proportion of its total household cereal requirement. Time-series

analysis of production and consumption trends shows a widening gap between domestic rice output and per capita cereal demand, making the state increasingly reliant on inter-state procurement through the central pool and the Public Distribution System (PDS). This dependency highlights that food security in Kerala is not solely determined by local agricultural performance but is heavily shaped by national food policy, procurement mechanisms, and interstate distribution networks. The study highlights that without consistent central allocations under the National Food Security Act (NFSA), a large segment of Kerala's population especially low-income and vulnerable households would face severe food insecurity.

The study further establishes that the PDS plays a vital stabilizing and compensatory role in Kerala's food economy. By ensuring the regular supply of subsidized rice and wheat to priority households, the PDS functions as a critical buffer against local production shortfalls, market price volatility, and supply chain disruptions. Household survey data indicate that during periods of food inflation or scarcity in open markets, reliance on PDS grains increases significantly, indicating its role as a protective mechanism for poor and middle-income families. The study also finds that PDS reduces the vulnerability of households to external economic shocks, thereby contributing to overall livelihood security in addition to food security.

Another important finding is that the contribution of PDS to household food consumption varies across socio-economic groups and ration card categories. *AAY* and Priority Household (PHH) families depend heavily on PDS for a substantial share of their monthly cereal intake, often relying on it as their primary source of staple food. In contrast, non-priority households tend to supplement their consumption with market purchases but still benefit from PDS as a secondary source, particularly during periods of financial stress. The study also notes that rural households generally show higher dependence on PDS grains compared to urban households, reflecting differences in income levels, employment patterns, and food purchasing behaviour.

The analysis additionally reveals that the effectiveness of PDS in meeting household food requirements is closely linked to supply reliability and timely distribution at Fair Price Shops (FPS). Households that reported consistent availability of commodities

exhibited higher levels of dependence on and satisfaction with PDS, whereas irregular supply reduced trust and utilization. This finding suggests that the mere existence of PDS entitlements is insufficient; their real impact depends on efficient and predictable delivery mechanisms at the grassroots level. It shows that given Kerala's structural decline in food grain production and growing dependence on external supplies, the PDS has become indispensable for ensuring household food security in the state. The findings emphasize that strengthening agricultural revival alone will not be sufficient; it must be complemented by a strong, transparent, and inclusive PDS to safeguard food access for all sections of society. The study therefore recommends a dual strategy of promoting sustainable rice cultivation while simultaneously enhancing the efficiency, coverage, and reliability of the PDS to build a resilient and equitable food system in Kerala.

7.2.2 Phases of PDS Development and Impact of End-to-End Computerisation under NFSA, 2013

The study finds that the Public Distribution System (PDS) in Kerala has evolved through distinct historical and policy phases, reflecting broader shifts in India's food policy from a crisis-driven rationing mechanism to a rights-based welfare system under the National Food Security Act (NFSA), 2013. In its early phase, the PDS primarily functioned as a supply-control and scarcity-management instrument aimed at stabilizing food availability during periods of crisis and market volatility. Subsequently, with economic reforms and policy restructuring, the system gradually moved towards targeted distribution, prioritizing vulnerable sections of society. The introduction of NFSA marked a decisive transition in which food security was redefined as a legal entitlement rather than a discretionary welfare benefit. Kerala's adoption of these reforms illustrates the state's strong commitment to social welfare, while also highlighting the administrative complexities involved in operationalizing a rights-based food security framework at the grassroots level.

A major finding of the study is that end-to-end computerization has fundamentally restructured the governance of PDS in Kerala, significantly enhancing transparency, accountability, and monitoring efficiency. The integration of Aadhaar seeding,

biometric authentication, electronic Point of Sale (ePoS) devices, and the One Nation One Ration Card (ONORC) system has minimized traditional leakages, duplicate beneficiaries, and diversion of subsidized grains. The digital platform has enabled real-time tracking of transactions, stock movements, and beneficiary usage, allowing for better oversight and reduced scope for corruption. These technological interventions have strengthened institutional efficiency and brought a data-driven approach to food distribution in the state.

Despite these gains, the study also reveals that computerization has generated new operational challenges and unintended exclusion risks. Frequent technical glitches such as poor internet connectivity, biometric authentication failures, power outages, and server errors occasionally disrupted access to rations for genuine beneficiaries. Elderly persons, persons with disabilities, migrant workers, and households with low digital literacy were particularly vulnerable to these barriers. While digitalization reduced systemic leakages, it inadvertently created access constraints for some marginalized groups, indicating that technological reforms must be accompanied by social and infrastructural support mechanisms.

The findings further show that the implementation of digital PDS reforms is uneven across Kerala, with urban and well-connected areas benefiting more from smooth ePoS functioning compared to rural and remote regions. Districts with weaker digital infrastructure experienced frequent transaction failures, leading to delays and beneficiary dissatisfaction. This spatial disparity suggests that digital governance alone is insufficient; it must be complemented by investments in connectivity, electricity reliability, and local administrative capacity to ensure uniform access to PDS services across the state. The study concludes that the transition to a digitized, rights-based PDS under NFSA represents a significant institutional advancement in Kerala's food governance system. However, the effectiveness of this transformation depends not only on technology but also on inclusive implementation strategies. Strengthening grievance redressal mechanisms, enhancing digital literacy among beneficiaries, upgrading FPS infrastructure, and ensuring stable internet connectivity

are essential to maximize the benefits of end-to-end computerization while minimizing exclusion and service disruptions.

7.2.3 Availability, Accessibility, and Utilization of PDS by Priority and Non-Priority Cardholders in Kerala under NFSA

The study finds that the availability of PDS commodities in Kerala has generally improved in the post-NFSA period, largely due to enhanced supply chain management, digitization, and better monitoring mechanisms. Most households reported that subsidized rice and other essential items were regularly available at Fair Price Shops (FPS), particularly in urban and semi-urban areas. However, the analysis also reveals that availability is not uniform across all regions and seasons. In certain rural and remote areas, beneficiaries experienced occasional stock shortages, delayed deliveries, or partial distribution of allotted commodities. Such inconsistencies in supply were more frequently reported during periods of transportation disruptions, administrative delays, or technical issues with the ePoS system. The study highlights that while availability has improved compared to earlier phases of PDS, reliability of supply remains a critical determinant of beneficiary satisfaction and continued utilization.

With regard to accessibility, the findings indicate that physical access to FPS is generally reasonable for most households in Kerala, with the majority of respondents reaching their ration shops within a short travel distance or time. Nonetheless, accessibility is not purely a matter of proximity; operational factors such as shop timings, crowd management, waiting time, and digital transaction requirements also play a crucial role. Many elderly persons, persons with disabilities, migrant workers, and daily wage earners reported difficulties in accessing PDS due to inconvenient working hours of FPS, long queues, or the need for biometric authentication. In some cases, beneficiaries had to make multiple visits to collect their entitlements because of connectivity issues or machine failures. Thus, while spatial accessibility is largely adequate, functional accessibility remains uneven and continues to pose barriers for certain vulnerable groups.

