

THE IMPACT OF NATIONAL FOOD SECURITY ACT, 2013 ON KERALA'S PUBLIC DISTRIBUTION SYSTEM- AN EXPLORATORY STUDY

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UNIVERSITY OF CALICUT
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DOCTOR OF PHILOSOPHY IN ECONOMICS

By

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DECLARATION

I, hereby declare that the work presented in the thesis entitled ‘ **The Impact of National Food Security Act, 2013 on Kerala’s Public Distribution System- An Exploratory Study** ’ is based on the original work done by me under the guidance of Dr. Abdulla M P, Associate Professor and Principal (Rtd), E.M.E.A College of Arts and Science, Kondotti and Dr. Ibrahim Cholakkal, Professor, E.M.E.A College of Arts and Science, Kondotti has not been included in any other thesis submitted previously for the award of any degree, diploma, title or recognition. The contents of the thesis are undergone plagiarism check using iThenticate software at C.H.M.K. Library, University of Calicut, and the similarity index found within the permissible limit.

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This is to certify that the dissertation titled '**The Impact of National Food Security Act, 2013 on Kerala's Public Distribution System - An Exploratory Study**' is the record of the original work done by Mr. **Mohamed Najeeb P M** under my guidance and supervision. The results of the research presented in this thesis have not previously formed the basis for the award of any degree, diploma, or certificate of this institute or any other institute or university.

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ABSTRACT

The Public Distribution System (PDS) in India is a critical government initiative aimed at achieving food security by providing essential commodities to economically vulnerable sections of society at subsidized rates. Despite its well-defined objectives, the effectiveness of the PDS in meeting its goals has been the subject of extensive debate and study. This research explores the PDS's role in ensuring food security, particularly in the context of the National Food Security Act (NFSA) of 2013, which marked a significant policy shift from a welfare-based to a rights-based approach to food security.

The NFSA aims to cover up to 75% of the rural population and 50% of the urban population, ensuring their access to highly subsidized food grains. This is a monumental task, given the scale and diversity of India's population. The Act also promotes women's empowerment by mandating that the eldest woman of a household, aged 18 or above, be designated as the head of the household for issuing ration cards, thereby acknowledging her pivotal role in family nutrition and decision-making.

This research investigates the extent to which the PDS effectively ensures food security for its intended beneficiaries and examines the challenges it encounters in its implementation. The effectiveness of the PDS, along with the impact of digitization processes introduced to improve its functioning, is critically analyzed. The study employs a combination of qualitative and quantitative research methods to provide a comprehensive assessment of the PDS's performance.

The core of this research focuses on the impact of the PDS on food security, which is measured through the accessibility, availability, and utilization of food grains distributed through the system. Despite the objective to alleviate hunger and improve nutritional outcomes, evidence suggests varying levels of effectiveness across different states and demographic segments. For instance, while some beneficiaries, particularly from lower-income groups, perceive the PDS as a lifeline, others, particularly from middle-income brackets, report that the quantities and quality of food grains are insufficient and of poor quality.

The implementation of the PDS faces numerous challenges, including logistical issues, corruption, and inefficiencies in the supply chain from procurement to distribution. The digitization of the PDS was intended to address these issues by enhancing transparency, improving the targeting of beneficiaries, and reducing leakages and corruption. This study evaluates the real-world implications of these digitization efforts, assessing their effectiveness in achieving the intended improvements.

Based on the findings, this research offers several policy recommendations to enhance the effectiveness of the PDS. These include strengthening the quality control mechanisms to ensure the distribution of high-quality food grains, enhancing the operational transparency of the system to build public trust, and continuing the expansion and refinement of digitization initiatives to ensure they effectively meet their goals.

Furthermore, the research suggests that more targeted approaches may be necessary to address the specific needs of diverse beneficiary groups. Tailoring the PDS provisions to better suit the dietary preferences and nutritional requirements of different regions and communities could help improve the utilization rates of distributed food grains.

This study contributes to the broader discourse on food security in India by providing empirical evidence of the strengths and weaknesses of the PDS. It highlights the critical role of government intervention in mitigating the impacts of inflation and market failures that disproportionately affect the most vulnerable segments of society. By examining the intersections of policy, technology, and beneficiary experiences, the research illuminates the complex dynamics that govern the PDS.

In conclusion, while the PDS is a vital component of India's social safety net, designed to combat poverty and hunger, its effectiveness is contingent on continuous monitoring, evaluation, and reform. Addressing the challenges identified through this research can lead to a more robust and responsive PDS that not only ensures food security but also supports the broader goals of social justice and equity in Indian society.

സംഗ്രഹം

ഇന്ത്യയിലെ പൊതുവിതരണ സംവിധാനം (പിഡിഎസ്) സമൂഹത്തിലെ സാമ്പത്തികമായി ദുർബലരായ വിഭാഗങ്ങൾക്ക് സബ്സിഡി നിരക്കിൽ അവശ്യസാധനങ്ങൾ നൽകിക്കൊണ്ട് ഭക്ഷ്യസുരക്ഷ കൈവരിക്കാൻ ലക്ഷ്യമിട്ടുള്ള ഒരു നിർണായക സർക്കാർ സംരംഭമാണ്. നന്നായി നിർവ്വചിക്കപ്പെട്ട ലക്ഷ്യങ്ങൾ ഉണ്ടായിരുന്നിട്ടും, അതിന്റെ ലക്ഷ്യങ്ങൾ കൈവരിക്കുന്നതിൽ പൊതുവിതരണ സംവിധാനത്തിന്റെ ഫലപ്രാപ്തി വിപുലമായ ചർച്ചകൾക്കും പഠനങ്ങൾക്കും വിഷയമാണ്. ഈ ഗവേഷണം ഭക്ഷ്യസുരക്ഷ ഉറപ്പാക്കുന്നതിൽ പൊതുവിതരണസംവിധാനത്തിന്റെ പങ്കിനെ പര്യവേക്ഷണം ചെയ്യുന്നു, പ്രത്യേകിച്ച് 2013-ലെ ദേശീയ ഭക്ഷ്യസുരക്ഷാ നിയമത്തിന്റെ പശ്ചാത്തലത്തിൽ, ഇത് ക്ഷേമാധിഷ്ഠിതത്തിൽ നിന്ന് ഭക്ഷ്യസുരക്ഷയ്ക്കുള്ള അവകാശാധിഷ്ഠിത സമീപനത്തിലേക്കുള്ള ഒരു സുപ്രധാന നയമാറ്റം അടയാളപ്പെടുത്തി.

ദേശീയ ഭക്ഷ്യസുരക്ഷാ നിയമം ഗ്രാമീണ ജനസംഖ്യയുടെ 75% വരെയും നഗരങ്ങളിലെ ജനസംഖ്യയുടെ 50% വരെയും, ഉയർന്ന സബ്സിഡിയുള്ള ഭക്ഷ്യധാന്യങ്ങളിലേക്കുള്ള പ്രവേശനം ഉറപ്പാക്കാൻ ലക്ഷ്യമിടുന്നു. ഇന്ത്യയിലെ ജനസംഖ്യയുടെ അളവും വൈവിധ്യവും കണക്കിലെടുക്കുമ്പോൾ ഇതൊരു മഹത്തായ ദൗത്യമാണ്. 18 വയസോ അതിൽ കൂടുതലോ പ്രായമുള്ള ഒരു കുടുംബത്തിലെ മുതിർന്ന സ്ത്രീയെ റേഷൻ കാർഡുകൾ നൽകുന്നതിന് കുടുംബനാഥയായി നിയോഗിക്കണമെന്നും അതുവഴി കുടുംബ പോഷണത്തിലും തീരുമാനങ്ങൾ എടുക്കുന്നതിലും അവളുടെ നിർണായക പങ്ക് അംഗീകരിക്കുന്നതിലൂടെയും ഈ നിയമം സ്ത്രീ ശാക്തീകരണത്തെ പ്രോത്സാഹിപ്പിക്കുന്നു.

ഈ ഗവേഷണം, പൊതുവിതരണ സംവിധാനം അതിന്റെ ഉദ്ദേശിച്ച ഗുണഭോക്താക്കൾക്ക് ഭക്ഷ്യസുരക്ഷ എത്രത്തോളം ഫലപ്രദമായി ഉറപ്പാക്കുന്നു എന്ന് അന്വേഷിക്കുകയും അത് നടപ്പിലാക്കുന്നതിൽ നേരിടുന്ന വെല്ലുവിളികൾ പരിശോധിക്കുകയും ചെയ്യുന്നു. പൊതുവിതരണ സംവിധാനത്തിന്റെ ഫലപ്രാപ്തിയും അതിന്റെ പ്രവർത്തനം മെച്ചപ്പെടുത്തുന്നതിനായി അവതരിപ്പിച്ച ഡിജിറ്റൈസേഷൻ പ്രക്രിയകളുടെ സ്വാധീനവും വിമർശനാത്മകമായി വിശകലനം ചെയ്യപ്പെടുന്നു. പൊതുവിതരണ സംവിധാനത്തിന്റെ പ്രകടനത്തെക്കുറിച്ച് സമഗ്രമായ ഒരു വിലയിരുത്തൽ നൽകുന്നതിന് ഗുണപരവും അളവ്പരവുമായ ഗവേഷണ രീതികളുടെ സംയോജനമാണ് പഠനം ഉപയോഗിക്കുന്നത്.

ഈ ഗവേഷണത്തിന്റെ കാതൽ ഭക്ഷ്യ സുരക്ഷയിൽ പൊതുവിതരണ സംവിധാനം ചെലുത്തുന്ന സ്വാധീനത്തിൽ ശ്രദ്ധ കേന്ദ്രീകരിക്കുന്നു. പൊതുവിതരണ സംവിധാനത്തിലൂടെ വിതരണം ചെയ്യുന്ന ഭക്ഷ്യധാന്യങ്ങളുടെ പ്രവേശനക്ഷമത, ലഭ്യത, ഉപയോഗം എന്നിവയിലൂടെ അളക്കുന്നു. വിശപ്പ് ലഘൂകരിക്കാനും പോഷകാഹാര ഫലങ്ങൾ മെച്ചപ്പെടുത്താനുമുള്ള ലക്ഷ്യം ഉണ്ടായിരുന്നിട്ടും, തെളിവുകൾ വിവിധ സംസ്ഥാനങ്ങളിലും ജനസംഖ്യാ വിഭാഗങ്ങളിലും വ്യത്യസ്ത തലത്തിലുള്ള ഫലപ്രാപ്തിയെ സൂചിപ്പിക്കുന്നു. ഉദാഹരണത്തിന്, ചില ഗുണഭോക്താക്കൾ, പ്രത്യേകിച്ച് താഴ്ന്ന വരുമാനക്കാരായ ഗ്രൂപ്പുകളിൽ നിന്ന്, പൊതുവിതരണ സംവിധാനം ഒരു ജീവനരേഖയായി കാണുമ്പോൾ, മറ്റുള്ളവർ, പ്രത്യേകിച്ച് ഇടത്തരം വരുമാനമുള്ളവർ ഭക്ഷ്യധാന്യങ്ങളുടെ അളവ് അപര്യാപ്തമാണെന്നും ഗുണനിലവാരമില്ലാത്തതാണെന്നും പ്രസ്താവിക്കുന്നു.

സംഭരണം മുതൽ വിതരണം വരെയുള്ള പ്രക്രിയകളിൽ വിതരണ ശൃംഖലയിലെ കടത്ത് സംബന്ധമായ പ്രശ്നങ്ങൾ, അഴിമതി, കാര്യക്ഷമതയില്ലായ്മ എന്നിവ ഉൾപ്പെടെ നിരവധി വെല്ലുവിളികൾ പൊതുവിതരണ സംവിധാനം നടപ്പിലാക്കുന്നത് അഭിമുഖീകരിക്കുന്നു. സുതാര്യത വർദ്ധിപ്പിക്കുക, ഗുണഭോക്താക്കളുടെ തിരഞ്ഞെടുപ്പ് മെച്ചപ്പെടുത്തുക, ചോർച്ചയും അഴിമതിയും കുറയ്ക്കുക എന്നിവയിലൂടെ ഈ പ്രശ്നങ്ങൾ പരിഹരിക്കാനാണ് പൊതുവിതരണ സംവിധാനത്തിലെ ഡിജിറ്റലൈസേഷൻ ഉദ്ദേശിച്ചത്. ഈ ഡിജിറ്റലൈസേഷൻ ശ്രമങ്ങളുടെ യഥാർത്ഥ പ്രത്യാഘാതങ്ങളെ ഈ പഠനം വിലയിരുത്തുകയും ഉദ്ദേശിച്ച മെച്ചപ്പെടുത്തലുകൾ കൈവരിക്കുന്നതിൽ അവയുടെ ഫലപ്രാപ്തി വിലയിരുത്തുകയും ചെയ്യുന്നു.

കണ്ടെത്തലുകളെ അടിസ്ഥാനമാക്കി, ഈ ഗവേഷണം പൊതുവിതരണ സംവിധാനത്തിന്റെ ഫലപ്രാപ്തി വർദ്ധിപ്പിക്കുന്നതിന് നിരവധി നയ നിർദ്ദേശങ്ങൾ വാഗ്ദാനം ചെയ്യുന്നു. ഉയർന്ന ഗുണമേന്മയുള്ള ഭക്ഷ്യധാന്യങ്ങളുടെ വിതരണം ഉറപ്പാക്കുന്നതിന് ഗുണനിലവാര നിയന്ത്രണ സംവിധാനങ്ങൾ ശക്തിപ്പെടുത്തുക, പൊതുജനവിശ്വാസം വളർത്തിയെടുക്കുന്നതിന് സംവിധാനത്തിന്റെ പ്രവർത്തന സുതാര്യത വർദ്ധിപ്പിക്കുക, ഡിജിറ്റൈസേഷൻ സംരംഭങ്ങളുടെ വിപുലീകരണവും പരിഷ്കരണവും തുടരുക, അവയുടെ ലക്ഷ്യങ്ങൾ ഫലപ്രദമായി നിറവേറ്റുന്നുവെന്ന് ഉറപ്പാക്കുക, എന്നിവ അവയിൽ ഉൾപ്പെടുന്നു.

കൂടാതെ, വൈവിധ്യമാർന്ന ഗുണഭോക്തൃ ഗ്രൂപ്പുകളുടെ പ്രത്യേക ആവശ്യങ്ങൾ പരിഹരിക്കുന്നതിന് കൂടുതൽ ലക്ഷ്യം വെക്കുന്ന സമീപനങ്ങൾ ആവശ്യമായി വന്നേക്കാമെന്ന് ഗവേഷണം സൂചിപ്പിക്കുന്നു. വിവിധ പ്രദേശങ്ങളുടേയും സാമൂഹികവിഭാഗങ്ങളുടേയും ഭക്ഷണ മുൻഗണനകൾക്കും പോഷക ആവശ്യങ്ങൾക്കും അനുയോജ്യമായ രീതിയിൽ പൊതുവിതരണ സംവിധാനത്തിലെ വ്യവസ്ഥകൾ ക്രമീകരിക്കുന്നത് വിതരണം ചെയ്ത ഭക്ഷ്യധാന്യങ്ങളുടെ ഉപയോഗ നിരക്ക് മെച്ചപ്പെടുത്താൻ സഹായിക്കും.

പൊതുവിതരണ സംവിധാനത്തിന്റെ ശക്തിയും ബലഹീനതയും സംബന്ധിച്ച അനുഭവപരമായ തെളിവുകൾ നൽകിക്കൊണ്ട് ഈ പഠനം ഇന്ത്യയിലെ ഭക്ഷ്യസുരക്ഷയെക്കുറിച്ചുള്ള വിശാലമായ വ്യവഹാരത്തിന് സംഭാവന നൽകുന്നു. സമൂഹത്തിലെ ഏറ്റവും ദുർബലരായ വിഭാഗങ്ങളെ പ്രതികൂലമായി ബാധിക്കുന്ന പണപ്പെരുപ്പത്തിന്റെയും വിപണി പരാജയങ്ങളുടെയും ആഘാതങ്ങൾ ലഘൂകരിക്കുന്നതിൽ സർക്കാർ ഇടപെടലിന്റെ നിർണായക പങ്ക് ഇത് എടുത്തുകാണിക്കുന്നു. നയം, സാങ്കേതികവിദ്യ, ഗുണഭോക്തൃ അനുഭവങ്ങൾ എന്നിവയുടെ മേഖലകൾ പരിശോധിക്കുന്നതിലൂടെ ഈ ഗവേഷണം പൊതുവിതരണ സംവിധാനത്തെ നിയന്ത്രിക്കുന്ന സങ്കീർണ്ണമായ ചലനാത്മകതയെ പ്രകാശിപ്പിക്കുന്നു.

ഉപസംഹാരമായി, ദാരിദ്ര്യത്തെയും പട്ടിണിയെയും നേരിടാൻ രൂപകൽപ്പന ചെയ്തിട്ടുള്ള ഇന്ത്യയുടെ സാമൂഹിക സുരക്ഷാ വലയുടെ ഒരു സുപ്രധാന ഘടകമാണ് പൊതുവിതരണ സംവിധാനം. അതിന്റെ ഫലപ്രാപ്തി തുടർച്ചയായ നിരീക്ഷണം, വിലയിരുത്തൽ, പരിഷ്കരണം എന്നിവയെ ആശ്രയിച്ചിരിക്കുന്നു. ഈ ഗവേഷണത്തിലൂടെ തിരിച്ചറിഞ്ഞ വെല്ലുവിളികളെ അഭിസംബോധന ചെയ്യുന്നത് കൂടുതൽ ശക്തവും പ്രതികരണശേഷിയുള്ളതുമായ പൊതുവിതരണ സംവിധാനത്തിലേക്ക് നയിക്കും. അത് ഭക്ഷ്യസുരക്ഷ ഉറപ്പാക്കുക മാത്രമല്ല, ഇന്ത്യൻ സമൂഹത്തിലെ സാമൂഹിക നീതിയുടെയും തുല്യതയുടെയും വിശാലമായ ലക്ഷ്യങ്ങളെ പിന്തുണയ്ക്കുകയും ചെയ്യുന്നു.

CONTENTS

List of Tables

List of Figures

List of Abbreviations

Chapter No.	Title	Page No.
1	Introduction	1-16
	1.1 Public Distribution System and food Security in India	3
	1.2 The National Food Security Act, 2013	6
	1.3 Problem statement	9
	1.4 Objectives of the Research	11
	1.5 Important Research Questions	12
	1.6 Broad hypothesis of the Study	13
	1.7 Research Hypotheses	13
	1.8 Significance of the Research	14
	1.9 Methodology	15
	1.10 Research Outline	16
2	Theoretical Frame Work and Review of Literature	17-72
	2.1 Theoretical Framework of food security and PDS	17
	2.1.1 Theory of Individual Deficiency	18
	2.1.2 Malthusian Theory	19
	2.1.3 Welfare Theory	20
	2.1.4 Economic Theory	20
	2.1.5 Market Failure Theory	22
	2.1.6 Political Economy Theory	22
	2.1.7 Human Rights Perspective	24
	2.2 Review of Literature	25
	2.2.1 Evolution and Historical Context of PDS	29
	2.2.2 Targeted PDS	33
	2.2.3 Structure and Components of PDS	35
	2.2.4 Objectives and importance of PDS	35
	2.2.5 Effectiveness of PDS in India	37
	2.2.6 Digitization of PDS in India	52
	2.2.7 Conclusion	71

3	Data and Methodology	73-82
	3.1 Introduction	73
	3.2 Primary Data Collection	74
	3.2.1 Sampling Design of the Study	75
	3.3 statistical Methods used in the Study	76
4	PDS and National Food Security Act in India – History, Evolution and Trends	83-118
	4.1 Public Distribution System and National Food Security Act in India: History, Evolution And Trends	83
	4.2 Efficiency of PDs in India – A general Review	93
	4.2.1 What do studies say about Improving the PDS in India	97
	4.3 National food Security Act, 2013	102
	4.3.1 NFSA in Kerala Context	110
	4.4 Conclusion	116
5	Empirical Analysis and Findings	119-182
	5.1 Introduction	119
	5.2 General Profile of the Households	119
	5.3 Descriptive Statistics of Key Household Variables	125
	5.3.1 Estimated Food Deficit	148
	5.3.2 Satisfaction with Distribution Process	150
	5.3.3 Distance to Ration Shops	153
	5.3.4 Delivery Time from PDS	154
	5.4 Impact of PDS on Food Security: A Comprehensive Analysis	155
	5.4.1 Reasons for Beneficiary Dissatisfaction with Foodgrains in PDS	157
	5.4.2 Importance of the PDS in meeting Family’s needs by Type of Ration card	159
	5.4.3 Uncertainty from Ration Shops	162
	5.4.4 Household Response to Digitization of PDS	164
	5.4.5 Nutritional Quality of Food grains of PDS	167
	5.4.6 Effect of TPDS on Food Security	169
	5.4.7 Factors affecting the Effectiveness of TPDS	174
6.	Summary	183-210
	6.1 Socio economic Characteristics of the Study Units	183
	6.2 Food grain purchases by Households and food Deficit	187
	6.3 Effectiveness of Service Delivery and public satisfaction on PDS	191

6.4 Effectiveness of PDS and its Impact on Food Security	194
6.5 Households' Responses to Digitalization of the PDS	204
6.6. Impact of PDS on Nutritional Status	204
6.7 Policy Recommendations	206
6.8 Scope for Future Research	208
6.9 Conclusion	210
References	211-216
Appendix	

LIST OF TABLES

<i>Table No.</i>	<i>Title</i>	<i>Page No.</i>
4.1	Food Entitlement Under NFSA 2013	105
4.2	Total Number of Beneficiaries under NFSA in Different States	106
4.3	NFSA Implementation in India and Kerala	111
4.4	Card wise Food Entitlement in Kerala	114
5.1	Location wise Household Distribution	120
5.2	Gender wise Distribution	120
5.3	Descriptive Statistics of Key Household Variables	126
5.4	Cross Tabulation of Location and Card Type, and Chi Square Test Results	128
5.5	Cross Tabulation of Gender and Ration Card Type and Chi Square Test Results	130
5.6	Distribution of Types of Households by Religion	132
5.7	Distribution of Types of Households by Caste	134
5.8	Distribution of Types of Households by Occupation	136
5.9	Distribution of Types of Households by Land holdings	138
5.10	Differences in Household size and Households' Annual Income by Type of Ration Card	140
5.11	Estimated ANOVA Test Results	140
5.12	Differences in Total Quantity of Rice Wheat Purchased by Households in the Last Month	142
5.13	Estimated Results of ANOVA of Total Quantity of Rice and Wheat by Type of Ration Card	143
5.14	Average Quantity of Different Types of Food grains Purchased from PDS by the Households	144
5.15	Estimated ANOVA Test for Quantity of Food grains Purchased from PDS by Types of Ration Cards	145
5.16	Average Quantity of Different Types of food grains Purchased from Open Market by Households	147
5.17	Estimated ANOVA Test for Quantity of Food grains Purchased from Open Market by Types of Ration Cards	148
5.18	Estimated Food Deficit in the Households in Relation to PDS	149
5.19	Distance to Ration Shop and Delivery Time From PDS	155

5.20	Quality of food grains Supplied at the FPSs by type of Ration Card Holders	156
5.21	Importance of PDS in meeting Family's Needs by Type of ratio card	161
5.22	Households' Response to Digitalization of the PDS	165
5.23	Effect of TPDS on Food Security by Type of Ration Cards	174
5.24	Bivariate Examination of Self – assessed Food Security by TPDS among Households	176
5.25	Bivariate Examination of Self- assessed Food Security by TPDS among Households	178
5.26	Ordered Probit Regression Results of Effectiveness of TPDS in Kerala	181

LIST OF FIGURES

<i>Figure No.</i>	<i>Title</i>	<i>Page No.</i>
4.1	Distribution of Ration Cards in Kerala	112
4.2	Subsidy spent for Various Categories of Card Holders in Kerala	115
5.1	Religion wise Distribution of Households	121
5.2	Caste wise Distribution of Households	122
5.3	Occupation wise Distribution of Households	123
5.4	Education wise Distribution of Households	124
5.5	Agricultural Land Possession wise Distribution of Households	125
5.6	Distribution of Households Across Geographical Locations	129
5.7	Satisfaction with Distribution, Availability of Foodgrains and Behaviours of FPS Dealers	152
5.8	Awareness of the Total Quantity of Food Grains Entitlement per Household from PDS	153
5.9	Distance to Ration Shop	154
5.10	Quality of Food Grains Supplied at the FPS by Type of Ration Card Holders	157
5.11	Reasons for Beneficiary Dissatisfaction with Food Grains in the PDS	159
5.12	Importance of the PDS in Meeting Family's Needs by Type of Ration Cards	162
5.13	Uncertainty from Ration Shops	163
5.14	Perceptions of Households Regarding the Impact of Ration Shops on Nutritional Status	166
5.15	Nutritional Quality of PDS Food grains	168
5.16	Perceptions of the PDS in Enhancing Nutritional Safety for the economically Disadvantaged	169
5.17	Self-assessed Effectiveness of TPDS on Food Security of Households	172
5.18	Effect of TPDS on Food Security by Type of Households	174

LIST OF ABBREVIATIONS

AAY	:	Antyodaya Anna Yojana
AI	:	Artificial Intelligence
APC	:	Agricultural Prices Commission
APL	:	Above Poverty Line
ARD	:	Authorised Ration Dealer
BPL	:	Below Poverty Line
CEP	:	Consumer End Prices
CIP	:	Central Issue Prices
DBT	:	Direct Benefit Transfer
DFS	:	Double Fortified Salt
EPoS	:	Electronic Point of Sale
FCI	:	Food Corporation of India
FMCG	:	Fast Moving Consumer Goods
FPS	:	Fair Price Shop
FWP	:	Food for Work Programme
GIS	:	Geographic Information System
ICDS	:	Integrated Child Development Services
ICT	:	Information Communication Technology
KPI	:	Key Performance Indicators
MDM	:	Mid- Day Meals
MGNREGA	:	Mahatma Gandhi National Rural Employment Guarantee Act
MIS	:	Management Information System
MSP	:	Minimum Support Price
NFSA	:	National Food Security Act

NIC	:	National Informatics Centre
NITI	:	National Institution for Transforming India
NSSO	:	National Sample Survey Organization
OBC	:	Other Backward Classes
PDS	:	Public Distribution System
PHH	:	Priority House Holds
RCMS	:	Ration Card Management System
RPDS	:	Revamped Public Distribution System
SC	:	Scheduled Caste
ST	:	Scheduled Tribes
TPDS	:	Targeted Public Distribution System
UT	:	Union Territory

INTRODUCTION

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- 1.1 Public Distribution System and food Security in India*
 - 1.2 The National Food Security Act, 2013*
 - 1.3 Problem statement*
 - 1.4 Objectives of the Research*
 - 1.5 Important Research Questions*
 - 1.6 Broad hypothesis of the Study*
 - 1.7 Research Hypotheses*
 - 1.8 Significance of the Research*
 - 1.9 Methodology*
 - 1.10 Research Outline*
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1. INTRODUCTION

India, a large country grappling with acute poverty and an unequal distribution of national income, faces the challenges of food scarcity, shortages of necessary goods and services, and soaring inflation. These economic difficulties have severely impacted the impoverished population, making it extremely hard for them to meet their basic needs. Consequently, the underprivileged continue to suffer from deprivation and they are yet to be free from hunger. Planning and development efforts appear reverberant when a large majority of the population cannot access minimum food and essential items. To achieve India's aspirations of enhancing human life, upholding democracy, and achieving social justice, it is crucial to ensure equitable distribution of food and essential goods to the poor and the marginalized and vulnerable sections.

Food security stands as an essential prerequisite for the development of human resources and increased human efficiency. It refers to a state where every individual has both physical and economic access to sufficient, safe, and nutritious food at all times, meeting their nutritional needs and enabling them for an active and balanced life. This necessitates a sufficient aggregate supply of food and also sensible purchasing capacity at the personal or at the household level which helps the individuals meet their demand for adequate food consumption. Thus, both the quantitative aspect, ensuring sufficient overall availability of food, and the qualitative aspect, considering the nutritional needs of the population, are vital for achieving food security.

In response to the food security crisis, the Government of India has implemented various food-based safety programs, including the Public Distribution System (PDS), Integrated Child Development Scheme (ICDS), Mid-Day Meals Program (MDM), and Food for Work Program (FWP). Among these, the PDS has the widest coverage and incurs the highest public subsidy expenditure. It is recognized that mere availability of food grains is not enough to guarantee food security; it can be achieved through either raising revenues or providing food grains at subsidized prices. While the schemes aimed at generating jobs becomes the first

approach, the Public Distribution System embodies the second one, constituting a crucial component of demand and supply management. The primary goal of the PDS, an open intervention of the government, is to fulfil the basic needs of marginalized and weaker communities who cannot otherwise purchase necessary commodities due to no or low access to sources of income. Thus, PDS has by far become an effective instrument that ensures essential supplies of household commodities at a very reasonable price.

Public Distribution System in India

The concept of PDS and its broad definition is challenging due to its contextual and situation-specific nature. In theory, PDS refers to a distribution system regulated by public authorities on behalf of the general public or a specific group, with two key distinctions from private distribution: the influence of public authority and a primary focus on social welfare rather than bagging profits. In India, the Public Distribution System takes on unique characteristics. It differs from socialist countries with complete public control over distribution or the autonomous private systems found in Scandinavian countries. Instead, India's PDS operates as a jointly regulated retail system, overseen by both state and central governments, aiming to provide essential goods at subsidized or fair prices to the vulnerable and disadvantaged sections of society.

The current setup involves a joint responsibility of the state and central governments. The central government handles the procurement, storage, transportation, and allocation of food grains to state governments through Food Corporation of India (FCI). On the other hand, state governments manage the scheme's functioning, which includes identifying families Below the Poverty Line (BPL), issuing ration cards, allocating rations within the state, and supervising the functions of FPS (Fair Price Shops). The items currently supplied under the Public Distribution System include rice, wheat, Atta, kerosene, pulses and sugar.

The primary goal of India's public distribution system is to offer basic consumer goods at affordable and subsidized rates to shield customers from the impact of escalating commodity prices and ensure the minimum nutritional well-

being of the population. Initially, the system was universal and applied to all income classes without differentiation. However, it was later restructured and relaunched as a targeted system, providing subsidies to families below the poverty line (BPL) while above poverty line (APL) families pay the economic cost for these goods.

During inflation, the public distribution system becomes even more crucial as it helps regulate inflation rates in an economic scenario where high amount is required to purchase limited goods. Inflation is seen as a multifaceted crisis with economic, political, social, and systemic implications, creating an imbalance between the availability of basic commodities and the active money circulation in the market. This situation particularly affects the poorest segments of society, causing hardships and exacerbating economic inequalities. Inflation also disrupts the distribution mechanism, hitting individuals with fixed incomes particularly hard and widening the gap between rich and poor.

The public distribution system is thus a form of state intervention in the market for essential goods like cereals, primarily aimed at controlling inflation and mitigating its impact on vulnerable sections of society. It serves as an anti-inflationary measure that significantly contributes to stabilizing prices. Moreover, the public distribution system apart from ensuring access to essential goods at reasonable rates for the people, it also gives benefits to farmers by providing them with a proper price for their crops. Government agencies procure crops at minimum support prices (MSP), which helps stabilize market prices when there is excess supply due to excess quantities. These procured goods are then distributed through the PDS network and hence it becomes highly beneficial to farmers to ensure returns to their back breaking hard works. The wide market presence of more than 5 lakh fair price shops in India demonstrates the importance of such shops in Indian economy and it is evident that the PDS in India is one of the largest networks of its kind in the world.

1.1 Public Distribution and Food Security in India

Food security is a fundamental concern for countries across the globe, and India is no exception. With its massive and diverse population, ensuring adequate

and consistent access to nutritious food for all citizens has been a persistent challenge.

Food security can be defined as the condition where all individuals and households have access to sufficient, safe, and nutritious food at all times, ensuring they meet their dietary needs for an active and healthy life. It is a multi-dimensional concept that goes beyond mere food availability to encompass accessibility, affordability, and nutritional adequacy. Achieving food security is crucial for not only individual health and well-being but also for national development and stability.

In India, the Public Distribution System has been a cornerstone in the government's efforts to address food security challenges. Introduced in the 1960s, the PDS aims to provide essential commodities, primarily rice, wheat, sugar, and kerosene, at subsidized rates to economically vulnerable sections of society. By acting as a safety net, the PDS aims to protect the poor from the impacts of inflation and ensure they have access to basic consumer goods.

The PDS in India is operated through a vast network of Fair Price Shops (FPS), which is responsible to distribute these commodities to targeted customers who are identified as Below Poverty Line (BPL) and Above Poverty Line (APL). The system has undergone various reforms to improve efficiency, transparency, and effectiveness in reaching the intended beneficiaries from time to time.

The Public Distribution System has had a significant impact on improving food security in India (Dreze, 2019). By providing subsidized food grains and essential commodities to the economically disadvantaged, the PDS has contributed to poverty reduction and enhanced the nutritional status of beneficiaries. The availability of affordable food through the PDS has helped in achieving dietary diversity and improving calorie intake among vulnerable sections of the population. Moreover, the PDS plays a critical role in stabilizing food prices and regulating market forces, acting as a buffer against fluctuations in the economy. During times of inflation and food crises, the PDS provides a lifeline for millions by ensuring access to essential commodities at reasonable prices.

While the Public Distribution System has made significant strides in enhancing food security, several challenges persist in achieving food security for all of India's population.

- a. **Leakage and Corruption:** A key obstacle encountered by the PDS is the occurrence of leakages and corruption within the distribution network. These issues lead to a considerable amount of subsidized food failing to reach the rightful recipients, resulting in inefficiencies and imbalances within the system.
- b. **Targeting Errors:** Another difficulty lies in precisely identifying and reaching the most vulnerable populations. The current targeting mechanisms have faced criticism for their inadequacy, resulting in both inclusion and exclusion errors (Gulati and Saini, 2015). This means that deserving individuals are excluded from the benefits while ineligible ones end up benefiting from the system.
- c. **Insufficient Coverage:** Although there have been attempts to broaden the reach of the PDS, certain segments of the population still remain without access to its benefits. This limited coverage continues to sustain food insecurity among numerous vulnerable groups.
- d. **Nutritional Quality:** The main emphasis of the PDS is on cereals, but it frequently overlooks the importance of diverse nutrition. It is crucial to ensure availability and access to a wide range of nutritious foods, such as millets, fruits, vegetables, and proteins, to effectively combat malnutrition and enhance overall health.
- e. **Supply Chain Management:** The PDS encounters issues due to ineffective supply chain management, resulting in storage losses, distribution delays, and suboptimal system performance. Strengthening the supply chain plays a vital role in improving the efficiency of the system.
- f. **Rural-Urban Divide:** The rural-urban divide in access to food security remains a pressing issue. Rural areas, where a large proportion of India's

population resides, often face greater challenges in ensuring food security compared to urban areas.

In conclusion, food security is a multifaceted concept that encompasses not only the availability of food but also its accessibility, affordability, and nutritional adequacy for all individuals and households. In India, achieving food security has been a longstanding challenge given its vast and diverse population. The Public Distribution System (PDS) has emerged as a crucial tool in the government's efforts to address food security concerns and improve the well-being of vulnerable sections of society. Through the PDS, subsidized food grains and essential commodities are made available to economically disadvantaged populations, reducing poverty and enhancing nutritional intake.

However, it is essential to acknowledge the challenges associated with food security in India. Leakage and corruption within the distribution chain, inadequate targeting mechanisms, insufficient coverage, and nutritional imbalances are hurdles that need to be addressed effectively. Despite these challenges, the Public Distribution System remains an effective and valuable instrument in achieving food security in India. It has made significant strides in improving access to affordable and nutritious food for millions of vulnerable citizens. Policy reforms and technological advancements, coupled with a renewed focus on strengthening the supply chain and enhancing nutritional diversity, hold the promise of further augmenting the system's effectiveness.

Thus, the Public Distribution System continues to be a pivotal force in providing food security in India. By building on its successes, addressing its challenges, and fostering a collaborative approach among various stakeholders, India can forge a path towards a more secure and resilient food future for its citizens. The PDS, despite its few limitations, remains a critical pillar in the nation's pursuit of food security and the ultimate goal of a hunger-free India.

1.2 The National Food Security Act (NFSA) of 2013

The National Food Security Act (NFSA) of 2013, passed with great significance, is aimed at guaranteeing food security for a significant segment of India's populace. This document offers an in-depth exploration of the main aspects

of the NFSA, illuminating its scope, entitlements, transparency measures, and specific beneficiary categories.

The extent of NFSA's coverage is established by the NITI Aayog, relying on the 2011-12 Household Consumption Expenditure Survey conducted by NSSO. This ensures a comprehensive approach to tackling food insecurity.

Within the framework of NFSA, up to 75% of the rural population and 50% of the urban population are legally entitled to access heavily subsidized food grains through the Targeted Public Distribution System (TPDS), encompassing roughly two-thirds of the entire populace.

This legislation mandates the distribution of food grains at significantly reduced prices through the Public Distribution System, guaranteeing affordability for recipients. Additionally, NFSA extends nutritional support to women and children, offering complimentary nutritious meals to pregnant and lactating women through the Maternity and Child Care, Mid- Day Meal Programme (MDM) and Integrated Child Development Services (ICDS) schemes. Children aged 6-14 years also benefit from free nutritious meals under these programmes.

The government has historically addressed household food security through initiatives such as the Public Distribution System and the Targeted Public Distribution System. However, the NFSA of 2013, enacted on July 5, 2013, signifies a notable shift in the approach to food security, transitioning from a welfare-based model to one founded on rights. Under the NFSA, up to 75% of the rural population and 50% of the urban population are legally entitled to receive subsidized food grains through the Targeted Public Distribution System, effectively covering approximately two-thirds of the population. In a move promoting gender equality, the NFSA designates the eldest woman in a household as the head for issuing ration cards, recognizing her pivotal role in food distribution.

The Central Government extends financial assistance to states to facilitate the transportation of food grains within the state and also regulates the margins of Fair Price Shop (FPS) dealers in accordance with established norms. Provisions for a

food security allowance are in place to compensate beneficiaries in cases of non-supply of food grains, ensuring accountability.

To enhance transparency, mechanisms are established for disclosing records related to the Public Distribution System (PDS). Recently, the digitization of PDS has contributed to promoting transparency from procurement to distribution.

Beneficiaries of TPDS under NFSA 2013 are categorized into two groups:

1. Antyodaya Anna Yojana (AAY) Households:

This category includes widows, disabled individuals, and those aged 60 or older with no assured means of support, often comprising households below the poverty line, with a focus on supporting women and children.

2. Priority Households (PHH):

Priority Households (PHH) encompasses eligible households entitled to receive subsidized food grains under the National Food Security Act (NFSA), 2013 representing a significant portion of ration cardholders in the priority sector. This provision is a vital step in poverty alleviation.

Implementation of NFSA places the responsibility of identifying eligible households within the Targeted Public Distribution System (TPDS) coverage on the respective states and union territories, highlighting the importance of decentralized implementation.

In summary, the National Food Security Act (NFSA) of 2013 signifies a transformative shift towards a rights-based approach to food security in India. By legally guaranteeing access to heavily subsidized food grains for a significant portion of the population and emphasizing transparency, empowerment, and support for women and children, the NFSA endeavours to ensure food security for countless vulnerable households across the nation. This research document has provided a comprehensive overview of the NFSA's key provisions, beneficiary categories, and implementation mechanisms, underscoring its significance in addressing food security challenges in India.

1.3 Problem Statement

The Public Distribution System (PDS) in India serves as a cornerstone in addressing food security concerns by providing essential commodities to economically vulnerable sections of society at subsidized rates (Shanmugam and Thomas, 2016). However, despite its well defined object, the effectiveness of the PDS in achieving its goals has been a subject of debate and study. This research aims to investigate the extent to which the PDS effectively ensures food security for its intended beneficiaries and the challenges it encounters in its implementation. Additionally, this study also looks into the effectiveness of digitization process in the proper functioning of PDS. The effectiveness is analysed as a step to evaluate the impact of National Food Security Act (NFSA), 2013.

The Government has long addressed the issue of household food security through initiatives like the Public Distribution System and the Targeted Public Distribution System. However, the National Food Security Act (NFSA) of 2013, enacted on July 5, 2013, represents a significant shift in the approach to food security. It moves from a welfare-based approach to a rights-based one. The NFSA legally entitles up to 75% of the rural population and 50% of the urban population to receive subsidized food grains through the Targeted Public Distribution System, covering about two-thirds of the population.

As a part of promoting women's empowerment, the Act mandates that the eldest woman in a household aged 18 or above must be the head of the household for issuing ration cards.

The NFSA is being implemented in all States and Union Territories, with approximately 80 crore people out of a maximum coverage of 81.34 crore individuals currently benefiting from highly subsidized food grains under this Act. States and UTs continuously identify beneficiaries, removing ineligible, fake, or duplicate ration cards while also adding new households due to births and addressing cases of genuine households that were previously left out.

The problems associated with the PDS, including issues such as leakages, targeting errors, and supply chain inefficiencies, have been well-documented. However, this research endeavours to provide a comprehensive assessment of these problems and their impact on the overall effectiveness of the PDS. By addressing these issues, this study aims to offer recommendations for potential policy reforms and improvements that can enhance the PDS's ability to contribute to food security in India.

In essence, this research seeks to bridge the existing knowledge gap by critically analysing the PDS's efficacy in ensuring food security, assessing the financial feasibility of FPS, and addressing the challenges that hinder the system's efficient operation.

Though the Public Distribution System (PDS) in India is significant tool in guaranteeing food security and alleviating poverty, yet critical research gaps persist, warranting further investigation into its effectiveness, digitization effects, and challenges. Moreover, previous studies in this area also calls for more reformed approach to improve the efficiency of PDS (Datta and Ramaswami, 2001; Desai, 2015)

Primarily, a research gap exists in analysing the PDS's effectiveness in ensuring food security. Despite its mission to offer subsidized food grains to vulnerable groups, empirical evidence highlights low utilization and market purchases at inflated rates (Khera, 2011; Gulati and Saini, 2015). Exploring the extent to which the PDS genuinely serves its intended beneficiaries to secure free food is crucial as the existing researches are giving mixed results. While few studies find it effective, there are few studies pointing out that PDS is yet to achieve its intended outcome. Thus, in Kerala context, exploring how far the PDS has succeeded in ensuring food security is important. As the extant study focuses on assessing the impact of PDS in ensuring food security by caste, gender, rural-urban location and religion, the findings of this study will be a fruitful addition to existing literature on PDS in India.

Moreover, the lack of broader studies concerning the impact of digitization on PDS underlines an urgent research gap. While digitization initiatives have been implemented to enhance efficiency, transparency, and accountability (Drèze, 2019), empirical exploration of its real-world implications remains limited. As the digitization is introduced with an intention of reducing leakages, properly targeting customers, timely and hassle-free delivery of food grains and improving overall efficiency, a thorough examination is still needed to find out its effectiveness in attaining intended outcomes. Such studies are still lacking in India.

Furthermore, comprehensive research into the multifaceted challenges confronting the PDS is important. Despite some state-level reforms, the PDS is still poised with certain challenges (Drèze, 2019). Identifying and comprehending specific hurdles – ranging from procurement and storage to transportation and distribution of food grains – is indispensable. The extant study promises to unravel insights into the potential barriers hindering optimal PDS operation.

In conclusion, a substantial research gap is seen in the areas of PDS and its effectiveness covering food security and digitization. Addressing these gaps through comprehensive inquiry not only adds to existing literature but also provides evidence-driven policy formulations and recommendations to enhance food security and reduce poverty in India.

1.4 Objectives of the Research

The overarching objective of this research is to provide a comprehensive assessment of the impact of Public Distribution System (PDS) on food security in India. By systematically analysing the effectiveness of the PDS, evaluating the financial feasibility of Fair Price Shops (FPS), and identifying challenges in its implementation, this study aims to contribute to a deeper understanding of the intricate dynamics that shape food security initiatives in the country. Through a holistic exploration of these facets, this research aims at making proper policy recommendations and strategies that can enhance the ability of PDS to alleviate hunger and ensure access to nutritious food for vulnerable populations.

The specific objectives the current research include:

1. Analyse the socio-demographic features of households in the study area: This is aimed at studying the demographic features of the households including their socio-economic details, types of ration cards, food entitlements from the PDS etc.
2. Assess the quantity of food grains being purchased from PDS and open market by households and to evaluate the extent of food deficit.
3. Assess the effectiveness of delivery mechanism of PDS and to evaluate the satisfaction of the households.
4. Assess the Impact of the Public Distribution System and the NFSA, 2013 on Food and nutritional security:

This is to comprehensively evaluate the effectiveness of the Public Distribution System (PDS) in Kerala in achieving its primary goal of ensuring food security for vulnerable populations. This objective seeks to analyse the extent to which the PDS has contributed to improving access to affordable and nutritious food among the targeted beneficiaries. The impact shall be assessed by gender, caste, religion and rural-urban locations. This analysis is made to assess how far the National Food Security Act of 2013 has helped in ensuring food security.

1.5 Important Research Questions

1. How do socio-demographic features vary among types of ration card holders?
2. How does the purchase of different types of foodgrains differ between the Public Distribution System (PDS) and the open market? Is there a food grain deficit in households in the study area?
3. What problems do households encounter in the delivery mechanism of the PDS, and are they satisfied with the current delivery system?