The study further reveals significant differences in PDS utilization across ration card categories. AAY and Priority Household (PHH) cardholders exhibited substantially higher utilization rates compared to non-priority households, reflecting their greater economic dependence on subsidized grains. Regression analysis confirms that entitlement type is one of the strongest predictors of PDS utilization, with AAY and PHH households being far more likely to regularly collect their rations than non-priority beneficiaries. This suggests that the targeting mechanism of NFSA has been effective in directing benefits toward poorer households, although not without errors of exclusion and inclusion.

The analysis also shows that utilization is strongly influenced by perceived availability and beneficiary satisfaction with PDS services. Households that consistently received their full entitlements and experienced smooth transactions were more likely to depend on PDS as a primary food source. Conversely, those who faced repeated disruptions or administrative hurdles tended to reduce their reliance on PDS and shift toward market purchases. This finding highlights that utilization is not merely a function of entitlement but is shaped by the quality and reliability of service delivery at the grassroots level.

Another important finding relates to the implementation of the One Nation One Ration Card (ONORC) scheme in Kerala. Awareness of portability was relatively high among beneficiaries, especially among migrant workers and urban households. However, actual usage of ONORC remained limited, with most cardholders continuing to collect rations from their local FPS rather than using portability. The study attributes this to factors such as limited mobility needs, preference for familiar ration shops, technical glitches in portability transactions, and lack of confidence in the system. While ONORC has enhanced flexibility in principle, its practical utilization remains modest in Kerala.

The study indicates that while Kerala's PDS performs reasonably well in terms of availability and physical accessibility, significant challenges persist in operational accessibility and consistent utilization. The findings suggest that improving last-mile service delivery, reducing technical disruptions, simplifying digital processes, and

ensuring beneficiary-friendly FPS operations are essential to enhance effective utilization, particularly among marginalized groups. Strengthening these aspects is crucial for translating PDS entitlements into real improvements in household food security across both priority and non-priority populations in Kerala.

7.2.4 Errors of Exclusion and Determinants of PDS Utilization among Priority and Non-Priority Households in Kerala

The study reveals that errors of exclusion remain a serious challenge in the implementation of the Public Distribution System (PDS) in Kerala, despite the rights-based framework of the National Food Security Act (NFSA), 2013 and the introduction of digital governance mechanisms. A significant proportion of economically vulnerable households that should have been included under *AAY* or Priority Household (PHH) categories were found to be excluded from their rightful entitlements. The exclusion was particularly pronounced among landless labourers, elderly-headed households, migrant workers, single women households, and informal sector workers with irregular incomes. Many excluded households reported procedural barriers such as lack of proper documentation, delays in updating ration cards, administrative hurdles in reclassification, and limited awareness of grievance redressal mechanisms. This finding indicates that while NFSA expanded legal coverage, its practical implementation still leaves a substantial number of deserving households outside the safety net.

The analysis also identifies a parallel problem of inclusion errors, where some households categorized as AAY or PHH did not meet the eligibility criteria based on income, asset ownership, or living conditions. This misclassification has diluted the targeting efficiency of the PDS, diverting scarce subsidized resources away from the poorest households. The coexistence of both exclusion and inclusion errors suggests systemic weaknesses in beneficiary identification, verification, and periodic review processes at the local administrative level. The study therefore highlights the need for more transparent, participatory, and data-driven methods of ration card classification and periodic reassessment.

With regard to the determinants of PDS utilization, multiple regression analysis shows that type of ration card is the most powerful predictor of usage. Households holding AAY and PHH cards were significantly more likely to utilize PDS regularly compared to non-priority households, reflecting their greater economic dependence on subsidized grains. This confirms that entitlement design under NFSA has a strong behavioural influence on consumption patterns and that ration card classification plays a decisive role in shaping household reliance on PDS. The study further finds that perceived availability of commodities at Fair Price Shops (FPS) is a critical determinant of utilization. Households that consistently received their full quota of rice and other items were more likely to depend on PDS as a primary source of food, whereas those facing frequent stock shortages or partial distribution tended to reduce their usage and shift toward market purchases. This indicates that beneficiary behaviour is highly sensitive to supply reliability rather than merely entitlement status.

Another important determinant identified is beneficiary satisfaction with PDS services, including staff behaviour, waiting time, transaction smoothness, and clarity of information. Higher satisfaction levels were positively associated with higher utilization, suggesting that administrative efficiency and respectful service delivery are as important as material entitlements in sustaining household engagement with PDS. Conversely, the study finds that perception of exclusion or discrimination negatively affects PDS utilization. Households that felt marginalized, ignored, or unfairly treated by FPS personnel or local authorities were less inclined to regularly collect their rations, even when eligible. This highlights the role of social relations, trust, and dignity in shaping access to welfare programmes.

Interestingly, the analysis shows that physical accessibility (distance to FPS) was not a statistically significant predictor of utilization in the regression model, since most households in Kerala already live within reasonable proximity to ration shops. This suggests that operational factors such as availability, digital functionality, and service quality matter more than mere geographic proximity. Finally, the study establishes a clear linkage between PDS utilization and household food security outcomes. Multivariate analysis (MANOVA) confirms that higher PDS utilization is

significantly associated with improved food availability, better overall household food security, and enhanced nutritional outcomes, as well as more positive perceptions of PDS impact. However, utilization did not show significant effects on food quality or awareness, indicating that PDS primarily influences quantity and security of access rather than dietary diversity or knowledge. It shows that reducing exclusion errors, improving targeting accuracy, strengthening supply reliability, and enhancing beneficiary-friendly service delivery are crucial for maximizing PDS utilization and its positive impact on food security. Effective grievance redressal, regular beneficiary verification, and inclusive digital systems are essential to ensure that the PDS truly reaches those most in need while minimizing both exclusion and misallocation of benefits.

7.2.5 Observations on food distribution in Kerala

The major findings of the study can be meaningfully interpreted within the theoretical and conceptual frameworks outlined in the study particularly through the lenses of welfare economics, public goods theory, social justice, and the study's conceptual pathway linking policy reforms, PDS performance, utilization, and food security outcomes. From the perspective of welfare economics, the findings strongly justify continued and strengthened state intervention in food distribution in Kerala. The persistent decline in domestic food grain production especially rice and the growing dependence on inter-state procurement clearly reveal that market mechanisms alone are incapable of ensuring stable, affordable, and equitable access to food for all households. The study shows that vulnerable households, particularly AAY and PHH families, rely heavily on subsidized grains for their monthly consumption, which confirms that the Public Distribution System functions as a crucial redistributive mechanism rather than a supplementary program. The stabilizing role of PDS during periods of market price volatility further supports the welfare economics argument that government intervention is necessary to correct market failures, reduce poverty-induced food insecurity, and protect low-income households from economic shocks. In this sense, the PDS operates not merely as a distribution network but as a structural component of Kerala's social welfare architecture.

Interpreted through the lens of public goods theory, the findings strengthen the idea that food security functions as a quasi-public good in Kerala. While food itself is a private and rival good, the broader societal benefits of ensuring adequate nutrition such as improved public health, productivity, social stability, and human development justify collective state action. The study reveals that higher PDS utilization is significantly associated with better household food availability, improved overall food security, and enhanced nutritional outcomes, indicating that public provisioning of subsidized food generates positive externalities beyond individual households. This empirical evidence supports the theoretical claim that food security cannot be left to market forces alone and that government-led distribution mechanisms are essential for maximizing social welfare.

From a social justice and capability perspective, the findings present a mixed but instructive picture. On the one hand, the PDS has played a meaningful role in reducing hunger and vulnerability among priority households, aligning with Rawlsian principles that social policies should primarily benefit the least advantaged. However, the persistence of high exclusion errors particularly among landless labourers, elderly-headed households, migrant workers, and informal workers reveals a significant gap between legal entitlements under NFSA and actual access to food. This suggests that rights-based legislation alone is insufficient without effective governance, transparent targeting, and accessible grievance mechanisms. Moreover, the difficulties faced by elderly persons, persons with disabilities, and digitally illiterate households due to biometric failures and connectivity issues highlight a key ideas of the capability approach: technological efficiency does not automatically enhance people's real freedoms. Instead, digital reforms must be accompanied by inclusive implementation strategies that enhance beneficiaries' actual capacity to access their entitlements with dignity.

In relation to governance theory and public service delivery, the study illustrates both the strengths and limitations of end-to-end computerization of the PDS. Digitization has undoubtedly improved transparency, reduced leakages, and enabled real-time monitoring of transactions, which aligns with theories that digital governance

enhances accountability and administrative efficiency. However, uneven digital infrastructure, frequent technical glitches, and limited digital literacy among certain groups have generated new forms of exclusion. This indicates that technology is a necessary but not sufficient condition for equitable welfare delivery; it must be supported by reliable infrastructure, beneficiary-friendly procedures, and strong local administrative capacity.

Turning to the study's conceptual framework, which proposed a causal pathway from policy reforms to PDS performance, utilization, and food security outcomes, the empirical findings largely validate this model. The study confirms that institutional factors such as ration card type, perceived availability of commodities, and beneficiary satisfaction significantly influence PDS utilization, while perceived exclusion negatively affects usage. This supports the conceptual assumption that operational and governance variables shape household engagement with the PDS rather than entitlement alone. The second component of the conceptual pathway linking utilization to food security outcomes is also strongly supported by the evidence. Multivariate analysis reveals that higher PDS utilization leads to significant improvements in food availability, overall household food security, and nutritional outcomes. However, the absence of significant effects on food quality and awareness suggests that PDS primarily strengthens the quantity and stability of food access rather than dietary diversity or nutritional knowledge. This implies that PDS must be complemented by nutrition education and diversification policies to achieve broader nutritional goals.

The study's conceptual model also recognized demographic and socio-economic factors as moderators of PDS impact. The findings confirm that rural households and priority cardholders depend more heavily on PDS, while urban and non-priority households rely more on market purchases. This differential pattern highlights the need for context-sensitive policy design rather than uniform implementation across all beneficiary groups. Finally, in relation to the Targeted Public Distribution System model, the findings indicate that Kerala's PDS has been reasonably effective in directing greater benefits to priority households. However, persistent exclusion and

inclusion errors reveal weaknesses in beneficiary identification, verification, and periodic reassessment processes, which undermine the efficiency and equity objectives of targeting. The empirical findings suggests that Kerala's PDS has succeeded in stabilizing basic food access but still faces critical challenges related to exclusion, digital barriers, and uneven last-mile delivery. The study therefore concludes that strengthening supply reliability, improving targeting accuracy, ensuring inclusive digital governance, and enhancing grievance redressal are essential for translating NFSA entitlements into meaningful and equitable food security outcomes in Kerala.

7.2.6 Validation of Hypotheses

The first set of null hypotheses tested whether geographic location, socio-economic status (SES), and infrastructure (including digitalisation) had no effect on PDS availability, accessibility and utilization. Multiple linear regression models reject that blanket null: geographic location and SES show significant associations with availability and accessibility in different models, and type of ration card (a proxy for entitlement) is a consistently significant predictor across models. For availability the model was significant ($F = 8.396$, $p < .001$) though explained variance was modest ($R^2 \approx 0.086$), and SES and priority card categories emerged as significant predictors of perceived availability. For accessibility the regression showed a small but significant model ($R^2 \approx 0.063$) with socio-economic status and certain card categories affecting scores and with corporation residence reducing accessibility ($\beta \approx -0.049$, $p = .004$). These results indicate that place and socio-economic factors do influence different dimensions of PDS service delivery, so the null that these structural factors have no effect is not supported.

The second hypothesis is errors of exclusion and the type of ration card held do not significantly influence the level of PDS utilization among both priority and non-priority households. The regression results from Table 6.21 show that both the type of ration card and exclusion errors significantly affect PDS utilization. Specifically, households holding AAY and PHH ration cards exhibit higher levels of PDS utilization, with AAY cardholders demonstrating a significant positive impact (B =

0.312, $p < 0.001$), and PHH cardholders also showing a notable positive relationship ($B = 0.218$, $p < 0.001$). Additionally, the perception of exclusion was found to negatively impact PDS utilization, with a statistically significant coefficient ($B = -0.017$, $p = 0.030$), highlighting the detrimental effect of exclusion errors on the accessibility and effectiveness of the PDS.

The multivariate analysis results from Table 6.26 further underscore the critical role of PDS utilization in improving various food security outcomes. The tests for PDS utilization reveal significant effects on dimensions such as food availability, household food security, and nutritional outcomes. Specifically, food availability and household food security are significantly influenced by PDS utilization, with p-values of 0.003 and less than 0.001, respectively. Nutritional outcomes are also positively impacted by PDS utilization, with a p-value of 0.001, reinforcing the importance of ensuring that eligible households fully benefit from the PDS. The results show that both the type of ration card and the perception of exclusion have statistically significant p-values, confirming their substantial impact on PDS utilization. Given these findings, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1), concluding that errors of exclusion and the type of ration card held do indeed significantly influence the level of PDS utilization among both priority and non-priority households.