4. To what extent has the Targeted Public Distribution System (TPDS) under the NFSA improved access to affordable and nutritious food among its intended beneficiaries?
5. How has the TPDS impacted the food security status of vulnerable populations?
6. What variations exist in the impact of the PDS on food security based on factors such as gender, caste, religion, and rural-urban locations?
7. What factors determine the effectiveness of TPDS on food security in Kerala?
8. What specific challenges impede the effective functioning of the TPDS, and what opportunities exist to address these challenges and enhance food security through the system?

1.6 Broad hypothesis of the Study

The study hypothesizes that the Public Distribution System (PDS) in Kerala effectively contributes to improving food security among vulnerable populations, as indicated by socio-demographic features, food purchase patterns, satisfaction with delivery mechanisms, and overall impact assessment, with significant differences observed across gender, caste, religion, and rural-urban locations.

1.7 Research Hypotheses

Hypothesis for Question 1:

Socio-demographic features, such as income level, education, and household size, will vary significantly among different types of ration card holders.

Hypothesis for Question 2:

Household purchases of various types of foodgrains will differ between the Public Distribution System (PDS) and the open market. Additionally, there may be a food grain deficit in households in the study area, with households relying more on the open market when they face shortages.

Hypothesis for Question 3:

Households encounter various issues in the delivery mechanism of the PDS, including delays, irregularities, and quality concerns. It is expected that many households may not be fully satisfied with the current delivery system.

Hypothesis for Question 4:

The Targeted Public Distribution System (TPDS) has moderately improved access to affordable and nutritious food among its intended beneficiaries, with variations based on income levels and the accuracy of targeting.

Hypothesis for Question 5:

The TPDS has had a positive impact on the food security and nutritional status of vulnerable populations, with vulnerable groups experiencing a more significant improvement in food security and nutritional status compared to the other sections of population.

Hypothesis for Question 6:

Variations in the impact of the PDS on food security exist based on factors such as type of ration cards, location, caste, distance to PDS, income and family size. AAY and other BPL card holders, marginalized castes, and no asset holders may experience a different impact.

Hypothesis for Question 7:

The effectiveness of TPDS on food security in Kerala is determined by multiple factors, including the type of card holders, rural/urban location, caste group, landholdings, distance to PDS, income and household's size.

1.8 Significance of the Research

The Public Distribution System (PDS) stands as a critical instrument in India's quest to ensure food security for its diverse and vast population. This research holds significant importance due to its potential to shed light on the effectiveness of the PDS in fulfilling its intended purpose and its impact on achieving food security. By comprehensively analysing the functioning, strengths,

and weaknesses of the PDS, this research aims to provide valuable insights to policymakers, government authorities, and stakeholders involved in shaping food security strategies.

Furthermore, the research's focus on evaluating the impact of digitization on operational efficiency of Public Distribution System would undoubtedly help in bringing out how far the latest efforts of digitization under the NFSA have helped in enhancing the operations.

Unearthing the problems associated with the PDS is another vital facet of this research. Identifying the challenges that hinder the efficient operation of the PDS, such as leakages, targeting errors, and supply chain management issues, will contribute to a more holistic understanding of the system's shortcomings. This, in turn, can inform policy reforms and improvements necessary to enhance the PDS's efficacy in fulfilling its core objective of ensuring food security.

1.9 Methodology

The study, conducted using primary data, randomly selected two districts out of the 14 in Kerala, namely Malappuram and Palakkad. The selected Palakkad district is one of the districts with the highest poverty rate and is among the most vulnerable districts in the state. Malappuram, on the other hand, is one of the relatively low – percapita income districts in Kerala.

The total number of ration card holders in both Palakkad and Malappuram districts, as per official government reports, was 1,846,673. Therefore, the required sample size for the study was 543 to achieve a 98% confidence level with a 5% margin of error. However, some households did not report or cooperate during data collection, and there were instances where information in the questionnaire, especially regarding quantities of food grains purchased from the Public Distribution System (PDS), income, consumption, etc., was missing. As a result, 47 households were omitted from the required sample size, leaving a final sample of 496 households for this study. This sample represents a 50% distribution from both Palakkad and Malappuram districts of Kerala for this research.

To analyse the collected data comprehensively, the research employs a range of statistical methods. Descriptive statistics are harnessed to offer insights into the central tendencies and variations within key household variables. This work presents mean values, standard deviations, percentage distributions, frequency distributions, cross-tabulations, and visually represent the data through bar diagrams and pie diagrams. These techniques enhance our understanding of the data's underlying patterns and characteristics.

Inferential statistics are also a crucial part of our analysis, involving various statistical tests and techniques to explore relationships across different variables. Specifically, the study employs the Chi-square test to examine associations between categorical variables, such as food security levels, satisfaction, and types of ration cards, with demographic factors like caste, religion, and occupation. Additionally, this study utilizes one-way analysis of variance (ANOVA) to assess significant differences in means across groups, allowing us to compare variables like annual income, expenditure, and quantities of food grains purchased across various household groups.

Chapter 3 provides a detailed discussion on methodology and research design used for this study.

1.10 Research Outline

This thesis is structured into six different chapters. The first chapter provides the introduction, second chapter deals with the theoretical framework and review of related literature and the third chapter provides a detailed discussion on the research design and methodology adopted for completing this work. The fourth chapter discusses about the history, evolution and trends of the Public Distribution System and National Food Security Act, 2013. The fifth chapter provides a comprehensive discussion on pertinent issues such as effectiveness of PDS in ensuring food security, impact of digitization on PDS and challenges associated with PDS by analysing the data collected through primary survey. At the end, in the sixth chapter, detailed write up is given in terms of research summary, major research findings and policy recommendations.

**THEORETICAL FRAMEWORK AND
REVIEW OF LITERATURE**

2.1 Theoretical Framework of food security and PDS

2.2 Review of Literature

2.1 THEORETICAL FRAMEWORK OF FOOD SECURITY AND PDS

When we examine the theoretical frame work of PDS and food security, it is evident that it is multi-dimensional in the sense that it covers economic, political, social, policy and human rights perspectives. The influences of these factors are to be analyzed to understand the complex interplay of multiple forces in the availability, accessibility, and utilization of food resources for diverse populations. The theory often draws from different branches of knowledge such as economics, political science, sociology, and public policy.

The dynamics of supply and demand of food within the PDS framework, considering the complementary factors like production, distribution, patterns of consumption, and market forces, are analyzed in the economic perspective. It examines how food availability, accessibility and affordability for different socio economic groups are influenced by price controls, subsidies, and market interventions by the Government.

The role of political units, institutions, and interest groups, in influencing PDS policies and implementation processes is analyzed by the political economy theory. It also assesses the state's capacity to regulate, manage, and administer the distribution of essential food items through the PDS, and how political considerations of the governments and interested groups influence resource allocation and policy decisions.

The sociological dimension of the theory examines how PDS policies address such issues as equity, social inclusion, and vulnerability, particularly for disadvantaged and marginalized communities. It also makes an attempt to analyze the socio- cultural factors that influence food preferences, dietary habits, and perceptions of food security within diverse population.

The public policy perspective evaluates the structure, effectiveness, and efficiency of PDS programmes in achieving the objectives of food security like the mechanism of targeting, coverage, leakage, and structure of governance. It also

examines the impact of PDS policy interventions on household food consumption, nutrition outcomes, poverty reduction, and broader long run development goals.

The food security framework perspective assesses the availability, affordability, and utilization of food by individuals and households by focusing on ensuring adequate access to food which is nutritious and culturally appropriate. It also examines stability of the PDS by addressing the vulnerability of food systems to shocks and disruptions, including natural calamities, epidemics, conflicts, and economic crises. It also analyses the utilization aspect by examining the factors related to dietary diversity, food safety, hygiene practices, and nutritional outcomes within the context of food security.

2.1.1 Theory of Individual Deficiency

This theory was developed during the late 1970s and early 1980s by William Julius Wilson. According to this theory personal characteristics of individuals are the major causes of poverty. These characteristics include lack of sufficient hard work, low level of intelligence, laziness, lack of necessary skills, low level of educational attainments, inferior manners of living, etc. This theory states that the possibility of poverty alters on the basis of such factors as gender, age, structure of the family, health and economic conditions, geographical and climatic conditions, etc. These factors resulted in a situation where it is difficult for the people to survive and attain human development. To fight with these types of deficiencies people require education, training, awareness, motivation, remunerative occupations, and policies and measures to provide goods and services to those who are suffering from such deficiencies.

This theory thus emphasizes on the significance of policies and various anti-poverty programmes and provision of public goods and services instead of cash to overcome these deficiencies. Thus, the theory points towards the proper implementation of the PDS to extend its scope by helping people to overcome their basic deficiencies and achieving physical wellbeing. PDS is actually a social component of the individual- level anti- poverty programmes as it provides a safety net to help people who are suffering from various deficiencies. It is a public duty to

protect the deficient people as they are also part of the society. Their personal needs should be satisfied by such programmes and measures that directly distribute them with essential goods and services. People with deficiencies like lower income and asset levels, unhealthy conditions, low economic status, living in miserable and vulnerable geographical conditions, physical and mental disabilities, etc. should be provided with at least a minimum amount of goods and services to improve their living conditions. Therefore, along with various anti-poverty measures, PDS is a crucial component to meet the basic necessities of the people. If implemented efficiently, PDS can transform these deficient people into productive population by enabling them to work and earn and better their economic status and living conditions. Thus, PDS in effect, help these people to become productive and useful persons in the socio economic fabric of the nation. Any barriers to the four components of food security- proper availability, affordability, accessibility, and utilization of food – can itself create an individual deficiency which can again be resolved through a properly arranged PDS.

2.1.2 Malthusian Theory

Developed by Thomas Robert Malthus, the Malthusian Theory of Population (An Essay in The First Principle of Population, 1798) illustrates that population has a tendency to outgrow the existing food production. According to him, population increases geometrically and food production arithmetically. Thus Malthus was worried about the situation of poor, particularly the rural poor. Malthus opined that a faster growing population than the food supply would result in poverty, misery, hunger and famine in the world. If the nation could not check the rapidly growing population, it will create huge disparities in the economy. The supply of essential food items at reasonably low prices is imperative to counter with food deficiency. The PDS is, therefore, an important component of the anti-poverty measures of any Government.

Food is the basic necessity of all human beings and as its supply is limited with the productive capacity of the nation, it is crucial to ensure an equitable distribution of it to the alarmingly increasing population. Through the PDS the

government can balance the supply of food items among the people. With the proper and efficient implementation of the PDS the government can reduce hunger, poverty, famine and malnutrition among the population.

2.1.3 Welfare Theory

The Welfare theory of PDS focuses the role of government intervention in ensuring social welfare through the distribution of essential commodities to disadvantaged and low- income populations. This theory suggests that PDS has a crucial role for poverty eradication, nutritional security and social stability.

The key principles of the welfare theory of PDS include: Equity, Poverty alleviation, Nutritional support, and Social stability. This theory considers PDS as a welfare scheme to ensure food security for vulnerable and weaker sections of the society by distributing essential commodities at subsidized prices.

2.1.4 Economic Theory

The Economic Theory version of PDS examines the rationale, efficiency, and outcomes of government intervention in the distribution of essential goods, particularly food grains, from an economic perspective.

The key aspects of the theory include:

1. **Market Failure:** It recognizes that markets may fail to efficiently allocate resources, especially essential goods, to all segments of society, particularly the economically disadvantaged. Imperfect competition, externalities, asymmetric information, and income inequality are the basic forces reflecting the market failures that can lead to inefficient outcomes in the distribution of food. There is a separate theory of Market Failure also on PDS.
2. **Public Goods:** Essential goods like food grains are often considered public goods as they are non-excludable and non- rivalrous in nature. Economic theory argues that the provision of these public goods, including food items

may require government intervention to ensure equitable access to the targeted population and prevent market failures.

3. **Income Redistribution:** The theory viewed PDS as a mechanism for the redistribution of income, wherein subsidies and price controls are used to transfer purchasing power from the richer to the poorer. By providing subsidized food items to low- income households, PDS aims to improve their welfare and reduce poverty and inequality.
4. **Price Stabilization:** Government intervention in food markets, through subsidies and PDS, can help stabilize price and minimize the adverse impact of fluctuations in food prices on consumers and producers.
5. **Efficiency Considerations:** Economic theory evaluates the efficiency of PDS programmes in achieving their objectives relative to alternative policy instruments. To assess the effectiveness of PDS interventions, Cost- Benefit analysis, efficiency in resource allocation, and welfare implications are among the criteria used.
6. **Market Distortions:** Though the PDS programmes aim to address market failures and improve welfare outcomes, they may also create distortions and negative impacts in agricultural markets, production incentives, and consumer behavior. Economic theory perspective examines the unwarranted consequences and efficiency losses associated with price controls, subsidies, and other interventions implemented through PDS.

Overall, the economic theory of PDS provides an analysis about a framework for understanding the economic rationale behind government intervention in food distribution, assessing the efficiency and equity implications of PDS policies, and assessing the design of effective strategies to address food insecurity and poverty.

Supporters of this theory argue that PDS can stimulate economic growth through price stabilization, reducing income inequalities and enhancing the purchasing power of the people with low income.

2.1.5 Market Failure Theory

The Market Failure theory has evolved over time and does not have a single founder. However, prominent economists like Adam Smith, Alfred Marshall, and A C Pigou contributed foundational ideas that laid the ground work for understanding market failures. Modern interpretations and formalizations of market failure theory have been developed by economists like Kenneth Arrow, Ronald Coase, Joseph Stiglitz and others. These economists explained how and why market economies fail to efficiently allocate resources, leading to the need for Government intervention.

This theory emphasizing the role of government in an economy by efficiently performing the allocation function. The policy of PDS has been justified on the grounds of market failures as the private free market economy may not efficiently allocate resources, leading to insufficient access to food for certain sections of population. Imperfect competition, asymmetric information, and other types of market failures can be resulted in inequitable distribution, leaving certain sections of population without access to essential commodities. PDS mainly aimed to overcome market failures by supplying food items at subsidized prices directly to consumers or through targeted welfare schemes.

2.1.6 Political Economy Theory

The Political economy theory of PDS analyses the dynamics of the system through the views of political and economic interests, power relations, and institutional arrangements. The key aspects of the theory include:

Distribution of resources: PDS involves the allocation and distribution of resources, including food grains and subsidies. It analyses how different groups within the society, including politicians, bureaucrats, traders and consumers try to exert their control over these resources to their own vested interests.

Power relations: It considers the power dynamics among various stake holders involved in the PDS, such as government officials, political parties and private entities. These power relations influence decision-making processes, resource allocation, and the implementation of PDS policies.

Rent-seeking behavior: This theory highlights the possibilities for rent-seeking behavior within the PDS framework. Rent-seeking occurs when individuals or groups attempt to obtain economic benefits through manipulation of the political or regulatory process, rather than through productive activities. This can lead to inefficiencies, corruption, and distortions in the functioning of the PDS.

Interest Group Politics: Different interest groups including farmers, traders, consumers and intermediaries often have different interests regarding PDS policies and operations. Political economy theory examines how these interest groups mobilize and exert influence to shape PDS policies in a manner that fits with their preferences and purposes.

Institutional Design and governance: The design of PDS institutions and governance mechanisms significantly influences the effectiveness and efficiency of the system. Political economy analysis considers how institutional structures, regulatory frameworks, and accountability mechanisms shape the incentives and behaviours of actors involved in the PDS.

Social Welfare Vs Political Goals: The Theory also explores the tension between the objectives of Social welfare, such as poverty alleviation, and food security, and political considerations, such as electoral incentives and patronage networks. PDS policies may be influenced by political imperatives, leading to tradeoffs between welfare outcomes and political expediency.

Overall, the political economy theory of PDS provides insights into the complex interplay of political and economic forces that shape the design, implementation and outcome of PDS, highlighting the importance of understanding both the formal institutions and informal practices that govern their operations.

This theory views PDS as a strategy of political dynamics, with governments using it as a tool to garner political support by distributing essential goods at subsidized prices or at free of cost.

2.1.7 Human Rights Perspective

The Human Rights Theory of PDS emphasizes the role of PDS in fulfilling the fundamental human right to food and ensuring food security for all individuals, particularly the most vulnerable and marginalized populations. The key aspects of the Human Right theory of PDS include:

Right to Food: the theory is grounded in the recognition that access to an adequate and nutritious diet is a basic human right. PDS programmes are seen as essential mechanisms for realizing this right by ensuring that all individuals have physical and economic access to food, without discrimination.

Food Security: The Theory views PDS as a critical component of national food security strategies. PDS programmes aim to guarantee the availability, accessibility, and affordability of food for all segments of the society, especially those facing food insecurity and hunger.

Non- Discrimination and Equity: PDS policies are designed to prioritize the needs of vulnerable and marginalized groups, including women, children, the elderly, and socially disadvantaged communities. The theory emphasizes the importance of non- discrimination and equity in the distribution of food assistance through PDS.

Accountability and Participation: Governments are held accountable for ensuring the effective implementation of PDS programmes and for respecting, protecting, and fulfilling the right to food. This theory advocates for the active participation of individuals and communities in decision-making processes related to PDS, empowering them to demand transparency, accountability and responsiveness from authorities.

Legal Frameworks and International Obligations: The Human Rights Theory of PDS is informed by international human rights law, including treaties such as the International Covenant on Economic, Social, and Cultural Rights (ICESCR). States are obligated to respect, protect and fulfill the right to food under these legal

frameworks, which provide normative standards and mechanisms for holding governments accountable for their obligations.

Dignity and Empowerment: Beyond addressing immediate food needs, PDS programmes are viewed as instruments for promoting human dignity, empowerment, and social inclusion. By ensuring access to food, PDS contributes to broader efforts to realize the full range of human rights and promote human development.

In summary, the Human Rights Theory of PDS underscores the intrinsic link between food and prioritize the well-being and dignity of all individuals, particularly the most vulnerable members of the society.

2.2 REVIEW OF LITERATURE

Introduction

The Public Distribution System (PDS) has emerged as a pivotal instrument in India's pursuit of food security for its vast and diverse population. Rooted in concerns about food scarcity and equitable distribution, the PDS has evolved over the decades, adapting to the changing socio-economic landscape of the country. With wide market presence, the public distribution system in India is one of the largest food safety net programmes in the world (Kishore and Chakrabarti, 2017).

In a world committed to addressing hunger and bolstering food security, it is vital to recognize that significant challenges still persist, particularly in regions like sub-Saharan Africa and South Asia. India, in particular, stands out as a nation grappling with multifaceted issues of food insecurity and malnutrition (Kumar et al., 2021).

The international endeavour to tackle the issue of food insecurity has underscored the recognition that access to sufficient, safe, and nutritious food is fundamental to the overall health and well-being of populations worldwide. This global initiative acknowledges that proper nutrition is the bedrock upon which communities can build a foundation for sustainable development, improved health outcomes, and enhanced quality of life. Although strides have been taken on the

global stage to mitigate food insecurity, certain regions remain profoundly affected. Particularly in sub-Saharan Africa and South Asia, large segments of the population grapple with the relentless challenge of securing enough food. Their struggle is exacerbated by a confluence of factors, including economic instability, adverse climate events, and deficiencies in critical infrastructure that impede the efficient distribution of food resources.

India's plight in this global battle is emblematic of the acute complexities that confront nations striving for food security. The country's unique set of obstacles encompasses a vast spectrum, ranging from deeply entrenched socio-economic disparities to periodic environmental crises that disrupt agricultural productivity. Despite considerable economic growth and significant advances in agricultural practices, India continues to confront the paradox of food surplus coexisting with rampant malnutrition and hunger among its citizens.

This paradox is, in part, a reflection of the nation's intricate social fabric, where the disparities in income and social status lead to inequitable food distribution. Moreover, India's vast and varied geography contributes to diverse climatic patterns, resulting in some regions experiencing abundance while others suffer from severe shortages. The effects of climate change, manifesting as more frequent and severe droughts, floods, and cyclones, further threaten the country's agricultural output, which remains the primary source of sustenance for a large portion of the population.

Infrastructure also plays a crucial role in India's food security equation. While some areas boast advanced logistics and storage facilities, enabling efficient food distribution, other regions lag behind, with poor transportation networks and inadequate storage capabilities leading to substantial post-harvest losses. This disparity in infrastructure not only hinders the movement of food from surplus to deficit areas but also affects the quality and safety of the food that reaches consumers.

In addressing these challenges, India has put forth efforts like the Public Distribution System (PDS), aimed at providing subsidized food grains to the poor.

However, the effectiveness of such initiatives is often undercut by bureaucratic inefficiencies, corruption, and a lack of precise targeting, resulting in subsidies not always reaching the intended beneficiaries. Furthermore, the challenges are compounded by rapid population growth, which places additional strain on the country's natural resources and food supply chains.

These conditions in India serve as a stark reminder of the multifaceted nature of food insecurity issues and the need for solutions that are as complex and adaptive as the problems themselves. As the world moves forward in its quest to achieve Zero Hunger—a core Sustainable Development Goal—it is evident that solutions must be locally nuanced, culturally sensitive, and resilient to the dynamic challenges posed by changing climates and economies. The global community's efforts must be synergistic, combining local knowledge with international support, to forge sustainable pathways to food security for all.

Among nations battling the issue of food security, India's sheer population and intricate dynamics make it a significant case study. The nexus of poverty, hunger, and malnutrition remains a critical concern, necessitating targeted interventions to address the root causes.

At the core of India's strategy to combat food insecurity is the Public Distribution System (PDS), a key mechanism designed to act as a buffer against hunger and poverty (Dreze et al., 2017). The Public Distribution System (PDS) in India is designed as a vital component of the government's strategy to combat food insecurity, especially among the country's most vulnerable segments. This program is a crucial tool in the endeavour to provide consistent access to essential food commodities like grains, oil, and sugar at subsidized rates. The central objective of the PDS is to safeguard the interests of the economically weaker sections of society by ensuring that they have uninterrupted access to staple foods, even in the face of economic or environmental adversities that could disrupt market operations and price stability.

In its execution, the PDS serves multiple functions. It acts as a buffer against the volatility of the open market, where prices can fluctuate wildly due to various

factors such as seasonal changes, crop failures, or inflationary trends. For the marginalized, who often spend a significant portion of their income on food, these price instabilities can lead to food insecurity and hunger. By regulating food prices and ensuring availability through a network of Fair Price Shops, the PDS mitigates these risks, enabling these populations to allocate their meagre resources to other critical needs like healthcare and education (Dreze et al., 2017).

Moreover, the PDS is not merely about providing food at lower prices; it is also about ensuring food quality and consistent supply. This is particularly important in rural and remote areas where access to markets is limited. Here, the PDS serves as an essential source of nutrition and sustenance. For the urban poor, it provides a degree of protection against the high cost of living and the risk of being priced out of basic nutrition.

The system is backed by a complex logistical operation that involves procuring food grains from farmers at government-set prices, thereby also supporting the agricultural sector. These grains are then transported and stored in godowns before being distributed through the PDS network. This extensive process underscores the government's commitment to maintaining food security for its citizens.

However, the PDS is not without its challenges. Issues such as inefficiencies in distribution, bureaucratic delays, leakage and corruption in the supply chain, and difficulties in identifying and reaching the truly needy are persistent obstacles that the system faces. Despite these challenges, the PDS remains a critical lifeline for millions, ensuring that the most vulnerable populations are not left to the mercy of circumstances that could deny them their basic right to food.

In summary, the PDS's goal transcends mere sustenance; it embodies the nation's resolve to create a more equitable society where the right to food is upheld, contributing to the overall stability and well-being of the nation. The success of the PDS is thus intrinsically linked to the progress towards achieving broader social and economic objectives, including poverty reduction, social justice, and national development.

Central to the PDS's philosophy is the belief that access to subsidized staples is fundamental to human dignity. By making these commodities affordable, the PDS eases financial burdens and empowers individuals to allocate resources to other critical needs like education and healthcare, thereby catalysing broader poverty reduction efforts.

However, implementing the PDS is not without challenges. Distribution networks can face inefficiencies, leakages, and corruption. Ensuring transparency and accountability is essential, while the program's adaptation to India's evolving socio-economic landscape remains crucial.

To enhance the PDS's impact, policymakers must navigate a dynamic landscape, incorporating technology, data-driven decision-making, and institutional capacity-building. Holistic reforms, addressing determinants from agricultural productivity to gender empowerment, can rejuvenate the program's effectiveness.

In conclusion, India's experience in addressing food security provides valuable insights. It underscores the need for comprehensive solutions that leverage targeted interventions like the PDS. Amidst challenges, India's commitment to eradicating food insecurity exemplifies a global endeavour to ensure everyone's right to nourishment. As India refines its food security initiatives, its journey stands as a testament to the power of collective action and strategic policies toward a hunger-free world (Singh et al., 2021).

2.2.1 Evolution and Historical Context of Public Distribution System (PDS)

The origin of India's Public Distribution System (PDS) traces back to World War II when it was introduced to distribute essential goods (Cornia and Kiiski, 2001; Das, 2016) later shifting its focus to food grains distribution in response to the severe food scarcity during the Bengal Famine (Radhakrishna and Subbarao, 1997; Das, 2016; Bose, 1990). This shift led to its expansion into various urban areas, including Bengal, in 1942-43. By the mid-1960s, the PDS covered the entire nation, accompanied by the establishment of the Food Corporation of India, responsible for procuring and storing food grains (Bhattacharya et al., 2017). This expansion

entailed setting up mandis for procurement, large storage facilities, and numerous fair price shops (FPS) across the country.

During the global turmoil of World War II, the British government, then ruling over India, saw an urgent need to manage the country's food supply effectively. This led to the creation of the first structured system for the public distribution of food grains on the subcontinent. The system mandated a set quantity of grains, which would be allotted and sold to households possessing ration cards—a form of identification that ensured equitable distribution among the masses. This initiative, spearheaded in the bustling city of Bombay in 1939, represented a pivotal shift toward organized rationing in urban locales.

The concept of rationing was not new, but its implementation on such a systematic scale was unprecedented in India. The British colonial administration recognized the need to prevent shortages and hoarding during the war and sought to maintain stability in food supply and prices. As the war progressed, the system's efficacy and necessity became increasingly apparent, prompting an expansion beyond Bombay. By 1943, this rationing program had been introduced to thirteen additional cities, and by the conclusion of the war in 1946, it had extended its coverage to a vast network of 771 cities and towns across India. Notably, the expansion included some rural areas traditionally plagued by food scarcity, marking the government's acknowledgment of the widespread need for food security.

The 1942 establishment of the Department of Food by the Government of India was a landmark development. It signified the government's dedicated attention to the issue of food security, ensuring that food supply considerations received the highest level of administrative focus. Such a department was crucial for the coordination and execution of food distribution policies during these critical years.

A pivotal change occurred in 1997 with the introduction of the Targeted Public Distribution System (TPDS) (Supreme Court Order 2001). This revised system exclusively targeted households categorized as below-poverty-line (BPL), determined by state-specific poverty estimates (Shaw, & Telidevara, 2014). Eligible households were issued ration cards to access subsidized food grains through

designated FPS. Additionally, the Antyodaya Anna Yojana (AAY) was launched in 2000, offering highly subsidized food grains to the most economically disadvantaged BPL families (Department of Food and Public Distribution). Further transformation happened with the National Food Security Act (NFSA) in 2013 (George & Mckay, 2019). This expanded the PDS to approximately 67% of India's population, encompassing both rural and urban areas (National food security Act 2013). Eligibility criteria were outlined by state governments, benefiting about 800 million individuals or around 200 million households.

However, challenges emerged in targeting beneficiaries, leading to inclusion and exclusion errors (Ray & Ray 2011). Corruption and leakages persisted, with intermediaries diverting food grains to the open market (Dreze et.al 2020). Consequently, FPS dealer commissions decreased, prompting unauthorized acquisition of rations (Gaur & Rao, 2020). In response, anti-corruption measures were introduced, including digitization of beneficiary card details and revamped food grain transportation.

As India's Public Distribution System (PDS) has evolved, it has faced significant challenges in reaching its intended beneficiaries. Notably, Ray and Ray (2011) identified issues with the targeting mechanism, which often resulted in inclusion errors — where ineligible individuals receive benefits — and exclusion errors, where those in need are overlooked. These inaccuracies in targeting have undermined the effectiveness of the PDS and have had a detrimental impact on the very populations it aims to serve.

Furthermore, corruption within the system has been a persistent problem, as documented by Dreze et al. (2020). The PDS has been plagued by leakages, with dishonest intermediaries siphoning off food grains intended for distribution among the needy and illegally selling them in the open market. Such activities not only deprive vulnerable populations of essential food commodities but also inflate market prices, thereby exacerbating the problem of food insecurity.

These leakages and corrupt practices have had a ripple effect on the commissions of Fair Price Shop (FPS) dealers, as observed by Gaur and Rao (2020).

With the illegal diversion of rations, FPS dealers have experienced a decrease in legitimate sales, adversely affecting their earnings. In some instances, this has led to the unauthorized acquisition of rations by the dealers themselves, a desperate attempt to compensate for their diminished commissions. Such unauthorized activities point to broader systemic issues within the PDS and highlight the need for urgent reforms to ensure its integrity and sustainability.

In response to these multifaceted challenges, a series of anti-corruption measures has been put in place. One significant step towards reform has been the digitization of beneficiary card details. This technological intervention aims to create a more transparent and accountable system, enabling better tracking of food grain distribution and reducing the scope for fraudulent activities. By moving away from a paper-based system, which is susceptible to manipulation, to a digital framework, the PDS hopes to ensure that subsidies reach their rightful recipients.

Additionally, efforts have been made to overhaul the transportation mechanisms for food grains. The traditional methods of transport have often been inefficient and prone to pilferage. The revamped system seeks to streamline the supply chain, minimize losses during transit, and guarantee that a higher percentage of the procured grains reaches the FPS on time and in full quantity. These logistical improvements are crucial for enhancing the operational efficiency of the PDS and for curbing the illegal diversion of food commodities.

These reformative steps represent a concerted effort to address the vulnerabilities within the PDS and to reinforce its capacity to fulfil its mandate. By tackling corruption head-on and by leveraging technology to improve accountability, the PDS is being restructured to serve as a more reliable and effective vehicle for food security in India. However, the success of these measures will ultimately depend on their consistent and vigilant implementation, as well as ongoing evaluations to further refine the system.

Furthermore, India's approach to addressing food insecurity includes diverse policies spanning decades, prominently featuring the PDS as a strategy (Cornia and Kiiski, 2001). Collaboration between central and state governments established a

food safety net supplying essential commodities to households. Amendments aimed to enhance coverage, introducing the Targeted Public Distribution System (TPDS) and the Antyodaya Anna Yojana (National Food Security Act 2013). The NFSA emphasized a life cycle approach, legalizing India's food safety network and underscoring the right to nutritious food.

In conclusion, India's PDS, evolving from wartime origins, has evolved into a nationwide system combating food insecurity. Despite its positive impact, challenges necessitated ongoing reforms to ensure equitable resource distribution (Datta and Ramaswami, 2001).

2.2.2 Targeted Public Distribution System (TPDS) in India

In an ambitious move to streamline its efforts to combat food insecurity and enhance the efficiency of its resource distribution, the Indian government undertook a substantial revision of the Public Distribution System (PDS) in 1997. This overhaul led to the introduction of the Targeted Public Distribution System (TPDS), marking a strategic shift from the almost universal reach of the previous system to a more focused approach aimed at serving the most needy sections of the population. The crux of TPDS was to explicitly provide food grains at highly subsidized rates to families identified as below the poverty line (BPL), while those above the poverty line (APL) would purchase the grains at closer to the economic cost (Government of India, 1997).

The critical process of identifying BPL households fell under the purview of the BPL census, a comprehensive exercise managed by the Ministry of Rural Development, Government of India. The identification was based on a set of predetermined criteria meant to ensure that the subsidized food grains reached those who required them the most, thereby optimizing the use of government resources and addressing food scarcity where it was most prevalent (Ministry of Rural Development, 1997).

Under the TPDS, BPL families were allocated a fixed quantity of staple food grains each month, primarily rice and wheat or wheat flour (Atta), at 50 percent of

the economic cost. This intervention aimed to ensure a minimum level of food security for these families, aiding in the alleviation of hunger and poverty. In contrast, families categorized as APL did not have a predetermined quota of food grains and were entitled to purchase them at the full economic cost, reflecting their relatively higher capacity to afford market prices (Planning Commission, 1997).

As part of the continuous evolution of India's food security policies, 2000 saw the commencement of the Antyodaya Anna Yojana (AAY), an initiative targeting the ultra-poor, or the "poorest of the poor," within the society. The AAY was implemented following specific guidelines set by a Supreme Court directive, which established five distinct criteria to identify the beneficiaries. Under this program, eligible families received a substantial allocation of 35 kg of food grains per month, ensuring a greater degree of food security for those at the lowest economic strata (Supreme Court of India, 2001).

The AAY underwent further expansion in 2003 and 2004, with the government working to broaden its reach, thereby reinforcing the commitment to safeguard the nutritional needs of its most vulnerable citizens. These reforms and expansions of the PDS and its ancillary programs underscored the government's dedication to creating a robust safety net for its impoverished populace (Government of India, 2003; Government of India, 2004).

The central government assumes the responsibility of provisioning the required food grains for the PDS through the Food Corporation of India (FCI), and it subsidizes these to ensure affordability. Concurrently, state governments are tasked with facilitating beneficiary access to PDS commodities, managing the complete supply process from FCI storage facilities to beneficiaries, and overseeing PDS operations. Fair price shops (FPSs) within the PDS play a crucial role, as beneficiaries purchase subsidized PDS items through these establishments. The process of licensing FPSs and monitoring compliance through vigilance committees and government officials is comprehensively outlined in the PDS Control Order

2001 (GOI 2001), issued by the Department of Food and Public Distribution, Government of India.

The Food Corporation of India procures food grains from farmers at the minimum support price (MSP) and distributes them at a uniform central issue price (CIP) to all states. The CIP is lower than the central government's economic cost of procuring food grains. This economic cost comprises payments to growers and expenses associated with transportation, handling, storage, distribution, and maintaining the required buffer stock. The disparity between the economic cost and the CIP constitutes the food subsidy, which is covered by the central government from its non-Plan budget annually. At the FPS level, states determine consumer end prices (CEP) that are not more than Re.0.50 per kg higher than the central issue price (CIP), particularly for the population below the poverty line. States also have the flexibility to broaden the BPL category's coverage and finance the subsidy from their own resources.

2.2.3 Structure and Components of PDS

At its core, the PDS operates through a network of Fair Price Shops (FPS) spread across urban and rural areas of the country. These FPSs serve as distribution points for essential commodities, including cereals like rice and wheat, as well as items like sugar and kerosene. The commodities are distributed to eligible beneficiaries at subsidized rates to alleviate the economic burden of rising food prices. The PDS is a collaborative effort between the central and state governments, with the central government responsible for procurement, storage, and transportation, while the state governments handle distribution and implementation.

2.2.4 Objectives and Importance of PDS

The Public Distribution System (PDS) of India represents a foundational component of the nation's social welfare structure, with its mission firmly rooted in the commitment to combating food scarcity among the country's most destitute and vulnerable citizens. Instituted with the intention of delivering food security to these populations, the PDS operates on the principle of ensuring that everyone,

irrespective of their socio-economic status, has the right to access basic food supplies that are both sufficient and reasonably priced.

At the heart of the PDS is the distribution of food at highly subsidized rates. This subsidy is not merely a financial mechanism but a tool of empowerment for the poor, intended to facilitate an improvement in their nutritional intake. For households teetering on the edge of poverty, the reduced price of staple foods like rice, wheat, and other essential commodities can mean the difference between hunger and sustenance. It is this aspect of the PDS that directly contributes to a more nutritionally secure populace, where the provision of basic caloric needs can lead to better health outcomes and productivity.

Moreover, the PDS acts as a shield against the forces of inflation and economic uncertainty. As market prices fluctuate due to varying factors such as supply chain disruptions, inflationary pressures, or policy changes, the PDS maintains stability in the cost of food essentials. This stability is pivotal for families for whom food expenses constitute a significant portion of their daily expenditure. Without the PDS, these families could be subjected to the vagaries of an unpredictable market, often at the cost of their health and well-being.

In addition to its role in everyday economic conditions, the PDS assumes an even more critical function during times of crisis. Natural disasters such as floods, droughts, cyclones, and other emergencies can devastate local economies, obliterate crops, and disrupt food supply chains, often leaving the poorest and most vulnerable populations in a state of dire need. In such circumstances, the PDS serves as a critical safety net, providing much-needed relief to those who are most susceptible to the impacts of these calamities. The presence of a ready and responsive PDS during these trying times can significantly lessen the severity of food insecurity experienced by affected populations.

The PDS's role extends beyond immediate relief, as it also contributes to the resilience of communities by ensuring that individuals and families can recover more swiftly from the shocks of natural disasters and return to their normal lives. The steady availability of food aids in maintaining social stability and peace,

particularly in the aftermath of crises when communities are vulnerable and the risk of unrest is heightened.

To further strengthen the PDS and enhance its reach, various reforms and technological interventions have been introduced over time, including the digitization of ration cards and the integration of biometric identification systems. These advancements aim to reduce leakages, ensure that subsidies reach genuine beneficiaries, and improve overall transparency in the system.

The efficacy of the PDS is an ongoing concern and is subject to rigorous analysis and debate. Its success is integral to India's broader development goals, particularly in the context of achieving the Sustainable Development Goals (SDGs) related to eradicating hunger and promoting well-being for all. As India continues to navigate the challenges of a growing population and changing economic landscapes, the PDS remains a vital instrument in its policy arsenal, symbolizing the nation's resolve to ensure that no citizen is left behind in the quest for food security.

2.2.5 Effectiveness of PDS in India

The Public Distribution System (PDS) in India stands as a vital food security intervention aiming to provide subsidized food grains to populations in need (George & McKay, 2019). The efficacy of the PDS has sparked debates and research, with studies investigating various aspects including its utilization, effects, and challenges associated with it.

Khera (2011) conducted a study that examined how the PDS is utilized and its impact in Rajasthan. The findings indicated low usage rates, as many households opted to buy wheat from the market at higher costs rather than solely relying on the PDS. This phenomenon, termed the "puzzle of under-purchase," was attributed to limitations on the supply side, such as diversion, as well as challenges on the demand side, including transaction costs (Khera, 2011). Another study conducted by Drèze (2019) highlighted improvements in the PDS across multiple states, particularly Chhattisgarh, where significant reforms were initiated in the mid-2000s.

These reforms yielded positive outcomes in terms of enhancing food security and reducing poverty.

The PDS has thus gained recognition as a safety net for mitigating food insecurity in India (George & McKay, 2019). However, it is crucial to acknowledge the presence of challenges within the system. Operational inefficiencies, including leakages and corruption, have emerged as significant concerns (George & McKay, 2019). Additionally, critiques have surfaced, pointing out the limited role of the PDS in enhancing overall food security and addressing childhood mortality, attributed to these operational inefficiencies.

Efforts have been undertaken to tackle these challenges and enhance the effectiveness of the PDS. The National Food Security Act (NFSA) stands as an example of an initiative aiming to extend PDS reforms across the nation and rejuvenate the system (Drèze, 2019). The Act offers a legal entitlement to subsidized food grains for a substantial segment of the population (Simoliya & Dubey, 2022). Nevertheless, further reforms and enhancements are still necessary to ensure the PDS operates efficiently and has a heightened impact on food security and poverty alleviation.

In summary, the impact of India's Public Distribution System has been a subject of scrutiny and research. While the PDS plays a pivotal role in reducing food insecurity and safeguarding vulnerable households from hunger and poverty, it is evident that challenges must be addressed to enhance its efficiency and influence. Initiatives such as the NFSA have been rolled out to improve the operation of the PDS and expand its reach. However, operational inefficiencies and leakages remain significant issues that require proactive measures to ensure the successful distribution of subsidized food grains to those in need.

Impact of Public Distribution System (PDS) on Food Security

Food security, encompassing both availability and access to adequate, safe, and nutritious food, is a fundamental human right and a cornerstone of socio-economic development. In the context of India, where a substantial portion of the

population faces food insecurity, the Public Distribution System (PDS) emerges as a critical intervention aimed at alleviating hunger and enhancing food security. This section delves into the profound impact of the PDS on food security, focusing on its role in improving nutritional status, dietary diversity, and overall well-being among beneficiaries.

In a country like India, safety net programmes like Public Distribution System are very essential as India is still struggling to cover all of its population under a safe food security package. The Global Hunger Index (GHI), a comprehensive assessment of hunger and malnutrition, places India in the high end of the 'serious' category. The impact of food insecurity and malnutrition is particularly pronounced among India's children. Shockingly, one in three Indian children is undersized, representing a third of the world's undersized population. One in five children is malnourished, highlighting the alarming prevalence of undernutrition. In this context, the concept of "hidden hunger" emerges, wherein individuals may have sufficient calories but lack essential micronutrients, leading to lasting health consequences, particularly among children. Thus, analysis of an impact of PDS on food security must be covering not just the mere food intake but the calorie or nutrition intakes.

Food security remains a critical concern in India, where a significant portion of the population grapples with hunger and malnutrition. The Public Distribution System (PDS) has been instituted as a pivotal intervention to address food security issues by ensuring the availability of essential food grains at affordable prices. This report seeks to assess the impact of the PDS on food security in India, encompassing dimensions like utilization, household food insecurity, dietary diversity, and nutritional outcomes.

India's Public Distribution System (PDS) is recognized for its role in shaping the dietary habits of a significant segment of the nation's population. As documented by Khera (2011), the PDS has a considerable impact on the composition of cereal consumption across the country. With the PDS predominantly distributing wheat and rice at subsidized rates, there has been a noticeable trend of dietary shift amongst the

populace, moving away from traditionally consumed coarse cereals towards these more accessible grains.

Coarse cereals, which encompass a variety of grains such as millets and sorghum, have traditionally been integral to the Indian diet, especially in regions where rice and wheat are less prevalent. Known for their high nutritional value, these grains are packed with fibre, proteins, vitamins, and minerals. Their consumption has been associated with several health benefits, including a lower risk of chronic diseases, better management of blood sugar levels, and improved digestive health.

The shift in consumption patterns driven by the PDS poses questions about the broader implications for the population's nutritional well-being. The provision of rice and wheat at subsidized prices has inadvertently led to a homogenization of diets, reducing the intake of coarse cereals which, despite being nutritionally superior, are not as heavily subsidized or promoted by the PDS. This dietary transition has the potential to affect the nutritional status of individuals, particularly among the poor, who rely heavily on the PDS for their food security and may not have the means to purchase diverse food items outside of the system.

The lack of dietary diversity that follows can have far-reaching consequences for public health. Diets that rely heavily on a limited range of food items can lead to micronutrient deficiencies, impacting growth, immunity, and overall health. For children, in particular, a diet deficient in the wide array of nutrients necessary for development can have lasting adverse effects on cognitive and physical development.

Considering the PDS's influence on consumption patterns, it becomes crucial to assess the program's role in not just providing food security but also in ensuring that the food security translates into nutritional security. This requires a re-examination of the basket of commodities offered through the PDS to possibly include a broader range of grains, particularly nutrient-rich coarse cereals, to encourage more balanced dietary practices.

In addition, policymakers need to consider the cultural and regional preferences in cereal consumption, promoting the inclusion of locally grown and traditionally consumed coarse cereals in the PDS. This could be complemented by public awareness campaigns highlighting the nutritional benefits of diverse cereals, potentially influencing consumer behaviour towards making healthier food choices.

The PDS's impact on consumption patterns underlines the need for a more nuanced approach to food security, one that prioritizes nutritional outcomes alongside the availability of food. It necessitates a holistic view that considers the nutritional profile of subsidized food and its accessibility to ensure that the PDS contributes positively to the overall dietary quality and health of the Indian population.

In India, the Public Distribution System (PDS) has been established as a supplemental mechanism to augment the national food security framework, providing essential food grains at subsidized rates to sections of society that are economically vulnerable. As a facet of the government's broader welfare programs, the PDS plays a critical role in ensuring that the disadvantaged have access to basic foodstuffs, thereby supporting the mitigation of hunger and poverty.

However, while the PDS is an integral element of India's food security infrastructure, it is crucial to recognize its scope relative to the country's entire food system. According to Sukhwani et al. (2020), the PDS accounts for merely a small portion of India's food supply, catering to the needs of specific population segments. In contrast, the vast majority of the food supply, estimated at approximately 95%, is distributed through the private sector, comprising a complex network of producers, wholesalers, retailers, and other intermediaries who operate within the market economy.

This statistic illuminates the critical need for a comprehensive and multi-dimensional approach to food security, one that transcends the PDS and incorporates a variety of strategies aimed at bolstering the entire food supply chain. Such an approach necessitates concerted efforts to enhance agricultural productivity. It involves not only improving crop yields through the use of modern farming

techniques, better seeds, and efficient irrigation but also addressing the broader agricultural policies that affect the well-being of farmers and the sustainability of farming practices.

In addition to improving productivity, strengthening market linkages is vital. This can involve the development of better infrastructure to connect rural producers with urban markets, reducing post-harvest losses through improved storage and transportation, and establishing fair and transparent trading practices that ensure farmers receive a just price for their produce.

Furthermore, fostering income generation avenues for rural populations is essential. By creating opportunities for diversified income sources, rural households can become more resilient to the fluctuations of agricultural income due to factors such as seasonality, climate change, and market volatility. This resilience can be achieved through the promotion of non-farm employment, value-added agricultural activities, and support for small and medium enterprises that can provide services and goods both within and beyond the agricultural sector.

It is also crucial to consider the role of policy and governance in shaping the environment within which these strategies are deployed. Effective policy-making, which is responsive to the needs of the most vulnerable, alongside good governance practices that ensure the efficient and transparent use of resources, are fundamental to the success of any food security initiative.