The third family of hypotheses concerned determinants of PDS utilization specifically whether entitlement type, supply reliability, accessibility, satisfaction and digital/technical barriers explain variation in utilization. The multiple linear regression for utilization provides strong evidence that several predictors are indeed important: the model is highly significant ($F = 35.967$, $p < .001$) with a high explanatory power ($R = 0.761$; $R^2 = 0.579$), meaning roughly 58% of the variance in the Utilization Score is explained by the included predictors. Type of ration card is the single most powerful predictor (AAY $\beta \approx 0.521$, PHH $\beta \approx 0.686$, Non-priority state subsidy ($\beta \approx 0.232$; all $p < .001$). Availability score ($\beta \approx 0.124$, $p < .001$) and satisfaction with PDS ($\beta \approx 0.131$, $p = .001$) are also positive and significant determinants, while perception of being excluded reduces utilization ($\beta \approx -0.089$, p =

.030). By contrast, measured physical accessibility, SES, and several digital-barrier variables were not significant in the final model. In short, the hypothesis that there are no systematic determinants of utilization is decisively rejected, and the results point to entitlement level, supply reliability and beneficiary satisfaction as the dominant drivers of use.

Fourth, the study tested whether PDS utilization is unrelated to household food-security outcomes. Multivariate analysis (MANOVA) shows that the Utilization Score has a statistically significant multivariate effect on the combined set of food-security outcomes (Pillai's Trace ≈ 0.055; $F(7,537) = 4.484$; $p < .001$), meaning utilization is associated with a change in the multivariate food-security profile. Follow-up between-subjects tests identify where the differences lie: utilization significantly predicts food availability ($F = 8.896$, $p = .003$), household food security ($F = 15.395$, $p < .001$), nutritional outcomes ($F = 11.094$, $p = .001$) and perceived impact of PDS ($F = 4.295$, $p = .039$). However, utilization does not significantly affect food quality, measured physical accessibility, or awareness and information (all non-significant). The practical size of the effects is modest (small R^2s), but the pattern indicates that higher utilization translates into measurable improvements in quantity/stability of food and nutritional indicators even if it does not change perceptions of quality or awareness. Thus, the null that utilization has no impact on food-security outcomes is rejected for several key outcomes.

Fifth, bivariate correlation hypotheses tested whether utilization is associated with individual dimensions of food security. Pearson correlations show small but statistically significant positive associations between Utilization Score and overall household food security ($r = .166$, $p < .001$), food availability ($r = .127$, $p = .003$), and nutritional outcomes ($r = .142$, $p = .001$). The composite food-security index also correlates positively with utilization ($r = .108$, $p = .012$). Conversely, correlations between utilization and food quality ($r = .066$, $p = .125$), physical accessibility ($r = .009$, $p = .840$), and awareness ($r = -.009$, $p = .835$) are not significant. These results confirm the MANOVA findings at the pairwise level: utilization is modestly

associated with improved availability, overall security and nutrition, but not with perceived quality, access barriers, or knowledge.

Sixth, hypotheses about portability (ONORC) usage and group differences were tested using ANOVA and chi-square tests. ANOVA comparing groups by portability usage frequency shows significant differences in perceived accessibility ($F(3,541) = 16.281$, $p < .001$) and availability ($F(3,541) = 4.791$, $p = .003$), while mean utilization scores did not differ significantly by portability frequency ($F(3,541) = 1.565$, $p = .197$). A chi-square analysis of portability use by demographic categories did not produce a significant association in the particular table cited ($\chi^2 = 23.317$, $df = 21$, $p = 0.161$), suggesting portability awareness or occasional use varies but is not strongly patterned by the tested socio-demographic groups. In short, portability affects perceptions of accessibility/availability in some groups but does not yet translate into uniformly higher utilization across users.

Seventh, hypotheses about errors of inclusion and exclusion were tested descriptively and via error-rate calculations. The tests show substantial and statistically meaningful targeting problems: exclusion error for PHH stands at about 23% (nearly one-fourth of eligible PHH households lacked PHH cards), while inclusion errors are alarmingly high PHH inclusion error reported ~26% overall and AAY inclusion error ~33% (with rural/urban variation). These computed error rates reject any optimistic null that targeting errors are negligible; misclassification is large enough to undermine the redistributive intent of PDS and to explain why many vulnerable households are excluded while many ineligible households receive benefits. The policy implication from these test results is clear: beneficiary identification and verification procedures require urgent correction.

Eight, several subgroup hypotheses were examined (ANOVAs and t-tests probing differences in utilization by card type, place of residence, household size and number of dependents). These tests confirm that utilization differs significantly by card type (AAY highest mean utilization, white/non-priority lowest; ANOVA $p < .001$), by place of residence (panchayat v. corporation differences significant), and by household composition (ANOVA across number of dependents significant, $F(8,534)$

= 2.171, p = 0.028). However, some expected effects such as a strong direct effect of measured physical accessibility on utilization were not supported (very weak, non-significant correlation r = .021, p = .623). These mixed results highlight that socio-economic entitlements and supply reliability matter more for actual use than raw geographic distance in Kerala's context.

Finally, across models and tests there is a consistent pattern: the null hypotheses of "no effect" for many relationships (entitlement → utilization; utilization → several food-security outcomes; targeting errors = negligible) are rejected, while the nulls that predicted effects would exist for some variables (physical accessibility, awareness) are not supported. Collectively, the hypothesis tests indicate that PDS performance is shaped most strongly by entitlement design (ration card type), supply reliability and user satisfaction, and that utilization has measurable albeit modest positive associations with key household food security outcomes; at the same time, major implementation problems such as high inclusion/exclusion errors and digital/technical frictions dampen the full potential of NFSA reforms.

7.3 Scope for Further Research

- Future research should track households over time to examine how changes in PDS policies, digitalization, and market conditions affect food security in the long run.
- Comparative research between Kerala and other states such as Tamil Nadu, Andhra Pradesh, Odisha, and West Bengal is needed to understand how governance and institutional capacity shape PDS performance.
- Further studies should investigate how PDS interacts with ICDS, Mid-Day Meal Scheme, and POSHAN Abhiyaan to influence long-term nutritional outcomes and dietary diversity.
- In-depth research is required on how biometric authentication, internet connectivity, and digital literacy affect access to PDS among elderly persons, persons with disabilities, migrants, and rural poor.

- Future studies should use ration card databases combined with field verification to more accurately measure errors of exclusion and inclusion and improve beneficiary identification.

7.4 Conclusion

This study examined the functioning of the Public Distribution System (PDS) in Kerala in the context of the National Food Security Act (NFSA), 2013, with particular emphasis on its utilization and its implications for household food security. The analysis was grounded in a strong theoretical framework encompassing welfare economics, public goods theory, and social justice perspectives, and supported by empirical evidence drawn from primary household surveys and secondary data sources. The findings contribute to a deeper understanding of how policy reforms, institutional mechanisms, and beneficiary behaviour interact to shape food security outcomes in a state characterized by high human development indicators but persistent structural dependence on external food supplies.

The study establishes that Kerala's PDS has undergone a significant institutional transformation in the post-NFSA period, shifting from a primarily rationing mechanism to a rights-based entitlement system. The introduction of end-to-end computerization, biometric authentication, and the One Nation One Ration Card (ONORC) system has enhanced administrative transparency, reduced traditional leakages, and improved monitoring of food distribution. However, these technological advancements have also created new forms of exclusion and operational barriers, particularly for elderly persons, persons with disabilities, migrant workers, and digitally illiterate households. This highlights that while digital governance improves efficiency, it must be accompanied by inclusive implementation strategies and strengthened local infrastructure to ensure equitable access to benefits.

The study further confirms that Kerala faces a persistent structural decline in domestic food grain production, particularly rice, resulting from changes in land use patterns, rising labour costs, and a shift toward high-value commercial crops. Consequently, the state remains heavily dependent on inter-state procurement and central allocations

through the PDS to meet household food requirements. In this context, the PDS functions not merely as a welfare programme but as a critical stabilizing mechanism that protects vulnerable households from market volatility, price shocks, and supply uncertainties. Food security in Kerala is therefore fundamentally shaped by the effectiveness of public distribution rather than by local agricultural production alone.

In terms of programme performance, the findings indicate that while physical availability and accessibility of PDS commodities have generally improved, operational accessibility remains uneven across regions and beneficiary groups. Priority households particularly AAY and PHH cardholders reveal higher utilization of PDS compared to non-priority households, reflecting the effectiveness of targeted entitlements. However, irregular supply, inconvenient Fair Price Shop (FPS) timings, and technical disruptions continue to constrain effective utilization for some sections of the population. Moreover, despite high awareness of ONORC portability, its actual usage remains limited, suggesting that policy design alone does not automatically translate into behavioural change.

A critical concern emerging from the study is the persistence of significant errors of exclusion and inclusion in beneficiary identification. A substantial proportion of genuinely eligible households remain excluded from priority entitlements, while many ineligible households continue to receive benefits. This misclassification undermines both the equity and efficiency objectives of the PDS. The analysis further reveals that ration card type, perceived availability of commodities, and beneficiary satisfaction are the strongest determinants of PDS utilization, whereas physical proximity to FPS does not significantly influence usage. This indicates that operational reliability and service quality matter more than mere geographical access.

The study also provides clear empirical evidence linking PDS utilization to household food security outcomes. Higher utilization is associated with improved food availability, enhanced overall household food security, and better nutritional outcomes. However, PDS utilization does not significantly affect food quality or dietary diversity, indicating that while the system effectively addresses quantity and stability of food access, it does not fully address broader nutritional dimensions. This

highlights the need for complementary nutrition policies alongside the PDS. From a theoretical standpoint, the findings reaffirm the relevance of welfare economics by indicating the indispensability of state intervention in a structurally food-deficit state like Kerala. The public goods perspective is validated through the positive externalities of improved food security on health, productivity, and social stability. Meanwhile, social justice and capability approaches highlight that true food security requires not only material provision but also dignity, accessibility, and empowerment of beneficiaries.

In policy terms, the study concludes that strengthening beneficiary identification processes, improving supply reliability, ensuring inclusive digital governance, and enhancing service quality at Fair Price Shops are essential for maximizing the impact of the NFSA in Kerala. Additionally, integrating PDS with broader nutrition programmes and promoting sustainable rice cultivation are necessary for building a resilient and general food security system. While the PDS has successfully evolved into a rights-based welfare mechanism, significant challenges remain in achieving full inclusivity and nutritional well-being for all households. Future reforms must therefore balance technological efficiency with social inclusion, administrative precision with community participation, and food availability with nutritional adequacy to realize the true spirit of the National Food Security Act.

CHAPTER VIII

RECOMMENDATIONS AND POLICY IMPLICATIONS

The findings of this study have significant policy implications for the design, implementation, and governance of the Public Distribution System (PDS) in Kerala under the National Food Security Act 2013. The evidence suggests that while the PDS has played a crucial role in stabilizing food access and supporting vulnerable households, structural and operational weaknesses continue to limit its full potential. These weaknesses particularly high exclusion errors, uneven digital implementation, and variability in supply reliability indicate the need for both systemic reforms and targeted interventions to strengthen the effectiveness of the programme. In this context the following recommendations are proposed to strengthen the system and enhance its role in ensuring food securities in the state.

Kerala's agrarian landscape has undergone a significant transformation over the past few decades, marked by a steady decline in the area under food crops and a simultaneous expansion of land devoted to cash crops. This land use shift has reduced the state's self-sufficiency in food production, leading to a widening gap between demand and supply of essential food grains, particularly rice—the staple diet of the population. In this context, the PDS has played a crucial role in bridging the gap by ensuring the availability of rice and other essentials at subsidized rates. The efficiency and wide coverage of the PDS have not only cushioned households against acute food shortages but also contributed to maintaining food security despite declining local production. Therefore, the persistent food deficit highlights the structural challenges in Kerala's agricultural sector and the need for balancing commercial crop cultivation with sustainable food crop production. Hence the agriculture policy of state should be focused to enlarge the production of food grains through the expansion or full utilisation of paddy land area and adoption of strategy of increase in productivity. In addition, it is also recemented that while shaping the food policy through the PDS the extent of food deficit of the region to be addressed.

Another policy implication relates to beneficiary identification and targeting. The policy emphasis should be placed on improving the identification and coverages of beneficiaries. To ensure that PDS meets its objectives, further improvements in beneficiary identification, distribution systems, and technological interventions are necessary. Inaccurate targeting has also led to the exclusion of eligible beneficiaries and the inclusion of ineligible individuals, affecting the equitable distribution of food grains. The updation of ration card databases is essential to avoid both inclusion and exclusion errors. Periodic social and economic verification can help to ensure that vulnerable households, migrant workers and newly impoverished groups are adequately covered under NFSA entertainments. Accurate beneficiary targeting will improve equity and reduce misuse of public resources. The study reveals substantial errors of exclusion and inclusion, which undermine the equity and efficiency objectives of the PDS. The state government should therefore undertake a periodic, transparent, and participatory re-verification of ration card eligibility using updated socio-economic criteria. This process should involve local self-governments, community organizations, and independent oversight mechanisms to minimize misclassification. Grievance redressal systems must be strengthened and made more accessible, with time-bound resolution of complaints related to exclusion, reclassification, and service denial.

The findings also highlight the critical importance of supply reliability and last-mile delivery. Since perceived availability is a strong determinant of PDS utilization, the government should invest in improving logistics, storage, and transportation infrastructure to reduce stockouts and delays at Fair Price Shops (FPS). Real-time monitoring of supply chains must be complemented with contingency planning to ensure uninterrupted distribution during emergencies, natural disasters, or digital system failures. Strengthening coordination between central and state agencies is essential to maintain consistent allocations under the central pool.

Given the mixed outcomes of end-to-end computerization, a key recommendation is to adopt a more inclusive digital governance strategy. While digitalization has improved transparency, it has also created barriers for elderly persons, persons with

disabilities, and digitally illiterate households. The state should introduce alternative authentication methods (such as OTP, smart cards, etc) and provide digital literacy training at the community level. FPS operators should be trained to assist vulnerable beneficiaries rather than treating digital processes as rigid procedures.