As India continues to evolve and grow, the need for a robust food security strategy becomes increasingly apparent. While the PDS has been an essential component in addressing food insecurity, it is only one part of a much larger puzzle. Addressing the multifaceted aspects of food security will require a concerted effort that involves all stakeholders, including the government, the private sector, non-governmental organizations, and the agricultural community. By working collaboratively, these actors can develop a cohesive strategy that not only feeds India's population but also nourishes its people and sustains its agricultural heritage.

Recently, the COVID-19 pandemic has highlighted the paramount significance of the PDS in upholding food security during crisis periods. The Indian government has ensured the distribution of food grains at accessible rates through the PDS. Nonetheless, the pandemic has also introduced challenges to India's food supply and distribution systems. Lockdowns and business closures have led to reduced income and purchasing power, exacerbating food insecurity (Sukhwani et al., 2020). It is crucial to address these challenges and fortify the resilience of the food system against future shocks.

The PDS suffers from many operational inefficiencies that curtail its effectiveness in bolstering food security outcomes. These inefficiencies demand targeted policy reforms. The literature review underscores the PDS's role in combating hunger and malnutrition while also shedding light on its limited impact on improving food security and reducing childhood mortality rates (George & McKay, 2019). Policy interventions should concentrate on refining targeting mechanisms, curtailing leakages, and heightening the efficiency of the PDS to ensure its outreach to the most vulnerable populations.

The research article "Food Security and Public Distribution System in India" authored by Kumar and Ayyappan (2014) touches on the issue of food security in India and the pivotal role played by the Public Distribution System (PDS). The authors scrutinize the intricate challenges associated with food procurement and distribution within India and underscore the supplementary nature of the PDS. The study focuses on the significance of the PDS in ensuring the widespread availability of affordable food grains, particularly against the backdrop of the COVID-19 pandemic in India. The authors highlight the proactive measures taken by the Indian government to maintain substantial buffer stocks and ensure the uninterrupted flow of food grains through the PDS, as mandated by the National Food Security Act of 2013. Nevertheless, the article also concedes the considerable hurdles intertwined with food procurement and distribution in India. These challenges encompass issues like leakages, diversion, corruption, and misdirected targeting within the PDS system. The authors call for the dire necessity for policy reforms aimed at

addressing these obstacles and enhancing the PDS' efficacy in upholding food security in India. Overall, the article offers valuable insights into the operational dynamics of the PDS and its indispensable contribution to food security in India. It brings out the PDS' relevance amid the COVID-19 pandemic and underscores the significance of policy interventions to surmount the complexities inherent in food procurement and distribution.

Kishore and Chakrabarti (2015) in their article titled "Enhancing Effectiveness Through Inclusivity? A Study of India's Public Distribution System" explores the influence of the revamped "New Style" Public Distribution System (PDS) on enhancing food security in India. Following the enactment of the National Food Security Act in 2013, the Indian government expanded the reach of the PDS to cover around 66% of the population, establishing one of the world's most extensive food safety networks. Beneficiaries were identified based on their socio-economic status. The study evaluates the PDS' efficacy in enhancing food security, focusing on its inclusivity and scope. It investigates whether a more inclusive approach correlates with improved food security outcomes. The authors posit that while inclusivity is significant, effectiveness hinges on other factors like supply-side limitations and operational efficiency.

The findings indicate that the "New Style" PDS has enhanced beneficiary targeting and broadened population coverage. Nevertheless, the study underscores the necessity to tackle supply-side challenges like diversion and transaction costs, which impact PDS utilization. The phenomenon of under-purchase, where households buy wheat from the market at higher costs before utilizing their PDS allocations, emerges as a substantial issue that demands resolution.

Furthermore, the article delves into the PDS' influence on cereal consumption composition. It proposes that the PDS affects the composition, not the quantity, of cereal consumption, causing a shift away from more nutritious "coarse cereals." This shift might affect the nutritional well-being of the population. In essence, the study focuses on the necessity of considering factors beyond inclusivity when assessing the PDS' effectiveness. It underscores the importance of addressing

supply-side constraints and refining operational efficiency to amplify the PDS' impact on food security in India.

The research conducted by Chandrasekhar et al., (2017) "Household Food Insecurity and Children's Dietary Diversity and Nutrition in India: Evidence from the Comprehensive Nutrition Survey in Maharashtra" focuses on investigating the correlation between household food insecurity and children's dietary diversity and nutrition in India. Using data from the 2012 Comprehensive Nutrition Survey in Maharashtra, which surveyed 2,630 households, the study examines the nutritional status of mothers and children, as well as dietary habits and household food security. The study aims to address three key issues: the potential link between household food security and higher diet diversity in children aged 6-23 months, the connection between household food security and a reduced risk of undernutrition, and whether the enhanced diet diversity in food-secure households mediates the lower risk of undernutrition.

The findings indicate that children from moderately and severely food-insecure households display lower diet diversity scores. Moreover, there is a higher likelihood of children being severely stunted, underweight, or wasted in severely food-insecure households. After controlling for children's diet diversity and other factors, household food security is no longer statistically associated with stunting, wasting, or underweight. Instead, children's diet diversity proves to be significantly linked to stunting and underweight. It highlights the importance of addressing food insecurity to enhance dietary habits and, consequently, child nutrition. The findings emphasise on the significance of promoting varied and nutritious diets for children to improve long-term nutritional outcomes.

The research study titled "Enhancing Food Security through Improved Governance: A Case Study of the Public Food Distribution System in Odisha, India" by Kumar et al. (2017) investigates the interplay between governance and food security within the context of Odisha's Public Distribution System (PDS). The study is centred on Odisha and aims to evaluate the performance of the PDS from a governance perspective, while also examining its impact on food security. The

authors stress the crucial role of effective governance in facilitating the functioning of the PDS, which serves as a critical mechanism for supplying affordable food grains to vulnerable populations.

The article delves into the challenges encountered by the PDS in Odisha, including issues like leakages, corruption, and targeting discrepancies. These challenges impede the equitable distribution of food grains and may result in both undeserving recipients benefiting and deserving ones being excluded. The authors assert that addressing these governance-related hurdles is pivotal to optimizing the PDS' effectiveness in ensuring food security. Furthermore, the research analyzes how governance influences food security outcomes in Odisha. The findings indicate that improved governance, characterized by transparency, accountability, and citizen engagement, is linked to positive food security outcomes. The study underscores the necessity for policy interventions and institutional overhauls to bolster governance within the PDS, thereby fostering food security in Odisha. Overall, the article underscores the integral role of governance in shaping the PDS' operation and its impact on food security in Odisha, India. It underscores the urgency of tackling governance-related challenges and implementing reforms to amplify the PDS's efficacy in safeguarding food security for vulnerable communities.

The article titled "Food Security in India: Evolution, Efforts, and Problems" authored by Pillay & Kumar (2018) undertakes an examination of India's efforts to establish food security. The study retraces the historical trends and evolution of food security in India, originating from the inadequate production of food grains during the colonial era to the trials faced in post-independence India, even after achieving self-reliance in food production.

The primary objectives of the study involve outlining the establishment and progression of the Public Distribution System (PDS) in India, encompassing its transformation into the Targeted PDS and the execution of the National Food Security Act. Additionally, the study delves into the role of the Food Corporation of India (FCI) and the initiatives taken to enhance its functioning. Employing a critical analytical approach, the authors engage in an evaluation of India's existing food

security framework in light of contemporary challenges. The analysis encompasses the intricacies of procurement, storage, and distribution of cereals, and extends to an assessment of the efficacy of the PDS in effectively reaching the intended beneficiaries and ensuring food security for the population.

The principal findings of the study underscore the historical context of agrarian distress and farmer uprisings during the colonial period, propelled by factors such as meagre agricultural prices, substantial taxation, and a sense of political disenfranchisement among the farming populace. The study further addresses the impediments faced by the PDS, encompassing issues of leakages, corruption, and errors in targeting. The authors emphasize the necessity of policy reforms and enhancements within the food security system as essential steps to mitigate these challenges and guarantee effective implementation. To conclude, the article offers a historical panorama of the food security landscape in India, while critically assessing the evolution of the PDS and its attendant challenges. The insights presented contribute to an enriched understanding of the measures undertaken and the obstacles encountered in the pursuit of achieving food security in India.

Drèze (2019), in the article "Food Security and The Public Distribution System," focuses on India's National Food Security Act (NFSA) with specific attention given to the public distribution system (PDS). The author finds that historically, the PDS had a deficient track record, but it has witnessed considerable enhancements in numerous states. Notably, Chhattisgarh in northern India initiated a series of PDS reforms during the mid-2000s, yielding impressive outcomes that were subsequently adopted by other states.

The author acknowledges that while the restructured PDS is not flawless, it has played an essential role in safeguarding rural households from hunger and food insecurity. The PDS has significantly contributed to poverty reduction, a fact substantiated by recent National Sample Survey data.

The research article by George & McKay (2019), "The Public Distribution System and Food Security in India," deeply analyses the Public Distribution

System's (PDS) crucial role in combating food insecurity in India. The study aims to understand PDS operations and their impact on food security outcomes. Authors address the complexity of food insecurity in India, shaped by poverty, policy, food distribution, politics, and climate change. Despite being a cornerstone of food and nutrition policy, the PDS, as observed, fails to fully eradicate malnutrition and hunger among India's population. Reviewing 23 articles on PDS and food insecurity, the study adopts methodologies including surveys, interviews, and data analysis. It reveals that while recent years have witnessed PDS improvements, challenges such as targeting errors, corruption, and leakage persist. Efficient and monitored PDS administration, according to the authors, is crucial to tackle these issues. They emphasize policy adjustments to regulate barriers affecting PDS efficiency, advocating transparency and accountability for favourable food security outcomes.

The scholarly paper "Influencing Factors of Household Food Security in India: A Critical Review" authored by Arora & Nabi (2022) offers an extensive evaluation of the elements that shape household food security in India. The investigation identifies the pivotal determinants impacting food security, encompassing factors such as income, employment, education, social welfare initiatives, agricultural methodologies, and access to markets and infrastructure.

The study emphasises the indispensability of income as a key determinant of food security, with higher income levels correlating positively with enhanced food security. Concurrently, the presence of employment prospects and access to education emerges as significant contributors to bolstering the outcomes of food security. The analysis recognizes the vital role played by social protection programs, including the Public Distribution System (PDS) and the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), in elevating the status of household food security. Additionally, the research emphasises the critical import of adopting sustainable agricultural practices and diversifying crops to cement food security within households.

The article titled "Impact of Social Security Schemes on Multidimensional Poverty: A Study from Rural Tribes of Madhya Pradesh" by Septa et al., (2022) aims

to conduct an elaborative assessment of the determinants that shape household food security in India. The primary focus of the study is to pinpoint the key elements that contribute to food security and comprehend their ramifications for Indian households.

The study examines the impact of social security schemes on multidimensional poverty reduction among the rural tribes of Madhya Pradesh (India). The research is based on primary data collected from Dhar District. Quantitative techniques are employed to analyze the sample data. The empirical test results indicate that the Public Distribution System, Pradhan Mantri Awas Yojana, Old Age Pension Scheme, and Janani Suraksha Yojana exhibit a negative and significant influence on multidimensional poverty. Additionally, it is observed that attributes such as the household head's per capita income, age, education, and gender identity also have negative and significant effects on multidimensional poverty. The study's findings provide insights for policymakers regarding the importance of social security schemes in diminishing multidimensional poverty among tribal populations, thereby fostering the efficient implementation of these schemes.

The study conducted by Devi & Siwach (2023) aimed to assess the operational efficiency and scope of the Public Distribution System (PDS) in rural Haryana, India. Secondary data from official government sources, including the Economic Survey of Haryana, Economic Survey of India, Census of India, and the Food and Supply Department of Haryana, were analyzed. The study's findings indicated that the PDS covers 51.45% of Haryana's rural population, falling short of the 75% coverage mandated by the National Food Security Act (NFSA) of 2013. However, the research emphasized that the PDS in Haryana operates with an organized framework and an adequate ratio of beneficiaries to Fair Price Shops (FPS). The FPS network in the state effectively meets the stipulated criteria of the Food and Supply Department of India.

In conclusion, the study revealed that Haryana does not fully adhere to the NFSA criteria due to a substantial portion of the population categorized as Above Poverty Line (APL), thus not benefiting from the PDS. Furthermore, the study

underscored the significance of establishing monitoring and grievance redressal mechanisms at the village, block, and district levels to address challenges related to the PDS. In summary, the study contributes insights into the operational effectiveness and coverage of the PDS in rural Haryana, advocating for enhancements to ensure efficient NFSA implementation and inclusive participation of eligible recipients in the PDS.

Thus, it can be inferred that the Public Distribution System (PDS) assumes a pivotal role in addressing food security concerns within India. However, challenges like subdued utilization, supply-side constraints, and operational inefficiencies warrant attention to enhance its efficacy. The PDS should be regarded as a component of a comprehensive food security strategy, encompassing measures to elevate agricultural productivity, reinforce market connections, and foster income generation avenues. Enhancing the resilience of the food system is of paramount importance. Policy reforms should concentrate on refining targeting mechanisms, minimizing leakages, and amplifying the efficiency of the PDS to ensure its reach to the most vulnerable populations and contribute to enduring food security in India (Kumar et al., 2021; Singh et al., 2021).

In the landscape of India's multifarious strategies to combat hunger and ensure food security for its vast and diverse population, the Public Distribution System (PDS) emerges as a linchpin. It is designed as a buffer against food scarcity, aiming to deliver essential commodities to those most at risk of food deprivation. The PDS is a testament to the country's commitment to upholding the right to food—a right that is enshrined in the ethos of its welfare policies and socio-economic development initiatives.

Yet, the PDS is not without its imperfections. Observations have revealed that despite its critical role, there are issues of underutilization, where the potential of the system is not fully harnessed. This underutilization could be attributed to a multitude of factors including lack of awareness among beneficiaries, stigma associated with accessing welfare schemes, or logistical bottlenecks that hinder access to the services provided by the PDS (Singh et al., 2021).

Furthermore, supply-side constraints pose significant hurdles. These constraints include limitations in procurement, storage capacities, and the logistics involved in the timely distribution of food grains. These challenges can lead to delays and sometimes even the spoilage of food items, thereby preventing the effective operation of the system. Additionally, operational inefficiencies mar the PDS with instances of corruption, leakage of food grains, and diversion to non-targeted beneficiaries, thereby weakening the very foundation of this welfare mechanism (Kumar et al., 2021).

Considering these challenges, it becomes imperative to view the PDS not as an isolated entity but as an integral part of a larger, more comprehensive strategy for food security. This strategy should encompass concerted efforts to boost agricultural productivity through the adoption of modern agricultural practices, technology transfer, and sustainable farming methods. Reinforcing market connections is equally vital to ensure that produce from the farm reaches the market without undue loss and that farmers secure a fair return for their produce. Concurrently, income generation avenues beyond traditional agriculture must be developed to ensure a diversified income stream for rural households, thereby building economic resilience.

Improving the resilience of the entire food system is an overarching priority. To this end, policy reforms are indispensable. Policymakers must strive to fine-tune the mechanisms for identifying and targeting beneficiaries of the PDS, ensuring that those who are genuinely in need are not inadvertently excluded. Efforts to minimize leakages are crucial and call for the implementation of robust monitoring and accountability systems. There is also a need to amplify the overall efficiency of the PDS through technological interventions like digitization, which can transform tracking, identification, and delivery processes (Singh et al., 2021).

As such, policy reforms must be dynamic and responsive, evolving with the changing socio-economic landscape of India. By focusing on refining targeting mechanisms, bolstering the supply chain, and embracing technological advancements, the PDS can be reinvigorated. It can be transformed into a more

effective tool that not only reaches the most vulnerable populations but also contributes to enduring food security in India.

In essence, the PDS represents a promise—a promise of food security, of nutrition, and of support in times of need. Fulfilling this promise necessitates an acknowledgment of the system's current limitations and a commitment to its ongoing improvement. With concerted action and persistent reform, the PDS has the potential to form the backbone of a food-secure future for all of India's citizens (Kumar et al., 2021; Singh et al., 2021).

2.2.6 Digitization of Public Distribution System in India

The Public Distribution System (PDS) in India has played a crucial role in combating food insecurity and malnutrition over the years. The primary objective of the PDS is to supply subsidized food grains to eligible beneficiaries, with a special focus on economically disadvantaged segments of the population. However, the PDS has undergone a series of reforms to address issues related to leakages, operational inefficiencies, and corrupt practices. One of the most remarkable and transformative changes has been the integration of technology, leading to the digitization of the PDS. This technological advancement has streamlined processes, reduced theft, and increased transparency within the system. This is important as the study finds that the 58 per cent of food targeted to BPL families do not reach beneficiaries (Mishra and Maheswari, 2021).

The roots of the PDS can be traced back to the 1940s, when India faced severe food shortages. The government's initiation of the PDS aimed to ensure an equitable distribution of food grains to citizens in need. However, persistent challenges emerged over time, including the diversion of subsidized food grains to the black market, the existence of 'ghost' beneficiaries (non-existent individuals on ration lists), and inaccurate targeting of beneficiaries. These challenges highlighted the pressing need for a comprehensive overhaul of the system, with a focus on ensuring that the intended benefits reached the most deserving individuals.

The digitization of the PDS was catalyzed by the Indian government's broader agenda to modernize public service delivery and enhance governance (Biswal and Jenamani, 2018). This modernization gained substantial momentum with the introduction of Aadhaar, a biometric identification system that made its debut in 2009. Aadhaar aimed to assign a unique 12-digit identity number to every Indian resident, interlinked with their biometric and demographic data. This significant move marked a critical juncture in the journey toward digitizing the PDS.

Mishra and Maheswari (2021) provides an extensive study highlighting on the importance of digitizing PDS. The authors argue that the impact of PDS on ensuring food security is greatly hindered by the corruption, middlemen intervention, poor identification of targeted beneficiaries and leakages. By studying digitisations efforts in certain parts of the country, authors argue that the introduction of latest technology such as block chain will definitely bring positive changes and it will improve the effectiveness of the system. Similarly, George and Mckay (2019) finds in their study that digitization can improve operations of PDS by reducing the leakages.

The integration of technology within the Public Distribution System (PDS) has marked a transformative era in India's approach to food security and welfare governance. A profound analysis conducted by Bhattacharya et al., (2017) meticulously explores the advancements in the digitization process of ration card records across various states in India. This study illuminates the significant progress achieved by numerous states in transitioning from traditional, paper-based ration card systems to sophisticated, digitized databases. The advent of digitization within the PDS framework introduces a host of benefits poised to revolutionize the distribution and management of food security initiatives.

One of the paramount advantages of digitizing ration card records is the heightened transparency it affords. By establishing a centralized and readily accessible database, digitization lifts the veil on the operations of the PDS, allowing for real-time tracking and scrutiny of the flow of food grains from warehouses to

beneficiaries. This transparency is instrumental in curbing malpractices and ensuring that subsidies reach the legitimate recipients for whom they are intended.

The second advantage brought about by digitization is the enablement of cutting-edge technologies that can seamlessly interface with the digital records. These technologies include the implementation of barcodes and biometric smartcards, which serve as robust tools in the identification and authentication of beneficiaries. By leveraging such technologies, the government is empowered to eradicate the systemic issues of fake beneficiaries and ghost records—plagues that have historically siphoned off resources meant for the needy.

Furthermore, the Press Information Bureau (PIB) reported in 2015 that the herculean task of digitizing ration cards had been accomplished in 29 states and union territories. This digitization drive encapsulated over 320 million ration cards, a staggering figure that underscores the scale of the PDS in India. Remarkably, more than 80 million of these cards have been linked with Aadhaar, the nation's biometric identification system, thereby knitting a tighter safety net designed to eliminate duplicity and leakage in the system.

The linking of ration cards with Aadhaar serves as a cornerstone in the architecture of the digitized PDS, establishing a verifiable and auditable trail from the point of procurement to the point of distribution. This linkage is poised to facilitate accurate beneficiary targeting, streamline the subsidy disbursal process, and uphold the integrity of the PDS. It also enables beneficiaries to avail themselves of their entitlements anywhere in the country, fostering a sense of mobility and flexibility that was previously untenable.

The achievements in digitizing the PDS are not merely administrative victories; they are harbingers of a more equitable and just system that seeks to reinforce the fundamental rights of citizens to food security. However, the journey does not end with digitization. The continuous integration of technological innovation, ongoing monitoring, and the implementation of feedback mechanisms are essential to refine and enhance the efficacy of the PDS. With sustained commitment and adaptive strategies, the digitized PDS is envisioned to become a

paragon of transparency, efficiency, and accountability within India's welfare framework.

Biswal and Jenamani (2018) in their study on Leveraging ICT for Food Security: An analysis in the context of PDS in India delves into the challenges faced by the Indian food security system, which has been hampered by inefficiencies. In response to recommendations from national committees, the Indian government has taken steps to enhance the system's efficiency and efficacy by introducing several ICT (Information and Communication Technology) intervention projects. This study examines these ICT initiatives and their impact on India's food security. Employing secondary data, the research assesses the progress of various ICT projects and the subsequent performance of the PDS system using defined Key Performance Indicators (KPIs). Through the utilization of a multiple regression model, the investigation goes deep into the correlation between these independent and dependent variables. The findings underscore a positive correlation between reforms like ICT intervention and the improved effectiveness of the food security system. Given that food security in India carries global significance, the influence of ICT interventions on improving the system performance hold relevance not only for India but also for other developing nations.

Singh et al., (2021) conducted a comprehensive study and it introduces a block chain-based solution for the Indian Public Distribution System (PDS), where ration cards are linked with Aadhaar, the unique identification scheme. The framework addresses the complexity of the supply chain within the PDS and proposes effective technological integration. Initially, the existing PDS operations were studied to identify potential chain codes and corresponding smart contracts to automate manual decision-making scenarios. This approach resolves issues like poor beneficiary identification and data inconsistencies stemming from disorganized electronic records. Furthermore, the paper outlines data analytics options for various stakeholders' decision-making. The storage and analysis of data across on-chain and off-chain are discussed to optimize the proposed block chain's performance.

Utilizing unique beneficiary identification, a consortium-based block chain solution is demonstrated to counteract fraudulent activities like ghost ration cards and food grain leakage. The framework enhances transparency among PDS stakeholders, and prevents fraudulent transactions. While the model is primarily described for the last stage of the PDS supply chain, similar explorations are suggested for other stages. While the paper identifies decision-making scenarios involving on-chain and off-chain data, the specific analytics for each scenario require further elaboration.

Key Aspects of Digitization

Integration of Aadhaar Cards

Aadhaar played a pivotal role in the digitization of diverse government initiatives, including the PDS. Through the linkage of Aadhaar with ration cards and beneficiary accounts, the government established a stronger and tamper-resistant identification framework. This linkage facilitated the identification and elimination of duplicate or counterfeit ration cards and beneficiaries, consequently diminishing leakages and enhancing the precision of subsidy targeting.

The integration of Aadhaar has significantly enhanced the accuracy of beneficiary identification, thereby reducing the occurrence of fake or duplicate beneficiaries, ensuring that only deserving individuals receive subsidies. By connecting each beneficiary's Aadhaar number with their ration card, the possibility of fraudulent claims has been eliminated. Furthermore, the use of biometric authentication through Aadhaar has expedited the verification process, enabling real-time authentication to ensure that only eligible beneficiaries access their allocated benefits, thereby minimizing the risk of misappropriation or diversion of subsidized commodities from the eligible people. The integration of Aadhaar has also led to an improvement in the transparency in the Public Distribution System (PDS) as transactions are digitally recorded, enabling real-time tracking and preventing unauthorized intermediaries from exploiting the system or diverting resources. This integration has successfully reduced leakages that were previously prevalent due to fictitious beneficiaries associated with ration cards and beneficiary accounts linked

to Aadhaar. These leakages not only caused a loss of government resources but also deprived genuinely deserving individuals of their rightful entitlements. Moreover, the streamlined beneficiary identification and authentication processes have enhanced operational efficiency within the PDS, as automation has minimized errors originating from manual record-keeping, consequently resulting in a more effective allocation and utilization of resources. In terms of targeting, Aadhaar integration has facilitated a more precise distribution of subsidies to economically vulnerable segments of society, ensuring that the benefits of the PDS are directed to those who need them the most. This heightened targeting precision has the dual effect of contributing to poverty reduction and overall welfare improvement within the society.

Electronic Point of Sale (ePoS) Machines

Another significant aspect of the digitization effort was the introduction of ePoS machines at ration shops. These devices facilitated real-time tracking of transactions and stock levels. Prior to Electronic Point of Sales machines, ration shop owners manually recorded sales, leaving room for errors and manipulation. With ePoS machines, the process became automated, reducing the scope for malpractices and human errors and ensuring that beneficiaries received their rightful entitlements. As the beneficiaries are able to have a clear idea about their monthly entitlements through electronic point of sales, the chances are limited for corruption by Fair Price Shops. Thus, customers will be able to ensure that, their due share fixed by the government is received by them without any reductions.

Introduction of biometric authentication

The introduction of biometric authentication, which involves utilizing fingerprints was implemented with the aim of improving the precision and credibility of beneficiary identification within the Public Distribution System (PDS). This technology served a dual purpose: firstly, it acted as a robust safeguard against instances of identity fraud, thereby fortifying the integrity of the system. Secondly, and perhaps more importantly, it lessened the reliance on conventional physical documents, resulting in a more streamlined and secure process overall.

Further, the utilization of biometric authentication represents a significant leap forward in beneficiary verification. Unlike traditional methods that often rely on paper-based records or cards, biometric authentication draws on the unique physiological attributes of an individual, such as their fingerprints. This distinctive nature of biometric data greatly minimizes the likelihood of impersonation. In a system like the PDS, where ensuring the rightful distribution of benefits is of utmost importance, this improvement in the level of authentication is indispensable in preventing any potential manipulation or fraudulent activities.

Moreover, the incorporation of biometric authentication brings about operational efficiencies. Previously, the authentication process could involve presenting physical identification cards or documents, which might be subject to loss, damage, or forgery. Biometric data, on the other hand, is intrinsically linked to the individual and is nearly impossible to replicate, significantly reducing the chances of fraud. Consequently, this shift not only ensures the authenticity of the beneficiaries but also simplifies the distribution process. Beneficiaries no longer need to present physical documents at various stages of interaction, such as at ration shops. Instead, a simple biometric scan enables swift and accurate verification, expediting the process and minimizing the potential for errors.

Furthermore, this transition to biometric authentication aligns with broader efforts towards digitalization and reducing paperwork in administrative processes. Physical documents often necessitate storage, maintenance, and physical handling, which can be prone to errors. With biometric data securely stored in digital formats, administrative burdens are significantly reduced.

Allu et al., (2021) conducted a study to explore the alternatives of Aadhaar based system and concludes that despite the presence of other possible options, the utilization of biometric authentication appears to be more efficient in the registration procedure. As a result, the ongoing effort to link Aadhaar numbers with ration cards is a positive measure to enhance the effectiveness of states' Ration Card Management Systems (RCMS). However, during transactions, it may not be necessary to employ beneficiary biometrics. The optimal choice of approach at this

stage relies not only on its effectiveness in addressing inefficiencies but also on factors like internet connectivity strength, availability of e-governance centres, and the existing resource limitations in terms of time and budget. Hence, it's advisable for governments to carefully analyze their specific circumstances before making a selection. We offer insights into the situations where each approach is most suitable, aiding governments in conducting such evaluations. Nevertheless, more research is required to quantitatively evaluate the pros and cons of each available option. Instances of such research encompass estimating the value of portability features provided by central databases, performing a comparative cost-benefit analysis between biometric deduplication and deduplication using alternate methods such as regular physical visits.

Thus, the introduction of biometric authentication in the PDS is a pivotal advancement that enhances beneficiary identification accuracy and bolsters the security of the distribution process. By leveraging individuals' unique physiological traits, this technology acts as a formidable barrier against identity fraud and manipulation. Simultaneously, it reduces dependency on physical documents, streamlines operations, and contributes to the overall efficiency and effectiveness of the PDS. The integration of biometric authentication marks a significant step in aligning the PDS with modern technological trends, ensuring that the intended benefits reach the rightful recipients in a secure and efficient manner.

End to end computerization

The drive towards digitization extended well beyond the ration shops, covering the entire process and steps of the food grain supply chain, from the initial procurement stage to the final distribution phase. This holistic integration of technology facilitated a marked improvement in inventory management, minimization of wastage, and the enhancement of accountability throughout every stage of the supply chain.

Delving further into this aspect, the transition to end-to-end computerization signifies a historical shift in the traditional operational framework of the Public Distribution System (PDS). From the complete reliance on manual processes and

paper-based record-keeping, the digitization effort has brought about efficiency and accuracy into each stage of the food distribution process.

Starting with the procurement stage, digitalization has streamlined the tracking and management of food grain stocks. Previously, this process could be susceptible to discrepancies due to human errors, resulting in imprecise estimations of available stocks. With the introduction of computerized systems, the procurement of food grains can now be closely monitored in real time. This not only ensures accurate stock assessments but also aids in prompt decision-making regarding redistribution.

Thus, the benefits of computerization continue to flow throughout the supply chain, particularly when it comes to distribution logistics. Digital tracking mechanisms enable a seamless coordination between various distribution centres and ration shops. This efficient coordination leads to optimized routes for transportation, reducing transit time and the associated risks of spoilage. Moreover, real-time updates on stock levels at different points of the supply chain enable efficient stock rotation, ensuring that food grains are distributed on a first-in, first-out basis, thereby minimizing wastage which has been a major problem with PDS storage.

Equally significant is the enhancement of accountability across the supply chain. Computerization introduces an electronic trail that documents each transaction, movement, and utilization of food grains. This transparency is particularly crucial in curbing mismanagement, leakages, or unhealthy practices that are associated with the manual systems. It empowers authorities to promptly identify any irregularities and take necessary corrective measures, thereby safeguarding the integrity of the distribution process.

The digitization of the Public Distribution System (PDS) in India has brought about several transformative outcomes. One of the most noteworthy achievements has been the remarkable increase in transparency throughout the distribution process (Hughes et al., 2019; Wamba et al., 2019, 2020). The introduction of real-time tracking and transaction monitoring has effectively curbed

leakages and instances of corruption. This is very important especially when we come to know that the total volume of corruption in the system is estimated to be INR 3.58 billion (Transparency International India, 2005; Gupta and Misra, 2018). This newfound transparency not only results in greater public trust in the system but also empowers authorities to promptly address any irregularities that may arise.

Furthermore, the integration of technology has led to a higher level of efficiency within the PDS. Processes across the supply chain have been streamlined, resulting in improved supply chain management, reduced wastage, and the optimized distribution of essential food grains. Automation has played a pivotal role in minimizing manual intervention and human errors, particularly evident in stock management and beneficiary identification procedures.

By eliminating the presence of impersonation, the government has been able to allocate resources more judiciously to those who genuinely require support and assistance. This inclusive approach holds particular significance for marginalized communities that have historically faced challenges in accessing their entitled benefits, often due to discrimination or lack of proper documentation.

Further, cost savings have emerged as a tangible outcome of the technological integration. The transition to digitization has substantially reduced administrative overheads and diminished the necessity for resource-intensive paper-based processes. This shift ultimately translates into a more efficient allocation of resources, optimizing the utilization of government funds and assets.

Challenges associated with Digitization of PDS

The digital transformation of India's Public Distribution System (PDS) has undoubtedly yielded numerous benefits, yet it also presents several challenges that require thoughtful consideration and proactive strategies for mitigation.

Kumar et al., (2021) in their detailed study on Mapping the barriers of AI implementations in the Public Distribution System: The Indian Experience extensively analyses the challenges associated with the implementation of AI in PDS in India. Study says that though the digitization is need of the hour there are various

issues associated with it and lists out 18 major obstacles such as lack of trust in technology, lack of AI literacy, and political issues.

A significant challenge persists in the form of the ongoing digital divide (Mishra and Maheshwari, 2021), despite rapid technological expansion. Absence of digital infrastructure would definitely reduce the effectiveness (Sharma and Gupta, 2017; Kumar et al., 2021). Unequal access to technology, particularly in rural and remote areas, poses a substantial obstacle. Ensuring equitable access to the advantages of the digitalized system remains an ongoing task, necessitating tailored solutions to bridge this gap.

Technical disruptions and glitches, spanning from connectivity issues to malfunctions in electronic Point of Sale (ePoS) machines, have the potential to disrupt the seamless distribution process. These disruptions can result in untimely delays and inconvenience for beneficiaries, underscoring the importance of robust technical support and contingency plans.

The critical matter of data security and privacy becomes huge concern, particularly concerning sensitive biometric and personal data tied to Aadhaar. Addressing these concerns comprehensively is very essential to uphold public trust in the digitalized system and prevent misuse of very confidential private data of individuals.

Resistance from certain ration shop owners presents another challenge and this will hinder the functioning in an alarming way (Dreze et al., 2017). Concerns about their authority and reduced profit margins might hinder the fuller implementation of digitization. Addressing these issues through trainings, awareness building sessions and capacity-building initiatives along with providing incentives can foster support and cooperation from these stakeholders.

To overcome challenges, a comprehensive approach is essential that should focus on the following:

1. Development of Infrastructure:

Ensuring robust internet connectivity and reliable power supply, especially in rural areas, stands as a critical prerequisite (Dreze et al., 2017; Mishra and Maheswari, 2021). These foundations are essential for the effective and flawless implementation of the digitalized system. In the rural areas, frequent power shortages and lack of internet connectivity would lead to delays in distributions and people would find it difficult as the new digitized system makes them wait for long compared to the previous manual mechanism. This would in turn reduce the happiness of customers thereby generating a public opinion against digitization of PDS. Thus, having a public trust in favour of digitization is very important for successful implementation of the same (Kumar et al., 2021).

2. Capacity Enhancement:

Offering effective training to all stakeholders, including ration shop owners and government officials, is of paramount importance. Equipping them with the necessary skill sets to adopt and optimize technology will play a pivotal role in maximizing the benefits of digitization. Lack of awareness in utilizing the systems properly might lead to poor performance and it will reduce the benefits associated with digitization (Kumar et al., 2021).

3. Protection of confidential Data:

The implementation of strict data protection measures and addressing privacy concerns are of extreme significance. Protecting the confidential private data that is linked to Aadhaar is not only a legal requirement but also a pivotal factor in creating public trust and confidence in the system. People should have a confidence that, linking Aadhaar with the system should not lead to misuse of their personal data.

4. Continuous Monitoring:

The practice of continuous monitoring, frequent auditing, and detailed evaluation of the digitalized system is crucial. This is a proactive approach that enables timely identification and rectification of any problems and obstacles that

may arise. Regular systems for assessments as a valuable feedback mechanism will help in identifying limitations and implementing possible solutions promptly.

In essence, the digitization of PDS in India undoubtedly brings about a wide range of advantages (Ghabru et al., 2017), yet it is very essential to overcome the challenges associated with it. By directing efforts towards infrastructure enhancement, capacity building, data protection, and frequent monitoring, the government can find an effective solution for the problems associated with the digitalized system. This in turn leads to the efficacy, inclusivity, and long-term sustainability of PDS.

General Challenges Associated with Public Distribution System in India

The Public Distribution System (PDS) in India has been established with the noble objectives of ensuring food security and alleviating poverty, making it a vital element of the nation's social welfare initiatives. Despite its objective, the PDS faces a multitude of challenges that hinder its operational efficiency and overall effectiveness. This analysis delves into the intricate array of obstacles faced by the PDS in India, encompassing concerns related to leakages, corruption, technological constraints, and inadequacies in targeting mechanisms.

The Public Distribution System (PDS) holds a pivotal role in India's food and nutrition policy, aiming to alleviate food insecurity and malnutrition (George & McKay, 2019). However, the PDS encounters multiple obstacles in achieving its intended goals.

A key hurdle lies in the operational inefficiencies of the PDS. A systematic analysis determined that these inefficiencies hinder the PDS's capacity to enhance food security and diminish childhood mortality (George & McKay, 2019). Moreover, the review exposed a research gap concerning the PDS and food security in India, indicating a lack of published literature on this subject (George & McKay, 2019).

Another challenge is the gradual adoption of interventions within the PDS. A study on the Encapsulated Ferrous Fumarate Double Fortified Salt (DFS) uptake in

the PDS revealed slower-than-expected progress, beset by various hurdles (Muralidharan et al., 2020; Jadhav & Mannar, 2021). This suggests potential barriers impeding the implementation and acceptance of novel interventions within the PDS.

Furthermore, a study focusing on rural Haryana, India, emphasized the necessity of robust monitoring and grievance redressal mechanisms at the village, block, and district levels (Devi & Siwach, 2023). This brings out possible issues concerning accountability and transparency within the PDS, thereby hampering its efficiency.

In essence, the challenges confronting India's PDS encompass operational inefficiencies, gradual intervention uptake, and concerns with monitoring and grievance redressal systems. Addressing these challenges is pivotal for augmenting the PDS's effectiveness in realizing food security goals and mitigating malnutrition in India.

Leakages and Corruption:

The Public Distribution System in India grapples with a significant impediment in the form of leakages and corruption. The supply chain encounters leakages at various stages, stretching from procurement to distribution. These leakages materialize due to intermediaries who exploit the system to their advantage, diverting subsidized food grains into the parallel black market. (Khera, 2011; Overbeck, 2016; Muralidharan et al., 2020; Devi and Sivach, 2023) This diversion not only deprives the rightful beneficiaries of their entitled provisions but also results in the squandering of precious public resources.

Corruption compounds the issue, with officials and intermediaries demanding bribes or engaging in unethical practices to manipulate the allocation and distribution of essential food commodities. Such corruption undermines the core objective of the PDS, leaving vulnerable segments of the population underserved and intensifying the challenges of poverty and malnutrition (Kumar, 2010; Chakrabarty et al., 2016; Shanmugam and Thomas, 2016; Ghabru et al., 2017; George McKay, 2019).

Targeting Shortcomings:

A noteworthy challenge that the PDS faces is the inadequacy of its targeting mechanism. The system relies heavily on outdated and imprecise methods like Below Poverty Line (BPL) identification cards, leading to instances of both inclusion and exclusion errors. Deserving households often find themselves excluded, while relatively affluent households manage to gain access to subsidized food grains (Swaminathan and Misra, 2001; Gulati and Saini, 2015).

The absence of real-time data and accurate identification techniques compounds this problem. Without robust mechanisms to determine eligibility, the PDS remains vulnerable to manipulation and exploitation. Hence, a reform in the field of PDS is needed specifically focusing on the measures to reduce targeting errors (Datta and Ramaswami, 2001).

Khera (2008) provides an extensive study on Access to the Targeted Public Distribution System: A case study in Rajasthan focusing on targeting errors. The study covered 400 respondents at village level. The study highlights significant limitations in the execution and conceptual structure of India's Public Distribution System (PDS). Only a fraction of households, approximately one-third, have access to the PDS, revealing deficiencies in the selection criteria and its application. The official standards used to identify Below Poverty Line (BPL) households suffer from deficiencies in both conceptualization and execution. These shortcomings encompass the assumption of unchanging poverty, the uniformity of criteria across diverse geographical and socio-economic contexts, and the inadequate incorporation of land productivity considerations.

Observations derived from fieldwork emphasise on these concerns, underscoring the problematic depiction of poverty as a static condition. The study evaluates the prevalence of the uniform criteria, questioning its suitability across regions and raising doubts about its precision. Operational challenges exacerbate the issue, leading to the exclusion of a substantial number of deserving households from the Targeted Public Distribution System (TPDS). Biases are introduced during the

allocation process as states try to match their estimated poverty statistics with central government targets.

Although the BPL list demonstrates some targeting efficacy, it is not free from inaccuracies. While a degree of correlation exists between BPL card ownership and indicators of economic disadvantage, the research identifies a notable omission of eligible households. Significant targeting discrepancies prove during the testing process, even when officially stipulated criteria are employed. The study emphasizes the necessity for a comprehensive reassessment of both the foundational concepts and the practical implementation of the PDS, including its eligibility-testing mechanism, to ensure its effectiveness in alleviating poverty and enhancing food security.

Challenges in the Supply Chain:

The PDS operates through a complex supply chain involving multiple stages, including procurement, storage, transportation, and distribution. Each of these phases presents its unique set of challenges. Procurement grapples with issues related to the timely availability of food grains, quality control, and pricing. Inadequate storage facilities contribute to spoilage and wastage. Transportation bottlenecks lead to delays and inefficiencies, further deteriorating the quality of the food supplies (Kumar, 2010; Ghabru, 2017).

Moreover, the distribution network encounters inefficiencies and lacks transparency. Challenges in last-mile delivery arise due to underdeveloped infrastructure, resulting in delayed and insufficient distribution of essential food commodities.

Quality and Nutritional Concerns:

Despite its aim of ensuring food security, the PDS often prioritizes quantity over quality. Subsidized food grains provided through the PDS frequently lack essential nutritional elements, giving rise to concerns about the overall health and well-being of beneficiaries, particularly children and expectant mothers. The limited diversity in the food basket offered through the PDS restricts dietary variety, a

crucial aspect of a well-rounded and nutritious diet. This limitation contributes to malnutrition and related health issues among vulnerable populations.

The research conducted by Ray and Ray (2011) entitled *Role and Effectiveness of Public Distribution System in Assuring Food Security in India: An Appraisal* highlights the failure of policy formulation and execution in addressing the widespread issue of under-nutrition. Initial policies enacted in the mid-1960s aimed to combat food insecurity through strategies involving production, storage, and distribution, yielding limited success in increasing food grain production and stabilizing prices. However, the advent of economic liberalization in 1991 weakened food security policies, resulting in detrimental effects on consumption and nutritional well-being. The ongoing high inflation rate further exacerbates the challenges.

Economic reforms aimed to diminish food subsidies, transition distribution to market mechanisms, and undermine intervention and support for the most vulnerable segments of the population. Consequently, the size of food subsidies, both absolutely and relatively, declined, with the food subsidy bill experiencing a reduction from 2002-03 to 2006-07. The public distribution system (PDS), a pivotal tool in food policy, suffered due to the narrow focus resulting from liberalization. The Targeted PDS excluded many genuinely deserving individuals, thereby negatively impacting the PDS network and failing to achieve the intended goal of price stabilization.

Despite the equilibrium between grain supply and demand, regional imbalances, and widespread under-nutrition, the need for nationwide price stabilization remains. A return to a uniform allocation system featuring comprehensive coverage and equitable pricing through the PDS can assist in realizing this objective. While acknowledging state-specific disparities, granting states flexibility in shaping food security systems, including PDS grain utilization, is imperative. Improving government delivery mechanisms through enlightened political practices, transparency, and accountability, along with the implementation of social audits, stands as a crucial step toward effective execution.

Technological Limitations:

Despite the contemporary technological landscape, the PDS continues to rely on manual processes and outdated technologies, impeding its efficiency and transparency. The absence of effective data management systems and real-time tracking mechanisms leads to delays, errors, and challenges in monitoring the distribution process.

Incorporating modern technologies such as biometric authentication, smart cards, and digital platforms could significantly enhance the efficiency of the PDS and minimize opportunities for corruption.

Political Intervention:

The PDS frequently falls prey to political interference (Kumar et al., 2021), potentially distorting its objectives and leading to biased distribution. Political considerations, such as targeting specific voter groups, can undermine the equitable allocation of food grains, diverting resources away from the neediest sections of the population.

Administrative Inefficiencies:

The administrative framework responsible for overseeing the PDS grapples with challenges related to capacity, training, and accountability. Inadequate training and resources for frontline workers result in errors and delays during the distribution process. Moreover, the absence of robust grievance redressal mechanisms leaves beneficiaries with limited avenues for resolving issues.

Population Growth and Urbanization:

The rapid expansion of India's population and the growing trend of urbanization introduce further complexities for the PDS. Existing infrastructure and distribution networks may struggle to meet the demands of a burgeoning population and shifting settlement patterns.

Financial Viability of Fair Price Shops (FPS)

The financial sustainability of Fair Price Shops has emerged as a critical issue. While FPS are pivotal to the functioning of the PDS, many struggle to remain financially viable. Factors such as administrative costs, operational challenges, and competition from private markets have contributed to the precarious financial situation of FPS operators. Balancing the need to compensate FPS operators adequately for their services while maintaining affordable food prices for beneficiaries remains a complex challenge.

Policy Reforms and Future Prospects

Recognizing the imperative to address these challenges, policymakers have initiated reforms aimed at strengthening the PDS. Technology-driven solutions, such as Aadhaar-based biometric authentication, have been introduced to curb leakages and enhance targeting accuracy. Additionally, the National Food Security Act (NFSA) of 2013 stands as a seminal legislative development that seeks to provide legal entitlements to food for a larger segment of the population. The NFSA underscores the significance of an effective PDS in achieving broader food security goals.

Regional Variations and Diversity

It is crucial to acknowledge the regional variations and diversity that characterize India's vast landscape. The impact of the PDS can vary based on factors such as geography, demographics, and socio-economic indicators (Datta and Ramaswami, 2001). While the system's objectives remain uniform, its implementation and outcomes may differ significantly across different states and regions. Understanding these variations is essential for tailoring policies and interventions to cater to the specific needs and challenges faced by different areas.

The challenges confronting the Public Distribution System in India are intricate and multifaceted. Addressing these obstacles necessitates a comprehensive and multi-pronged strategy encompassing policy reforms, technological innovations, improved targeting mechanisms, and heightened transparency and accountability. By fortifying the PDS against leakages, corruption, and inefficiencies, there lies the

potential for a reimagined system to genuinely fulfil its intended mission of ensuring food security and poverty alleviation among India's most vulnerable segments.