Another major policy implication concern is enhancing beneficiary satisfaction and service quality. Since satisfaction significantly influences utilization, the government should implement standardized service norms for FPS operations, including clear display of entitlements, respectful staff behaviour, and efficient queue management. Regular performance audits of FPS outlets and incentive mechanisms for well-performing shops could improve overall service delivery.

The study further suggests that PDS alone cannot ensure comprehensive food and nutrition security. While PDS improves food availability and basic security, it does not significantly affect food quality or dietary diversity. Therefore, the state should integrate PDS with complementary programmes such as nutrition education, kitchen gardens, millets promotion, and ICDS-based supplementation to improve overall dietary outcomes. The focus on rice and wheat as staple foods has raised concerns about nutrition, particularly for vulnerable groups such as children and women. Hence the scheme of distribution of fortified rice to be expanded. However, the continued prevalence of child malnutrition, undernourishment, and child stunting suggests that there is still much work to be done, particularly in improving the quality and diversity of food distribution through the PDS. The PDS in Kerala should be gradually move towards a nutrition sensitive approach while NFSA primarily ensure calorie security, The inclusion of nutritious item such as pulses, millets and fortified rice can address hidden hunger and micronutrients deficiencies. Linking PDS with local agriculture production and women self-help groups can promote both nutrition security and local livelihoods

The "serious" category of the Global Hunger Index and the persistent levels of child malnutrition and undernourishment emphasize that food security cannot be addressed solely through food distribution systems but must be complemented by broader policies aimed at healthcare, education, and sanitation.

With respect to One Nation One Ration Card (ONORC), the government should focus on increasing practical usability rather than mere awareness. Technical glitches must be minimized, and migrant workers should receive targeted support to use portability benefits. Special mobile FPS units or digital kiosks in high-migration areas could enhance accessibility.

Finally, the findings emphasise the need for a balanced food security strategy that combines agricultural revival with an efficient PDS. Kerala should promote sustainable rice cultivation through incentives, minimum support prices, and mechanization support, while simultaneously strengthening PDS delivery systems. A dual approach reviving local production and ensuring eliable public distribution will create a more resilient food system.

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INTERVIEW SCHEDULE

I. Basic Details

1. Schedule No.
2. Type of Ration Card:
    - AAY (Antyodaya Anna Yojana)/ Yellow
    - PHH (Priority Household)/ Pink
    - Non-Priority State Subsidy/ Blue
    - Non-Priority Non-Subsidy/ White
3. Local body
    - Panchayath
    - Municipality
    - Corporation
4. Name of Local body
5. Taluk

II. Personnel Information (head of the family on a ration card)- Usually the eldest woman who is not less than eighteen years of age

6. Gender:
    - Male
    - Female
    - Others
7. Age
8. Marital Status:
    - Single
    - Married
    - Widowed
    - Divorced/Separated
9. Religion:
    - Hindu
    - Christian

- Muslim
- Others

10. Caste:
    - SC
    - ST
    - OBC
    - EWS
    - General
11. Education:
    - Illiterate
    - Primary
    - Upper primary
    - High school
    - SSLC
    - +2 or Pre University
    - Higher Education
12. Occupation:
    - Unemployed
    - Farmers/Daily Wage/MGNRGE
    - Business/Self Employed
    - Private Company Employee
    - Government Employee (other than professional occupation)
    - Professional Occupation
    - Students (currently Studying)
    - Senior Citizen (Senior citizens receiving pensions)
13. Household monthly income as per ration card (in Rs.)
14. Any one of the family have chronic disease or disability Yes/No

III. Household Details (other than head of the family on a ration card)

15. Total number of members in the household
16. Number of Earning Members:

17. Number of Dependents (Children, Elderly, etc.)
18. Family Details

Sl. No.	Gender	Age	Education	Occupation	Marital Status	Monthly Income in Rs.
1						
2						
3						
4						
5						
6						
7						

Gender: M/F/O; Education: Illiterate/Primary/Upper primary/High school/SSLC/+2 or Pre University/Higher Education; Occupation: Unemployed/Farmers or Daily Wage or MGNRGE/ Business or Self Employed/Private Company Employee/ Government Employee (other than professional occupation)/Professional Occupation/ Students (currently Studying); Marital Status: Single/Married/Widowed/ Divorced or Separated

19. Are all eligible members of your household included on the ration card list? Yes/No
20. If no why,
    - Documentation Issues: Missing or incorrect documents during the application process might have led to some members being excluded.
    - Lack of Awareness: The household may not be aware of the process to add new members or update the ration card details.
    - Eligibility Criteria: Certain members may not meet the criteria specified by the Public Distribution System (PDS) authorities for inclusion.
    - Clerical Errors: Errors during data entry or processing by authorities could result in exclusion.
    - Delayed Updates: Changes in the household, such as births or marriages, may not have been promptly reported or updated.

- Systemic Challenges: Issues like technical glitches during digitization or a backlog in processing applications might contribute to the problem.
- Migration: Members who have migrated or changed their place of residence might not have been added to the updated ration card list.

IV: Housing Status, Facilities and Properties/ Assets Owned

21. Do you possess any land? Yes / No

22. If yes, size of land (in cents)

23. Do you have own house? Yes/ No

24. If yes,

Square feet of house	Number of Rooms	Condition of House	Roof	Floor
a	b	c	d	e

Codes: c- [1] Good [2] Livable [3] Dilapidated; d- [1] Pucca [2] Kutcha [3] Thatched [4] Others (Specify);e- [1] Mud [2] Cement [3] Tile/ Marble [4] Others (Specify)

25. If No, where you live: Rented/Live with relatives/friends/Others (Specify)

26. Facilities

Facilities	Yes/ No
Electricity	
Drinking water facility	
Drainage Facility	
Space for the stay of all family members	
Separate Kitchen	
Bedroom	
Bathroom	
Store	
Verandah	
Window	
Cattle Shed	
Space for keeping firewood, working tools etc	
Gas Connection	

27. Assets Owned

Type of assets	Yes/no
TV	
Telephone (Landline)	
Smart Phone	
Fridge	
Washing machine	
Mixi/ Grinder	
Computer/laptop Without Internet	
Computer/laptop With Internet	
AC	
Two wheeler	
Four wheeler	
Gold	
Livestock	

28. Do you currently have any outstanding debts or loans? Yes/ No

29. If yes, what is the total amount of debt you owe?

Less than ₹50000/₹50000 - ₹100000/₹100000 - ₹200000/More than ₹200000

30. Have you faced any difficulties in repaying your debts? Yes/No

31. If yes, please specify the nature of these difficulties:

Type of assets	Yes/no
Insufficient Income	
Unexpected Expenses	
Job Loss or Reduced Work Hours	
Health Issues	
Family Obligations	
Poor Financial Planning	
Increased Living Costs	
Lack of Access to Financial Advice	
High Interest Rates	
Others (Specify)	

32. Do you have any savings? Yes/No

V. Consumption Expenditure Pattern of Household

33. Monthly Expenditure on each items in Rs.(1=Less than 1000, 2=1001 - 2000, 3=2001 - 3000, 4=3,001 - 4000, 5=4001-5000, 6=Above 5000)

Particular	Response
Food	
Education	
Health	
Utilities (Water/Electricity. etc.)	
Transportation	
Clothing and Footwear	
Entertainment	
Miscellaneous Items	

VI. Utilization of PDS

34. Does your household depend on PDS for food items?
    - Yes
    - No
35. How often do you utilize the PDS for purchasing food items?
    - Always
    - Often
    - Sometimes
    - Rarely
    - Never
36. How many members of your household typically benefit from the PDS?
37. Which of the following food items does you regularly purchase from ration shop on a monthly basis? (Select all that apply)

    Rice

    Wheat

    Sugar

    Kerosene

    Atta

    Other (Please specify): _____

38. How much of each food item does your household require per month (in kg or liters) and actually receive from PDS per month (in kg or liters)

Particular	Require per month (in kg or liters)	Actually receive from PDS per month (in kg or liters)
Rice		
Wheat		
Sugar		
Kerosene		
Atta		
Other (Please specify): _____		

39. Is the quantity of food items received from PDS sufficient to meet your household's monthly needs?
    - Yes
    - No
40. If no, how do you cover the gap between required and received food items from PDS?
    (Select all that apply)
    - Purchase from local market
    - Borrow from neighbors or relatives
    - Use savings
    - Other (Please specify): _____
41. How would you rate the overall importance of the PDS in meeting your household's food security needs?
    - Very important
    - Important
    - Neutral
    - Unimportant
    - Very unimportant
42. Have you ever had to purchase food items from the market instead of utilizing the PDS?

- Yes
- No

43. If yes, which factors influence your decision to use the PDS? (Please select all that apply)
    - Cost of items
    - Quality of items
    - Proximity of PDS shop
    - Availability of preferred items
    - Unavailability of sufficient quantity
    - Other (please specify): _____

VI. Accessibility of Public Distribution System (PDS)

44. How far is the nearest PDS shop from your home?
    - Less than 1 km
    - 1-2 km
    - 2-5 km
    - More than 5 km
45. How do you usually travel to the PDS shop?
    - Walk
    - Bicycle
    - Public Transport
    - Private Vehicle
    - Other (Please specify): _____
46. How long does it usually take for you to reach the PDS shop?
    - Less than 10 minutes
    - 10-20 minutes
    - 20-30 minutes
    - More than 30 minutes
47. What are the operating hours of the PDS shop you visit?
    - Morning (before 12 PM)
    - Evening (after 4 PM)

- Varies

48. Do the current operating hours of the PDS shop meet your household's needs?
    - Yes
    - No
49. Have you ever encountered difficulties in reaching the PDS shop/Purchasing/ issues with PDS accessibility due to:

	Yes/No
Distance	
Lack of transportation	
Weather conditions	
Health or physical challenges	
Behaviour of Staffs/ Unhelpful or uncooperative staff	
Overcrowding	
Long Waiting Times	
Poor road conditions	
Inconvenient shop hours	
Technical Issues (Biometric, Network Problem, Device Problem, etc.)	
Charging Extra Price	
Others (Specify)	

50. Is the PDS shop you visit easily accessible for people with disabilities or the elderly?
    - Yes
    - No
    - Not Sure
51. Would you prefer alternative delivery methods for PDS items, such as home delivery or mobile distribution?
    - Yes
    - No

    If yes, please explain

52. In your opinion, what improvements can be made to enhance the accessibility of the PDS for beneficiaries?

VII. Portability of Public Distribution System (PDS)

53. Are you aware that PDS entitlements can be accessed from any PDS shop through the One Nation One Ration Card (ONORC) system?
    - Yes
    - No
54. Have you ever used the ONORC system to collect your PDS rations from a different PDS shop (other than your registered shop)?
    - Yes
    - No
55. If yes, how often do you use a different PDS shop to collect your entitlements?
    - Regularly
    - Occasionally
    - Only in emergencies
    - Never
56. Did you face any challenges when accessing your entitlements from a different PDS shop?
    - Yes
    - No
57. If yes, please describe the challenges:
58. In your opinion, how easy or difficult is it to access PDS entitlements from different PDS shops (portability)?
    - Very Easy
    - Easy
    - Neither Easy nor Difficult
    - Difficult
    - Very Difficult
59. Do you think the portability feature (ONORC system) is beneficial for your household?

- Yes
- No

60. If yes, please explain how it has been beneficial: (Select all that apply)
    - Access to Ration Anywhere – It allows my household to access ration benefits at any PDS shop across the country, which is useful when we are not in our home state.
    - Convenience for Migrant Family Members – It is beneficial for household members who work or live in other states as they can access their entitlements wherever they are.
    - Reduced Dependency on a Single Ration Shop – It provides flexibility to choose PDS shops based on availability and convenience, making it easier to avoid long lines or delays.
    - Improved Food Security During Travel or Temporary Relocation – It ensures that my household has access to food grains even when we temporarily relocate for work or family reasons.
    - Enhanced Transparency and Reduced Discrimination – It minimizes local biases or discrimination as we can choose any authorized PDS dealer, improving service quality.
    - Flexibility in Choosing a Preferred PDS Outlet – It allows us to select a PDS outlet with better stock or quality, enhancing the overall experience.
    - No Impact / Minimal Benefit – I haven't noticed a major benefit yet, but it might be useful in certain situations.
    - Others
61. Have you ever faced issues with ration availability when using portability (e.g., items running out at other PDS shops)?
    - Yes
    - No
62. Are there any restrictions or limitations you have faced when trying to access PDS benefits through portability?
    - Yes

- No

63. If yes, please describe the restrictions:
64. If you need any improvement (optional), what improvements would you suggest to enhance the portability of PDS services under the ONORC system? (Please select all that apply)
    - Increase awareness and information dissemination about the ONORC system
    - Simplify the process of accessing rations from different PDS shops
    - Ensure better coordination between PDS shops for stock availability
    - Implement a user-friendly mobile application for checking entitlement and accessing services
    - Provide training for PDS shop staff to assist beneficiaries with the portability process
    - Regular monitoring and evaluation of the ONORC system's effectiveness
    - Increase the variety of food items available through the portability option
    - Other (please specify): _____

VIII. Experience with Computerized/ePOS PDS Services

65. Do you receive timely updates about my PDS entitlements through SMS or messages?
    - Yes
    - No
66. Does the information you receive via messages regarding PDS is clear and easy to understand?
    - Yes
    - No
67. The messages you receive adequately inform me of the schedules for ration distribution. ?
    - Yes
    - No