2.2.7 Conclusion

The influence of the Public Distribution System on food security in India is both evident and profound. By providing subsidized food distribution, the PDS not only boosts the nutritional quality and variety for recipients, but it also plays a pivotal role in decreasing malnutrition rates and enhancing overall welfare. It is particularly advantageous for at-risk groups such as children and expectant mothers, as the PDS tackles regional imbalances in food availability and access, guaranteeing a dependable source of sustenance for even the most marginalized communities. Serving as a cornerstone in India's fight against food insecurity, the PDS underscores the importance of public policy interventions in moulding the nutritional landscape and promoting socio-economic progress.

The digitization of the Public Distribution System (PDS) in India has brought about significant transformations in the realm of food security and distribution. The literature section on digitization of PDS delves into the wider impacts of digitization of PDS and the challenges that accompany this process. The digitization of PDS involves the technological enhancement of the system through the integration of databases, biometric authentication, and digital ration cards. While this advancement promises improved transparency, efficiency, and reduced leakages, it also presents challenges such as inadequate technological infrastructure, data privacy concerns, and issues related to beneficiary identification.

Despite these challenges, the PDS remains a crucial pillar in addressing food insecurity in India. The system ensures the distribution of subsidized food grains to millions of vulnerable citizens, enhancing their nutritional intake and overall well-being. It particularly benefits marginalized groups, including children and pregnant women, by mitigating geographical disparities in food accessibility.

With effective integration of technology, such as robust digital platforms and biometric authentication, many of the challenges can be mitigated. Additionally,

reducing political and administrative bottlenecks is essential for the program's success. By addressing these concerns and fostering a collaborative approach, the PDS has the potential to become one of the world's exemplary food security programmes.

In essence, the digitization of the PDS is a step towards modernizing food distribution, and while challenges exist, the programme's fundamental value in alleviating food insecurity cannot be denied. Through strategic improvements and comprehensive reforms, the PDS can emerge as a model food safety net programme that effectively addresses the nutritional needs of India's most vulnerable populations. However, detailed studies need to be conducted focusing on the impact of PDS on ensuring food security of the people of various backgrounds. Studies are limited in Indian context that analyses the impact of PDS on people by religion, caste, gender and geographical location. Additionally, studies need to be conducted to look at the nutritional safety of the beneficiaries. Focus should not be just on food entitlements but on the nutritious food entitlements. Thus, the current study will definitely be an addition to existing literature as it proposes to provide a detailed analysis of the impact of PDS on food security and nutritional status of people by gender, caste, religion and sector. Moreover, the study also seeks to assess how the digitization efforts are taken by the people and how far it has improved the effectiveness of PDS. The study also finds out various challenges associated with PDS in India.

DATA AND METHODOLOGY

3.1 Introduction

3.2 Primary Data Collection

3.3 statistical Methods used in the Study

3.1 Introduction

In this chapter, discussions are held in detail outlining the data collection process and the methodologies employed to investigate the effectiveness of the Targeted Public Distribution System (TPDS) in ensuring food security among vulnerable households in the study area. The study is rooted in primary data collected through a comprehensive survey questionnaire that captures crucial socio-demographic and economic characteristics of households, along with insights into the delivery mechanisms of the Public Distribution System (PDS), and gauges satisfaction and effectiveness levels related to the PDS.

The chapter is structured to provide a clear understanding of the study's sampling design, ensuring the representation of the diverse landscape of Kerala, focusing specifically on the randomly selected districts of Malappuram and Palakkad. I employ a multistage random sampling approach to secure a well-rounded sample that accurately reflects the broader population.

The sampling process is detailed across three stages: district selection, taluk selection, and ward selection. Within this framework, I carefully deal with the selection of districts, the rationale behind choosing Malappuram and Palakkad, and the subsequent selection of taluks, emphasizing the significance of Mannarkkad and Ernad taluks within the chosen districts. The chapter also elucidates the process of selecting specific wards, with a focus on Kumaramputhur and Kavanoor Panchayats, and the random sampling of wards within these areas.

Furthermore, the chapter highlights the challenges encountered during data collection, including instances of non-reporting, non-cooperation, and missing information in the questionnaire. This led to the exclusion of specific households from the final sample size. Ultimately, this study arrives at a representative sample of 496 households, equally distributed between Palakkad and Malappuram districts, providing a robust foundation for our research.

To analyze the collected data comprehensively, the research employs a range of statistical methods. Descriptive statistics are harnessed to offer insights into the

central tendencies and variations within key household variables. This work presents mean values, standard deviations, percentage distributions, frequency distributions, cross-tabulations, and visually represent the data through bar diagrams and pie diagrams. These techniques enhance our understanding of the data's underlying patterns and characteristics.

Inferential statistics are also a crucial part of our analysis, involving various statistical tests and techniques to explore relationships across different variables. Specifically, the study employs the Chi-square test to examine associations between categorical variables, such as food security levels, satisfaction, and types of ration cards, with demographic factors like caste, religion, and occupation. Additionally, this study utilizes one-way analysis of variance (ANOVA) to assess significant differences in means across groups, allowing us to compare variables like annual income, expenditure, and quantities of food grains purchased across various household groups.

The core of our analysis centres on the Ordered Probit model, a sophisticated statistical tool used to evaluate the effectiveness of TPDS. This model treats the self-assessed TPDS effectiveness as a dependent variable measured on an ordinal scale. This research examines how this effectiveness is influenced by a set of independent variables, including the type of ration cards, rural/urban location, caste group, asset holdings, distance to PDS, income, and household size.

This chapter lays the groundwork for the subsequent analyses and findings, setting the stage for a rigorous exploration of TPDS's role in ensuring food security among vulnerable households in the study area. The detailed discussion of the data methods is summarised in the following heads.

3.2 Primary data collection

The study is based on primary data collected through a survey questionnaire that incorporates the socio-demographic and economic characteristics of households, the delivery mechanism of the Public Distribution System (PDS), and measures of

satisfaction and effectiveness related to the PDS. A detailed description of the sampling process is provided in this section.

3.2.1 Sampling Design of the Study

The effectiveness of food security in Kerala, the study area comprises the state of Kerala, which consists of 14 districts. Among these districts, the study selected Malappuram and Palakkad randomly. To ensure a representative sample, the study employed multistage random sampling method. The elaboration of the sampling process is explained as follows:

Sampling Process: Multistage Random Sampling

1. Stage 1: Selection of Districts

The study randomly selected two districts out of the 14 in Kerala, namely Malappuram and Palakkad. The study aims to investigate the impact of the Public Distribution System (PDS) on vulnerable populations in Kerala. To achieve this, two districts were selected based on per capita district income, using data from the Government of Kerala's Economic Review (2022-23). According to the economic review (2022-23), Palakkad, Kasaragod, Pathanamthitta, and Malappuram are the four lowest-ranking districts in terms of per capita district income. Malappuram and Palakkad were randomly selected from these four districts for the study.

Stage 2: Selection of Taluks

Within each selected district (Malappuram and Palakkad), the study randomly chose one taluk from each district. Out of the 7 taluks in Palakkad and Malappuram, Mannarkkad and Ernad taluks were randomly selected. Subsequently, the area was further divided into subdivisions of taluks.

2. Stage 3: Selection of Wards

Within the chosen Mannarkkad and Ernad taluks, Kumaramputhur and Kavanoor Panchayats were randomly selected. Specifically, ward numbers 9 and 15 from Kumaramputhur Panchayat and ward numbers 03 and 11 from Kavanoor

Panchayat were chosen using a random selection process. Subsequently, the household details of the selected ward numbers were collected from their respective Panchayats, with households selected through simple random sampling. The total number of ration card holders in both Palakkad and Malappuram districts, as per official government reports, was 1,846,673. Therefore, the required sample size for the study was 543 to achieve a 98% confidence level with a 5% margin of error. However, some households did not report or cooperate during data collection, and there were instances where information in the questionnaire, especially regarding quantities of food grains purchased from the Public Distribution System (PDS), income, consumption, etc., was missing. As a result, 47 households were omitted from the required sample size, leaving a final sample of 496 households for this study. This sample represents a 50% distribution from both Palakkad and Malappuram districts of Kerala for this research.

3.3 Statistical Methods Used in the Study

The study employed various statistical methods to analyse and interpret the data collected from randomly selected districts of Kerala, with a specific focus on Malappuram and Palakkad districts. The statistical methods used in this research include:

Descriptive Statistics

The study utilized descriptive statistics, such as mean, standard deviation, percentage distribution, frequency distribution, cross-tabulations, as well as bar diagrams and pie diagrams, to visualize the distribution of variables. Descriptive statistics were applied to key household variables, including household size, annual income, total monthly expenditure, total monthly expenditure on food items, quantities purchased from PDS, delivery mechanisms, and discussions regarding the effectiveness of PDS. These descriptive statistics provided a comprehensive overview of the central tendencies and variations within the study's variables, enhancing the understanding of the data.

Inferential Statistics

The study also employed inferential statistics, including various statistical tests and techniques, to analyse relationships and determine how socio-demographic and economic factors differ across types of ration card holders, self-rated satisfaction with the service delivery mechanism, satisfaction with food grains, nutritional status, and food security in the study.

Chi-square Test: This test may have been used to examine associations between categorical variables such as food security levels/satisfaction/types of ration cards and demographic factors like caste, religion, and occupation.

Chi-Square Formula is given in equation (1)

$$\chi^2 = \Sigma [(O - E)^2 / E] \dots\dots\dots(1)$$

Where:

- χ^2 : Chi-square statistic
- O: Observed frequency in each cell of the contingency table
- E: Expected frequency in each cell of the contingency table

ANOVA-Tests: ANOVA-tests have been used to determine if there are significant differences in means across groups, for example, comparing the mean annual income, expenditure, quantity of foodgrains purchased etc across household groups

The formula for one-way analysis of variance (ANOVA) can be expressed as follows:

$$\text{Total Variance (Total Sum of Squares, SST) = Between-Group Variance (Between-Group Sum of Squares, SSB) + Within-Group Variance (Within-Group Sum of Squares, SSW)}$$

The breakdown of the components in the ANOVA formula:

Total Variance (SST): This represents the total variability in the data and is calculated as the sum of the squared differences between each data point and the overall mean.

$$SST = \sum (X_{ij} - \bar{X})^2$$

Where:

X_{ij} is an individual data point;

\bar{X} is the overall mean of all data points;

Between-Group Variance (SSB): This measures the variability between different groups or categories of the independent variable. It is calculated as the sum of the squared differences between each group mean and the overall mean, weighted by the number of observations in each group.

$$SSB = \sum \left(n_i * (\bar{X}_i - \bar{X})^2 \right)$$

Where:

- n_i is the number of observations in group i.
- \bar{X}_i is the mean of group i.
- \bar{X} is the overall mean.

Within-Group Variance (SSW): This measures the variability within each group and represents random variation or error. It is calculated as the sum of the squared differences between each data point within a group and the mean of that group.

$$SSW = \sum \sum (X_{ij} - \bar{X}_i)^2$$

Where:

- X_{ij} is an individual data point in group i.
- \bar{X}_i is the mean of group i.

The degrees of freedom (df) associated with each sum of squares are used to calculate the mean squares (variances), which are then used to compute the F-statistic.

The F-statistic is calculated as:

$$F = (SSB / (k - 1)) / (SSW / (N - k)).....(2)$$

Where:

- k is the number of groups or levels of the independent variable.
- N is the total number of observations.

The F-statistic is compared to a critical value from an F-distribution to determine whether the differences among group means are statistically significant.

ANOVA helps assess whether there are significant differences among group means by partitioning the total variance into between-group and within-group components and then comparing them using the F-statistic.

1. Ordered Probit Regression models

This study employs the Ordered Probit model to assess the effectiveness of the Targeted Public Distribution System (TPDS) in ensuring food security among vulnerable households within the study area. The analysis involves estimating an Ordered Probit regression model, with the household's self-assessed rating of TPDS' effectiveness serving as the dependent variable. The independent variables considered in the model include types of ration cards, rural/urban location, caste group, asset holdings, distance to PDS, income, and household size.

In this modelling framework, the dependent variable, which represents the self-reported effectiveness of TPDS, is measured on a prescribed integer scale ranging from 1 to 3. This latent self-rated effectiveness of TPDS is assumed to be a linear function of a set of explanatory variables and a random error component. Individually indexed by the subscript "i," the model can be expressed as shown in equation (3), where "Si" represents the latent self-assessment of effectiveness for

individual "i," and "βs" denote the associated linear regression coefficients. The "Xki" terms stand for the k explanatory variables, and "Uis" are mutually independent standard normal variables. Estimation of the Ordered Probit model is accomplished through maximum likelihood estimation techniques.

$$S_i = \sum_{k=1}^k \beta_k X_{ki} + U_i \dots\dots\dots (3)$$

Equation (3) captures the essence of the analysis, illustrating how the study aims to quantify the relationship between the household's self-assessed TPDS effectiveness and a range of explanatory factors. This approach allows for a comprehensive examination of the factors influencing food security within the study area and sheds light on the impact of TPDS in addressing the needs of vulnerable households. Description of the variables is summarised in table 3.1

Table 3.1 Description of the dependent and independent variables used in the Ordered Probit regression model

Variable Name	Type	Description
Dependent Variable (Y)	Categorical	Self-assessed food security with values 1, 2, or 3 (ordinal scale).
Independent Variable (X2)	Binary	Urban/Rural location (0 for urban, 1 for rural).
Independent Variable (X3)	Binary	Caste group (1 for SC/ST, OBC, and 0 for General).
Independent Variable (X4)	Binary	Landholding (1 for no land, 0 for holding some land).
Independent Variable (X5)	Binary	Distance to PDS (1 for less than 1 km, 1 for more than 1 km).
Independent Variable (X6)	Continuous	Log Household income.
Independent Variable (X7)	Continuous	Household size.

Source: Author's calculations

Conclusion

In this chapter, I have meticulously outlined the data collection process and the methodological framework underpinning our study on the effectiveness of the Targeted Public Distribution System (TPDS) in enhancing food security among vulnerable households in Kerala, with a specific focus on Malappuram and Palakkad districts. The chapter provides a comprehensive understanding of how our research was conducted and serves as the bedrock upon which our findings and insights are built.

**PUBLIC DISTRIBUTION SYSTEM AND
NATIONAL FOOD SECURITY ACT IN INDIA:
HISTORY, EVOLUTION AND TRENDS**

-
- 4.1 PDS and National Food Security Act in India*
4.2 Efficiency of PDS in India – A general Review
4.3 National food Security Act, 2013
4.4 Conclusion
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4.1 PUBLIC DISTRIBUTION SYSTEM AND NATIONAL FOOD SECURITY ACT IN INDIA: HISTORY, EVOLUTION AND TRENDS

The beginning of public distribution of food grains in India can be traced to the rationing system implemented by the British during World War II. Considering the significant impact that both the rationing system and its subsequent form, the Public Distribution System (PDS), have had in ensuring food security for households and eradicating famine risks in India, an in-depth review of its development and effectiveness is both appropriate and necessary.

During the global turmoil of World War II, the British government, then ruling over India, saw an urgent need to manage the country's food supply effectively. This led to the creation of the first structured system for the public distribution of food grains on the subcontinent. The system mandated a set quantity of grains, which would be allotted and sold to households possessing ration cards—a form of identification that ensured equitable distribution among the masses. This initiative, spearheaded in the bustling city of Bombay in 1939, represented a pivotal shift toward organized rationing in urban locales.

The concept of rationing was not new, but its implementation on such a systematic scale was unprecedented in India. The British colonial administration recognized the need to prevent shortages and hoarding during the war and sought to maintain stability in food supply and prices. As the war progressed, the system's efficacy and necessity became increasingly apparent, prompting an expansion beyond Bombay. By 1943, this rationing program had been introduced to thirteen additional cities, and by the conclusion of the war in 1946, it had extended its coverage to a vast network of 771 cities and towns across India. Notably, the expansion included some rural areas traditionally plagued by food scarcity, marking the government's acknowledgment of the widespread need for food security.

The 1942 establishment of the Department of Food by the Government of India was a landmark development. It signified the government's dedicated attention to the issue of food security, ensuring that food supply considerations received the

highest level of administrative focus. Such a department was crucial for the coordination and execution of food distribution policies during these critical years.

Despite the apparent success of the rationing system, its dissolution came swiftly with the cessation of hostilities in 1943, mirroring actions taken by other war-torn nations eager to return to pre-war economic practices. The post-war period was one of reconstruction and reevaluation of wartime policies. However, India's transition from a colony to an independent nation brought its own set of economic challenges. Upon independence in 1947, the nation encountered rampant inflation, a common post-war economic woe. Compounding this issue were the global grain prices, which had surged dramatically, influenced by the war's aftereffects and presenting a fourfold increase from pre-war levels.

These economic pressures necessitated a return to the rationing system in 1950, barely three years after its abolition. The reinstatement of rationing was a reluctant but necessary measure to manage the economic instability and ensure that the population had access to essential food supplies at affordable prices. This move highlighted the newly independent India's resolve to maintain sovereignty over its food security and economic policies.

The expansion of the rationing system, now integral to the fabric of India's urban and rural life, laid the groundwork for what would later evolve into the more comprehensive Public Distribution System. The post-war period's reintroduction of rationing was a crucial moment, reflecting the nascent nation's prioritization of stability and equity in food distribution during a time of significant transition and economic recalibration.

As India started to follow on its journey of planned economic development in the year 1951, the retention of the public distribution of grains stood as a testament to the nation's commitment to socio-economic equality. This move was not merely a policy decision but a strategic cornerstone in India's broader vision for achieving inclusive growth that would benefit all sectors of its vast population.

In the budding years following independence, India was faced with the colossal task of addressing the disparities in wealth and access to resources. The public distribution system (PDS), which had taken root during wartime, was identified as a crucial vehicle for delivering social justice and economic equity. With this in mind, the first Five-Year Plan initiated a significant expansion of the PDS, aiming to bridge the gap between the urban centers, which had previously been the primary beneficiaries of the rationing system, and the rural hinterlands, where food scarcity was a longstanding issue.

This expansion of the PDS brought with it an innovative bifurcation in the system's structure. The government delineated two types of rationing areas. The first was known as the Statutory Rationing Areas. Here, the presence of food grains in the market was exclusively managed through state-operated ration shops. These were typically regions where the need for food security was acute, and the government's intervention was necessary to ensure a consistent supply of staple grains at controlled prices. These ration shops became the lifeline for many, providing essential sustenance in areas where the volatility of market forces could not guarantee stable availability.

The second type introduced was the Non-Statutory Rationing Areas. Unlike their statutory counterparts, these areas were not entirely dependent on the government shops for their grain supply. Instead, the PDS in these regions was designed to complement the existing market mechanisms. Ration shops in these areas functioned as an alternative source for grains, often at subsidized rates, supplementing what was available in the open market. This dual approach provided a safety net for consumers, ensuring that even if market prices fluctuated or supplies dwindled, there was a backup source available.

The extension of the PDS into rural India represented a critical step in the government's plan to democratize access to food. It was a recognition of the fact that economic planning and development had to be rooted in the reality of India's demographic and geographic diversity. The PDS was thus not only a mechanism for food distribution but also a tool for nation-building. It was a means to unite a

country marked by diverse landscapes and economic disparities under a common agenda of growth and stability.

By integrating rural India into the fold of the PDS, the government aimed to create a more cohesive and equitable society where the basic needs of every citizen were met. This move was both a reflection of India's socialist principles and an acknowledgement of the strategic importance of food security in the nation's overall development agenda. The expansion and adaptation of the PDS were seen as vital for fostering a sense of national solidarity and for propelling the country on a path towards self-sufficiency and prosperity for all.

In the late 1950s, India witnessed a period of abundant grain production that momentarily reduced the dependence on the Public Distribution System (PDS). However, this period was short-lived as the nation experienced a sudden and significant decline in grain production in 1958. This unexpected downturn necessitated a critical reassessment of the PDS, leading to its substantial augmentation and recalibration to meet the pressing needs of the population.

During this time, the PDS underwent significant changes to enhance its role and reach. Recognizing the system's importance in the socio-economic fabric of the country, the government not only reinstated it but also expanded its scope. A notable addition to the PDS during this period was the introduction of other vital commodities that were essential to the daily lives of the citizens, such as cooking oil, sugar, and kerosene. This diversification helped address the broader needs of the Indian populace, ensuring that the PDS provided a more holistic approach to household sustenance.

Concurrently, there was a substantial increase in the number of distribution outlets. Ration Shops, which had been the cornerstone of the rationing system, were rebranded as Fair Price Shops. This rebranding signified a shift in the system's ethos, emphasizing the government's commitment to maintaining affordability in essential commodities. The network of these shops expanded exponentially, enhancing the system's accessibility to a larger segment of society, especially those in marginalized and low-income groups.

Another pivotal development in this era was the introduction of American PL-480 grains into the PDS. The PL-480 program, also known as 'Food for Peace', was an agreement under which the United States exported agricultural commodities to friendly countries under concessional terms. The infusion of PL-480 grains into the Indian market significantly bolstered the volume of grains available for distribution, providing a buffer against the fluctuations in domestic grain production and helping to stabilize prices.

By the conclusion of the Second Five-Year Plan, it was evident that the PDS had evolved markedly from its original incarnation as a wartime rationing measure. It had become a robust social safety net designed to ensure the availability of affordable grains to Indian households. The system played a pivotal role in mitigating the effects of market volatility, providing a stable source of food grains at regulated prices, thereby preventing the adverse outcomes of market speculations on the availability and pricing of food grains.

The strategic creation of buffer stocks was another crucial feature that was incorporated into India's overarching food security strategy during this period. Buffer stocks served as a safeguard against crop failures and supply shocks, ensuring that the government had reserves to manage the demand and supply effectively. However, the consistent availability of grains through the PL-480 initiative meant that there was no immediate need to amass large domestic buffer stocks. This external support provided a much-needed relief to the national reserves, allowing India to navigate periods of scarcity without exerting undue pressure on its own agricultural systems.

In summary, by the end of the Second Five-Year Plan, the PDS had firmly established itself as an integral component of India's food security framework. Its transition to a multifaceted social safety mechanism underscored the country's proactive measures to safeguard its citizens against food scarcity and economic uncertainty. The PDS's development during this period laid a solid foundation for its future role in supporting India's commitment to social welfare and economic stability.

Food Corporation of India (FCI)

The inception of the Food Corporation of India (FCI) and the Agricultural Prices Commission (APC) in 1965 marked a pivotal moment in strengthening India's Public Distribution System (PDS). With the formation of these bodies, the Indian government unequivocally committed to securing a stable income for farmers by instituting a guaranteed minimum support price (MSP) for vital crops such as wheat and paddy. This policy assured that even if market prices fell below the MSP, the government would step in to purchase the produce, thereby safeguarding farmers' livelihoods and ensuring that their crops did not go to waste.

The FCI was tasked with the strategic procurement of essential grains from farmers at these MSPs, a move that stabilized farmers' income and incentivized them to continue farming these crucial crops. The grains thus procured became part of the national reserves, which were then methodically distributed through the network of the PDS. The intent was to ensure that these food staples remained accessible and affordable to all sections of society, especially those living on the margins of the economy.

In addition to bolstering the PDS, a portion of these stocks was allocated towards creating buffer stocks. These reserves were instrumental in counterbalancing the fluctuations in grain production caused by variable monsoons, market conditions, and other unforeseen events affecting agriculture. The buffer stocks acted as a cushion for the country's food security, ensuring that, in times of shortfall, there was an adequate supply to meet the demand of the PDS without causing distress in the market.

However, despite the best efforts in planning and procurement, there were instances when the domestically procured stocks proved insufficient to meet the PDS needs. In such scenarios, the government did not hesitate to engage in international trade, importing grains to supplement the domestic reserves. This commitment to maintaining the supply chain integrity of the PDS underscored the government's pledge to not just the farmers of the country but also to the consumers, particularly those who relied heavily on the PDS for their daily sustenance.

Throughout the various seasons of Indian agriculture, marked by both bountiful harvests and lean yields, the PDS remained a constant feature of the government's welfare policies. Its foundational objectives were clear: first, to ensure the provision of food grains and other essential commodities at subsidized rates to the vulnerable segments of society, thereby safeguarding them against the volatilities of food scarcity and inflation. Second, to exert a stabilizing influence on the open market prices of cereals; given the significant volume of grains the PDS handled, it was well-positioned to moderate price swings and keep cereals affordable for the average consumer. Third, the system was designed to democratize the distribution of these essential goods, a step towards the socialization of the food supply chain, which aimed to guarantee that all citizens had equitable access to the basic necessities, irrespective of their economic status.

The continuous operation of the PDS as a conscious social policy reflects the government's commitment to social welfare and economic justice. By ensuring the availability and affordability of essential commodities, the PDS aimed to foster a more equitable and inclusive society where basic nutritional needs were met, allowing all individuals the opportunity to contribute to and benefit from India's economic progress.

The Public Distribution System (PDS) in India has been instrumental in ensuring the distribution of basic food staples, specifically rice and wheat, to its vast population. Additionally, the PDS also provides a set of four critical commodities that include sugar, edible oil, soft coke, and kerosene oil. These items constitute the core offerings of the PDS and represent the government's commitment to maintaining a baseline of nutritional and household energy needs for its citizens, particularly those from economically disadvantaged backgrounds.

However, the responsibility for the administration of the PDS lies with the state governments, which operate the system at the grassroots level. These local governments are not only responsible for the effective distribution of these commodities but are also encouraged to broaden the scope of the PDS by including a variety of other essential goods. These additional items—pulses, which are a

primary source of protein for many Indian households; salt, a fundamental dietary requirement; candles and matchboxes, necessary for lighting; everyday clothing; and educational materials such as school textbooks and writing supplies—serve to enhance the quality of life and support the basic needs of the populace.

The augmentation of the PDS becomes even more significant in the context of India's remote and rural interior regions. In these areas, traditional market mechanisms are often inadequate, and access to a diverse range of goods is limited. Market dynamics in such locations can be skewed by the presence of one or two dominant shopkeepers who may also function as moneylenders. This dual role can lead to a monopolistic control over the supply and pricing of goods, making it difficult for residents to obtain necessities at fair prices. The potential for exploitation in such settings underscores the importance of the PDS as a counterbalancing force.

To combat these challenges and ensure the equitable distribution of goods, various state governments have proactively set up Civil Supplies Corporations or Essential Commodities Corporations. These state-run entities are tasked with the procurement of essential commodities directly from the manufacturers, bypassing the traditional wholesale and retail market chains that often contribute to price escalation. By leveraging the existing infrastructure of the PDS, these corporations are able to disseminate these additional commodities to the farthest reaches of the state, ensuring that they are available at lower-than-market prices.

The strategic acquisition and distribution of these goods through the PDS network exemplify the government's dedication to not just food security but also to supporting the overall well-being of its citizens. It reflects a holistic approach to welfare, recognizing that the stability of a household is not solely dependent on food security but also on access to a range of basic commodities that collectively contribute to a dignified standard of living. Through these efforts, the PDS transcends its original mandate and becomes a comprehensive mechanism for social support, reaching into the very fabric of rural life and offering a lifeline to those in need.

In essence, the PDS's expansion to include a broader spectrum of commodities represents a nuanced understanding of the diverse needs of a vast country like India. It embodies a compassionate and pragmatic response to the challenges of geographic and economic disparities, ensuring that the benefits of economic development are not confined to urban centers but are shared with every corner of the nation. The success and sustainability of such a system are critical not only for the present but also for the future generations that will inherit this model of inclusive growth and equitable distribution.

Available Commodities under PDS

The Public Distribution System (PDS) is designed to ensure that beneficiaries have access to two staple grains—rice and wheat—as well as a set of four crucial commodities, namely sugar, cooking oil, soft coke, and kerosene. It is the responsibility of the state governments, who oversee the PDS operations locally, to expand this list to include additional necessities. These include pulses, which are a key protein source; salt, a dietary staple; candles and matchboxes for lighting; basic apparel; and educational materials like school textbooks and notebooks. The addition of these items is particularly important in remote areas where market access is limited and one or two dominant vendors may also act as lenders, controlling prices. To address this, several state governments have established Civil Supplies or Essential Commodities Corporations that procure these supplementary items directly from the producers, leveraging the PDS network to distribute them at prices more affordable than those in the open market.

The onus of supplying these six primary items to the beneficiaries through the state governments falls on the central government, ensuring a coordinated effort to maintain essential goods availability across the country.

Sugar

For sugar, the central government determines a mandatory supply quota under the Essential Commodities Act, which mandates each sugar mill to allocate a specified portion of their output to the government, currently at 40%. The

government then distributes this sugar to states monthly based on a per capita allocation, which is calculated using the 1991 census figures at 425 grams per person. State governments are responsible for collecting this sugar from designated mills and then selling it through the Public Distribution System (PDS). The price at which sugar mills provide this sugar to the government is set by the central government and reflects the minimum support price that the mills pay to sugarcane farmers. The remainder of the sugar, known as non-levy or free-sale sugar, may be sold by the mills in the open market at market-driven prices.

Edible Oil

Regarding edible oil, its distribution through PDS is not regular but occurs only under specific circumstances. When there's a shortfall in oilseed production leading to a surge in oil prices, making it unaffordable for economically disadvantaged segments, the central government steps in. It imports edible oils like Palmolein or Rapeseed through its trading arms and allocates them to states, which then distribute the oils via PDS. The pricing of these oils, whether sold at subsidized rates or on a no-profit, no-loss basis, depends on the comparison between international prices and domestic market prices.

Soft Coke

Soft coke distribution follows a different protocol where state governments receive allocations from public sector coal companies. Aimed at providing an economical cooking fuel for impoverished households, soft coke is heavily subsidized. However, as liquefied petroleum gas (LPG) becomes more widespread, either in cylinders or through piped connections, the allocation of soft coke is progressively decreased.

Kerosene Oil

Kerosene oil, a critical fuel for lighting and cooking in impoverished households—primarily for cooking in urban settings and lighting in remote rural areas—is allocated to states by the central government. Public sector oil companies

ensure this supply, drawing from domestic production or imports as necessary. Kerosene is distributed at subsidized rates to meet the needs of the poor.

Rice and Wheat

When it comes to rice and wheat, the responsibility for stockpiling, managing, and distributing these grains rests with the Food Corporation of India (FCI). The FCI primarily builds its reserves through domestic procurement, resorting to imports only occasionally and in minimal quantities. These reserves not only fulfil the requirements of PDS allocations to states but also contribute to the national buffer stock. In years when crop yields are high, procurement exceeds distribution, leading to an accumulation of the buffer stock. Conversely, in years of poor harvests, distribution intensifies due to increased demand and more robust collections by states and union territories, resulting in a drawdown of the buffer stocks.

4.2 Efficiency of PDS in India: A General Review

The Public Distribution System (PDS) of India has been a cornerstone in the nation's social welfare framework for over four decades, succeeding its forerunner, the British-era rationing system. It has stood as a bulwark against famine, with its effectiveness coming to the fore during the calamitous drought of 1987—the century's worst. During this critical period, the PDS was pivotal in ensuring that the widespread hunger and resultant crises of previous decades, such as those experienced in the 1960s and 1970s, did not repeat. According to the comprehensive nutrition assessment conducted by the National Institute of Nutrition in March 1992, the PDS's role was central in averting a recurrence of the widespread hunger seen in earlier droughts.

The success of the PDS during this time can be largely attributed to the strategic accumulation of buffer stocks in the years leading up to the drought. These reserves provided the necessary support not only for the PDS but also empowered food-for-work programs that were vital in those trying times. However, despite these successes, the PDS has been critiqued for its limited impact on household food

security, with critics pointing out that it is the weakest link in the tripartite food policy framework that includes procurement, distribution, and storage.

The other two facets of this framework—procurement and storage—have demonstrated their robustness and utility. A well-structured system of support pricing ensured that farmers were encouraged to produce greater quantities of food grains, as they were assured of a minimum earning for their produce. Without the intervention of the Food Corporation of India (FCI) and other procurement agencies, ready at thousands of purchasing centers to buy grains at the government-mandated prices, the volatility of market prices at harvest times could have led to significant losses for farmers, potentially resulting in a drastic reduction in agricultural output.

These support mechanisms were crucial during the drought of 1986-87. At this juncture, India's buffer stocks, having reached an all-time high of 27 million tonnes by July 1, 1986, played a critical role in addressing the food crisis. This well-maintained reserve enabled the country to navigate the challenges of the drought without seeking external food aid, highlighting the foresight and planning of the government's food security strategy. Additionally, the delayed need for importing wheat and rice until the 1988-89 period allowed the country to import based on favourable terms, rather than out of desperation.

The PDS also made an indelible impact by consistently providing rice and wheat to the public at stable, government-regulated prices, irrespective of the region. This approach was instrumental in preventing the specter of famine from haunting any part of the country during the drought. Moreover, the PDS's extensive network was integral to the implementation of food-for-work programs, which not only addressed immediate hunger but also fostered employment, ensuring the sustenance of rural communities during one of the toughest periods of environmental adversity.

The efficacy of the PDS, combined with the strategic stocking of grains and the support provided to farmers through minimum pricing, painted a comprehensive picture of a government determined to protect its people from the vagaries of climate and the market. This period underscored the strength of India's commitment to a PDS that was more than just a distribution network but a lifeline for its citizens,

upholding the dignity and security of millions during times of distress. The PDS thus was able to strongly establish its role as a critical component of India's social safety net, ensuring food security and sustaining the agricultural backbone of the nation.

However, the PDS in India is not free from criticisms either. Critics often point out that the Public Distribution System (PDS) is not cost-effective, citing high operational expenses. They argue that the proportion of procurement to transportation costs is excessively high, leading to what is deemed 'unnecessary' movements of goods. There are also claims that the storage losses within the system are substantial.

An in-depth examination of the Food Corporation of India's (FCI) expenses reveals that around 80% of these costs are beyond the control of the FCI, making it impossible for the organization to curb them should they increase. For instance, costs such as the minimum support price or procurement price have soared by approximately 20% annually over the last four years. Other significant expenditures that the FCI cannot regulate include interest rates on bank loans and the costs of rail and road transportation.

Consequently, only about 20% of the FCI's costs are subject to any potential reductions. It is within these controllable expenses that the FCI must strive to enhance labour productivity, which includes reducing handling costs. There is also a need for more efficient movement plans to eliminate unnecessary cross-country transportation, and efforts must be made to decrease losses during transit and storage.

Moreover, the PDS has faced criticism for its limited impact on the economic betterment of impoverished households. With the system being accessible to a vast number of people, the actual monetary benefit per capita is relatively minor. Research conducted using the data from the 42nd round of the National Sample Survey (NSSO, 1990) found that even for households who purchase all their cereal needs from ration shops, the value of the subsidy is minimal. The bottom 20% of the rural population benefits from a subsidy of merely Rs. 2.08 per person every 30 days. Considering the average rural family size of six, the total monthly subsidy

amounts to roughly Rs. 12.50 per family. To put this into perspective, it has been noted that just one additional day of employment per family each month could equate to the same level of financial support as the subsidy provided by the PDS for cereals.

Many of the current deficiencies in the Public Distribution System (PDS) arise from its all-encompassing approach, which distributes benefits across the entire population, regardless of economic status. This broad-brush strategy has resulted in diluted benefits that do not effectively discriminate between the needy and the well-off. While numerous studies have recommended that the PDS should be more focused on reaching the poor, they often overlook the complexities involved with targeting, including both the costs and the political implications. In various developing nations, the administrative expenses linked to targeting within such systems are noted to be substantial. Furthermore, efforts to target aid often lead to significant leakages where the intended beneficiaries do not receive their full entitlements.

According to many studies conducted in the country, the principal failing of the PDS is its ineffectiveness in serving the impoverished due to its universal scope. Every family, irrespective of income, is eligible for a ration card, which results in limited allocations per household and a distribution system that operates on a first-come, first-served basis. These factors lead to both the misappropriation of goods and a lack of engagement from impoverished households who should be the primary beneficiaries.

Targeting the PDS to the poor could potentially resolve these issues. By concentrating the assistance, it could fulfil a greater portion of a household's needs through increased rations, thus fostering a sense of ownership and responsibility among recipients. With targeted support, beneficiaries could be rallied and informed to take an active role in overseeing the distribution process. They would be more inclined to ensure that the Fair Price Shops (FPS) receive the correct quantity and quality of supplies and that these are indeed sold to legitimate cardholders. Those entitled to support would then be empowered to insist on their full quota from the FPS, reducing the likelihood of being dismissed with excuses such as stock

shortages or poor-quality grains, which in some cases are the result of manipulation by unscrupulous parties.

Therefore, shifting towards a targeted PDS that focuses on the truly destitute is not only a critical step but an urgent one. Maintaining an effective PDS is essential until such a time when the nation no longer has households struggling with poverty and in dire need of support.

4.2.1 What do studies say about improving the PDS in India

So many studies have been conducted in India in order to assess the efficiency of PDS in the country. The general results of those studies are given below with an intention of having an idea about the strategies that can be introduced in the improvement of public distribution system. The objective here is not to individually assess the studies but to talk about the general findings. The detailed review of such studies are already mentioned in the literature review part. Hence the individual analysis and review of the studies and researches are not attempted in this section.

1. Improved Stock Delivery to FPS:

The survey highlighted the need for precise weight measurements in stock delivery to FPS, advocating for an end to the practice of sample weighing which can lead to discrepancies in the actual amount of goods received.

2. Uniform Retail Pricing:

It suggested standardizing retail prices at FPS across the entire state or designated areas, taking into account the variations in transportation costs. This would involve a weighted averaging of these costs to ensure a fair and uniform price for all consumers.

3. Quality Assurance:

The regular provision of high-grade grains was cited as crucial to maintain public trust in the PDS. Ensuring quality in the supplies is imperative for the sustenance of the system.

4. Entitlement Card Accessibility and Durability:

The study also recommended enhancements to the entitlement cards—making them more accessible, improving their design, and ensuring their durability for prolonged use.

5. Direct Delivery System:

To streamline logistics, the report proposed a direct delivery system whereby PDS commodities are distributed directly to the households by the FPS, rather than the FPS owners collecting the stocks from Food Corporation of India (FCI) godowns.

6. Enhancing FPS Viability:

The survey pointed to the necessity of improving the financial and operational viability of FPS to ensure their continued service to the community.

7. Expanded PDS Commodity Basket:

By broadening the range of commodities offered through the PDS to include a more diverse selection of essential items, the utility of the system for consumers could be significantly improved. This would also contribute to the economic stability and attractiveness of managing an FPS.

8. Supply Chain Optimization:

The survey advised the construction of smaller, intermediary godowns that would act as logistical nodes between the primary FCI godowns and the FPS located in the hinterlands, ensuring a smoother supply chain with less wastage and delay.

9. Management Information System (MIS):

Lastly, the introduction of a sophisticated and more effective MIS was proposed. Such a system would better manage the intricacies of the PDS, ensuring efficiency and transparency in its operations.

These recommendations, derived from the on-the-ground realities of the PDS in remote and challenging terrains, are designed to address the critical pain points within the system. Implementing these changes could have a profound impact on the effectiveness of the PDS, ensuring that it serves its intended purpose as a key instrument of social welfare and food security in India.

The transformation of India's Public Distribution System (PDS) became a focal point for the central government following a shift in political leadership in 1991. The then-newly appointed Prime Minister, recognizing the critical importance of the PDS, took the initiative to personally oversee the Ministry responsible for its administration. This direct involvement at the highest level of government underscored the renewed commitment to addressing the shortcomings of the PDS, especially its failure to reach the most vulnerable populations.

The administration identified that despite the long-standing presence of the PDS, its benefits were not effectively reaching individuals in areas beset by geographic isolation, inadequate PDS infrastructure, and the scourge of poverty. Many individuals in these areas were unable to reap the advantages of the PDS due to their marginalized status, precipitated by factors such as challenging terrain, limited economic opportunities, and lack of awareness or access to the distribution system. To address these issues head-on, the government proposed a fundamental reorientation of the PDS with the goal of extending its reach to the farthest and most economically and socially disadvantaged communities, where poverty was widespread.

As part of this reorientation, an ambitious and strategic initiative, termed the "Revamped Public Distribution System" (RPDS), was launched. The RPDS was an accelerated program that aimed to bring about tangible improvements in the delivery of PDS services. Under the RPDS, a comprehensive plan of action was laid out, beginning with the identification of around 1750 blocks. These blocks were carefully selected based on criteria such as being tribal-dominated, located in hilly regions, susceptible to frequent droughts, or being 'de-certified areas'—zones that faced significant environmental and developmental challenges.

1. A significant increase in the number of Fair Price Shops (FPS) to ensure that beneficiaries could access PDS commodities more conveniently. The establishment of new FPS outlets was envisioned as a direct measure to reduce the distance that individuals had to travel to collect their rationed goods.
2. A dedicated campaign spearheaded by the state governments aimed at weeding out fraudulent or "bogus" entitlement cards, thus streamlining the beneficiary database. Simultaneously, there was a push to identify and register eligible households that had previously been left out of the system, ensuring they were provided with new entitlement cards.
3. A gradual and systematic approach to incorporating more FPS into the doorstep delivery scheme for PDS commodities. This initiative sought to ease the burden on beneficiaries, particularly those who faced difficulties in traveling to FPS due to age, disability, or distance.
4. The formation of vigilance committees at both the local FPS level and at broader administrative levels. These committees, with a strong representation of women, were to act as watchdogs, ensuring transparency and accountability in the operations of the FPS and addressing grievances related to the distribution of PDS commodities.
5. Enhancing the supply chain was a critical aspect of the RPDS, with plans to build or rent intermediary godowns situated strategically between the FCI's base godowns and the FPS. This would mitigate the logistical challenges associated with transporting commodities to remote locations and reduce the risk of spoilage and loss.
6. The introduction of a wider variety of commodities through the FPS, aimed at both increasing the utility of the PDS to its beneficiaries and improving the financial sustainability of operating an FPS. This measure was expected to meet a broader range of consumer needs and make the PDS more relevant to the daily lives of the beneficiaries.

Addressing poverty and the resultant hunger remains a core challenge that all societies face, and nations across the globe, from economic powerhouses like the United States to smaller nations such as Jamaica, adopt various strategies to mitigate these issues. Generally, these strategies center on providing direct aid to impoverished households to enhance their access to basic necessities, particularly food. This assistance might manifest as income support programs like food stamps or cash allowances found in the U.S., or through systems like India's PDS, which employ different pricing for different income groups.

The implementation of these policies involves considerable financial resources, typically drawn from a country's food subsidy budget. In a populous country like India, where an estimated one-third of its nearly 900 million people were living in poverty during the late 1980s, the financial demands of such a welfare program are substantial. It is crucial, then, for subsidies to be allocated efficiently, ensuring they effectively bolster food security for the poor.

In the current fiscal environment, where subsidy availability is heavily limited by overarching budget deficits, the question arises: Can India afford to continue dispersing its food subsidy without targeted precision? The extant PDS, which expends a significant Rs 30,000 million in subsidies annually, allows access to all, rich and poor alike. Moreover, the universal nature of the current system enables considerable diversion and leakage of resources. A notable portion of the subsidy, therefore, benefits not only the non-poor but also certain FPS dealers, logistics contractors, and some state officials engaged in the unethical diversion and replacement of goods.

Continuation of this indiscriminate allocation of subsidies is untenable. Redirecting this support exclusively towards the impoverished is not just an alternative but a necessity. Once there is consensus on this redirection, the nation can decide on the most suitable mechanism to enact this focus, whether by devising a new system or refining the existing PDS that has been operational for over forty years. A pivotal consideration in this decision-making process is the scope of the population that the revamped system will cover. This scope must align with the

country's logistical capacities, such as available food grain stocks, and financial limits, like the funds earmarked for food subsidies.

The PDS in its present form hardly qualifies as an effective safety net. Currently, it serves an indeterminate mix of individuals, including unauthorized beneficiaries, without clarity on who genuinely benefits from it or who, desperately in need, is excluded. Given the vast number of impoverished individuals in India, abolishing the PDS is not a viable option. The only feasible path forward is to repair and re-establish the system so that it provides coverage exclusively to those in need, within the constraints imposed by the country's resources. This recalibration will require a redefinition of who is deemed 'needy' to ensure that the safety net is both sustainable and just.

4.3 National Food Security Act 2013 (NFSA)

The Government of India has been actively addressing the critical concern of 'food security' at the household level for a substantial period, initially through the Public Distribution System and subsequently through the Targeted Public Distribution System. However, the promulgation of the National Food Security Act (NFSA) on July 5, 2013, signifies a notable transition in the approach towards food security, shifting from a welfare-based to a rights-based perspective. This landmark Act confers a legal right upon 75% of the rural and 50% of the urban population to procure food grains at subsidized rates through the Targeted Public Distribution System, effectively ensuring that about two-thirds of India's populace are beneficiaries of this entitlement. In a stride towards fostering women's empowerment, the Act stipulates that the eldest female member, aged 18 or older, in a family is to be designated as the head of the household for the issuance of ration cards.

Presently, the NFSA is operational across all States and Union Territories. With the provision to encompass a maximum of 81.34 crore individuals, the scheme is currently extending highly subsidized food grains to approximately 80 crore individuals. The procedure of pinpointing eligible recipients is an ongoing and dynamic process undertaken by the States and Union Territories, involving the

regular updating of the beneficiary list to remove ineligible, spurious, or duplicated ration cards, as well as to account for changes such as death, migration, births, and the inclusion of previously omitted households.

One of the cornerstone philosophies of the NFSA is its holistic life-cycle approach, which makes particular provisions for the nutritional needs of specific demographic groups. This includes pregnant women, lactating mothers, and children between 6 months to 14 years of age. The Act ensures these groups have access to free nutritious meals through a well-established network of Integrated Child Development Services (ICDS) via Anganwadi Centers under the ICDS scheme and through the provision of meals in schools as part of the Mid-Day Meal (MDM) scheme. The Act mandates enhanced nutritional standards for malnourished children under the age of 6. Additionally, it stipulates a monetary maternity benefit of no less than Rs. 6,000 for pregnant women and lactating mothers, intended to partially offset income loss during pregnancy and to augment their nutritional intake.

In circumstances where the entitled food grains or meals are not furnished to the beneficiaries, the Act ensures that such individuals are eligible for a food security allowance. This allowance is disbursed by the respective State Government in a timely and prescribed manner as outlined by the Central Government. The guidelines and enforcement of these provisions fall under the jurisdiction of the Food Security Allowance Rules, established in 2015.

Responsibilities under NFSA

The National Food Security Act (NFSA) entrusts the responsibilities on both the Central Government and the State/Union Territory Governments, establishing a framework of collaboration in the mission to achieve food security. The Central Government bears the responsibility for the procurement and allocation of the requisite quantity of food grains to the States and Union Territories. This includes overseeing the transportation of these food grains to the designated depots within each State or Union Territory. Furthermore, the Central Government provides financial support to the States and Union Territories to facilitate the delivery of food

grains from the storage godowns operated by the Food Corporation of India (FCI) directly to the doorsteps of the Fair Price Shops (FPS).

On the other hand, the State and Union Territory Governments carry the crucial onus of effectively enacting the provisions of the NFSA. Their tasks are comprehensive and multifaceted, ranging from the identification of households eligible to benefit from the NFSA to the issuance of ration cards to these households. They are tasked with the distribution of the allotted food grain entitlements to eligible households through the network of Fair Price Shops. In addition, the State and Union Territory Governments are responsible for the licensing and oversight of Fair Price Shop dealers, ensuring that these dealers operate within the stipulated guidelines and with transparency. An integral part of their mandate under the NFSA also includes the establishment of a robust and responsive grievance redressal mechanism that can address any issues or complaints that may arise. Moreover, these governments are charged with the fortification of the Targeted Public Distribution System (TPDS), an endeavor that requires constant vigilance and adaptive management to ensure that the objectives of the NFSA are met effectively and efficiently.

Coverage under NFSA

The National Food Security Act (NFSA) extends its coverage to a substantial portion of the Indian populace, incorporating up to 75% of the rural and 50% of the urban populations under programs such as the Antyodaya Anna Yojana (AAY) and other priority households. Under the auspices of the AAY, the households identified as the most destitute—the "poorest of the poor"—are assured a monthly entitlement of 35 kg of food grains per family. In contrast, families categorized as priority households are guaranteed 5 kg of food grains per individual each month.

To establish the state-specific coverage under the NFSA, the erstwhile Planning Commission, now reformed as the NITI Aayog, utilized data from the National Sample Survey (NSS) Household Consumption Survey of 2011-12. This data helped determine the proportion of the population to be covered within each

state, aligning with the overarching national coverage targets of 75% for rural and 50% for urban areas.

The identification of households eligible for benefits under the Targeted Public Distribution System (TPDS) within this predetermined coverage is a task assigned to the respective State and Union Territory Governments. It is incumbent upon these governments to devise and implement criteria for the delineation of priority households and undertake their actual identification.

In accordance with Section 10 of the NFSA, the State Governments and Union Territories have the authority and responsibility to earmark households under the AAY, following the existing guidelines associated with the scheme. Subsequently, they are to identify the remaining households as priority households eligible for coverage under the TPDS. This identification process is to be guided by the parameters and guidelines specified by the respective State Government, ensuring adherence to the objectives and spirit of the NFSA.

The following table (4.1) explains the food entitlement under NFSA for different economic groups in rural and urban areas:

Table 4.1: Food Entitlement Under NFSA 2013

Category	Rural Coverage	Urban Coverage	Entitlement per Month
Antyodaya Anna Yojana (AAY) Households	75%	50%	35 kg per family
Priority Households	75%	50%	5 kg per person

Source: Ministry of Consumer Affairs, Food and Public Distribution

As it can be seen from the Table 4.1 it is clear that the entitlements are different with respect to economic backgrounds.

- 1. Antyodaya Anna Yojana (AAY) Households:** These are families that are identified as the "poorest of the poor." The NFSA covers 75% of the rural

population and 50% of the urban population. For households under the AAY category, there is an entitlement of 35 kilograms of food grains per family each month, regardless of the family size. This allocation aims to address the most severe levels of poverty by ensuring that these households have access to essential food supplies.

- 2. Priority Households:** Separate from AAY households, these are other households that fall under the umbrella of the NFSA but are not necessarily the poorest of the poor. Like the AAY households, they also cover 75% of the rural population and 50% of the urban population. Individuals in these households are entitled to 5 kilograms of food grains per person each month. This category allows a broader base of the less affluent population to benefit from subsidized food grains, thereby contributing to the overall food security mission of the NFSA.

The state-wise coverage under the NFSA was determined based on data from the NSS Household Consumption Survey for the year 2011-12. The responsibility for identifying eligible households within this framework lies with the State Governments/UTs. They are tasked with evolving criteria for identifying priority households, issuing ration cards, and ensuring these households receive their food grain entitlements. The aim is to create a targeted and effective public distribution system that can reach the intended beneficiaries with the requisite food supplies.

Total Number of Beneficiaries Under NFSA in Different States

Table 4.2: Total number of beneficiaries in different states

Sl.	States/UTs	Accept number of persons under NFSA (in lakh)
1	Andhra Pradesh	268.23
2	Arunachal Pradesh	8.71
3	Assam	251.90
4	Bihar	871.16
5	Chhattisgarh	200.77
6	Delhi	72.78
7	Goa	5.32
8	Gujarat	382.84

9	Haryana	126.49
10	Himachal Pradesh	36.82
11	Jammu & Kashmir	74.13
12	Jharkhand	264.25
13	Karnataka	401.93
14	Kerala	154.8
15	Madhya Pradesh	546.42
16	Maharashtra	700.17
17	Manipur	25.06
18	Meghalaya	21.46
19	Mizoram	7.06
20	Nagaland	14.79
21	Odisha	326.21
22	Punjab	141.45
23	Rajasthan	446.62
24	Sikkim	4.06
25	Tamil Nadu	364.7
26	Telangana	191.70
27	Tripura	25.02
28	Uttar Pradesh	1520.6
29	Uttarakhand	61.94
30	West Bengal	601.84
31	Andaman & Nicobar	0.63
32	Daman & Diu	1.19
33	Dadra & Nagar Haveli	2.36
34	Lakshadweep	0.22
35	Chandigarh	4.96
36	Puducherry	6.34
	Total	8134.94

Source: Ministry of Consumer Affairs, Food and Public Distribution, 2023

Direct Benefits Transfer (DBT)

The National Food Security Act of 2013 has laid the groundwork for modernizing the Targeted Public Distribution System (TPDS), proposing initiatives such as the Direct Benefit Transfer (DBT) for the delivery of food entitlements. As a part of these reformative measures, the Government of India ratified the 'Cash Transfer of Food Subsidy Rule, 2015' in August 2015, based on the permissive guidelines stipulated under section 12 of the NFSA. The introduction of the DBT model seeks several objectives: it aims to mitigate the extensive logistical requirements for the physical transportation of food grains, afford beneficiaries the

freedom to select their food choices, promote a more varied diet, minimize systemic leakages, refine the accuracy of beneficiary targeting, and encourage broader financial inclusion.

In consonance with the prescriptive mandates of the NFSA, the Government of India formalized the 'Cash Transfer of Food Subsidy Rule, 2015' in August of the same year, reinforcing the legal and operational framework for implementing cash transfers. This rule articulates a structured pathway for the DBT model, which purports to fulfill multiple objectives as part of a broad-based strategy to advance public welfare and fortify the nation's social security infrastructure.

The DBT model primarily aims to abate the burdensome and often inefficient logistics involved in the physical transport of food grains across the vast geographical expanse of India. By streamlining this process, the government anticipates significant savings in time and resources, which have traditionally been invested in the movement, storage, and handling of food commodities.

Moreover, this innovative transfer system empowers beneficiaries with the autonomy to make food choices that best suit their dietary preferences and needs. This empowerment is not trivial; it signifies a major leap towards facilitating consumer sovereignty within the ambit of state-sponsored welfare programs. In doing so, the DBT initiative is envisioned to promote dietary diversity, encouraging households to enrich their nutritional intake with a variety of foodstuffs, which might have been previously inaccessible or unaffordable.

Another critical objective of the DBT scheme is to staunch systemic leakages that have plagued the TPDS. Leakages, manifesting as diversions of food grains to the black market and pilferage, have not only eroded the integrity of the distribution system but have also led to wastage of valuable fiscal resources. By channelling subsidies directly into the bank accounts of beneficiaries, the DBT model seeks to plug these gaps, ensuring that the benefits reach the intended recipients without the dilution of intermediaries.

The precision in beneficiary targeting is yet another facet of the DBT model that promises to revolutionize the PDS. With sophisticated data analytics and robust validation systems, the DBT aims to ensure that subsidies are disbursed to eligible beneficiaries accurately, thereby optimizing the welfare impact of the subsidies.

Finally, the DBT initiative dovetails with the larger objective of promoting financial inclusion. By necessitating the transfer of subsidies through banking channels, it implicitly mandates that beneficiaries participate in the formal financial ecosystem, thereby fostering financial literacy and inclusion, particularly among the rural and marginalized sections of society. The ripple effects of this could be transformative, potentially leading to greater economic participation and empowerment of these communities.

In essence, the DBT under the NFSA is not just a fiscal reallocation tool; it is a comprehensive strategy aimed at enabling a more efficient, inclusive, and empowering food security framework. It symbolizes a concerted move towards a future where food security is ensured not just in principle, but in practice, through measures that are sustainable, scalable, and sensitive to the needs and rights of every citizen.

The practical implementation of the DBT for food subsidies commenced in the Union Territories of Chandigarh and Puducherry in September 2015, with a subsequent rollout in parts of Dadra & Nagar Haveli in March 2016. Within these regions, the NFSA is operational through the DBT mode, wherein the cash equivalent of the food subsidy is deposited directly into the bank accounts of eligible households. This empowers them to purchase food grains from the open market. The adoption of the DBT scheme remains discretionary for States and Union Territories and is only applied in "Identified areas" where the State or Union Territory government has provided explicit consent to implement the system. Outside of these designated areas, the traditional mechanism of food grain distribution via the Public Distribution System remains in effect.

4.3.1 NFSA in Kerala Context

The National Food Security Act, 2013, enacted by the Parliament of India, is a significant legislative measure aiming to deliver food grains at subsidized rates to roughly two-thirds of India's population, which stands at 1.2 billion. The Act received the President's approval on September 12, 2013, and has been in effect since July 5, 2013. The state of Kerala began implementing the NFSA from November 1, 2016.

A key component of the NFSA is the comprehensive computerization of the Public Distribution System, envisaged to curtail leakages, bolster accurate targeting of beneficiaries, and diminish the costs associated with the distribution of subsidies. This sweeping digital transformation encompasses the deployment of electronic point-of-sale (e-PoS) devices at Authorized Ration Dealer (ARD) outlets, management of the supply chain from the Food Corporation of India (FCI) down to the ARD level, the use of biometric technology for authentication in retail and wholesale transactions, and the utilization of decision support systems within a Geographic Information System (GIS) interface. These technological advancements aim to overhaul the Public Distribution System into an entity that is efficacious, prompt, transparent, efficient, and devoid of corruption. The undertaking of these initiatives is a collaborative effort between the department, the National Informatics Centre (NIC), and other partners, with the target to conclude the end-to-end computerization within the 2017-2018 timeframe. In Kerala, the Supplyco has been charged with the responsibility of implementing doorstep delivery of rationed commodities as part of the PDS.

In adherence to the directives of the NFSA, the Kerala Government took proactive steps to discern and classify households that were eligible for benefits under the Act. Coinciding with the renewal of existing ration cards, the transition to the NFSA necessitated a shift from the older BPL (Below Poverty Line) and APL (Above Poverty Line) ration cards to the newly designated “priority” and “non-priority” categories. The Act stipulates that the coverage of the priority list is not to exceed 75% for rural populations and 50% for urban populations. However, to

prevent the exclusion of deserving households from subsidized ration benefits, Kerala opted for a state-wise beneficiary ranking instead of a taluk-wise approach. This decision, made by the new government, led to a postponement in the ration card renewal process. It is anticipated that by January 2018, the full-fledged operationalization of the NFSA, including the setup of E-PoS machines at ARD outlets and the integration of GIS in the logistics transporting food grains, will be robustly underway.

A comparison of NFSA implementation in India and Kerala can be easily understood with the help of the Table 4.3 given below:

Table 4.3: NFSA Implementation in India and Kerala

Event	Date	Details
NFSA Signed into Law	12 September 2013	Aims to provide subsidised food grains to approximately two thirds of India's 1.2 billion people.
Kerala NFSA Implementation Start	1 November 2016	Comprehensive computerization of the PDS to improve efficiency and reduce corruption.
End to End Computerization Planned Completion	2017-2018	Includes e-POS, biometric authentication, GIS-based systems for transparent and responsive PDS.
Full-fledged NFSA Operations Expected	January 2018	Installation of E-PoS machines in ARDs, fitting of GIS in transport vehicles, etc.

Source: Civil Supplies Department, Kerala

Distribution of Ration Cards in Kerala

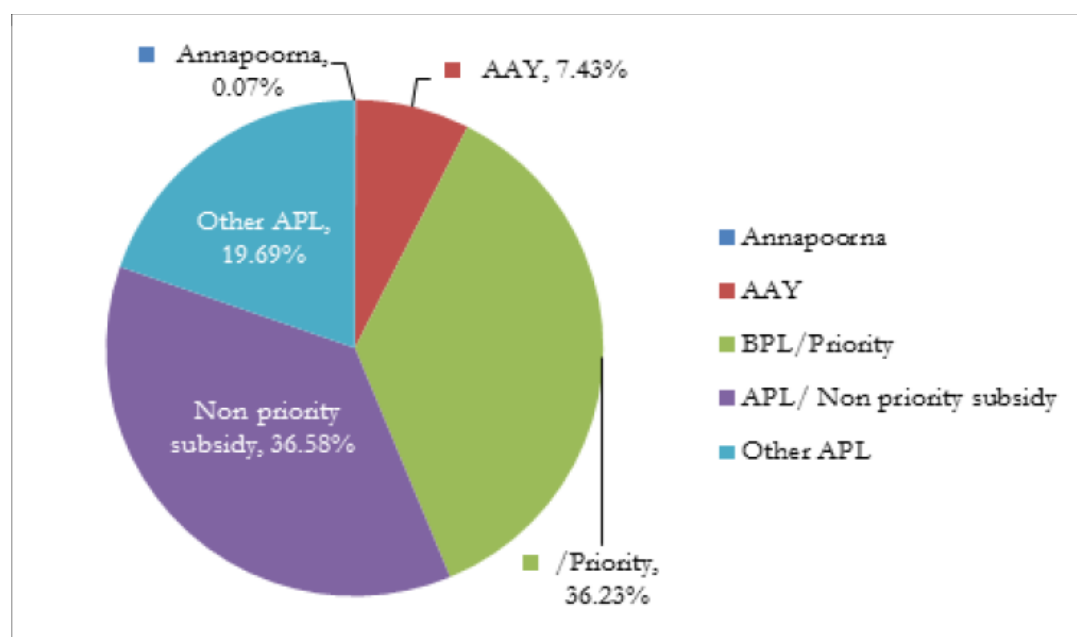
Following the Essential Commodities Act of 1955, the Public Distribution System (PDS) was inaugurated in the State on July 1, 1965. Given the notable shortfall in food grain production within the region, the PDS holds considerable significance. A critical function of the PDS is securing the regular procurement of food grains from the central allocation and ensuring their efficient distribution through a network of 14,335 ration shops. Kerala has been at the forefront with its introduction of a Universal Rationing System.

Over the period from 2015-16 to 2016-17, the total number of ration cardholders in the State witnessed a reduction from 83.14 lakh to 80.24 lakh. Among these, 35.08 lakh ration cards are categorized under the National Food Security Act

(NFSA), with the remainder of 45.16 lakh falling outside the ambit of the NFSA. Within the NFSA bracket, there are 5.96 lakh Antyodaya Anna Yojana (AAY) cardholders, 5726 Annapoorna beneficiaries, and 29.07 lakh priority cardholders. Meanwhile, the non-NFSA category is subdivided into 29.35 lakh non-priority subsidy recipients and 15.80 lakh non-priority members. The rollout of the NFSA in 2013 has led to significant reforms in the PDS structure across Kerala.

A system of four distinctively coloured ration cards has been established to differentiate between household categories. AAY households are issued yellow cards, priority households receive pink cards, the non-priority subsidy group is given blue cards, and white cards are allotted to the non-priority group (as illustrated in Figure 2.7). Beyond these, 6044 ration permits are allocated to institutions such as charitable organizations and others engaged in humanitarian efforts, which allow them to purchase food grains at subsidized rates.

Figure 4.1: Distribution of ration cards in Kerala:



Source: Civil Supplies Department, Kerala

The pie chart provides a visual breakdown of the distribution of food subsidies under different categories of beneficiaries. Here's a summary of each segment:

1. Annapoorna, 0.07%: This is the smallest sliver in the chart, representing a marginal program that provides food subsidies.
2. AAY (Antyodaya Anna Yojana), 7.43%: This portion represents households that fall under the AAY category, which is targeted at the poorest strata of the population.
3. BPL/Priority, 36.23%: This large segment denotes households classified as Below Poverty Line or Priority, which receive subsidized food grains.
4. APL/Non-priority subsidy, 36.58%: Almost equivalent in size to the BPL/Priority segment, this category represents the Above Poverty Line or Non-priority households that still receive a subsidy, though it might not be as significant as the BPL/Priority segment.
5. Other APL, 19.69%: This significant portion reflects the households that are classified as Above Poverty Line and do not fall into the subsidized categories. They may not receive the same level of subsidy as the other categories.

From the distribution of these segments, we can infer that the NFSA and related subsidy programs are structured to cater to various strata within the population, from the most needy to those who are relatively better off economically. The near-equal size of the BPL/Priority and APL/Non-priority subsidy segments suggests a considerable part of the population receives some level of support to access food grains, while a smaller portion, identified as Other APL, may represent individuals who are above the poverty line and receive less or no subsidy. The Annapoorna and AAY categories are clearly defined to focus on the most vulnerable and marginalized individuals, respectively.

Table 4.4: Card wise Food Entitlement in Kerala

Sl. No.	Category	No. of Ration Cards	Rice	Wheat	Fortified Atta
1	AAY	595,800	28 Kg/Month (free of Cost)	7 Kg Month (free of cost)	
2	Priority	2,906,709	4 Kg/Member/Month (free of cost)	1 Kg/Member/Month (free of cost)	
3	Non Priority (Subsidy)	2,935,436	2 Kg/Member/Month (@ 2.00/Kg)		1 Kg/Month (@ 15.00/Kg)
4	Non Priority (Non Subsidy)	1,580,085	8.90/Kg as per the availability of Stock	6.70/Kg as per the availability of Stock	2 Kg/Month (@ 15.00/Kg)
5	Annapoorna	5,726	10 Kg/month (@ free of cost)		

Source: Civil Supplies Department, Kerala

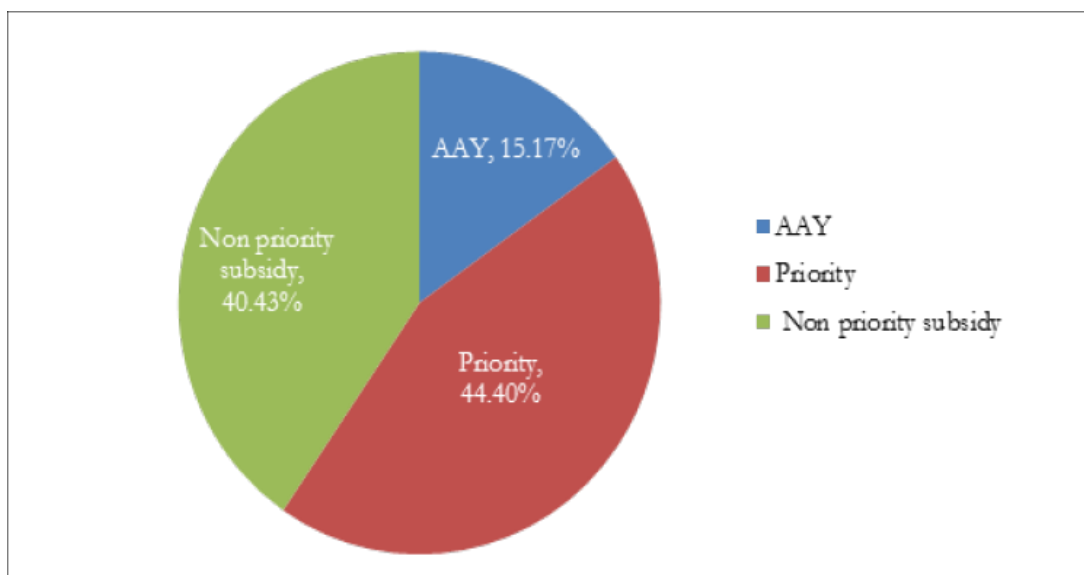
Supplyco in Kerala

The state of Kerala boasts a premier Public Distribution System (PDS) in India, significantly bolstered by the Kerala State Civil Supplies Corporation, also known as Supplyco, which serves as a crucial component in maintaining market stability for essential commodities. Established in 1974 with the fundamental objective of safeguarding food security in the state, Supplyco plays a pivotal role in curbing unwarranted price inflation—a task especially critical in a predominantly consumer-centric region like Kerala. The efficiency of the PDS in curbing price surges relies heavily on Supplyco's capacity to effectively intervene in the market all year round.

Functioning as the backbone of Kerala's PDS, Supplyco ensures the consistent flow of vital commodities through its extensive network of fair price shops and company-run outlets, ensuring that every individual within the state has access to necessary goods. The organization is tasked with maintaining regulated prices for a list of 13 crucial commodities by offering them at reduced rates across its 1,406 stores dispersed throughout Kerala.

Supplyco's operational hub is situated in Kochi, from where it governs activities across five regional offices, 56 depots, and more than 1100 retail outlets. Its broad mandate extends over various segments including the retail of Fast Moving Consumer Goods (FMCG) at competitive prices, the orchestration of specialized fairs to prevent price spikes during festive times, the retailing of pharmaceuticals via government-run medical stores, the acquisition and processing of paddy, the handling of wheat and related products, the dealership of petroleum products such as kerosene, petrol, diesel, and LPG, and serving as the pivotal entity for the execution of central government programs in the state, which includes the establishment of Micro Biology Labs and Food Processing Units. In the fiscal year 2016-17, Supplyco inaugurated 8 Maveli stores, 10 supermarkets, 1 People's Bazaar, and 4 medical stores. The corporation witnessed a substantial increase in sales turnover from ₹ 2,223 crores in 2010-11 to ₹ 3,857 crores in 2015-16. As of April 1, 2017, Supplyco was managing 21 FCI sub depots, 140 wholesale shops, and 11,572 retail shops, evidencing its expansive reach and substantial impact on Kerala's food distribution network.

Figure 4.2 Subsidy Spent for Various Categories of Card Holders in Kerala as per 2017



Source: Civil Supplies Department, Kerala

The pie chart illustrates the distribution of different types of food subsidies within a Public Distribution System (PDS). The categories include:

1. Antyodaya Anna Yojana (AAY): This category accounts for 15.17% of the subsidies. It is targeted towards the poorest of the poor, providing them with food grains at the most subsidized rates.
2. Priority: The largest segment at 44.40% represents households that are under the priority category. These households typically fall under the Below Poverty Line (BPL) category and receive significant food subsidies.
3. Non-priority Subsidy: Almost as large as the priority segment, at 40.43%, this represents households that are above the poverty line (APL) but still qualify for some subsidy, although less than the priority group.

The graph indicates that while a substantial portion of subsidies is directed towards priority households, there is also a significant allocation for non-priority subsidies, reflecting an effort to provide a safety net across a broader economic spectrum. The AAY's smaller proportion underscores its targeted approach to assist the most vulnerable. The chart suggests a balanced distribution of resources with a slight emphasis on priority households, ensuring that those most in need receive more assistance.

4.4 Conclusion

Thus, from the detailed discussion provided above, it can be understood that the Public Distribution System (PDS) in Kerala stands as a model of efficiency within India, thanks to its comprehensive network and the pivotal role played by the Kerala State Civil Supplies Corporation, also known as Supplyco. Established in 1974, Supplyco has been crucial in stabilizing the prices of essential commodities and ensuring the equitable distribution of food grains across the state through an expansive network of fair price shops. In Kerala, the implementation of the National Food Security Act (NFSA) in 2016 marked a significant step toward refining the PDS to cater to the needs of the poorest, ensuring food security and bolstering women's empowerment through the provision of ration cards.

Across India, the PDS has served as a cornerstone in the government's effort to combat food insecurity, especially for the economically vulnerable sections of the society. The NFSA, enacted in 2013, represented a paradigm shift, introducing rights-based access to food for about two-thirds of the population. The Act ensured that eligible households received highly subsidized food grains, thereby reinforcing the country's commitment to food security.

The NFSA's implementation saw the introduction of innovative reforms such as the end-to-end computerization of the PDS, aiming to improve efficiency, enhance transparency, and curb leakages within the system. Kerala's approach has included the digitization of ration card records, the integration of e-PoS devices at distribution points, and the introduction of a GIS-based monitoring system to streamline the PDS.

Despite the robust framework of the PDS and the strides made with the implementation of the NFSA, challenges persist at both the state and national levels. Issues such as operational inefficiencies, corruption, and exclusion errors need to be addressed to enhance the effectiveness of the PDS. Nonetheless, with ongoing reforms and the steadfast commitment of the government, the PDS in Kerala and across India continues to be an essential mechanism in ensuring that the right to food is not a mere promise but a lived reality for millions.

EMPIRICAL ANALYSIS AND FINDINGS

5.1 Introduction

5.2 General Profile of the Households

5.3 Descriptive Statistics of Key Household Variables

5.4 Impact of PDS on Food Security: A Comprehensive Analysis

5.1 Introduction

In the pursuit of ensuring food security among its populace, the Public Distribution System (PDS) has remained a cornerstone of government initiatives in Kerala. This study embarks on a comprehensive exploration of the PDS's impact on food security within the region. With a multifaceted approach, the research addresses several key objectives, starting with an analysis of the socio-demographic profiles of households in the study area. This initial step delves into the diverse characteristics of households, encompassing socio-economic aspects, the types of ration cards held, and the food entitlements provided through the PDS. Subsequently, the study assesses the quantities of food grains procured from both the PDS and the open market by households, while also critically evaluating the extent of food deficit faced by these households. Moreover, the research endeavours to evaluate the efficacy of the PDS's delivery mechanism and gauge the level of satisfaction among the beneficiary households. Finally, employing a comprehensive analytical framework that incorporates Chi-square tests, ANOVA, t-tests, and ordered probit models, the study aims to discern the true impact of the Public Distribution System on food security in Kerala. By addressing these objectives, the analysis chapter seeks to unravel the intricate dynamics of food security in the context of PDS and provide valuable insights into its effectiveness as a social welfare program in the region.

5.2 General Profile of the Households

In this section, a comprehensive profile of the households participating in the study is presented. Understanding the demographic and socio-economic characteristics of these households is essential for contextualizing the analysis of the Public Distribution System (PDS) and its impact on food security. The study explores various aspects of household composition, including location, gender distribution, religious affiliation, caste distribution, occupation, educational status, and land possession patterns. Additionally, this also provides descriptive statistics for key household variables such as household size, annual income, total monthly expenditure, and monthly expenditure on food items. This introductory overview

lays the foundation for a deeper analysis of how these household characteristics may influence food security dynamics and interactions with the PDS.

Location wise Household Distribution

The data for this study was collected from both rural and urban sectors. The majority of the sample, accounting for 78.4%, represents households are situated in rural, while the remaining 21.6% are located in urban sector.

Table 5.1: Location wise Household Distribution

Location	Number	%
Rural	389	78.4%
Urban	107	21.6%

Source: Primary Survey, 2023

Gender Distribution of Households

Table 5.2 displays the gender distribution within the surveyed households. It shows that 52.0% of the households are male headed , while 48.0% are female headed. Gender is a critical demographic variable as it can influence food security dynamics and PDS utilization differently among male headed and female headed households.

Table 5.2: Gender Distribution

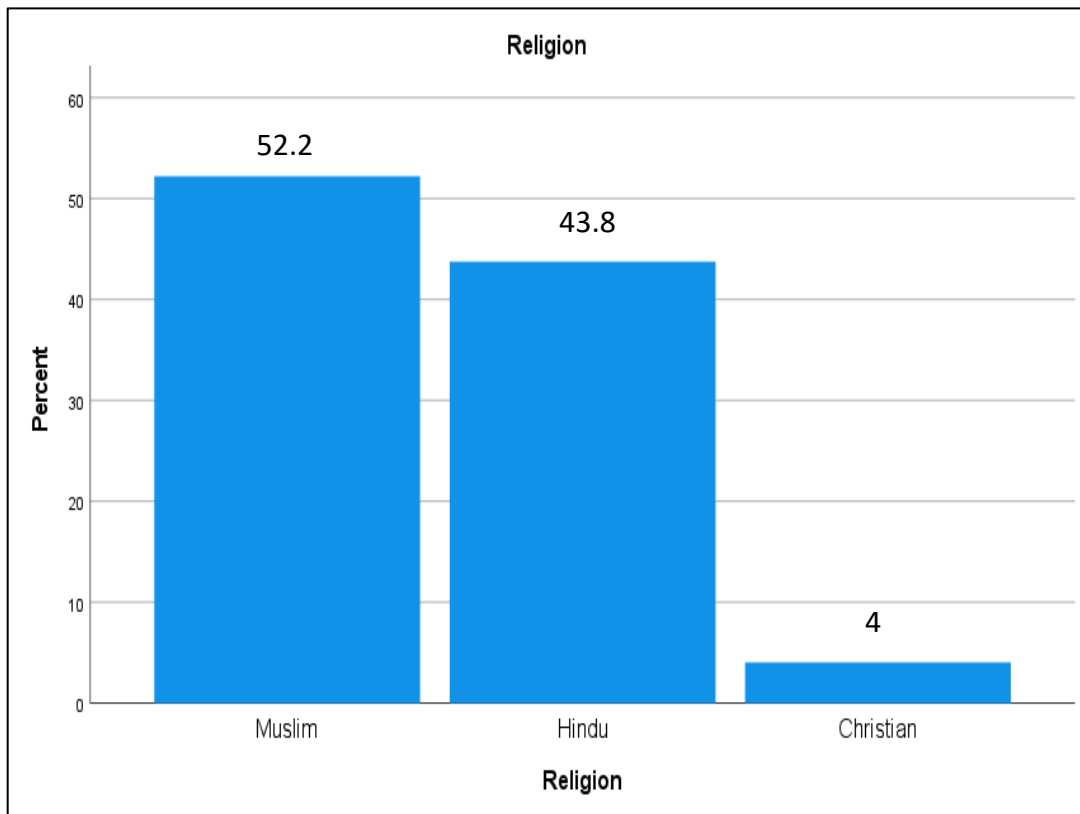
Gender	Number	%
Male headed	258	52.0%
Female headed	238	48.0%

Source: Primary Survey, 2023

Religious wise Distribution

Figure 5.1 presents the religious affiliation of the surveyed households. The majority of households (52.2%) belong to Islam followed by Hindus (43.8%). A smaller percentage (4.0%) belongs to the third religious category (Christian). Understanding the religious composition of your sample is important as it can shed light on potential cultural and dietary variations that may impact food security.

Figure 5.1: Religious wise Distribution of Households



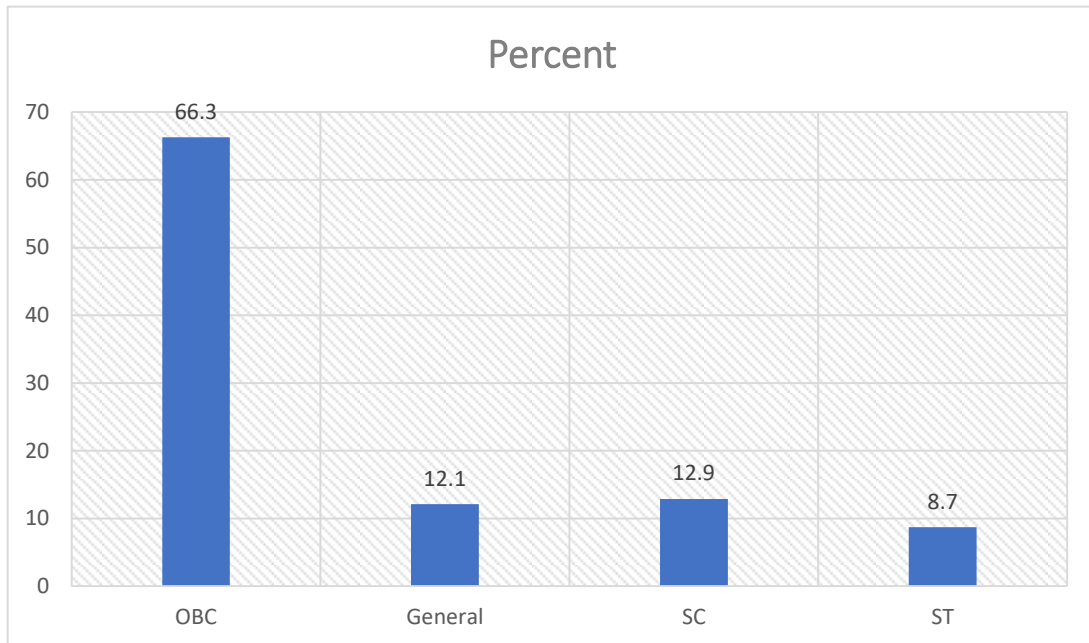
Source: Primary Survey, 2023

Caste wise Distribution

Figure 5.2 illustrates the caste distribution among the surveyed households. The data shows that the largest group (66.3%) belongs to the first caste category (OBC), followed by the second caste category (General) at 12.1%, the third caste category (SC) at 12.9%, and the fourth caste category (ST) at 8.7%.

Caste is a significant socio-economic variable, and its distribution can provide insights into the socio-economic diversity within your sample and its potential impact on food security.

Figure 5.2: Caste wise Distribution of Households



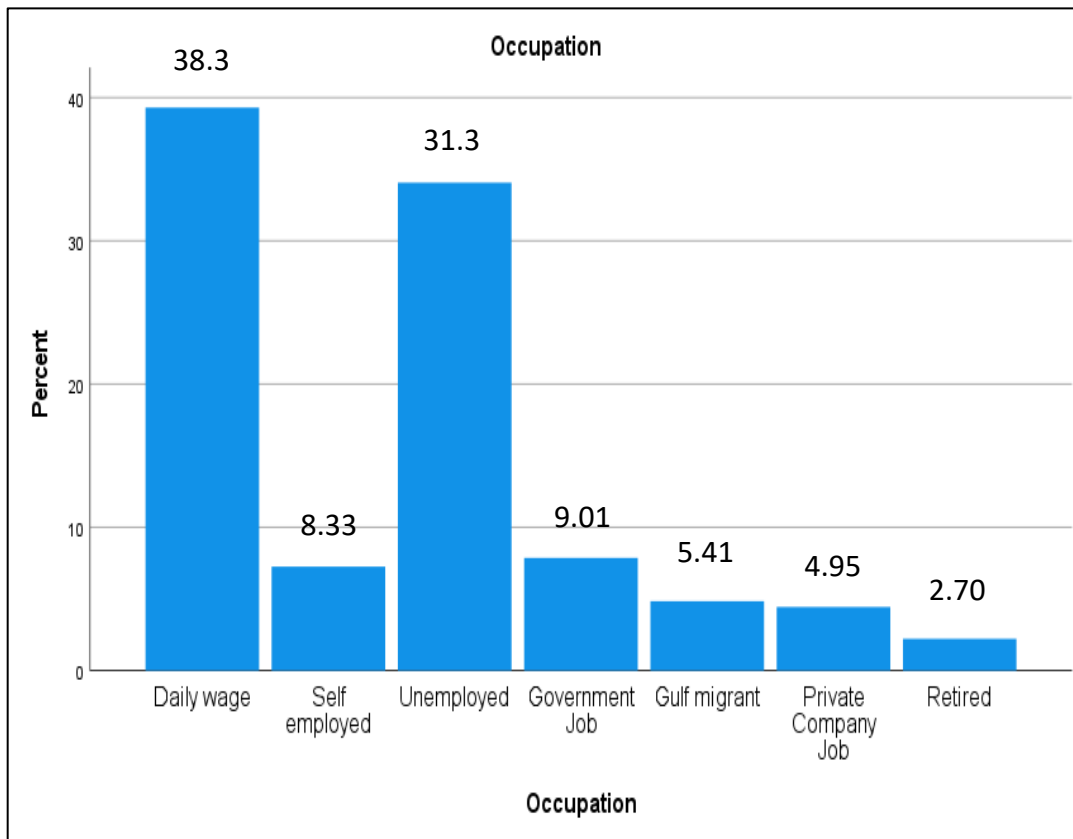
Source: Primary Survey, 2023

Occupational Distribution

Figure 5.3 outlines the occupation distribution within the surveyed households. It demonstrates the diversity of occupations among the sample, with varying percentages for each occupation category.

Occupation is a key socio-economic variable as it can influence income, access to resources, and food security. The table helps to characterize the occupational diversity of your sample.

Figure 5.3: Occupation wise Distribution of Households

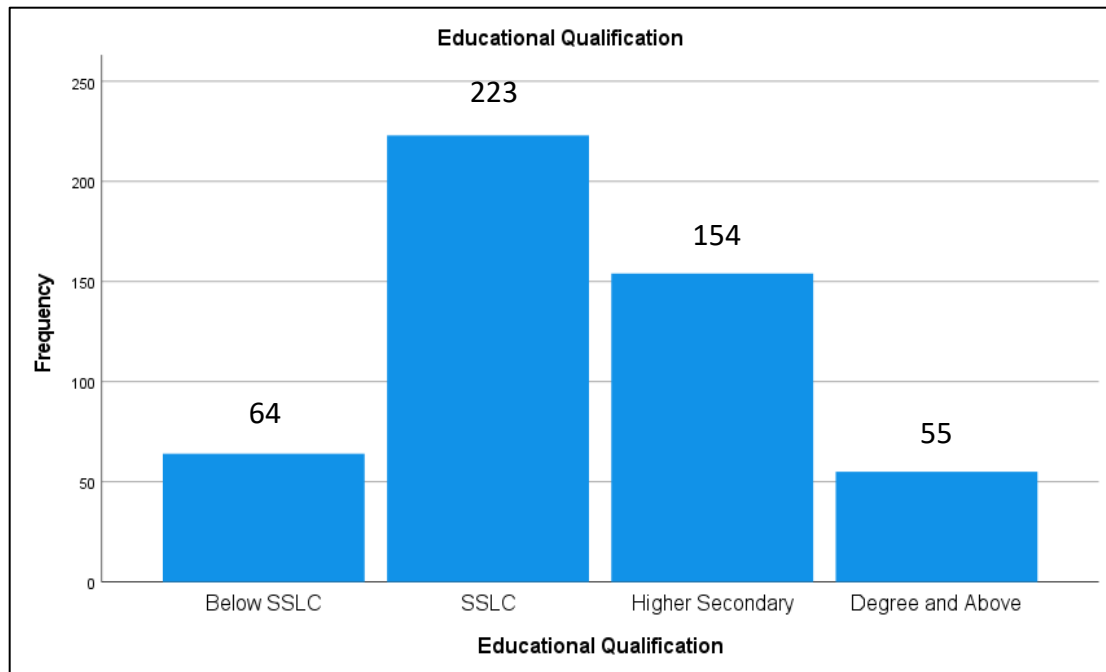


Source: Primary Survey, 2023

Educational Status of the Sample Units

The Figure 5.4 illustrates the educational qualifications of households participating in a study examining the impact of the Public Distribution System (PDS) on food security. Among the households, 12.9% have educational levels below Secondary School Leaving Certificate (SSLC), while the majority, constituting 45.0%, have education up to the SSLC level. Another significant portion, 31.0%, possesses qualifications up to the Higher Secondary level. A smaller but noteworthy group, comprising 11.1% of the households, holds a degree or higher educational qualification. These varying educational backgrounds may play a role in shaping how households perceive and interact with the PDS and its effects on their food security.

Figure 5.4: Education wise Distribution of Households

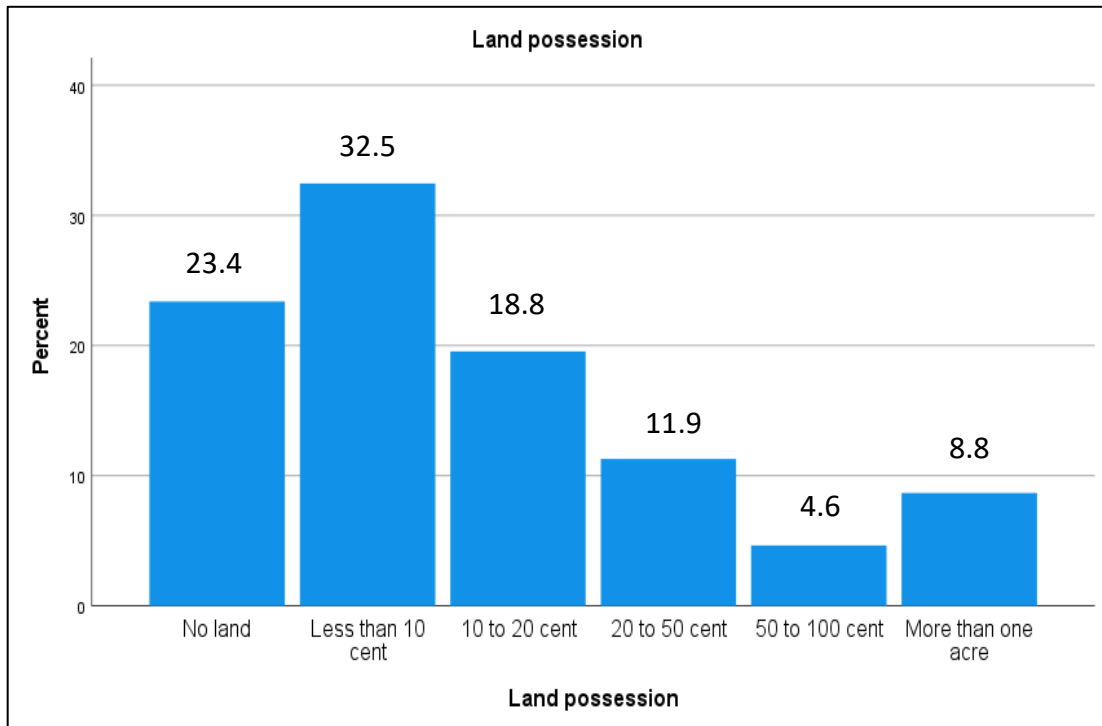


Source: Primary Survey, 2023

Agricultural land Possession of the Households

Figure 5.5 offers insights into the agricultural land possession patterns among the surveyed households, which is particularly relevant in an agrarian state like Kerala. The distribution encompasses various categories based on the size of land holdings, from "No Land" to "More than One Acre." The table reveals that a substantial portion (32.5%) of households possess land parcels smaller than 10 cents, while 23.4% do not own any agricultural land. Land ownership is a key determinant of agricultural productivity and income, and it plays a crucial role in shaping the livelihoods and food security of households. Analysing the differential impact of the PDS across these land possession categories can provide valuable insights into how land ownership influences food security outcomes.

Figure 5. 5: Agricultural Land Possession wise Distribution of Households



Source: Primary Survey, 2023

5.3 Descriptive Statistics of Key Household Variables

The Table 5.3 presents descriptive statistics for several important variables within the dataset, offering a comprehensive overview of their central tendencies and variations among the 496 observations. Firstly, concerning household size, the data show that household sizes in the sample range from as small as 2 members to as large as 15 members, with an average household size (mean) of approximately 4.98. The moderate standard deviation of 1.66588 indicates some variability in household sizes.

Secondly, the variable "Annual Income of Households from All Sources" exhibits a wide spectrum of incomes, ranging from INR 4000 to INR 300000, with an average annual income (mean) of about INR 55455.45. The substantial standard deviation of INR64556.30 underscores the significant income diversity among households.

Thirdly, regarding total monthly expenditure, the data reveal monthly spending ranging from INR 4000 to 100000, with an average monthly expenditure (mean) of approximately INR 13,102.42. The standard deviation of INR 14,433.76 points to considerable variation in monthly expenditure levels across households.

Lastly, the variable "Total Monthly Expenditure on Food Items" displays monthly food-related expenditures spanning from INR 3000 to INR 70000, with an average monthly food expenditure (mean) of around 7,023.40. The standard deviation of INR 11,127.86 suggests noteworthy disparities in monthly food spending among households. These descriptive statistics provide a comprehensive snapshot of the dataset, offering insights into household demographics, income distribution, and expenditure patterns. They serve as a foundational understanding of the characteristics of the households surveyed, facilitating further analysis and interpretation in the context of the study.

Table 5.3: Descriptive Statistics of Key Household Variables

	Minimum	Maximum	Mean	Std. Deviation
Household size	2.00	15.00	4.9758	1.66588
Annual income of households from all sources	4000	300000.00	55455.45	64556.30
Total monthly expenditure	3000	100000.00	13102.4242	14433.756
Total monthly expenditure on food items	3000	70000	7023.4008	11127.8516
Number of observations	496			

Source: Primary Survey, 2023

These tables collectively provide valuable insights into the demographic and socio-economic composition of the households in the study area. Understanding these characteristics is crucial for analysing the impact of the Public Distribution System (PDS) on food security and nutritional status, as these demographic and socio-economic factors can potentially influence how households interact with and benefit from the PDS.

Distribution of households across socio-demographic characteristics

In this section, the study delves into the distribution of Public Distribution System (PDS) classifications among households, examining how these classifications vary across various socio-demographic characteristics. The PDS classifications serve as an essential framework for understanding the accessibility and utilization of subsidized food items among households. By analysing how these classifications align with key socio-demographic factors such as location, gender distribution, religious affiliation, caste, occupation, educational status, and land possession patterns, this research aims to gain valuable insights into the socio-economic dynamics that influence the effectiveness of the PDS in ensuring food security. This exploration allows us to assess whether certain demographic groups are more or less likely to benefit from the PDS, ultimately contributing to a more comprehensive understanding of the program's impact within the studied population.

Distribution of the households by Ration Card Types Across Geographical Locations

The Table 5.4 presents a cross tabulation of the location (differentiating between rural and urban and the type of ration card held by households (including blue card APL, Pink Card BPL, White Card, and Yellow Card AAY), along with the results of the Chi-Square test. This analysis is help in understanding the distribution of various types of ration cards across different geographical locations within the study area, which is essential for designing effective policies and interventions related to the Public Distribution System (PDS).

In examining the data, it becomes evident that there are substantial disparities in the distribution of ration cards between rural and urban areas. Specifically, within rural, the majority of households hold Pink Cards (36.0%) and Blue Cards (26.2%), while White Cards (19.5%) and Yellow Cards (18.3%) are also represented. In contrast, urban areas exhibit a different distribution, with a significantly higher proportion of Blue Cards (43.9%) compared to other card types.

The Chi-Square test, with a remarkably low p-value of 0.0000, confirms the statistical significance of the relationship between location and ration card type. This statistical significance implies that the distribution of ration cards is not random but influenced by geographical location. Such findings underscore the need for location-specific considerations in the administration of the PDS. Understanding these differences in ration card distribution can aid in the equitable and efficient delivery of food security benefits, ensuring that vulnerable populations in both urban and rural settings have adequate access to essential food supplies through the PDS.

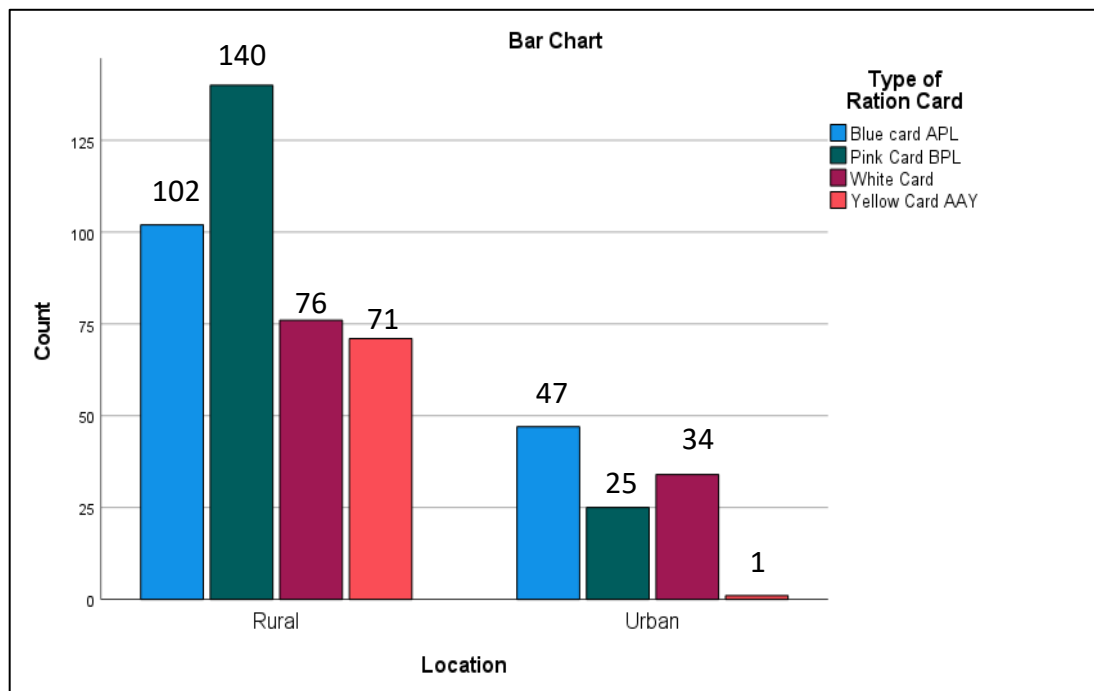
Table 5.4. Cross tabulation of Location and Card Type, and Chi-Square Test Results

Location		Card			Total	
		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	
Rural	Count	102	140	76	71	389
	% within Location	26.2%	36.0%	19.5%	18.3%	100.0%
Urban	Count	47	25	34	1	107
	% within Location	43.9%	23.4%	31.8%	0.9%	100.0%
Total	Count	149	165	110	72	496
	% within Location	30.0%	33.3%	22.2%	14.5%	100.0%
Chi square test result	35.768					
P value	0.0000					

Source: Estimated from Primary data

Note: In this study, urban areas are defined as towns within each panchayat where residents have easy access to all services.

Figure 5.6: Distribution of the Households Across Geographical Locations



Source: Primary Survey, 2023

Distribution of the Households by Ration Card Types Across Gender

The Table 5.5 presents a cross tabulation of gender (differentiating between male and female) and the type of ration card held by households (including blue card APL, Pink Card BPL, White Card, and Yellow Card AAY). Additionally, it provides the results of the Chi-Square test, which assesses the relationship between gender and ration card type distribution.

The Table 5.5 categorizes households into two groups based on gender: male and female. It then breaks down the distribution of ration card types within each gender category. Among male-headed households, there are 94 Blue cards (36.4% of the total in this gender category), 74 Pink cards (28.7%), 55 White cards (21.3%), and 35 Yellow cards (13.6%). This distribution reflects the prevalence of different ration card types among male-headed households.

In contrast, female-headed households exhibit a different distribution of ration card types. This category consists of 55 Blue cards (23.1% of the total in this

gender category), 91 Pink cards (38.2%), 55 White cards (23.1%), and 37 Yellow cards (15.5%). The table showcases the distribution of ration cards among female-headed households. The bottom row and rightmost column of the table provide the total count and percentage distribution of ration card types across all genders. These figures represent the overall distribution of ration cards in the entire sample, irrespective of gender.

The Chi-Square test result is 13.34, with a p-value of 0.02. The statistical significance of this test suggests that there is a significant association between gender and the distribution of ration card types. In other words, the distribution of ration cards is not uniform across genders, indicating a potential gender-related influence on the type of ration card held.

The table reveals gender-wise variations in the distribution of ration card types among households. Male-headed households tend to have a higher percentage of blue and pink cards, while female-headed households show a relatively more balanced distribution across card types. The Chi-Square test further emphasizes the significance of this relationship, suggesting that gender may play a role in determining the type of ration card a household possesses.

Table 5.5: Cross Tabulation of Gender and Ration Card Type, and Chi-Square Test Results

Gender		Type of ration card				Total
		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	
Male	Count	94	74	55	35	258
	%	36.4%	28.7%	21.3%	13.6%	100.0%
Female	Count	55	91	55	37	238
	%	23.1%	38.2%	23.1%	15.5%	100.0%
Total	Count	149	165	110	72	496
	%	30.0%	33.3%	22.2%	14.5%	100.0%
Chi square test result	13.34					
P value	0.02					

Source: Primary Survey, 2023

Distribution of Households by Types of Ration Cards Across Religious Groups

The Table 5.6 presents a cross tabulation of religion (categorized into Muslim, Hindu, and Christian) and the type of ration card held by households (including blue card APL, Pink Card BPL, White Card, and Yellow Card AAY). Additionally, it provides the results of the Chi-Square test, which assesses the relationship between religion and ration card type distribution.

The table 5.6 categorizes households based on their religious affiliation into three groups: Muslim, Hindu, and Christian. Within each religious group, it breaks down the distribution of ration card types. Among Muslim households, there are 116 Blue cards (44.8% of the total in this religious group), 66 Pink cards (25.5%), 73 White cards (28.2%), and 4 Yellow cards (1.5%). This distribution reflects the prevalence of different ration card types among Muslim households. Within Hindu households, there are 25 Blue cards (11.5% of the total in this religious group), 95 Pink cards (43.8%), 30 White cards (13.8%), and 67 Yellow cards (30.9%). The table showcases the distribution of ration cards among Hindu households. Christian households exhibit a different distribution of ration card types. This category consists of 8 Blue cards (40.0% of the total in this religious group), 4 Pink cards (20.0%), 7 White cards (35.0%), and 1 Yellow card (5.0%). The table highlights the distribution of ration cards among Christian households. The bottom row and rightmost column of the table provide the total count and percentage distribution of ration card types across all religious groups. These figures represent the overall distribution of ration cards in the entire sample, irrespective of religious affiliation.

Chi-Square Test Results: The Chi-Square test result is 140.33, with a p-value of 0.000. The statistical significance of this test suggests that there is a significant association between the religion of households and the distribution of ration card types. In other words, the type of ration card held is not uniformly distributed across different religious groups, indicating a potential religious influence on the type of ration card possessed.

The Table 5.6 reveals significant disparities in the distribution of ration card types among households belonging to different religious groups. While the

distribution pattern varies, it is evident that religion plays a role in determining the type of ration card households hold. The Chi-Square test underscores the statistical significance of this association, raising questions about the factors contributing to these disparities and their implications for equitable access to food security benefits through the Public Distribution System (PDS).

Table 5.6: Distribution of Types of Households by Religion

Religion		Card				Total
		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	
Muslim	Count	116	66	73	4	259
	% within religion	44.8%	25.5%	28.2%	1.5%	100.0%
Hindu	Count	25	95	30	67	217
	% within religion	11.5%	43.8%	13.8%	30.9%	100.0%
Christian	Count	8	4	7	1	20
	% within religion	40.0%	20.0%	35.0%	5.0%	100.0%
Total	Count	149	165	110	72	496
	% within religion	30.0%	33.3%	22.2%	14.5%	100.0%
Chi square test result	140.33					
P value	0.000					

Source: Primary Survey, 2023

Distribution of Households by Ration Card Types Across Various Castes

The Table 5.7 provides a breakdown of the types of households based on caste categories, including OBC (Other Backward Classes), General, SC (Scheduled Caste), and ST (Scheduled Tribe). The distribution of these households is further analysed based on the type of ration card held, which includes blue card APL, Pink Card BPL, White Card, and Yellow Card AAY. Among OBC households, there are 128 Blue cards (38.9% of the total in this caste category), 110 Pink cards (33.4%), 85 White cards (25.8%), and 6 Yellow cards (1.8%). This distribution reflects the

prevalence of different ration card types among OBC households. In the General category, there are 19 Blue cards (31.7% of the total in this caste category), 18 Pink cards (30.0%), 21 White cards (35.0%), and 2 Yellow cards (3.3%). The table showcases the distribution of ration cards among General caste households. SC households exhibit a different distribution of ration card types. This category consists of 2 Blue cards (4.7% of the total in this caste category), 37 Pink cards (86.0%), 3 White cards (7.0%), and 1 Yellow card (2.3%). The table highlights the distribution of ration cards among SC households. ST households show a unique distribution pattern. This category has no blue cards, no pink cards, 1 White card (1.6% of the total in this caste category), and 63 Yellow cards (98.4%). The table emphasizes the distribution of ration cards among ST households.

The bottom row and rightmost column of the table provide the total count and percentage distribution of ration card types across all caste categories. These figures represent the overall distribution of ration cards in the entire sample, regardless of caste affiliation.

The Chi-Square test result is 456.44, with a p-value of 0.000. This highly significant p-value indicates that there is a substantial association between caste and the distribution of ration card types. In other words, the type of ration card held is not randomly distributed among different caste groups, highlighting a significant caste-related influence on the type of ration card possessed.

The Table 5.7 reveals profound disparities in the distribution of ration card types among households belonging to various caste categories. Different caste groups exhibit distinct patterns of ration card ownership, with significant variations in the prevalence of each card type.

Table 5.7: Distribution of Types of households by Caste

Caste		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	Total
OBC	Count	128	110	85	6	329
	%	38.9%	33.4%	25.8%	1.8%	100.0%
General	Count	19	18	21	2	60
	%	31.7%	30.0%	35.0%	3.3%	100.0%
SC	Count	2	37	3	1	43
	%	4.7%	86.0%	7.0%	2.3%	100.0%
ST	Count	0	0	1	63	64
	%	0.0%	0.0%	1.6%	98.4%	100.0%
Total	Count	149	165	110	72	496
	%	30.0%	33.3%	22.2%	14.5%	100.0%
Chi square test result	456.44					
P value	0.000					

Source: Primary survey, 2023

Distribution Households by Types of Ration Cards and Occupations

The Table 5.8 presents a detailed breakdown of households based on their occupation and the corresponding distribution of ration card types, including blue card APL, Pink Card BPL, White Card, and Yellow Card AAY. Additionally, it provides the results of the Chi-Square test to examine the relationship between occupation and the distribution of ration card types.

Daily Wage Occupation: Among households engaged in daily wage labour, there are 47 Blue cards (24.1% of the total in this occupational group), 69 Pink cards (35.4%), 13 White cards (6.7%), and 66 Yellow cards (33.8%). This distribution reflects the prevalence of different ration card types among daily wage earners.

Self-Employed Occupation: Self-employed households exhibit a different distribution of ration card types. This category consists of 19 Blue cards (52.8% of

the total in this occupational group), 10 Pink cards (27.8%), 7 White cards (19.4%), and no yellow cards (0.0%). The table highlights the distribution of ration cards among self-employed households.

Unemployed: Among unemployed households, there are 51 Blue cards (30.2% of the total in this occupational group), 78 Pink cards (46.2%), 35 White cards (20.7%), and 5 Yellow cards (3.0%). This distribution reflects the prevalence of different ration card types among unemployed individuals and families.

Government Job : Households with government jobs show a distinct distribution pattern. This category consists of 2 Blue cards (5.1% of the total in this occupational group), 1 Pink card (2.6%), 35 White cards (89.7%), and 1 Yellow card (2.6%). The table emphasizes the distribution of ration cards among government jobholders.

Gulf Migrants: Gulf migrant households exhibit yet another distribution pattern. This category has 16 Blue cards (66.7% of the total in this occupational group), 3 Pink cards (12.5%), 5 White cards (20.8%), and no yellow cards (0.0%). The table showcases the distribution of ration cards among Gulf migrant households.

Private Company Occupation: Among households with private company jobs, there are 11 Blue cards (50.0% of the total in this occupational group), 4 Pink cards (18.2%), 7 White cards (31.8%), and no yellow cards (0.0%). The table highlights the distribution of ration cards among those employed in the private sector.

Retired Occupation: Retired households show a specific distribution pattern with 3 Blue cards (27.3% of the total in this occupational group), no pink cards (0.0%), 8 White cards (72.7%), and no yellow cards (0.0%). The table emphasizes the distribution of ration cards among retired individuals.

Total Distribution: The table's bottom row and rightmost column provide the total count and percentage distribution of ration card types across all occupational categories, representing the overall distribution of ration cards in the entire sample, irrespective of occupation.

Chi-Square Test Results: The Chi-Square test result is 256.33, with a p-value of 0.000. This highly significant p-value indicates that there is a substantial association between occupation and the distribution of ration card types. In other words, the type of ration card held is not randomly distributed among different occupational groups, suggesting that occupation plays a significant role in determining the type of ration card possessed.

Table 5.8: Distribution of Types of Households by Occupation

Occupation		Type of card				Total
		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	
Daily Wage	Count	47	69	13	66	195
	%	24.1%	35.4%	6.7%	33.8%	100.0%
Self employed	Count	19	10	7	0	36
	% n	52.8%	27.8%	19.4%	0.0%	100.0%
Unemployed	Count	51	78	35	5	169
	%	30.2%	46.2%	20.7%	3.0%	100.0%
Government Job	Count	2	1	35	1	39
	%	5.1%	2.6%	89.7%	2.6%	100.0%
Gulf migrant	Count	16	3	5	0	24
	%	66.7%	12.5%	20.8%	0.0%	100.0%
Private company job	Count	11	4	7	0	22
	%	50.0%	18.2%	31.8%	0.0%	100.0%
Retired	Count	3	0	8	0	11
	%	27.3%	0.0%	72.7%	0.0%	100.0%
Total	Count	149	165	110	72	496
	%	30.0%	33.3%	22.2%	14.5%	100.0%
Chi square test result	256.33					
P value	0.000					

Source: Primary Survey, 2023

Distribution of Types of Households by Landholdings

The Table 5.9 provides an in-depth breakdown of households based on their landholding status and the corresponding distribution of ration card types, including blue card APL, Pink Card BPL, White Card, and Yellow Card AAY. Among

households with no land, there are 28 Blue cards (24.1% of the total in this landholding category), 35 Pink cards (30.2%), 19 White cards (16.4%), and 34 Yellow cards (29.3%). This distribution reflects the prevalence of different ration card types among households without land. For households with landholding less than 10 cents, there are 47 Blue cards (29.2% of the total in this landholding category), 86 Pink cards (53.4%), 23 White cards (14.3%), and 5 Yellow cards (3.1%). The table highlights the distribution of ration cards among households with small landholdings. Among households with landholding ranging from 10 to 20 cents, there are 41 Blue cards (42.3% of the total in this landholding category), 27 Pink cards (27.8%), 29 White cards (29.9%), and no yellow cards (0.0%). This distribution reflects the prevalence of different ration card types among households with moderate landholdings. Households with landholding ranging from 20 to 50 cents exhibit a distinct distribution pattern. This category consists of 22 Blue cards (39.3% of the total in this landholding category), 11 Pink cards (19.6%), 21 White cards (37.5%), and 2 Yellow cards (3.6%). The table emphasizes the distribution of ration cards among households with relatively larger landholdings in this range. Among households with landholding ranging from 50 to 100 cents, there are 7 Blue cards (30.4% of the total in this landholding category), 5 Pink cards (21.7%), 11 White cards (47.8%), and no yellow cards (0.0%). The table showcases the distribution of ration cards among households with larger landholdings in this category. Households with landholding exceeding one acre display a unique distribution pattern. This category includes 4 Blue cards (9.3% of the total in this landholding category), 1 Pink card (2.3%), 31 White cards (72.1%) (16.3%), and 7 Yellow cards (16.3%). The table highlights the distribution of ration cards among households with substantial landholdings.

The table's bottom row and rightmost column provide the total count and percentage distribution of ration card types across all landholding categories, representing the overall distribution of ration cards in the entire sample, irrespective of landholding.

Chi-Square Test Results: The Chi-Square test result is 223.33, with a p-value of 0.000. This highly significant p-value indicates that there is a substantial association between landholding and the distribution of ration card types. In other words, the type of ration card held is not randomly distributed among different landholding categories, suggesting that landholding status plays a significant role in determining the type of ration card possessed.

Table 5.9: Distribution of Types of Households by landholding

landholding	Count	Type of ration card				Total
		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	
No land		28	35	19	34	116
	%	24.1%	30.2%	16.4%	29.3%	100.0%
Less than 10 cents	Count	47	86	23	5	161
	%	29.2%	53.4%	14.3%	3.1%	100.0%
10 to 20 cents	Count	41	27	29	0	97
	%	42.3%	27.8%	29.9%	0.0%	100.0%
20 to 50 cents	Count	22	11	21	2	56
	%	39.3%	19.6%	37.5%	3.6%	100.0%
50 to 100 cents	Count	7	5	11	0	23
	%	30.4%	21.7%	47.8%	0.0%	100.0%
More than 1 acre	Count	4	1	31	7	43
	%	9.3%	2.3%	72.1%	16.3%	100.0%
Total	Count	149	165	110	72	496
	%	30.0%	33.3%	22.2%	14.5%	100.0%
Chi square test result	223.33					
P value	0.000					

Source: Primary Survey, 2023

Disparities in Household Size and Household Annual Income by Types of Ration Card

The Table 5.10 presents statistics regarding household size and household annual income for different types of ration cards: blue card APL, Pink Card BPL,

White Card, and Yellow Card AAY. The table provides the mean (average) values, standard deviations, and the number of observations (N) for each type of ration card.

Household Size: The mean household size is highest for blue card APL households (5.4966), followed by White Card households (5.2273), Pink Card BPL households (4.8667), and Yellow Card AAY households (3.7639). The standard deviation measures the variability within each group.

Household Annual Income: The mean annual income of households varies significantly across ration card types. White Card households have the highest mean annual income (4,589,678.50), followed by blue card APL households (25,916.95), Pink Card BPL households (11,127.60), and Yellow Card AAY households (6,520.14). The standard deviation indicates the income variability within each group.

The Table 5.10 presents the results of an analysis of variance (ANOVA) test for both household size and household annual income, examining the differences between groups based on the type of ration card. The ANOVA test assesses whether there are statistically significant differences in the means of these variables among the four ration card groups.

Household Annual Income: Conversely, the ANOVA test for household annual income reveals a significant result with an F-statistic of 30.86 and a p-value of 0.000 (Sig.). This indicates that there are statistically significant differences in household annual income among the four types of ration card holders. These results suggest that while household size significantly varies across ration card types, household annual income does show such significant differences

Household Size: The ANOVA test for household size shows a significant result with an F-statistic of 20.872 and a p-value of 0.000 (Sig.). This suggests that there are statistically significant differences in household size among the four types of ration card holders.

Table 5.10: Differences in Household Size and Households' Annual Income by Type of Ration Card

Type of ration Card	Statistics	Household size (mean)	Household annual income (mean)
Blue card APL	Mean	5.4966	25916.946
	N	149	149
	Std. Deviation	1.76537	43129.216
Pink Card BPL	Mean	4.8667	11127.600
	N	165	165
	Std. Deviation	1.52832	13292.107
White Card	Mean	5.2273	45894.234
	N	110	110
	Std. Deviation	1.63482	47668.170
Yellow Card AAY	Mean	3.7639	6520.1389
	N	72	72
	Std. Deviation	1.08112	8362.28395
Total	Mean	4.9758	22449.345
	N	496	496
	Std. Deviation	1.66588	27899.567

Source: Primary Survey, 2023

Table 5.11: Estimated ANOVA Test Results

		Sum of Squares	df	Mean Square	F	Sig.
Annual income * Type of Ration Card	Between Groups	93814599712.164	3	31271533237.388	30.868	.000
	Within Groups	498429022758.933	492	1013067119.429		
	Total	592243622471.097	495			
Household size* Type of Ration Card	Between Groups	155.090	3	51.697	20.872	.000
	Within Groups	1218.619	492	2.477		
	Total	1373.710	495			

Source: Primary Survey, 2023

1. Public Distribution System and Food Grain Purchases by Households

The Public Distribution System (PDS) is a crucial pillar of food security in many countries, including India. It plays a vital role in ensuring the equitable

distribution of essential food grains to economically vulnerable populations. Under the PDS, the government procures food grains such as rice, wheat, and other staples and then distributes them at subsidized rates through a network of fair price shops to eligible households. This system not only aims to address hunger and malnutrition but also serves as a social safety net for millions of people. In this section, the work will look into the intricate relationship between the Public Distribution System and food grain purchase. This study will examine the patterns of food grain purchase under the PDS, shedding light on the choices and preferences of households in procuring their staple food items. Understanding this nexus between the PDS and food grain purchase is essential for evaluating the effectiveness of this vital program in achieving its goals and sustaining food security among the most vulnerable segments of the population.

Differences in Total Quantity of Rice and Wheat Purchased by Households in the Last Month from PDS.

The Table 5.12 presents statistics regarding the total quantity of rice and wheat purchased by households in the last month, categorized by the type of ration card: blue card APL, Pink Card BPL, White Card, and Yellow Card AAY. The table provides the mean (average) values, standard deviations, and the number of observations (N) for each type of ration card.

Total Kg Rice Purchased: The mean quantity of rice purchased varies across the ration card types. Yellow Card AAY households have the highest mean rice purchase (29.0972 kilograms), followed by White Card households (23.3909 kilograms), Pink Card BPL households (18.6909 kilograms), and blue card APL households (18.0134 kilograms). The standard deviation measures the variability in the quantity of rice purchased within each group.

Total Kilogram Wheat Purchased: Similarly, the mean quantity of wheat purchased also varies across the ration card types. Yellow Card AAY households have the highest mean wheat purchase (3.5278 kilograms), followed by White Card households (3.1455 kilograms), Pink Card BPL households (3.1636 kilograms), and blue card APL households (2.6174 kilograms). The standard deviation indicates the variability in the quantity of wheat purchased within each group.

Total: The total row provides overall statistics for the entire sample, including the mean and standard deviation for both rice and wheat purchases.

The Table 5.13 presents the results of separate analysis of variance (ANOVA) tests for both the total quantity of rice and wheat purchased, examining the differences between groups based on the type of ration card.

Total Quantity of Rice: The ANOVA test for the total quantity of rice purchased shows a significant result with an F-statistic of 4.347 and a p-value of 0.004 (Sig.). This suggests that there are statistically significant differences in the total quantity of rice purchased among the four types of ration card holders.

Total Quantity of Wheat: Similarly, the ANOVA test for the total quantity of wheat purchased reveals a significant result with an F-statistic of 2.816 and a p-value of 0.039 (Sig.). This indicates that there are statistically significant differences in the total quantity of wheat purchased among the four types of ration card holders. These results imply that the type of ration card has a significant impact on the total quantity of both rice and wheat purchased by households.

Table 5.12: Differences in Total Quantity of Rice and Wheat Purchased by Households in the Last Month

Type of Ration Card		Total Kg Rice purchased	Total Kilogram Wheat purchased
Blue card APL	Mean	18.0134	2.6174
	N	149	149
	Std. Deviation	11.51555	2.68277
Pink Card BPL	Mean	18.6909	3.1636
	N	165	165
	Std. Deviation	11.45863	2.29339
White Card	Mean	23.3909	3.1455
	N	110	110
	Std. Deviation	46.99777	2.39202
Yellow Card AAY	Mean	29.0972	3.5278
	N	72	72
	Std. Deviation	6.73055	1.72775
Total	Mean	21.0403	3.0484
	N	496	496
	Std. Deviation	24.31657	2.38295

Source: Primary Survey, 2023

Table 5.13: Estimated Results of ANOVA of Total Quantity of Rice and Wheat by Type of Ration Card

		ANOVA Table				
		Sum of Squares	df	Mean Square	F	Sig.
Total quantity of rice x Type of Ration Card	Between Groups	7557.474	3	2519.158	4.347	.004
	Within Groups	285133.720	492	579.540		
	Total	292691.194	495			
Total quantity of wheat x Type of Ration Card	Between Groups	47.445	3	15.815	2.816	.039
	Within Groups	2763.394	492	5.617		
	Total	2810.839	495			

Source: Primary Survey, 2023

Average Quantity of Different Types of Foodgrains Purchased from PDS by Households

The Table 5.14 presents the average quantities of different foodgrains (rice, wheat, sugar, pulses, and kerosene) purchased by households categorized by their type of ration card: blue card APL, Pink Card BPL, White Card, and Yellow Card AAY. The table provides the mean (average) values, standard deviations, and the number of observations (N) for each type of ration card.

Quantity of Rice Purchased: The average quantity of rice purchased varies among the four types of ration card holders. Yellow Card AAY households have the highest mean rice purchase (26.9306 kilograms), followed by Pink Card BPL households (15.7697 kilograms), Blue card APL households (9.0805 kilograms), and White Card households (4.9591 kilograms).

Quantity of Wheat Purchased: Similarly, the average quantity of wheat purchased also varies across the ration card types. Yellow Card AAY households have the highest mean wheat purchase (3.6250 kilograms), followed by Pink Card BPL households (3.4242 kilograms), Blue card APL households (1.0201 kilograms), and White Card households (0.9636 kilograms).

The second table presents the results of separate analysis of variance (ANOVA) tests for each type of foodgrain (rice, wheat, sugar, pulses, and kerosene), examining the differences between groups based on the type of ration card.

The ANOVA test for the quantity of rice purchased indicates a highly significant result with an F-statistic of 240.84 and a p-value of 0.000 (Sig.) (see Table 5.16). This suggests that there are statistically significant differences in the quantity of rice purchased among the four types of ration card holders.

Similarly, the ANOVA test for the quantity of wheat purchased also shows a highly significant result with an F-statistic of 55.654 and a p-value of 0.000 (Sig.). This indicates that there are statistically significant differences in the quantity of wheat purchased among the four types of ration card holders.

For the quantity of sugar, pulses, and kerosene purchased, the ANOVA tests also yield highly significant results, indicating differences in purchasing behaviour across ration card categories. These results highlight the influence of the type of ration card on the quantities of various food items purchased by households from the Public Distribution System (PDS) in Kerala.

Table 5.14: Averages Quantity of Different Types of Foodgrains Purchased from PDS by the Households

Type of Ration Card		Quantity of rice purchased	Quantity of wheat purchased	Quantity of sugar purchased	Quantity of pulses purchased	Quantity of kerosine purchased
Blue card APL	Mean	9.0805	1.0201	.4027	.1342	.3322
	N	149	149	149	149	149
	Std. Deviation	6.03091	1.88332	1.04571	.64103	.37941
Pink Card BPL	Mean	15.7697	3.4242	.1091	.0727	.4197
	N	165	165	165	165	165
	Std. Deviation	7.11802	2.72780	.39844	.28292	.39042
White Card	Mean	4.9591	.9636	.2727	.1155	.2707
	N	110	110	110	110	110
	Std. Deviation	4.01038	1.62507	.72831	.47722	.40358
Yellow Card AAY	Mean	26.9306	3.6250	1.0000	.0417	.4861
	N	72	72	72	72	72
	Std. Deviation	4.33241	1.81106	.16784	.26203	.11785
Total	Mean	12.9829	2.1855	.3629	.0962	.3700
	N	496	496	496	496	496
	Std. Deviation	9.14718	2.47612	.76367	.45881	.36987

Source: Primary Survey, 2023

Table 5.15: Estimated ANOVA Test for Quantity of Foodgrains Purchased from PDS by Types Ration Card

		Sum of Squares	df	Mean Square	F	Sig.
Quantity of rice	Between Groups	24639.104	3	8213.035	240.84	0.000
X Type of Ration Card	Within Groups	16778.001	492	34.102		
	Total	41417.104	495			
Quantity of wheat	Between Groups	768.963	3	256.321	55.654	0.000
X Type of Ration Card	Within Groups	2265.972	492	4.606		
	Total	3034.935	495			
Quantity of sugar	Between Groups	40.984	3	13.661	27.136	0.000
X Type of Ration Card	Within Groups	247.693	492	0.503		
	Total	288.677	495			
Quantity of pulse	Between Groups	0.561	3	0.187	0.888	0.447
X Type of Ration Card	Within Groups	103.641	492	0.211		
	Total	104.203	495			
Quantity of kerosine	Between Groups	2.676	3	0.892	6.747	0.000
X Type of Ration Card	Within Groups	65.044	492	0.132		
	Total	67.72	495			

Source: Primary Survey, 2023

Average Quantity of Different Types of Foodgrains Purchased from Open Market by Households

The Table 5.16 provides information on the average quantities of various food items (rice, wheat, pulses, and sugar) purchased from the open market by households, categorized by their type of ration card: blue card APL, Pink Card BPL, White Card, and Yellow Card AAY. It includes the mean (average) values, standard deviations, and the number of observations (N) for each type of ration card.

Quantity of Rice Purchased from Open Market: The table indicates that, on average, blue card APL households purchase the highest quantity of rice from the open market (16.0671 kilograms), followed by White Card households (16.8500 kilograms), Pink Card BPL households (9.6727 kilograms), and Yellow Card AAY households (11.5000 kilograms).

Quantity of Wheat Purchased from Open Market: Pink Card BPL households purchase the highest average quantity of wheat from the open market (1.6037 kilograms), followed by blue card APL households (2.3691 kilograms), White Card

households (3.0636 kilograms), and Yellow Card AAY households (.6667 kilograms).

Quantity of Pulses Purchased from Open Market: The table shows that, on average, blue card APL households purchase the highest quantity of pulses from the open market (3.3859 kilograms), followed by White Card households (4.1364 kilograms), Pink Card BPL households (2.7364 kilograms), and Yellow Card AAY households (3.3056 kilograms).

Quantity of Sugar Purchased from Open Market: Blue card APL households, on average, purchase the highest quantity of sugar from the open market (6.2181 kilograms), followed by White Card households (5.3273 kilograms), Pink Card BPL households (4.8455 kilograms), and Yellow Card AAY households (2.2361 kilograms).

Table 5.16 given Estimated ANOVA Test for Quantity of Foodgrains Purchased from Open Market by Types of Ration Cards. The table presents the results of separate analysis of variance (ANOVA) tests for each type of foodgrain (rice, wheat, pulses, and sugar) purchased from the open market. These tests aim to determine whether there are statistically significant differences in the quantities of foodgrains purchased among the four types of ration card holders.

Quantity of Rice Purchased from Open Market: The ANOVA test for the quantity of rice purchased from the open market shows a highly significant result with an F-statistic of 15.523 and a p-value of 0.000 (Sig.). This indicates that there are statistically significant differences in the quantity of rice purchased from the open market among the four types of ration card holders.

Quantity of Wheat Purchased from Open Market: The ANOVA test for the quantity of wheat purchased from the open market also yields a significant result with an F-statistic of 4.913 and a p-value of 0.002 (Sig.). This suggests that there are statistically significant differences in the quantity of wheat purchased from the open market across the ration card categories.

Quantity of Pulses and Sugar Purchased from Open Market: For pulses, the ANOVA test yields a marginally significant result with a p-value of 0.030 (Sig.).

Similarly, for sugar, the ANOVA test shows a highly significant result with an F-statistic of 12.660 and a p-value of 0.000 (Sig.). These results indicate differences in the quantities of pulses and sugar purchased from the open market based on the type of ration card.

In summary, these findings suggest that the type of ration card plays a role in influencing the quantities of different food items purchased from the open market, and this variation could have implications for household food security and consumption patterns. Further investigation may be needed to understand the factors contributing to these differences.

Table 5.16: Averages Quantity of Different Types of Foodgrains Purchased from Open Market by the Households

Type of Ration Card			Quantity of rice purchased from open market	Quantity of wheat purchased from open market	Quantity of pulses purchased from open market	Quantity of sugar purchased from open market
Blue card APL	Mean		16.0671	2.3691	3.3859	6.2181
	N		149	149	149	149
	Std. Deviation		12.91953	2.94166	5.44385	6.33105
Pink Card BPL	Mean		9.6727	1.6037	2.7364	4.8455
	N		165	164	165	165
	Std. Deviation		8.74515	6.52848	2.30691	3.77274
White Card	Mean		16.8500	3.0636	4.1364	5.3273
	N		110	110	110	110
	Std. Deviation		9.81329	3.81758	3.88948	4.09320
Yellow Card AAY	Mean		11.5000	.6667	3.3056	2.2361
	N		72	72	72	72
	Std. Deviation		7.72594	1.30005	1.53493	1.18075
Total	Mean		13.4506	2.0222	3.3246	4.9859
	N		496	495	496	496
	Std. Deviation		10.72150	4.55172	3.81524	4.70941

Source: Primary Survey, 2023

Table 5.17: Estimated ANOVA Test for Quantity of Foodgrains Purchased from Open Market by Types Ration Cards

		Sum of Squares	df	Mean Square	F	Sig.
Quantity of rice purchased from open market	Between Groups	4920.109	3	1640.036	15.523	.000
	Within Groups	51980.431	492	105.651		
	Total	56900.540	495			
Quantity of wheat purchased from open market	Between Groups	298.265	3	99.422	4.913	.002
	Within Groups	9936.490	491	20.237		
	Total	10234.756	494			
Quantity of pulses purchased from open market	Between Groups	130.165	3	43.388	3.017	.030
	Within Groups	7075.075	492	14.380		
	Total	7205.240	495			
Quantity of sugar purchased from open market	Between Groups	786.727	3	262.242	12.660	.000
	Within Groups	10191.674	492	20.715		
	Total	10978.401	495			

Source: Primary Survey, 2023

5.3.1 Estimated Food Deficit among Households with respect to PDS

Table 5.18 presents a comprehensive analysis of the estimated food deficit within households concerning the Public Distribution System (PDS). The table focuses on four essential foodgrains: rice, wheat, sugar, and pulses. For each foodgrain, the mean quantities purchased through the PDS are compared with those obtained from the open market. The PDS column provides the average amount of each foodgrain acquired through the Public Distribution System, expressed in kilograms. Simultaneously, the Open Market column displays the mean quantities purchased from the open market for each foodgrain. The calculated Deficit in Foodgrains column reveals the difference between the combined quantities obtained from both the PDS and the open market and the quantities obtained solely from the open market.

The deficit in foodgrains is particularly crucial as it signals the gap between the total food resources available to households from both PDS and the open market and the resources they would have if relying solely on the open market. This comparison is vital for understanding the efficacy of the Public Distribution System in addressing household food needs. In essence, Table 5.19 serves as a valuable tool for policymakers, researchers, and Governments interested in assessing the impact of the Public Distribution System on household food security. The detailed breakdown of foodgrains and the calculated deficits provide actionable insights into potential areas for improvement in the distribution system, ensuring more effective support for households in meeting their nutritional needs.

Table 5.18: Estimated Food Deficit in the Households in Relation to PDS

Foodgrains	PDS (Mean)	Open market (Mean)	Deficit in foodgrains {(PDS+ Open market)-Open market}
Quantity of rice purchased	12.982 (9.147)	15.235 (10.234)	15.235 kg
Quantity of wheat purchased	2.18 (2.12)	2.01 (2.01)	2.01 kg
Quantity of sugar purchased	0.365 (0.291)	4.956 (4.11)	4.956 kg
Quantity of pulses purchased	0.095 (0.823)	3.36 (3.21)	3.36 kg
Observation	495		

Source: Authors Estimation from Primary Data, 2023

2. Effectiveness of Delivery Mechanism of PDS and Public Satisfaction

The efficient and equitable delivery of essential food commodities to the intended beneficiaries is a cornerstone of any successful Public Distribution System (PDS). The Service Delivery Mechanism in the PDS encompasses the detailed processes and infrastructure that facilitate the procurement, storage, transportation, and distribution of food grains from government granaries to the doorsteps of eligible households. This section delves into the multifaceted Service Delivery Mechanism within the PDS, aiming to provide a comprehensive understanding of

how this system operates. An efficient and transparent Service Delivery Mechanism is vital for the PDS to fulfil its objectives of ensuring food security, reducing hunger, and alleviating poverty among disadvantaged populations.

5.3.2 Satisfaction with Distribution Process of Food grains

Figure 5.7 presents the satisfaction levels of individuals regarding the distribution of foodgrains through the Public Distribution System (PDS) in Kerala. It reveals that roughly 20.4% of respondents expressed dissatisfaction with the distribution process. This dissatisfaction may be attributed to various factors, such as irregular distribution schedules, long waiting times at distribution centres, or perceived inefficiencies in the system. The majority, constituting about 70.8% of respondents, reported a moderate level of satisfaction, indicating that while there may be room for improvement, they are generally content with how foodgrains are distributed through the PDS. A smaller but still significant portion, around 8.9%, expressed a high level of satisfaction, signifying that they perceive the PDS as effectively meeting their foodgrain distribution needs.

Satisfaction with the Availability of Food grains

Figure 5.7 also examines the satisfaction levels of individuals concerning the availability of foodgrains through the PDS. Notably, approximately 32.1% of respondents indicated dissatisfaction with the availability of foodgrains. This suggests that a significant portion of beneficiaries may face challenges in accessing foodgrains when needed, possibly due to shortages or limitations in the supply chain. About half of the respondents, totalling 50.8%, reported a moderate level of satisfaction, indicating that they may encounter occasional difficulties but, overall, find the PDS satisfactory in terms of grain availability. Additionally, around 17.1% of respondents expressed a high level of satisfaction, implying that they perceive consistent and reliable access to food grains through the PDS.

Satisfaction with the Behaviour of Fair Price Shop Dealers

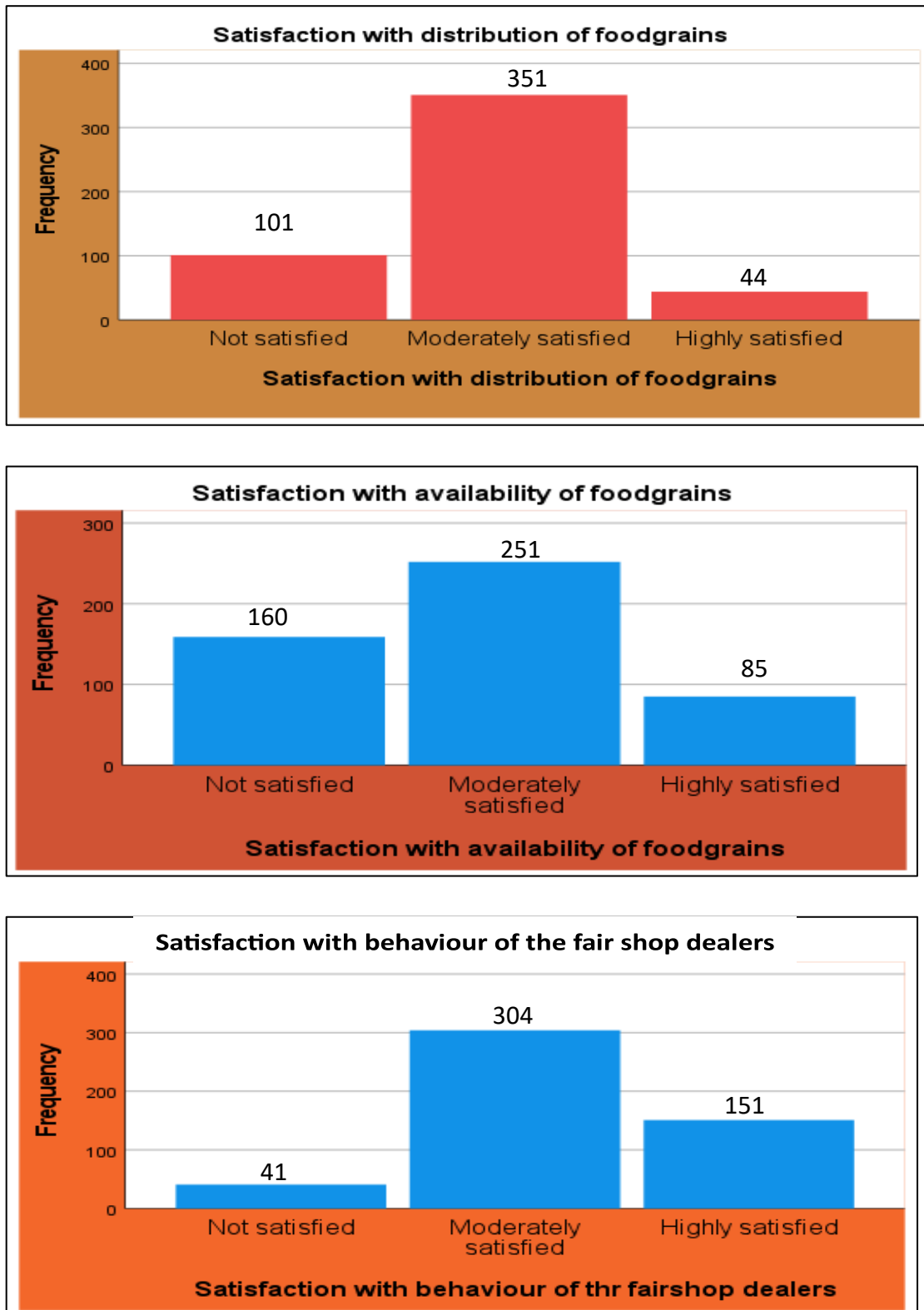
Figure 5.7 also focuses on the satisfaction levels of individuals with the behaviour of Fair price shop dealers, who are responsible for the distribution of foodgrains. Notably, a small percentage, approximately 8.3%, reported dissatisfaction with the behaviour of these dealers. This dissatisfaction could arise

from perceived rudeness, uncooperative attitudes, or other negative interactions during the distribution process. A majority of respondents, constituting about 61.3%, expressed a moderate level of satisfaction, suggesting that they may have generally positive and courteous interactions with Fair Price shop dealers. Moreover, around 30.4% of respondents reported a high level of satisfaction, indicating that they have experienced consistently positive and accommodating behaviour from the dealers.

Awareness about Food Grain Entitlements in the Public Distribution System

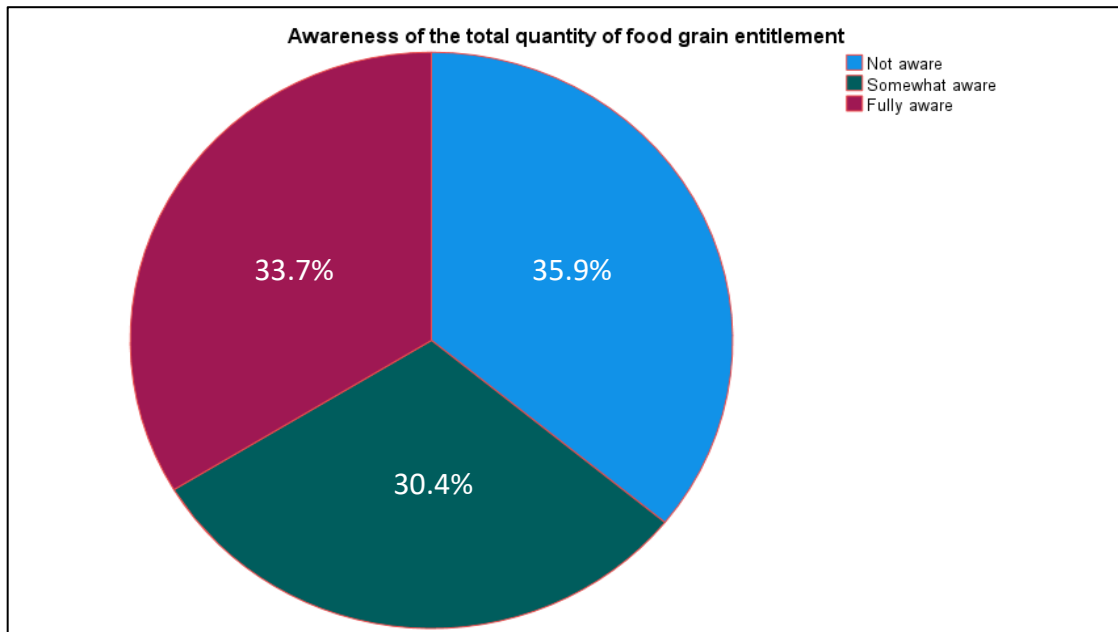
Figure 5.7 offers insights into the awareness levels of individuals regarding their total quantity of food grain entitlement within the Public Distribution System (PDS). These awareness levels are essential indicators as they reflect the degree to which beneficiaries understand their rights and entitlements within the PDS framework. Approximately 35.9% of the respondents reported that they are "Not aware" of their total food grain entitlement. This percentage suggests that a significant portion of beneficiaries may lack information about the quantity of food grains they are entitled to receive through the PDS. This lack of awareness could potentially lead to underutilization of the PDS benefits, as individuals may not be availing themselves of their full entitlement due to this informational gap. On the other hand, around 30.4% of the respondents indicated that they are "Somewhat aware" of their entitlement. While this group has some awareness, it implies that there is room for improvement in disseminating information about entitlements more comprehensively. Beneficiaries who fall into this category may benefit from additional education or communication efforts to ensure they fully understand and utilize their food grain entitlements. Lastly, approximately 33.7% of respondents reported being "Fully aware" of their total food grain entitlement. This group appears to have a solid understanding of their rights within the PDS, and they are likely making informed decisions about their food grain purchases based on their entitlements. These individuals may serve as examples of effective communication and awareness-building efforts within the PDS system. This data underscores the importance of effective communication and awareness campaigns within the PDS to ensure that all beneficiaries, regardless of their current awareness levels, are fully informed about their entitlements. This knowledge empowers beneficiaries to make the most of the PDS, contributing to enhanced food security and equitable distribution of essential food grains in Kerala.

Figure 5.7: Satisfaction with Distribution, Availability of Foodgrains and Behaviour of FPS Dealers



Source: Primary Survey, 2023

Figure 5.8: Awareness of the Total Quantity of Food Grain Entitlement per Household from PDS

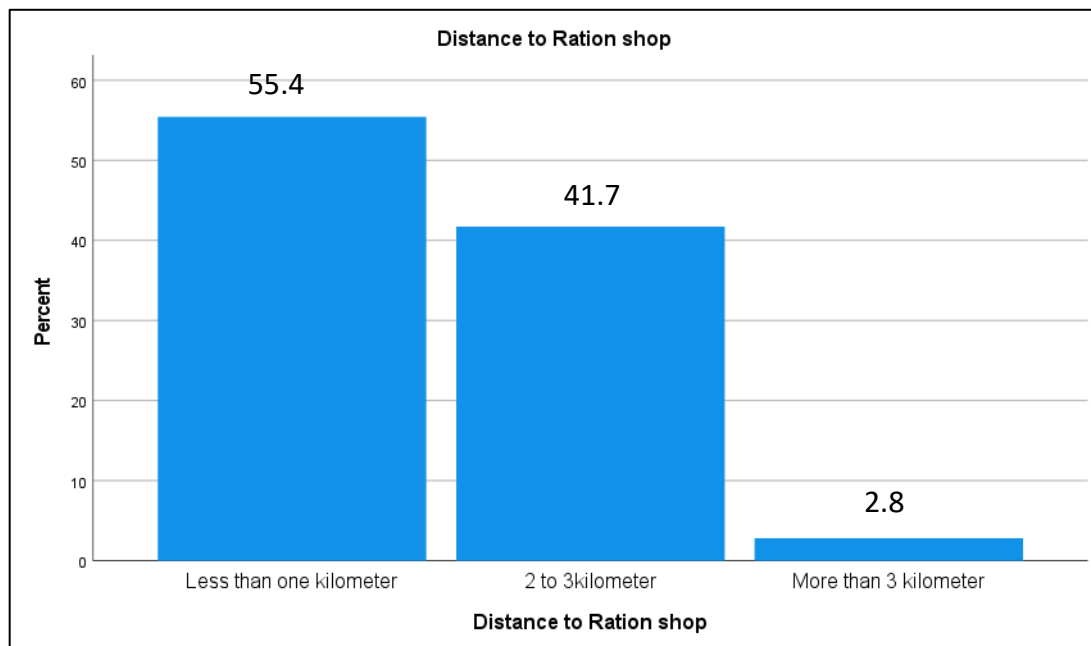


Source: Primary Survey, 2023

5.3.3 Distance to Ration Shops

The figure 4. 9 and Table 5.20 provides information about the distance that beneficiaries have to travel to reach their nearest ration shop within the Public Distribution System (PDS). It is crucial to consider the proximity of ration shops as it directly impacts beneficiaries' accessibility to essential food grains. The majority, constituting approximately 55.4% of respondents, have a ration shop located "Less than one kilometre" from their residence. This close proximity likely enhances their ease of access to the PDS. About 41.7% of respondents reported that their nearest ration shop is "2 to 3 kilometres" away, indicating a moderate level of accessibility but a slightly longer commute. A smaller proportion, approximately 2.8%, mentioned that their nearest ration shop is "More than 3 kilometres" away. This group faces a greater travel distance, which can potentially present challenges, particularly for those with limited transportation options. The distribution of respondents across these distance categories highlights the geographical disparities in access to PDS services and underscores the need for equitable distribution of ration shops to ensure food security for all with ease of travel.

Figure 5.9: Distance to Ration Shop



Source: Primary Survey, 2023

5.3.4 Delivery Time from PDS

The table 5.19 presents data on the time it takes for beneficiaries to receive their entitlements once they arrive at the Public Distribution System (PDS) distribution points. The delivery time is a critical aspect of PDS service quality, as it directly impacts beneficiaries' convenience and efficiency in obtaining essential food grains. Notably, approximately 30.0% of respondents reported a "Less than 10 minutes" delivery time, indicating a quick and efficient distribution process. A significant majority, around 54.4%, mentioned a delivery time of "10 to 30 minutes," reflecting a relatively short wait period. However, a smaller proportion, approximately 7.5%, reported a delivery time of "30 to 60 minutes," suggesting a longer wait, though still within a reasonable timeframe. Notably, about 8.1% of respondents indicated a "More than 60 minutes" delivery time, which may be considered lengthy and could potentially pose challenges for beneficiaries, especially those with time constraints.

Table 5.19: Distance to Ration shop and Delivery time from PDS

Distance to Ration shop		Delivery time from PDS	
Distribution		Distribution	
One km and less than one km	275 (55.4%)	Less than 10 minutes	30% (149)
2 to 3kilometer	207 (41.7%)	10 to 30 minutes	54.4% (270)
More than 3 kilometre	14 (2.8%)	30 to 60 minutes	7.5% (37)
		More than 60 minutes	8.1% (40)
Observation	496 (100%)		496 (100%)

Source: Primary Survey, 2023

5.4 Impact of PDS on Food Security: A Comprehensive Analysis

To comprehensively evaluate the effectiveness of the Public Distribution System (PDS) in Kerala in achieving its primary goal of ensuring food security for vulnerable populations. This objective seeks to analyse the extent to which the PDS has contributed to improving access to affordable and nutritious food among the targeted beneficiaries. The impact shall be assessed by gender, caste, religion and rural-urban locations. This analysis is made to assess how far the National Food Security Act of 2013 has helped in ensuring food security. The third session provides a detailed discussion on various aspects of effectiveness of PDS on food security.

Quality of Food Grains Supplied at the FPS by Types of Ration Card Holders

The Table 5.20 provides an overview of the quality of food grains supplied at Fair Price Shops (FPS) within the Public Distribution System (PDS) in Kerala, categorized by the type of ration card held by beneficiaries. This information is vital as it assesses the satisfaction levels of different types of cardholders regarding the quality of food grains they receive. The table 17 indicates that among blue cardholders (APL), 40.3% expressed being "Very dissatisfied" with the quality of

food grains, while 28.9% were "Dissatisfied," and 25.0% were "Neutral." For Pink cardholders (BPL), 33.9% were "Very dissatisfied," 33.2% were "Dissatisfied," and 32.5% were "Neutral." White cardholders showed slightly higher satisfaction levels, with 21.0% being "Very dissatisfied," 21.1% "Dissatisfied," and 35.0% "Neutral." In contrast, yellow cardholders (AAY) demonstrated the highest satisfaction, with only 4.8% being "Very dissatisfied," 16.8% "Dissatisfied," and 7.5% "Neutral."

Table 5.20: Quality of Food Grains Supplied at the FPS by Type of Ration Card Holders

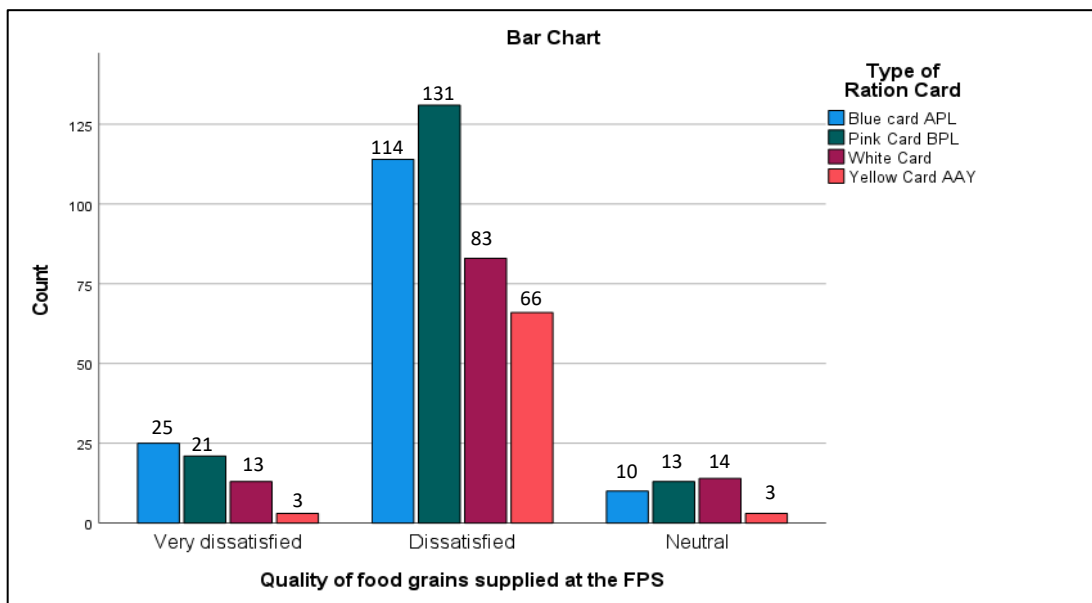
Quality of food grains supplied at the FPS		Type of Ration Card				Total
		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	
Very dissatisfied	Count	25	21	13	3	62
	% within Quality of food grains supplied at the FPS	40.3%	33.9%	21.0%	4.8%	100.0%
Dissatisfied	Count	114	131	83	66	394
	% within Quality of food grains supplied at the FPS	28.9%	33.2%	21.1%	16.8%	100.0%
Neutral	Count	10	13	14	3	40
	% within Quality of food grains supplied at the FPS	25.0%	32.5%	35.0%	7.5%	100.0%
Total	Count	149	165	110	72	496
	% within Quality of food grains supplied at the FPS	30.0%	33.3%	22.2%	14.5%	100.0%
	Chi square value	234.55				
	P value	0.000				

Source: Primary Survey, 2023

The Chi-square test was performed to assess the association between the quality of food grains supplied at FPS and the type of ration card held. The results reveal a statistically significant association, as indicated by a Chi-square value of 234.55 and a p-value of 0.000. This suggests that there is a strong relationship

between the type of ration card and the level of satisfaction or dissatisfaction with the quality of food grains received. Further analysis is warranted to understand the specific factors contributing to these variations in satisfaction among different types of ration cardholders. Such insights can inform policy decisions aimed at improving the quality of food grain distribution within the PDS to better meet the needs and expectations of beneficiaries across various cardholder categories.

Figure 5. 10: Quality of Food Grains Supplied at the FPS by Type of Ration Card Holders



Source: Primary Survey, 2023

5.4.1 Reasons for Beneficiary Dissatisfaction with Foodgrains in the Public Distribution System (PDS)

The Figure 5.11 presents data on the reasons for dissatisfaction among beneficiaries with the quality of foodgrains distributed through the Public Distribution System (PDS). These reasons shed light on specific issues or concerns that have led to dissatisfaction with the foodgrains, and understanding them is crucial for improving the PDS and enhancing food security.

1. *Broken Grains (30.4%)*: A significant proportion of beneficiaries, accounting for approximately 30.4%, reported dissatisfaction due to receiving broken

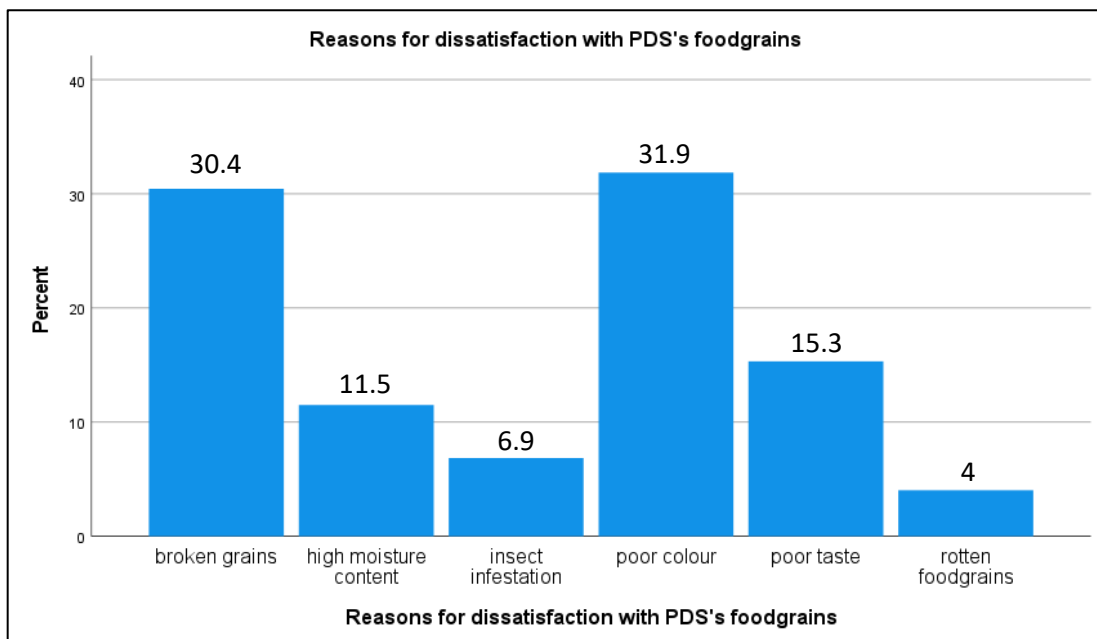
grains. Broken grains may be less desirable as they can affect the overall quality and nutritional value of the food. This issue highlights the importance of ensuring that foodgrains distributed through the PDS are intact and of good quality.

2. *High Moisture Content (11.5%)*: Approximately 11.5% of respondents expressed dissatisfaction with foodgrains that had high moisture content. High moisture can lead to spoilage and the growth of fungi, making the grains unsuitable for consumption. Ensuring proper storage and handling to prevent moisture-related issues is essential.
3. *Insect Infestation (6.9%)*: Some beneficiaries, constituting around 6.9%, reported receiving foodgrains with insect infestations. Insect-infested grains are not only unappetizing but can also pose health risks. Effective pest control measures within the PDS supply chain are crucial to address this concern.
4. *Poor Colour (31.9%)*: A significant percentage, approximately 31.9%, cited poor colour as a reason for dissatisfaction. Poor colour in food grains may be indicative of aging or quality issues. Ensuring that grains maintain their natural colour and appearance is essential to meet consumer expectations.
5. *Poor Taste (15.3%)*: Around 15.3% of beneficiaries were dissatisfied due to poor taste in the foodgrains. Taste is a fundamental aspect of food quality, and poor taste can deter beneficiaries from consuming the distributed grains. Efforts to enhance the taste and flavor of food grains are warranted.
6. *Rotten Foodgrains (4.0%)*: A smaller but still significant percentage, approximately 4.0%, reported receiving rotten foodgrains. Rotten grains are not only inedible but also pose health risks. This issue highlights the need for improved quality control and storage practices.

This evidence shows the need for comprehensive quality control measures and monitoring throughout the PDS supply chain, from procurement to distribution. Addressing issues such as broken grains, high moisture content, insect infestation,

poor colour, poor taste, and rotten foodgrains is critical to ensuring that beneficiaries receive foodgrains of high quality and nutritional value. Efforts should focus on enhancing the quality of foodgrains at every stage, including proper storage, transportation, and distribution. Additionally, training and capacity-building programs for PDS personnel can help improve their ability to identify and mitigate these quality-related issues. Beneficiary feedback mechanisms should also be established to promptly address concerns and ensure continuous improvement in foodgrains quality. Ultimately, by addressing these reasons for dissatisfaction, the PDS can better fulfil its mission of providing essential food security to the beneficiaries, ensuring that they receive foodgrains that are not only accessible but also of high quality and nutritional value.

Figure 5.11: Reasons for Beneficiary Dissatisfaction with Foodgrains in the Public Distribution System (PDS)



Source: Primary Survey, 2023

5.4.2 Importance of the PDS in Meeting Family's Needs by Type of Ration Card

The table 4. 22 and figure 5. 11 present data on the perceived importance of the Public Distribution System (PDS) in meeting the needs of families, categorized

by the type of ration card held by households. Understanding the perceived importance of the PDS among different cardholders is crucial for assessing its role in providing essential support to households.

Not at all important (26.5%): A notable percentage of blue cardholders (APL), approximately 26.5%, indicated that they do not consider the PDS to be important in meeting their family's needs. This suggests that some blue cardholders may rely on alternative sources for their food and essential requirements.

Somewhat important (40.4%): Among Blue cardholders, 40.4% expressed that the PDS is "Somewhat important" to their family's needs, indicating a moderate level of importance. This group may see the PDS as a supplementary source of support.

Important (31.3%): A significant portion of blue cardholders, around 31.3%, considered the PDS "Important" in meeting their family's needs. This suggests that a substantial number of blue cardholders rely on the PDS as a significant source of essential provisions.

Very Important (11.7%): A smaller percentage of blue cardholders, approximately 11.7%, deemed the PDS "Very Important." This group places high importance on the PDS in fulfilling their family's needs.

The Chi-square test was conducted to examine the association between the importance of the PDS and the type of ration card held by households. The results indicate a statistically significant association, as evidenced by a high Chi-square value of 1254.33 and a p-value of 0.000. This signifies a strong relationship between the perceived importance of the PDS and the type of ration card held. The table and chi-square results show the varying perceptions of the PDS among different types of ration cardholders. Notably, Blue cardholders (APL) exhibit diverse opinions regarding the importance of the PDS in meeting their family's needs. While a significant portion considers it important, others do not view it as a primary source of support. In contrast, pink cardholders (BPL) and yellow cardholders (AAY) overwhelmingly find the PDS important, with a substantial percentage deeming it

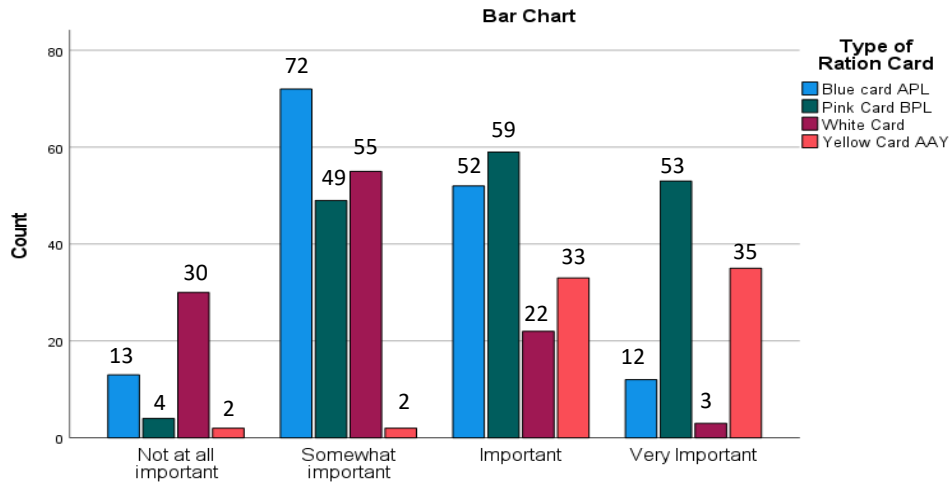
"Very Important." White cardholders fall in between, with a notable proportion considering the PDS important. Strategies to enhance the PDS's effectiveness and address the needs of diverse beneficiaries may include targeted interventions, improved service delivery, and communication campaigns to raise awareness about the PDS's role in meeting family needs. Additionally, ongoing monitoring and evaluation are essential to ensure that the PDS aligns with the expectations and priorities of its beneficiaries across various cardholder categories.

Table 5.21: Importance of the PDS in Meeting Family's Needs by Type of Ration Card

Important of the PDS		Type of Ration Card				Total
		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	
Not at all important	Count	13	4	30	2	49
	%	26.5%	8.2%	61.2%	4.1%	100.0%
Somewhat important	Count	72	49	55	2	178
	%	40.4%	27.5%	30.9%	1.1%	100.0%
Important	Count	52	59	22	33	166
	%	31.3%	35.5%	13.3%	19.9%	100.0%
Very Important	Count	12	53	3	35	103
	%	11.7%	51.5%	2.9%	34.0%	100.0%
Total	Count	149	165	110	72	496
	%	30.0%	33.3%	22.2%	14.5%	100.0%
Chi square	1254.33					
P value	0.000					

Source: Primary Survey, 2023

Figure 5.12: Importance of the PDS in Meeting Family's Needs by Type of Ration Card



Source: Primary survey, 2023

5.4.3 Uncertainty from Ration Shop

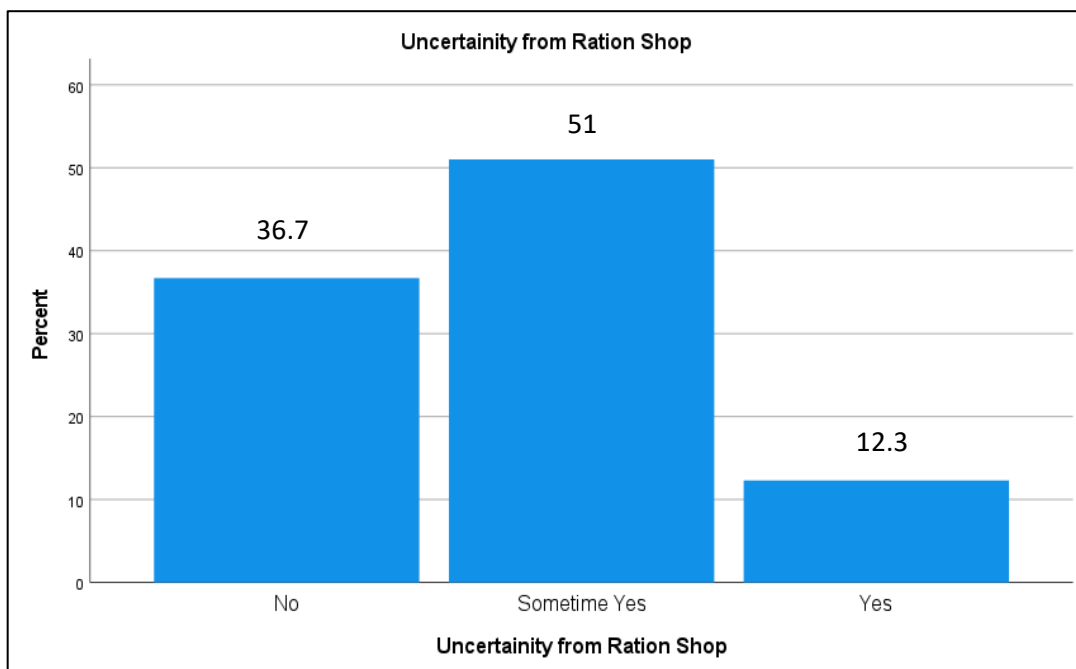
Figure 5.13 provides data on the level of uncertainty experienced by beneficiaries while interacting with their local ration shops, which are part of the Public Distribution System (PDS). The responses are categorized into three groups based on the level of uncertainty:

A significant portion of respondents, approximately 36.7%, reported that they do not experience any uncertainty when dealing with their ration shops. This group likely perceives their interactions with the ration shops as straightforward and predictable, with minimal challenges or uncertainties. The majority of respondents, constituting approximately 51.0%, indicated that they sometimes experience uncertainty when dealing with ration shops. This suggests that while their interactions may generally proceed smoothly, there are occasional instances of ambiguity or unpredictability that introduce uncertainty into their PDS experiences. A smaller percentage of respondents, around 12.3%, reported experiencing uncertainty when interacting with ration shops. This group appears to face more consistent challenges or issues when accessing their entitled food items through the PDS, leading to a higher level of uncertainty.

This results light on the varying degrees of uncertainty that beneficiaries encounter while engaging with ration shops within the Public Distribution System. The prevalence of uncertainty, even if occasional, indicates potential areas for improvement in the PDS service delivery. While a substantial portion of respondents reported no uncertainty, it is essential to maintain and further enhance the transparency and efficiency of ration shops to ensure that this positive perception continues. For those who sometimes or frequently experience uncertainty, efforts to address and mitigate these challenges are crucial.

Factors contributing to uncertainty may include issues such as stock availability, ration shop operating hours, distribution delays, and adherence to eligibility criteria. Addressing these concerns through improved inventory management, regular operating hours, and better communication can help reduce uncertainty and enhance the overall effectiveness of the PDS. Efforts to minimize uncertainty in interactions with ration shops are vital, as they contribute to improved beneficiary experiences and ultimately support the overarching goal of the PDS – ensuring food security for all.

Figure 5.13: Uncertainty from Ration Shop



Source: Primary survey, 2023

5.4.4 Households' Responses to Digitalization of the Public Distribution System (PDS)

Table 5.22 provides insights into households' responses regarding the digitalization of the Public Distribution System (PDS) aimed at expediting delivery, categorized by the type of ration card held. Responses are divided into three categories: "Not sure," "Yes," and "No."

Approximately 30.6% of blue cardholders, 31.1% of Pink Card BPL holders, 21.9% of White Card holders, and 16.4% of Yellow Card AAY holders expressed uncertainty regarding the digitalization of the PDS. These respondents were unsure about whether digitalization would enhance delivery speed. On the other hand, approximately 28.6% of blue cardholders, 34.2% of Pink Card BPL holders, 21.8% of White Card holders, and 15.4% of Yellow Card AAY holders responded affirmatively, indicating that they believed digitalization would expedite PDS delivery. A notable percentage of respondents, approximately 34.9% of blue cardholders, 39.5% of Pink Card BPL holders, 25.6% of White Card holders, and none of the Yellow Card AAY holders, expressed scepticism, stating that they believed digitalization would not lead to faster delivery.

The Chi-square test results with a value of 43.44 and a p-value of 0.044 indicate a statistically significant association between the type of ration card held and households' responses regarding the impact of digitalization on PDS delivery speed.

Table 5.22: Households' Responses to Digitalization of the Public Distribution System (PDS)

Digitalisation of PDS		Type of Ration Card				Total
		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	
Not sure	Count	67	68	48	36	219
	%	30.6%	31.1%	21.9%	16.4%	100.0%
Yes	Count	67	80	51	36	234
	%	28.6%	34.2%	21.8%	15.4%	100.0%
No	Count	15	17	11	0	43
	%	34.9%	39.5%	25.6%	0.0%	100.0%
Total	Count	149	165	110	72	496
	%	30.0%	33.3%	22.2%	14.5%	100.0%
Chi square value	43.44					
P values	0.044					

Source: Primary Survey, 2023

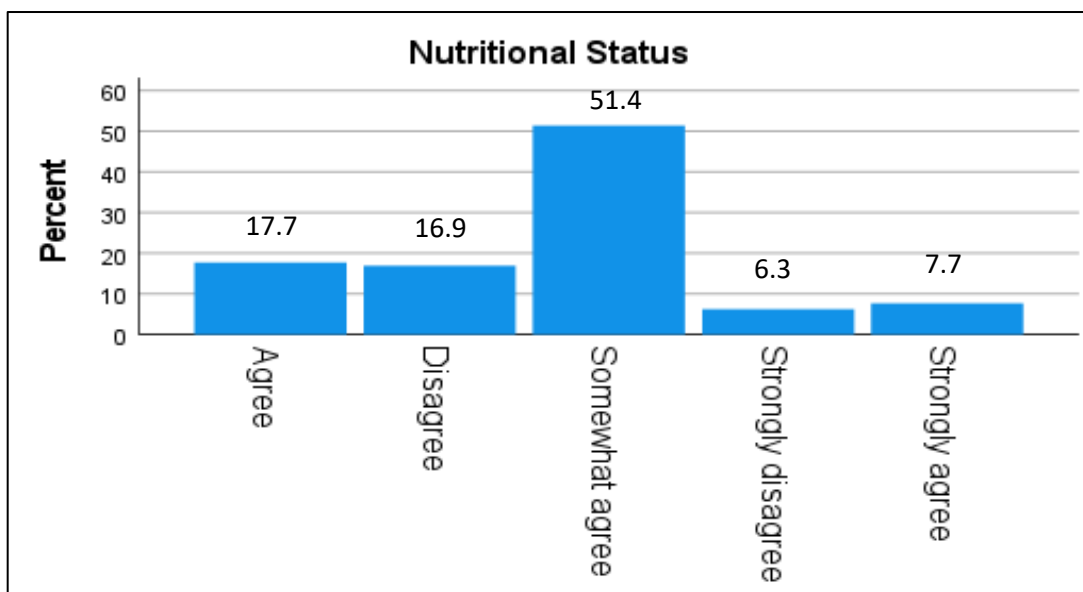
4. Perceptions of Households Regarding the Impact of Ration Shops on Nutritional Status

Figure 5.13 presents responses from households regarding the statement, "Good being distributed through ration shops help in improving the nutritional status of households." The responses are categorized into five options: "Agree," "Disagree," "Somewhat agree," "Strongly disagree," and "Strongly agree." A minority of respondents, approximately 17.7%, agreed that the distribution of quality goods through ration shops contributes to improving the nutritional status of households. This group acknowledges the positive impact of ration shops on nutritional well-being. Nearly 16.9% of respondents disagreed with the statement, indicating scepticism about the role of ration shops in enhancing nutritional status. The majority, constituting approximately 51.4% of respondents, somewhat agreed with the statement, suggesting that they see some degree of positive influence on nutritional status but may have reservations or consider it only moderately effective. A small percentage, around 6.3%, strongly disagreed with the statement, indicating a firm belief that ration shops do not contribute to improving nutritional status. Lastly, approximately 7.7% of respondents strongly agreed with the statement, emphasizing

their conviction that ration shops play a significant role in enhancing nutritional well-being.

The responses reflect a range of perspectives among households regarding the impact of ration shops on nutritional status. It is noteworthy that the majority of respondents fall into the categories of "Somewhat agree" and "Agree," suggesting a prevailing belief that ration shops do have a positive influence on nutritional status, albeit to varying degrees of certainty. However, the presence of respondents who either "Strongly disagree" or "Disagree" highlights some level of scepticism or dissatisfaction with the nutritional impact of ration shops. Factors influencing this scepticism could include concerns about the quality of goods distributed, accessibility to the shops, or the adequacy of the ration in meeting nutritional requirements. To address these varying perceptions and concerns, it is important for governments overseeing the Public Distribution System (PDS) to ensure the quality and diversity of food items available in ration shops. Additionally, efforts to raise awareness about the nutritional benefits of the PDS and to enhance the accessibility and affordability of essential goods are essential.

Figure 5.14: Perceptions of Households Regarding the Impact of Ration Shops on Nutritional Status



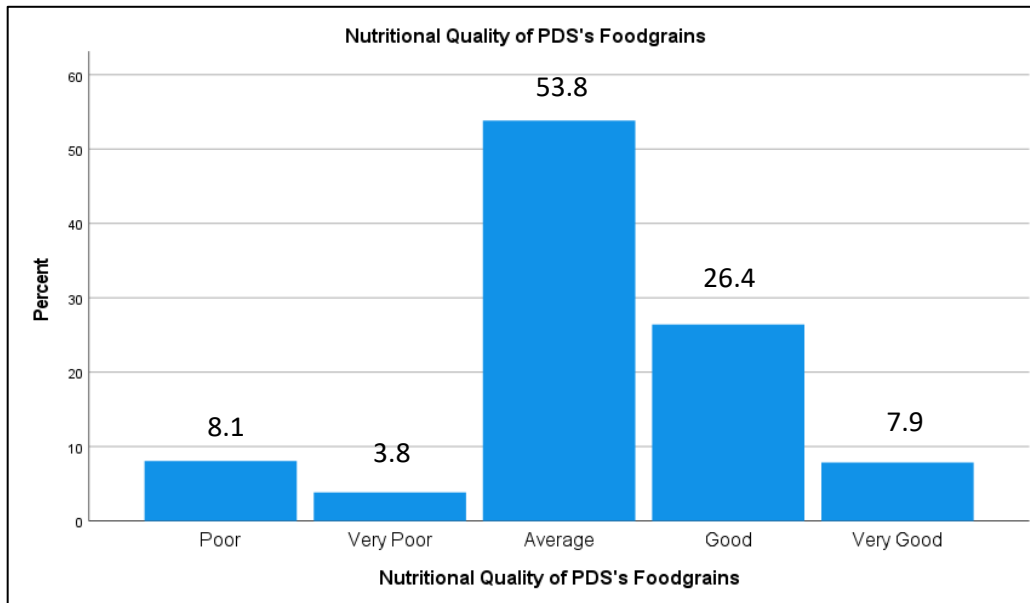
Source: Primary Survey, 2023

5.4.5 Nutritional Quality of Food Grains Being Supplied Through PDS

Figure 5.14 provides an assessment of the nutritional quality of foodgrains distributed through the Public Distribution System (PDS). Respondents were asked to rate the quality of the PDS foodgrains on a scale from "Poor" to "Very Good." The table presents the frequency and percentage of respondents' ratings. Approximately 8.1% of respondents rated the nutritional quality of PDS foodgrains as "Poor," indicating that they perceive these foodgrains as having lower nutritional value. A smaller percentage, around 3.8%, rated the nutritional quality as "Very Poor," suggesting an even lower perception of nutritional value. The majority of respondents, constituting approximately 53.8%, considered the nutritional quality of PDS foodgrains as "Average," implying that they perceive these foodgrains to be of moderate nutritional value. About 26.4% of respondents rated the nutritional quality as "Good," indicating that they believe PDS foodgrains have a reasonably high nutritional value. A smaller but still significant percentage, approximately 7.9%, rated the nutritional quality as "Very Good," suggesting that they perceive PDS foodgrains as having a high nutritional value.

The Figure 5.14 reflects the diverse perceptions of households regarding the nutritional quality of foodgrains distributed through the Public Distribution System (PDS). Notably, the largest proportion of respondents rated the quality as "Average," indicating a moderate perception of nutritional value. This suggests that a significant segment of respondent's views PDS food grains as providing a reasonable level of nutrition. However, it is important to acknowledge that there are varying perceptions, with a notable percentage rating the nutritional quality as "Poor" or "Very Poor." These respondents likely have concerns about the nutritional adequacy of PDS foodgrains. Conversely, those who rated the quality as "Good" or "Very Good" perceive PDS foodgrains as having a higher nutritional value. This group may have a more positive view of the quality and nutritional benefits of the food items distributed through the PDS. Efforts to improve the quality and diversity of food items provided through the system, as well as initiatives to raise awareness about their nutritional benefits, can help align perceptions with the program's objectives.

Figure 5.15: Nutritional Quality of PDS's Foodgrains



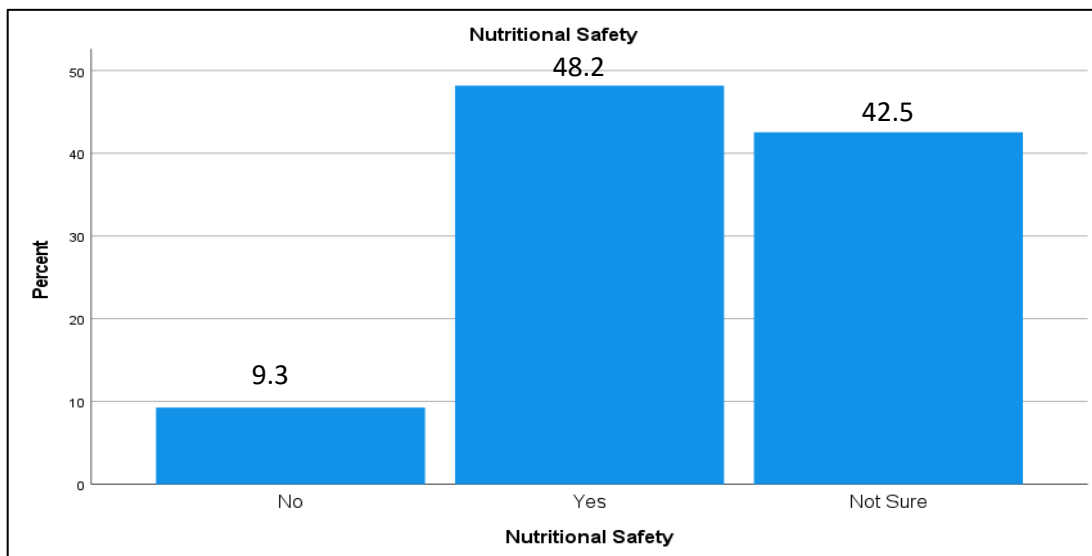
Source: Primary Survey, 2023

Perceptions of the Public Distribution System (PDS) in Enhancing Nutritional Safety for the Economically Disadvantaged

Figure 5.15 reflects responses regarding the role of the Public Distribution System (PDS) in improving the nutritional safety of economically disadvantaged individuals. Respondents were asked whether they believed that the PDS contributes to enhancing nutritional safety for the poor. A small percentage of respondents, approximately 9.3%, expressed a negative view, indicating that they do not believe the PDS plays a role in improving the nutritional safety of impoverished individuals. The majority of respondents, constituting approximately 48.2%, held a positive perception, asserting that the PDS does contribute to enhancing nutritional safety for the economically disadvantaged. A substantial percentage, around 42.5%, reported being uncertain about the PDS's role in improving nutritional safety, suggesting a lack of clarity or mixed opinions on this matter.

The diverse range of responses highlights varying perspectives on the effectiveness of the PDS in addressing nutritional safety among the poor. While a significant portion of respondents believe in its positive impact, a sizeable group remains uncertain or sceptical. This shows the need for effective communication and awareness campaigns to educate the public about the PDS's role in enhancing nutritional security and to address any misconceptions or doubts that may exist. It also emphasizes the importance of continuous evaluation and improvement of the PDS to ensure that it effectively fulfils its mission of providing nutritional safety for economically vulnerable populations.

Figure 5.16: Perceptions of the Public Distribution System (PDS) in Enhancing Nutritional Safety for the Economically Disadvantaged



Source: Primary Survey, 2023

5.4.6 Effect of Targeted PDS on Food Security of the Households

The Targeted Public Distribution System (PDS) stands as a pivotal policy framework in the realm of food security worldwide. Rooted in the belief that equitable access to essential food items is a fundamental human right, targeted PDS programs have been designed and implemented by governments to address the multifaceted challenge of food insecurity. Food security, a concept that encompasses not only the availability and accessibility of sufficient food but also its nutritional quality and the stability of access over time, is a cornerstone of national well-being and social stability. Targeted PDS initiatives aim to ensure that food reaches those

who need it most, often focusing on vulnerable populations such as low-income households, marginalized communities, and individuals facing economic hardships. In the context of India, the Targeted Public Distribution System (PDS) plays a central role in addressing the complex issue of food security within one of the world's most populous nations. India's diverse socio-economic landscape, with varying levels of income and accessibility to resources, has made ensuring food security a top priority for policymakers. The Indian PDS, operating under the National Food Security Act (NFSA) of 2013, represents a targeted approach aimed at efficiently distributing essential food commodities to those in need while minimizing wastage and economic burden.

Kerala's commitment to food security extends beyond mere calorie intake and encompasses the provision of nutritionally rich food items to its diverse population. The state's PDS initiatives are designed to cater to the specific needs of its residents, focusing on vulnerable communities, low-income households, and marginalized groups. The Kerala PDS model, often distinguished by its progressive policies and high human development indicators, serves as an exemplar of how targeted interventions can enhance food security in a region marked by social inclusivity and economic resilience. In this context, this thesis also examines the effectiveness Targeted PDS in ensuring food security in Kerala.

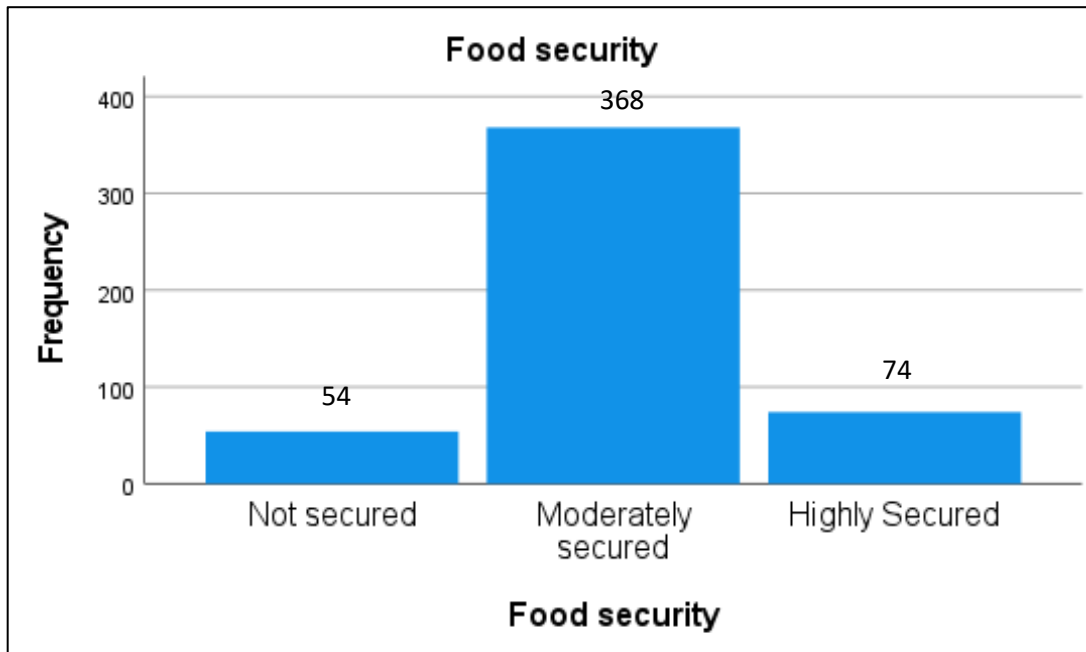
The primary objective of this research is to empirically examine the effectiveness of the Targeted Public Distribution System (PDS) in ensuring food security among households, especially those considered vulnerable, in Kerala. Instead of quantifying food security in terms of food intake and calorie consumption, the study heavily relies on the assessments provided by households regarding the Targeted PDS's impact on food security. To gather this information, respondents were asked the following question: 'The government introduced the Targeted PDS to ensure a minimum required supply of food grains for people living below the poverty line. Please rate your opinion on a scale of 1 to 3, indicating the extent to which the Targeted PDS ensures food security in your household.' Respondents' answers were recorded as 1 for 'not secured,' 2 for 'moderately

secured,' and 3 for 'highly secured.' The respondents' answers are presented in the figure 1 below. The Figure 5.17 presents self-assessed effectiveness of Targeted Public Distribution System (PDS) on food security, where individuals or respondents have categorized their food security status into three groups (see Figure 5.16):

1. *Not Secured:* This category includes 54 respondents, which is approximately 10.9% of the total respondents. These individuals have self-assessed their food security as not being adequately ensured by the Targeted PDS. It suggests that they may still face challenges in accessing enough food through the PDS.
2. *Moderately Secured:* The largest group consists of 368 respondents, accounting for about 74.2% of the total. These individuals have assessed their food security as moderately secured by the Targeted PDS. This suggests that they feel the PDS helps them to some extent but may not completely eliminate food security concerns.
3. *Highly Secured:* This category comprises 74 respondents, which is approximately 14.9% of the total respondents. These individuals have self-assessed their food security as highly secured by the Targeted PDS. It indicates that they believe the PDS is very effective in ensuring their food security needs are met.

It shows how the respondents perceive the effectiveness of the Targeted PDS in terms of food security. It suggests that a majority of respondents consider it to be moderately effective, while a smaller portion feels that it is not very effective (not secured) or highly effective (highly secured).

Figure 5.17: Self Assessed Effectiveness of TPDS on Food Security of Households



Source: Primary Survey, 2023

Targeted Public Distribution System (TPDS) on food security, categorized by the type of ration card held by households in Kerala

Table 5.23 and Figure 5.18 offer insights into the impact of the Targeted Public Distribution System (TPDS) on food security, categorized by the type of ration card held by households in Kerala. It evaluates how households perceive their level of food security based on their participation in the TPDS program.

Not Secured Households: Among Blue cardholders (APL), approximately 35.2% indicated that they do not feel secured in terms of food security due to TPDS. This suggests that a notable portion of blue cardholders might not find the program effective in ensuring their food security. This can also be due to the fact that the provisions for blue card holders are mainly limited to rice.

Moderately Secured Households: In the case of pink cardholders (BPL), 31.3% mentioned that they feel "Moderately Secured" in terms of food security through TPDS. This category suggests that while the TPDS program contributes to their food security, there may be room for improvement.

Highly Secured Households: A smaller percentage of blue cardholders, approximately 20.3%, reported feeling "Highly Secured" in terms of food security. This group perceives TPDS as highly effective in meeting their food security needs. Interestingly, Yellow cardholders (AAY) do not have any respondents in the "Not Secured" category, indicating that this group perceives the TPDS program positively in terms of food security. Instead, 44.6% of yellow cardholders reported feeling "Highly Secured."

The Chi-square test conducted on this data indicates a statistically significant association between the type of ration card held and the level of perceived food security due to TPDS. The Chi-square value of 76.566 and a p-value of 0.000 indicate that there is a strong relationship between these variables.

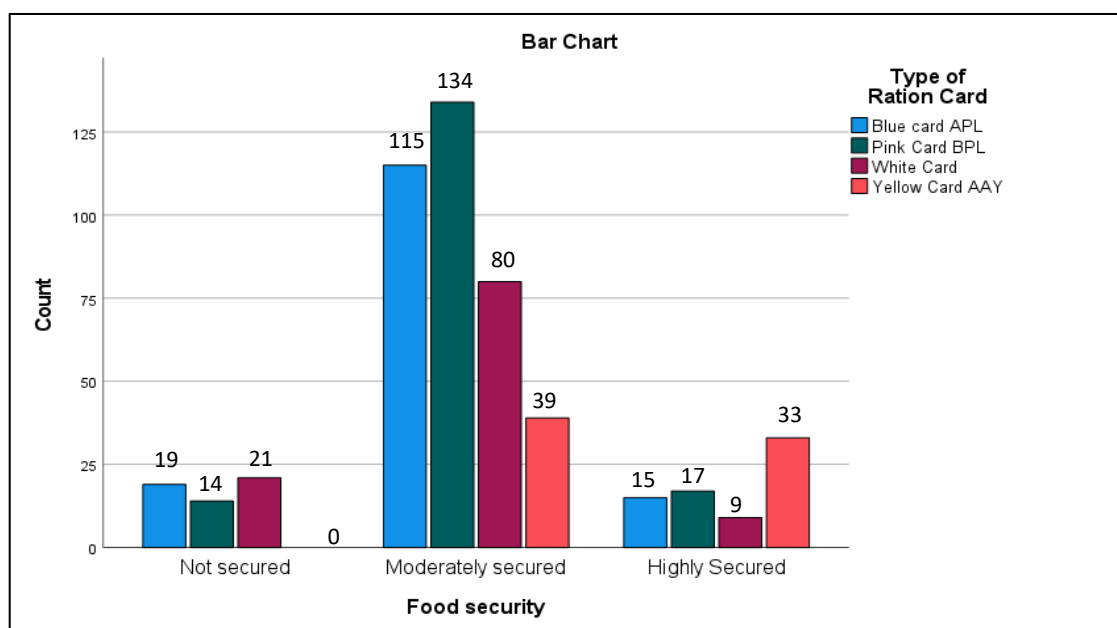
Table 5.23 and Figure 5.18 reflect the varying perceptions of food security among different types of ration cardholders in Kerala concerning the impact of TPDS. It suggests that blue cardholders, who are categorized as Above Poverty Line (APL), have a more mixed perception of the program's effectiveness in ensuring food security. Some feel highly secured, while others do not. Pink cardholders, classified as Below Poverty Line (BPL), generally perceive themselves as moderately secured, indicating that TPDS contributes to their food security but may not fully meet their needs. Notably, Yellow cardholders, who are beneficiaries under the Antyodaya Anna Yojana (AAY), overwhelmingly report feeling highly secured, indicating that TPDS is perceived as highly effective in ensuring food security among this group.

Table 5.23: Effect of TPDS on food security by type of Ration Cards

Food security		Type of Ration Card				Total
		Blue card APL	Pink Card BPL	White Card	Yellow Card AAY	
Not secured	Count	19	14	21	0	54
	%	35.2%	25.9%	38.9%	0.0%	100.0%
Moderately secured	Count	115	134	80	39	368
	%	31.3%	36.4%	21.7%	10.6%	100.0%
Highly Secured	Count	15	17	9	33	74
	%	20.3%	23.0%	12.2%	44.6%	100.0%
Total	Count	149	165	110	72	496
	%	30.0%	33.3%	22.2%	14.5%	100.0%
Chi square	76.566					
P value	0.000					

Source: Primary survey, 2023

Figure 5.18: Effect of TPDS on food security by type of households



Source: Primary survey, 2023

5.4.7 Factors Affecting the Effectiveness of the Targeted Public Distribution System (PDS) in Ensuring Food Security

To investigate the impact of various factors such as the type of ration card holders, rural/urban location, caste groups, landholding, distance from PDS,

household income, and household size on the self-assessed effectiveness of the Targeted Public Distribution System (TPDS) in ensuring food security, the study employed an Ordered Probit regression model. In this model, self-assessed food security served as the dependent variable, while type of ration card holder, urban/rural location, caste group, landholding, distance to PDS, income, and household size were considered as independent variables. The results of this analysis are summarized in Table 5.24. Additionally, Table 5.24 provides the distribution of samples across selected variables categorized by food security, and Table 5.24 presents the mean differences in continuous variables among different food security levels.

The Table 5.24 provided presents a bivariate examination of self-assessed food security in relation to the Targeted Public Distribution System (TPDS) among households. It aims to analyse how various factors, including the type of ration card, urban or rural location, caste group, landholding, and distance to the Public Distribution System (PDS), are associated with self-assessed food security levels among households.

Among the findings related to the type of ration card, households with Yellow Cards (AAY) had 15.4% self-assessing as "Not secured," 75.3% as "Moderately Secured," and 9.3% as "Highly Secured." In contrast, Pink Card (Priority BPL) holders didn't report as "Not secured" at all, with 54.2% assessing as "Moderately Secured" and 45.8% as "Highly Secured." Households with other types of cards had 8.5% self-assessing as "Not secured," 81.2% as "Moderately Secured," and 10.3% as "Highly Secured."

Regarding urban/rural location, urban households saw 18.7% self-assessing as "Not secured," 71.0% as "Moderately Secured," and 10.3% as "Highly Secured." In comparison, rural households had 8.7% self-assessing as "Not secured," 75.1% as "Moderately Secured," and 16.2% as "Highly Secured."

The Table 5.24 also explores these self-assessed food security levels based on caste group and landholding status, revealing further insights. Lastly, it examines the impact of distance to the PDS, with households living more than 1 km away

showing 8.6% as "Not secured," 71.5% as "Moderately Secured," and 19.9% as "Highly Secured." Meanwhile, those living less than 1 km away had 12.7% self-assessing as "Not secured," 76.4% as "Moderately Secured," and 10.9% as "Highly Secured."

Table 5.24: Bivariate examination of self-assessed food security by Target PDS among households

		Food security scale			Total
		Not secured	Moderately Secured	highly secured	
Type of card	Yellow card (AAY)	40 15.4%	195 75.3%	24 9.3%	259 100.0%
	Pink Card (Priority BPL)	0 0.0%	39 54.2%	33 45.8%	72 100.0%
	Others	14 8.5%	134 81.2%	17 10.3%	165 100.0%
	Total	54 10.9%	368 74.2%	74 14.9%	496 100.0%
	Urban	20 18.7%	76 71.0%	11 10.3%	107 100.0%
Urban/Rural location	Rural	34 8.7%	292 75.1%	63 16.2%	389 100.0%
	Total	54 10.9%	368 74.2%	74 14.9%	496 100.0%
	General	5 8.3%	52 86.7%	3 5.0%	60 100.0%
Caste Group	SC/ST	2 1.9%	70 65.4%	35 32.7%	107 100.0%
	OBC	47 14.3%	246 74.8%	36 10.9%	329 100.0%
	Total	54 10.9%	368 74.2%	74 14.9%	496 100.0%
	Land holding	28 10.1%	194 70.0%	55 19.9%	277 100.0%
Land holding	some land	26 11.9%	174 79.5%	19 8.7%	219 100.0%
	No land	26 11.9%	174 79.5%	19 8.7%	219 100.0%
	Total	54 10.9%	368 74.2%	74 14.9%	496 100.0%
Distance to PDS	More than 1 km	19 8.6%	158 71.5%	44 19.9%	221 100.0%
	Less than 1 km	35 12.7%	210 76.4%	30 10.9%	275 100.0%
	Total	54 10.9%	368 74.2%	74 14.9%	496 100.0%
	Total	54 10.9%	368 74.2%	74 14.9%	496 100.0%
	Total	54 10.9%	368 74.2%	74 14.9%	496 100.0%

Source: Author's estimation from primary data, 2023

The Table 5.25 offers insights into the mean differences in household size and log household income across various self-assessed food security levels, which are categorized as "Not secured," "Moderately secured," and "Very secured." In terms of household size, households self-assessed as "Not secured" exhibit an average size of approximately 5.57 members, with a standard error of about 0.289. Conversely, those categorized as "Moderately secured" have a mean household size of approximately 4.97, characterized by a smaller standard error of about 0.084. In the "Very secured" category, the mean household size is roughly 4.55, accompanied by a standard error of about 0.167. This suggests a descending trend in mean household size from "Not secured" to "Very secured" food security categories, indicating that households perceiving themselves as "Not secured" tend to have larger average household sizes compared to those in the other categories.

Moving on to log household income, households self-assessed as "Not secured" exhibit a mean log household income of approximately 3.98, with a standard error of about 0.138. Among "Moderately secured" households, the mean log household income is approximately 3.99, marked by a smaller standard error of about 0.034. In the "Very secured" category, the mean log household income is roughly 3.73, with a standard error of about 0.063. The mean log household income, in contrast to household size, demonstrates relatively minor differences across the three food security categories, with "Moderately secured" households displaying slightly higher average income levels compared to the other two categories. These mean differences provide valuable insights for researchers and policymakers seeking to comprehend the associations between household size, log household income, and self-assessed food security levels within the studied population, shedding light on potential factors influencing food security outcomes.

Table 5.25: Bivariate examination of self-assessed food security by Target PDS among households

Variables	Mean	Std. Err.	[95% Conf.	Interval]
Household size				
Not secured	5.574074	.2891007	5.006058	6.14209
Moderately secured	4.972826	.0839459	4.807892	5.13776
Very secured	4.554054	.1667934	4.226344	4.881764
Log household income				
Not secured	3.981693	.1382957	3.709974	4.253412
Moderately secured	3.992715	.0336795	3.926542	4.058887
Very secured	3.728035	.0634648	3.603342	3.852729

Source: Author's estimation from primary data, 2023

Estimated Results of Ordered Probit Regression Model

The estimated results from the ordered probit regression analysis reveal some significant findings regarding the factors influencing self-assessed food security (see Table 5.28). The analysis indicates a significant positive effect of holding Yellow Card (AAY) and Pink Card (Priority BPL) on food security. Specifically, households with Yellow Cards and Pink Cards are more likely to report higher levels of self-assessed food security compared to non-priority cardholders. This finding suggests that government efforts to provide priority ration cards have had a positive impact on ensuring food security among the poorer and more vulnerable segments of society. In other words, households with these priority cards are more confident in their access to an adequate food supply.

There is positive effect of location rural on food security. This finding highlight that the probability of high self-assessed food security is higher among households residing in rural areas when compared to those in urban areas. This implies that rural households tend to perceive themselves as having better food security than their urban counterparts. The reasons for this difference could be multifaceted and may involve factors such as agricultural activities, access to

government food distribution programs, and cost of living variations between rural and urban settings.

The analysis also reveals a similar positive effect observed for the SC/ST category. Specifically, the reported self-assessed food security is higher for SC/ST households when compared to households in the general category. However, it's noteworthy that OBC category households do not exhibit a statistically significant impact on food security. These findings indicate that government policies, particularly those related to the Targeted Public Distribution System (TPDS), have been effective in ensuring food security among vulnerable sections of society, particularly among the SC/ST population. The higher self-assessed food security among SC/ST households suggests that these policies have succeeded in addressing food security concerns within this demographic. On the other hand, the lack of a significant impact on food security among OBC category households may imply that there are other factors at play or that the policies targeting this group may require further evaluation or adjustments to achieve similar positive outcomes.

Similarly, the analysis indicates a positive effect of landholding on food security. Self-assessed food security is higher among households that do not hold any land compared to those who hold some land. This conclusion is drawn from the positive sign of the coefficient associated with landholding in the regression model. Additionally, a similar trend is observed for households living within one kilometre of PDS shops. The analysis shows that self-assessed food security is positively influenced by proximity to PDS shops. This positive result is indicated by the sign of the coefficient associated with distance to PDS. These findings collectively suggest that households without land ownership and those residing in close proximity to PDS shops tend to report higher levels of self-assessed food security. The positive coefficients in both cases indicate that these factors contribute to a greater sense of food security among these households. The positive impact of not holding land on food security may be attributed to reduced agricultural dependence and potentially greater access to government food distribution programs. Likewise,

the proximity to PDS shops likely facilitates easier access to subsidized food items, which can positively affect the perception of food security among households.

In summary, both landholding status and proximity to PDS shops play significant roles in influencing self-assessed food security, with positive effects observed in both cases. These results provide insights into the factors contributing to food security within the studied population and can inform policy decisions aimed at improving food security outcomes.

However, it is important to note that household income and family size did not have a statistically significant impact on the food security of households in the study area.

In the estimated ordered probit model, "cut1" and "cut2" represent the thresholds or cut points that separate the different categories of the dependent variable (self-assessed food security). "Cut1" is the threshold between the first category (e.g., "Not secured") and the second category (e.g., "Moderately secured"). "Cut2" is the threshold between the second category ("Moderately secured") and the third category (e.g., "Highly secured"). These cut points help determine the values of the independent variables at which the probability of moving from one category to another is 50%.

The log likelihood is a measure of how well the model fits the data. In this study, the log likelihood value is -337.6704. Higher (less negative) log likelihood values indicate a better fit of the model to the data. So the fitted model is better one. LR chi2(7) represents the likelihood ratio chi-squared statistic with 7 degrees of freedom. It is used to test the overall goodness of fit of the model. In your case, the LR chi-squared value is 65.42. A significant chi-squared value ($p < 0.05$) suggests that the model as a whole is a good fit for the data. In this study, Prob > chi2 is reported as 0.0000, indicating that the model's overall fit to the data is statistically significant. Pseudo R2 is a measure of the goodness of fit for ordered probit models. In this study, the Pseudo R2 value is 0.0883, indicating that the model explains approximately 8.83% of the variation in self-assessed food security.

These statistics collectively assess the fit and significance of estimated ordered probit regression model. The significant LR chi-squared value and the low p-value suggest that the model is a good fit for the data, and it explains a significant portion of the variation in self-assessed food security. The cut points (cut1 and cut2) help define the thresholds between different food security categories.

Table 5.26: Ordered Probit Regression Results of Effectiveness of TPDS in Kerala

	Coef.	Std. Err.	z	P>z
Independent variables				
1. Type of card holders				
Yellow card holders (AAY)	1.050***	.2502038	4.20	0.000
Pink Card holders (Priority BPL)	.1100	.1408395	0.78	0.434
Reference category=other non-priority card holders				
2. Location:				
Rural=1; urban=0	.1335196**	.113602	1.93	0.0252
3. Caste group				
SC/ST group	1.1964526***	.2476	4.79	0.008
Other Backward Group (OBC)	.0195116	.1798971	0.11	0.914
Reference category=General				
4. Landholding				
No land =1; others =0	.12252**	.123602	1.84	0.0161
5. Distance to PDS				
Less than 1 km=1; more than 1 km=0	.600***	.209	8.259	.004
5. Log annual income				
5. Household size				
	-.0557756	.0876858	-0.64	0.525
	-.0329439	.0361163	-0.91	0.362
/cut1	-1.377012	.4760849		
/cut2	1.106617	.4759544		
Log likelihood = -337.6704				
LR chi2(7) = 65.42				
Prob > chi2 = 0.0000				
Pseudo R2 = 0.0883				
Number of observations = 496				

Source: Author's estimation from primary data, 2023

** indicates 5% level of significance

*** indicates 5% level of significance

In summary, these findings highlight the effectiveness of government policies, such as priority ration cards and proximity to PDS shops, in promoting food security among vulnerable populations. The rural-urban divide, caste categories, and landholding status also play significant roles in shaping self-assessed food security. However, household income and family size did not emerge as significant factors in this context. These insights are valuable for policymakers and researchers in designing targeted interventions to enhance food security within the study area.

SUMMARY

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- 6.1 Socio economic Characteristics of the Study Units*
 - 6.2 Food grain purchases by Households and food Deficit*
 - 6.3 Effectiveness of Service Delivery and public satisfaction on PDS*
 - 6.4 Effectiveness of PDS and its Impact on Food Security*
 - 6.5 Households' Responses to Digitalization of the PDS*
 - 6.6 Impact of PDS on Nutritional Status*
 - 6.7 Policy Recommendations*
 - 6.8 Scope for Future Research*
 - 6.9 Conclusion*
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This study is a detailed analysis of effectiveness of Targeted Public Distribution System in India in line with National Food Security Act. The study is conducted using primary data collected from Malappuram and Palakkad districts. There were a total 496 sample units selected using random sampling method. The major objectives of the study are to examine the socio-demographic profile of the study units analysing their religion, caste, gender, location, economic status, occupation and many other general characteristics.

6.1 Socio-Demographic Characteristics of the Study Units

The first section of the study has presented a comprehensive profile of the study participants' households, which is crucial for contextualizing the analysis of the Public Distribution System (PDS) and its impact on food security. It has provided insights into various demographic and socio-economic characteristics of these households, including location, gender distribution, religious affiliation, caste distribution, occupation, educational status, and land possession patterns. Additionally, descriptive statistics for key household variables, such as household size, annual income, total monthly expenditure, and monthly expenditure on food items, have been provided. This foundational overview sets the stage for a deeper analysis of how these household characteristics may influence food security dynamics and interactions with the PDS.

Majority of the households are situated in the rural sector (78.4%). Gender distribution shows more or less an equal distribution with 52 per cent of males and 48 per cent of females. Most of the households are Muslims followed by Hindus and Christianity. As the study area includes Malappuram along with Palakkad, the representation of Muslims is more since it is a district with a greater number of Muslim populations.

When it comes to the educational qualification of the study units, the study provides an overview of the distribution of educational status among the surveyed households. Educational attainment is a vital demographic factor that can significantly influence socio-economic well-being and, consequently, food security. Notably, among the households, 12.9% have educational levels below Secondary

School Leaving Certificate (SSLC), while the majority, constituting 45.0%, have education up to the SSLC level. Another significant portion, 31.0%, possesses qualifications up to the Higher Secondary level. A smaller but noteworthy group, comprising 11.1% of the households, holds a degree or higher educational qualification. These varying educational backgrounds may play a role in shaping how households perceive and interact with the PDS and its effects on their food security.

The study provides insights into land possession patterns among the surveyed households, which is particularly relevant in an agrarian state like Kerala. These patterns encompass various categories based on land holding size, ranging from "No Land" to "More than One Acre." Notably, 32.5% of households possess land parcels smaller than 10 cents, while 23.4% do not own any land. Land ownership is a critical determinant of agricultural productivity, income, and overall livelihoods, significantly impacting food security. Analysing the PDS's differential impact across these land possession categories can offer valuable insights into how land ownership shapes food security outcomes.

The analysis also presents an overview of key statistics from the dataset of 496 observations. Household size ranges from 2 to 15 members, with an average of about 4.98, indicating some variability. Annual household incomes span from INR 0.00 to INR 500,000,000 with an average of approximately INR 1,030,305 highlighting significant income diversity. Total monthly expenditures range from 0.00 to INR 100,000 averaging around INR 13,102 showing considerable variation. Monthly food-related spending varies from 0.00 to INR 200,010 with an average of approximately INR 7,023 indicating noteworthy disparities. These statistics offer insights into household demographics, income distribution, and expenditure patterns, laying the groundwork for further analysis in the study's context.

An attempt has been made to examine how the ration card types are distributed among various households by rural-urban locations. Findings reveal significant disparities in the distribution of ration cards between Panchayats and Municipality/Corporation areas. In Panchayats, Pink Cards (36.0%) and Blue Cards

(26.2%) dominate, with White Cards (19.5%) and Yellow Cards (18.3%) also present. Conversely, Municipality/Corporation areas show a higher prevalence of Blue Cards (43.9%) compared to other types.

A Chi-Square test with a very low p-value (0.0000) confirms the substantial statistical relationship between location and ration card type, emphasizing that card distribution is influenced by geographical location. These findings highlight the importance of location-specific strategies in PDS administration. Recognizing these differences can ensure equitable and efficient food security benefits for vulnerable populations in both urban and rural areas, enhancing access to essential food supplies through the PDS.

When it comes to gender and types of ration cards, it becomes clear that there are notable disparities in the distribution of ration card types between male and female-headed households. Among male-led households, there is a higher prevalence of blue cards (36.4%) and pink cards (28.7%), while female-headed households exhibit a more balanced distribution across card types, including Blue (23.1%), Pink (38.2%), White (23.1%), and Yellow (15.5%) cards. The findings reveal gender-based variations in the distribution of ration card types, with male-headed households showing a higher prevalence of specific card types.

Findings of the study also indicate substantial disparities in the distribution of ration card types among households of various religious affiliations. Among Muslim households, blue cards (44.8%) and pink cards (25.5%) dominate, while Hindu households have a higher proportion of pink cards (43.8%) and yellow cards (30.9%). Christian households exhibit a different distribution, with blue cards (40.0%) and white cards (35.0%) being more prevalent.

The study indicates significant disparities in the distribution of ration card types among households from different caste categories. Among OBC households, blue cards (38.9%) and pink cards (33.4%) dominate, while General caste households have a relatively balanced distribution of Blue, Pink, White, and yellow cards. SC households primarily hold pink cards (86.0%), with minimal white (7.0%)

and Yellow (2.3%) card ownership. In contrast, ST households predominantly possess yellow cards (98.4%), with negligible representation of other card types.

The analysis conducted to examine the distribution of ration card types across various occupation categories demonstrates significant variations in the distribution of ration card types among households based on their occupation. Different occupational groups exhibit distinct patterns of ration card ownership. For daily wage labour households, pink cards (35.4%) and yellow cards (33.8%) are prominent. Self-employed households primarily possess blue cards (52.8%) and few White cards. Unemployed households are characterized by pink cards (46.2%) and blue cards (30.2%). Government job households have a high percentage of White cards (89.7%). Gulf migrant households predominantly hold blue cards (66.7%). Those employed in the private sector mainly have blue cards (50.0%), while retired households primarily possess White cards (72.7%). In summary, the analysis reveals that occupation plays a pivotal role in determining the distribution of ration card types among households, emphasizing the need to consider occupational dynamics in understanding ration card allocation patterns and their implications for equitable access to food security benefits through the Public Distribution System (PDS).

The analysis conducted to see how ration card types are distributed across land holdings unveils significant disparities in the distribution of ration card types based on landholding status among households. Households with no land predominantly possess pink cards (30.2%) and yellow cards (29.3%). Those with landholding less than 10 cents primarily hold pink cards (53.4%). In contrast, households with landholding ranging from 10 to 20 cents are characterized by a prevalence of blue cards (42.3%). For households with landholding ranging from 20 to 50 cents, blue cards (39.3%) and White cards (37.5%) dominate. Among households with landholding ranging from 50 to 100 cents, White cards (47.8%) are most common. Notably, households with landholding exceeding one acre have a significant proportion of yellow cards (72.1%).

The findings of the analysis conducted to examine the disparities in household size and annual income by types of ration cards reveal significant

differences among the groups. In terms of household size, blue card APL households have the highest mean household size (5.4966), followed by White Card households (5.2273), Pink Card BPL households (4.8667), and Yellow Card AAY households (3.7639). This variation is evident in the standard deviation values, indicating the range of household sizes within each group.

On the other hand, when it comes to household annual income, there are notable differences. White Card households have the highest mean annual income (4,589,678.50), followed by blue card APL households (25,916.95), Pink Card BPL households (11,127.60), and Yellow Card AAY households (6,520.14). However, the standard deviation values suggest that there is substantial income variability within each group.

6.2 Food Grain Purchases by Households and Food Deficit

The second section of the study provides the analysis of the food grain purchases by various households from PDS and Open Market to see the extent of food deficit.

The Public Distribution System (PDS) is a crucial component of food security in various nations, notably India, ensuring fair distribution of essential food grains to economically disadvantaged individuals. It involves the government procuring staples like rice and wheat and distributing them at reduced prices through authorized shops to eligible households. This system not only addresses hunger and malnutrition but also acts as a safety net for millions. This section explores the intricate relationship between the PDS and food grain purchase, studying the purchasing patterns of households. This understanding is crucial for assessing the PDS's effectiveness in achieving its objectives and sustaining food security for vulnerable populations.

The study examined the total quantity of rice and wheat purchased by households in the last month, categorized by their ration card type: Blue Card APL, Pink Card BPL, White Card, and Yellow Card AAY. The findings reveal significant variations in mean purchases across the ration card categories.

For rice purchases, Yellow Card AAY households had the highest mean quantity (29.0972 kilograms), followed by White Card households (23.3909 kilograms), Pink Card BPL households (18.6909 kilograms), and Blue Card APL households (18.0134 kilograms). The standard deviation highlighted the extent of variability in rice purchases within each group.

Similarly, for wheat purchases, Yellow Card AAY households had the highest mean quantity (3.5278 kilograms), followed by White Card households (3.1455 kilograms), Pink Card BPL households (3.1636 kilograms), and Blue Card APL households (2.6174 kilograms). The standard deviation indicated the variability in wheat purchases within each group.

The overall statistics showed that Yellow Card AAY households consistently had the highest average purchases for both rice and wheat from PDS.

Additionally, separate analysis of variance (ANOVA) tests was conducted to assess the impact of ration card type on total rice and wheat purchases. The results indicated statistically significant differences among the four ration card categories. It is clear that the type of ration card significantly influences the total quantity of both rice and wheat purchased by households, with Yellow Card AAY households consistently exhibiting higher mean purchases compared to other categories.

Similarly, an analysis was conducted to assess the differences in quantities of food grain purchases from the PDS by different types of card holders.

The study examined the average quantities of different food grains (rice, wheat, sugar, pulses, and kerosene) purchased by households, categorized by their type of ration cards.

For rice purchases, Yellow Card AAY households had the highest average quantity (26.9306 kilograms), followed by Pink Card BPL households (15.7697 kilograms), Blue Card APL households (9.0805 kilograms), and White Card households (4.9591 kilograms).

Similarly, for wheat purchases, Yellow Card AAY households had the highest average quantity (3.6250 kilograms), followed by Pink Card BPL households (3.4242 kilograms), Blue Card APL households (1.0201 kilograms), and White Card households (0.9636 kilograms).

The second part of the analysis involved separate analysis of variance (ANOVA) tests for each type of food grains (rice, wheat, sugar, pulses, and kerosene), examining the differences between groups based on the type of ration card.

The ANOVA tests for the quantity of sugar, pulses, and kerosene purchased also produced highly significant results, highlighting differences in purchasing behaviour across ration card categories.

Overall, these findings bring out the significant influence of the type of ration card on the quantities of various food items purchased by households through the Public Distribution System (PDS) in Kerala. Yellow Card AAY households consistently showed higher average purchases across multiple food grains, indicating the impact of ration card type on food procurement patterns.

When it comes to the average quantity of food grains purchased from the open market by different types of card holders, the study shows significant variations in the average quantities of food items (rice, wheat, pulses, and sugar) purchased from the open market by households, categorized by their ration card type. Blue card APL households purchase the highest average quantity of rice from the open market, followed by White Card households, Pink Card BPL households, and Yellow Card AAY households. Similarly, Pink Card BPL households purchase the highest average quantity of wheat from the open market, followed by blue card APL households, White Card households, and Yellow Card AAY households. For pulses, blue card APL households purchase the highest average quantity from the open market, followed by White Card households, Pink Card BPL households, and Yellow Card AAY households. Finally, Blue card APL households also purchase the highest average quantity of sugar from the open market, followed by White Card households, Pink Card BPL households, and Yellow Card AAY households.

This suggests that the type of ration card plays a role in influencing food purchasing behaviour from the open market, potentially impacting household food security and consumption patterns. These findings underscore the influence of ration card type on the quantities of various food items purchased from the open market. Economically weaker sections are mainly depending on the PDS for purchasing food grains whereas the economically well-to-do families are having their major purchases of food grains from the open market. This shows the positive impact of PDS on enabling food grain provisions to the people.

A separate analysis was conducted to assess the food deficit among households with respect to PDS. It compares the average quantities of various food grains (rice, wheat, sugar, and pulses) purchased through the PDS and from the open market.

For rice, households on average obtain approximately 12.982 kilograms from the PDS and 15.235 kilograms from the open market, resulting in a deficit of approximately -2.25 kilograms per household.

Regarding wheat, the average PDS purchase is about 2.18 kilograms, while from the open market, it is approximately 2.01 kilograms, resulting in a small deficit of approximately 0.17 kilograms per household.

For sugar, households acquire an average of about 0.365 kilograms through the PDS and approximately 4.956 kilograms from the open market, resulting in a substantial deficit of approximately -4.585 kilograms per household.

In the case of pulses, households typically acquire around 0.095 kilograms from the PDS and 3.36 kilograms from the open market, resulting in a deficit of approximately -3.265 kilograms per household.

These findings indicate that, on average, households tend to purchase larger quantities of food items (rice, wheat, sugar, and pulses) from the open market compared to what they receive through the PDS. The negative values for the food deficit indicate that households are supplementing their PDS purchases with

additional quantities from the open market, resulting in an overall deficit in food grains provided through the PDS.

This information highlights potential challenges in food security and access to essential food items for these households, as they rely significantly on the open market to meet their food needs. This gives an interesting insight that the households are not able to depend solely on PDS for food grain purchases.

6.3 Effectiveness of Service Delivery and Public Satisfaction on PDS

The third section of analysis is an attempt to assess the effectiveness of service delivery of PDS and public satisfaction. The Service Delivery Mechanism is a fundamental component of any effective Public Distribution System (PDS). It encompasses the intricate processes and infrastructure that enable the acquisition, storage, transportation, and distribution of food grains, ensuring they reach eligible households. This section delves into the multifaceted nature of the Service Delivery Mechanism within the PDS, seeking to offer a thorough comprehension of its functioning. A streamlined and transparent Service Delivery Mechanism is indispensable for the PDS to achieve its core objectives, which include enhancing food security, mitigating hunger, and alleviating poverty among vulnerable segments of the population.

In terms of household satisfaction with the food grain distribution process through the Public Distribution System (PDS) in Kerala, the data reveals that roughly 20.4% of respondents expressed dissatisfaction. This dissatisfaction may be attributed to various factors, such as irregular distribution schedules, long waiting times at distribution centres, or perceived inefficiencies in the system. The majority, constituting about 70.8% of respondents, reported a moderate level of satisfaction, indicating that while there may be room for improvement, they are generally content with how food grains are distributed through the PDS. A smaller but still significant portion, around 8.9%, expressed a high level of satisfaction, signifying that they perceive the PDS as effectively meeting their food grain distribution needs.

Regarding the satisfaction levels of individuals with the availability of food grains through the Public Distribution System (PDS), approximately 32.1% of respondents expressed dissatisfaction, suggesting challenges in accessing food grains when needed, potentially due to shortages or supply chain limitations. About half of the respondents, totalling 50.8%, reported a moderate level of satisfaction, indicating occasional difficulties but overall satisfaction with grain availability through the PDS. Additionally, around 17.1% of respondents expressed a high level of satisfaction, implying consistent and reliable access to food grains through the PDS.

The analysis also investigates the satisfaction levels of individuals concerning the behaviour of Fair Price Shop dealers, who are responsible for food grain distribution. Notably, a small percentage, approximately 8.3%, expressed dissatisfaction with the behaviour of these dealers. This dissatisfaction could arise from perceived rudeness, uncooperative attitudes, or other negative interactions during the distribution process. A majority of respondents, constituting about 61.3%, reported a moderate level of satisfaction, suggesting generally positive and courteous interactions with Fair Price Shop dealers. Moreover, around 30.4% of respondents reported a high level of satisfaction, indicating consistently positive and accommodating behaviour from the dealers.

The analysis conducted to test the awareness levels of the sample units in terms of food grains availability at fair price shops provides interesting insights regarding their total quantity of food grain entitlement within the Public Distribution System (PDS). These awareness levels are crucial indicators reflecting the beneficiaries' understanding of their rights and entitlements within the PDS framework.

Approximately 35.9% of the respondents reported being "Not aware" of their total food grain entitlement. This percentage suggests that a significant portion of beneficiaries may lack information about the quantity of food grains they are entitled to receive through the PDS. This lack of awareness could potentially lead to underutilization of the PDS benefits due to the informational gap.

Around 30.4% of the respondents indicated that they are "Somewhat aware" of their entitlement, implying that there is room for improvement in disseminating information about entitlements more comprehensively. Beneficiaries in this category may benefit from additional education or communication efforts to ensure they fully understand and utilize their food grain entitlements.

Lastly, approximately 33.7% of respondents reported being "Fully aware" of their total food grain entitlement. This group appears to have a solid understanding of their rights within the PDS, making informed decisions about their food grain purchases based on their entitlements. These individuals may serve as examples of effective communication and awareness-building efforts within the PDS system.

This data shows the importance of effective communication and awareness campaigns within the PDS to ensure that all beneficiaries, regardless of their current awareness levels, are fully informed about their entitlements. This knowledge empowers beneficiaries to make the most of the PDS, contributing to enhanced food security and equitable distribution of essential food grains in Kerala.

When it comes to the distance to be travelled to nearest fair price shops, the findings show that people have mixed responses. Approximately 55.4% of respondents reported that their nearest ration shop is located "Less than one kilometre" from their residence. This close proximity likely enhances their ease of access to the PDS, making food grain procurement convenient.

About 41.7% of respondents indicated that their nearest ration shop is "2 to 3 kilometres" away, signifying a moderate level of accessibility but a somewhat longer commute. While still manageable, this distance may pose a slight inconvenience.

A smaller proportion, approximately 2.8%, mentioned that their nearest ration shop is "More than 3 kilometres" away. This group faces a greater travel distance, which can potentially present challenges, particularly for those with limited transportation options.

The distribution of respondents across these distance categories highlights geographical disparities in access to PDS services, emphasizing the importance of equitable distribution of ration shops to ensure food security for all with ease.

The study also provides insights into the time it takes for beneficiaries to receive their entitlements once they arrive at the distribution points of the Public Distribution System (PDS). This delivery time is crucial for assessing PDS service quality, as it directly impacts beneficiaries' convenience and efficiency in obtaining essential food grains.

Approximately 30.0% of respondents reported a "Less than 10 minutes" delivery time, indicating a quick and efficient distribution process. A significant majority, around 54.4%, mentioned a delivery time of "10 to 30 minutes," reflecting a relatively short wait period. However, a smaller proportion, approximately 7.5%, reported a delivery time of "30 to 60 minutes," suggesting a longer wait but still within a reasonable timeframe.

Notably, about 8.1% of respondents indicated a "More than 60 minutes" delivery time, which may be considered lengthy and could potentially pose challenges for beneficiaries, especially those with time constraints. These findings underscore the importance of efficient distribution processes to minimize waiting times and ensure a smooth experience for beneficiaries within the PDS.

6.4 Effectiveness of PDS and its Impact on Food Security

The fourth and most important section of the analysis chapter deals with the pertinent issues of analysing the impact of PDS on food security.

The study assesses the quality of food grains supplied at Fair Price Shops (FPS) within the Public Distribution System (PDS) in Kerala, categorized by the type of ration card held by beneficiaries. The findings reveal varying levels of satisfaction among different cardholders regarding the quality of food grains they receive.

Among Blue cardholders (APL), a significant percentage expressed being "Very dissatisfied" with the quality of food grains, while Pink cardholders (BPL) also reported a considerable dissatisfaction level. In contrast, White cardholders showed slightly higher satisfaction levels. Notably, Yellow cardholders (AAY) demonstrated the highest satisfaction.

An association analysis was conducted to understand the relationship between the type of ration card and satisfaction with food grain quality. The results indicated a strong and statistically significant association, implying that the type of ration card significantly influences satisfaction or dissatisfaction levels with the quality of food grains received.

Further investigation is needed to identify specific factors contributing to these variations in satisfaction among different types of ration cardholders. Such insights can inform policy decisions aimed at improving the quality of food grain distribution within the PDS to better meet the needs and expectations of beneficiaries across various cardholder categories.

To dig further, analysis also focused on identifying the reasons for being dissatisfied with the PDS.

The presented data reveals various factors contributing to beneficiary dissatisfaction with the quality of food grains distributed through the Public Distribution System (PDS). These factors shed light on specific challenges that need attention for improving food security within the PDS:

Broken Grains: A substantial percentage of beneficiaries expressed dissatisfaction due to receiving broken grains. These grains can compromise the overall quality and nutritional value of the food, emphasizing the importance of ensuring intact and high-quality food grains within the PDS.

High Moisture Content: Some beneficiaries reported dissatisfaction with food grains containing high moisture content. This can lead to spoilage and the growth of fungi, necessitating proper storage and handling practices to prevent such issues.

Insect Infestation: Insect-infested food grains were a concern for a portion of beneficiaries, highlighting the need for effective pest control measures within the PDS supply chain.

Poor Colour: A significant number of beneficiaries cited poor colour as a reason for dissatisfaction. Poor colour may indicate aging or quality issues, emphasizing the importance of maintaining the natural colour and appearance of grains.

Poor Taste: Dissatisfaction with the taste of food grains was reported by a notable percentage of beneficiaries. Improving taste and flavour should be considered to encourage beneficiaries to consume the distributed grains.

Rotten Food Grains: A smaller yet significant portion of beneficiaries received rotten food grains, which are inedible and pose health risks. This issue underscores the need for improved quality control and storage practices.

These findings emphasize the necessity for comprehensive quality control measures and monitoring throughout the PDS supply chain. Strategies should encompass proper storage, transportation, and distribution, alongside training and capacity-building programs for PDS personnel. Establishing beneficiary feedback mechanisms is also crucial for prompt issue resolution and continuous improvement in food grain quality. Ultimately, addressing these factors of dissatisfaction will enable the PDS to better fulfil its mission of providing essential food security to beneficiaries by ensuring access to high-quality and nutritious food grains.

An exclusive analysis was conducted to look into the perceived importance of the Public Distribution System (PDS) in meeting the needs of households, with a focus on categorizing responses based on the type of ration card held by these households.

Among Blue cardholders (APL), approximately 26.5% expressed that they do not consider the PDS to be important when it comes to fulfilling their family's needs. This suggests that a notable portion of blue cardholders may rely on alternative sources to meet their essential requirements.

Conversely, 40.4% of blue cardholders considered the PDS to be "Somewhat important" to their family's needs. This group perceives the PDS as having a moderate level of importance, possibly seeing it as a supplementary source of support alongside other means.

Further, around 31.3% of blue cardholders viewed the PDS as "Important" in fulfilling their family's needs. This indicates that a substantial number of blue cardholders also rely on the PDS as a significant source of essential provisions, highlighting its importance to them.

In a smaller but still notable percentage, approximately 11.7% of blue cardholders deemed the PDS "Very Important." This group places high importance on the PDS in fulfilling their family's needs, considering it a critical source of support. This analysis demonstrates that Blue cardholders (APL) exhibit diverse opinions regarding the importance of the PDS in meeting their family's needs. While a significant portion considers it important, others do not view it as a primary source of support.

In contrast, pink cardholders (BPL) and yellow cardholders (AAY) overwhelmingly find the PDS important, with a substantial percentage deeming it "Very Important." White cardholders fall in between, with a notable proportion considering the PDS important. This shows that the weaker sections depend on the PDS for meeting their family needs. This calls for a more targeted approach to ensure that deserving class of people enjoy the benefits.

These varying perceptions among different types of ration cardholders highlight the need for targeted interventions, improved service delivery, and communication campaigns to raise awareness about the PDS's role in meeting family needs. Ongoing monitoring and evaluation are essential to ensure that the PDS aligns with the expectations and priorities of its beneficiaries across various cardholder categories.

Major focus of this study is to bring out the impact of PDS on food security and hence a greater importance is placed on this in the analysis. This analysis

examines the effectiveness of the Targeted PDS in ensuring food security in Kerala, evaluating how households perceive their food security based on their participation in the TPDS program.

Among blue cardholders (APL), approximately 35.2% do not feel secured in terms of food security due to TPDS, indicating that some blue cardholders may not find the program effective. This can also be due to the fact that the provisions for blue card holders are mainly limited to rice.

Pink cardholders (BPL), on the other hand, largely feel "Moderately Secured" in terms of food security through TPDS (31.3%). While TPDS contributes to their food security, there is room for improvement.

Interestingly, a smaller percentage of blue cardholders (APL), around 20.3%, report feeling "Highly Secured" due to TPDS, indicating that this group perceives the program as highly effective in meeting their food security needs. In contrast, yellow cardholders (AAY) overwhelmingly feel "Highly Secured" (44.6%), suggesting that TPDS is perceived as highly effective in ensuring food security among this group.

Overall, Blue cardholders exhibit mixed perceptions, pink cardholders feel moderately secured, and yellow cardholders view TPDS positively in terms of food security.

These findings highlight the importance of tailoring TPDS policies to the specific needs and perceptions of different ration cardholder categories to enhance overall food security in Kerala. Starting from the issuance of ration cards based on the economic status of the people to allocation and distribution of food grains through PDS should follow an evidence-based approach without any scope for political interventions. If done properly, it can undoubtedly be told that PDS is an effective mechanism to ensure food security.

This study, to have more understanding of the wider impact of PDS on food security digs deeper into the level of uncertainty experienced by beneficiaries when

interacting with their local ration shops under the PDS, shedding light on the quality of these interactions.

Approximately 36.7% of respondents reported no uncertainty in their dealings with ration shops. For them, interactions are straightforward and predictable, with minimal challenges or uncertainties.

The majority, around 51.0%, indicated that they sometimes experience uncertainty when dealing with ration shops. While interactions are generally smooth, occasional instances of ambiguity or unpredictability introduce uncertainty into their PDS experiences.

A smaller group, roughly 12.3%, reported frequent uncertainty when interacting with ration shops. This group consistently faces challenges when accessing their entitled food items, leading to a higher level of uncertainty.

These findings highlight the varying degrees of uncertainty that beneficiaries encounter when engaging with ration shops within the PDS. While a substantial portion reported no uncertainty, it is essential to maintain and further enhance the transparency and efficiency of ration shops.

For those who sometimes or frequently experience uncertainty, efforts to address and mitigate these challenges are crucial. Factors contributing to uncertainty may include issues such as stock availability, operating hours, distribution delays, and adherence to eligibility criteria.

Addressing these concerns through improved inventory management, regular operating hours, and better communication can help reduce uncertainty and enhance the overall effectiveness of the PDS. Efforts to minimize uncertainty in interactions with ration shops are vital, as they contribute to improved beneficiary experiences and ultimately support the overarching goal of the PDS – ensuring food security for all.

An analysis was also conducted to focus on assessing the effectiveness of the Targeted Public Distribution System (PDS) in ensuring food security among

households in Kerala, especially those vulnerable to food insecurity. Instead of quantifying food security through traditional measures, this study relies on households' assessments of the Targeted PDS's impact on their food security. Respondents were asked to rate the extent to which the Targeted PDS ensures food security in their households on a scale of 1 to 3, with 1 indicating "not secured," 2 indicating "moderately secured," and 3 indicating "highly secured."

The results indicate that a significant portion of respondents falls into the category of "Moderately Secured," comprising about 74.2% of the total. These households feel that the Targeted PDS contributes to their food security to some extent but may not entirely eliminate their food security concerns. Additionally, there is a group of respondents, approximately 10.9% of the total, who self-assessed as "Not Secured." This suggests that they still face challenges in accessing enough food through the Targeted PDS. On the other hand, a smaller but notable percentage, about 14.9% of the total, falls into the category of "Highly Secured." These households believe that the Targeted PDS is very effective in ensuring their food security needs