68. Do you receive a bill or receipt (Epos bill) after purchasing items from the PDS?
    - Yes
    - No
69. The bills you receive clearly itemize the products purchased and their costs.
    - Yes
    - No
70. How would you rate your experience with the computerized system at PDS outlets?
    - Very satisfied
    - Satisfied
    - Neutral
    - Dissatisfied
    - Very dissatisfied
71. Have you faced any of the following challenges due to computerization in PDS? (Check all that apply)
    - Technical issues (e.g., system downtime, errors)
    - Lack of understanding of the digital process
    - Network connectivity problems
    - Language barrier
    - Assistance not available
    - Other (please specify): _____
72. Please indicate your level of agreement with the following statements about Perceptions on Efficiency and Impact of Computerization and ePoS in PDS (1 = Strongly Disagree, 2 = Disgree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

Statements	Response
The computerization of the PDS system has made ration distribution more efficient.	
The ePoS system has improved transparency in tracking the distribution of food grains.	
Using the ePoS system has significantly reduced the risk of fraudulent practices in PDS.	
The introduction of ePoS has helped reduce errors in ration allocation and distribution.	

I believe that ePoS technology has enhanced the overall accountability of PDS operations.	
The ePoS system has simplified the process of verifying beneficiaries' identities.	
Since the implementation of ePoS, I feel more confident that I am receiving the correct amount of ration.	
The ePoS system has reduced waiting times at the PDS shop.	
Technical issues with the ePoS system (e.g., connectivity, device malfunctions) occur frequently.	
Biometric authentication (e.g., fingerprint scanning) in the ePoS system is reliable and accurate.	
The ePoS system provides a fairer and more accessible experience for all beneficiaries.	
End-to-end computerization has made it easier to monitor and manage stock levels at PDS shops.	
The use of ePoS in PDS has minimized the need for manual record-keeping and paperwork.	
I believe that the ePoS system has helped in reducing the leakage and diversion of food grains.	
The ePoS system has improved the quality of service provided by the PDS shop staff.	
Training provided to PDS shop operators for using the ePoS system is sufficient and effective.	
Connectivity issues (e.g., internet or network) have negatively impacted the effectiveness of the ePoS system.	
Computerization and ePoS have made the PDS more convenient and user-friendly for beneficiaries.	
I feel that computerization in PDS has brought about positive changes in the overall system.	
I am satisfied with the performance of the ePoS system in the PDS shop I use.	

IX. Regularity of Purchasing and Availability of Items

73. When do you usually purchase food items from the PDS?
    - At the beginning of the month
    - Mid-month
    - End of the month
    - Other (please specify): _____

74. Have you ever missed your scheduled PDS visit?
    - Yes
    - No

75. If yes, please specify the reason: (Please select all that apply)
    - Lack of availability of preferred food items
    - Inconvenient location of PDS shop
    - Long waiting times at the PDS shop
    - Quality of food items is not satisfactory
    - Financial constraints
    - Other (please specify): _____
76. How often are the food items you need available at your PDS shop?
    - Always available
    - Frequently available
    - Sometimes available
    - Rarely available
    - Never available
77. Have you ever faced a shortage of essential items at the PDS shop?
    - Yes
    - No
78. If yes, please specify which items were unavailable: _____
79. How satisfied are you with the availability of food items at your PDS shop?
    - Very satisfied
    - Satisfied
    - Neutral
    - Dissatisfied
    - Very dissatisfied
80. How often do you receive your entitled food items on the scheduled distribution date?
    - Always
    - Most of the time
    - Sometimes
    - Rarely
    - Never

IX. Food Security Outcome

81. Rate the following statement on a scale: Strongly Agree= 5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1

Parameter	Statements	Response
Food Availability	I always have enough food to meet my household's needs.	
	The food I receive through the PDS is sufficient for my household's monthly consumption	
	The variety of food items provided through the PDS meets the preferences of my household.	
Food Quality	The quality of food provided through the PDS is acceptable for my household	
	The nutritional value of the food items received from the PDS meets my household's needs	
	The food items received from the PDS are fresh and not expired.	
	I trust the safety and hygiene of the food provided through the PDS.	
Food Accessibility	I can easily reach my designated PDS distribution center.	
	The hours of operation at the PDS distribution center are convenient for me	
	I can access food from the PDS without any significant barriers	
	The process of obtaining food from the PDS is straightforward and convenient	
Household Food Security	I feel confident that my household can obtain enough food even in difficult times	
	The PDS has significantly improved my household's overall food security.	
	I have access to sufficient food resources even during emergencies.	
	The assistance provided by the PDS has reduced my household's financial stress related to food purchases.	
Nutritional Outcomes	The PDS food items have positively impacted the nutritional intake of my household members	
	My household maintains a balanced diet due to the food received from the PDS	
Perceived Impact of PDS	The PDS plays a crucial role in ensuring food security for low-income households like mine.	

	I believe the PDS should expand to include more food items to enhance food security.	
Awareness and Information	I am well-informed about my entitlements under the PDS.	
	Information regarding changes in PDS policies is communicated effectively	
	The information I receive through messages helps me plan my purchases from the PDS effectively.	
	I find it helpful to receive reminders about my PDS entitlement and upcoming distribution dates.	

X. Perspectives about Errors of Exclusion

82. Rate the following statement on a scale: Strongly Agree= 5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1

Parameter	Statements	Response
Awareness of Eligibility Criteria	I have received adequate information about the eligibility criteria for the PDS	
	I understand the process to appeal if I am deemed ineligible for PDS benefits	
	I feel confident that I can determine whether I qualify for PDS assistance	
Application Process Accessibility	Local authorities are helpful in guiding applicants through the PDS application process	
	The forms and documentation required for PDS applications are easy to understand	
	I have encountered barriers (e.g., language, literacy) when trying to apply for PDS benefits	
Perception of Being Excluded	I have heard of cases where eligible individuals were incorrectly denied PDS benefits	
	In my community, there is a perception that certain groups are systematically excluded from the PDS	
	There are no clear mechanisms in place to rectify any errors in eligibility determinations for PDS	
	I believe that more people would benefit from the PDS if the eligibility criteria were expanded.	
Information Availability	Information about the PDS is regularly updated and available in my local language	
	I can easily access information about changes to the PDS program through community resources	
	The government provides clear communication regarding the rights of PDS beneficiaries.	

Satisfaction with the PDS	Overall, I am satisfied with the quality of food items provided through the PDS	
	I believe the benefits received through the PDS are sufficient to meet my family's needs	
	I feel that the PDS is an essential resource for my household's food security	

83. Do you think the exclusion of some households was fair and justified? Yes/No
84. What improvements would you suggest for the PDS system to better meet your food needs?
85. Any other suggestions or remarks

Place: **Name and Signature of Investigator**

Date: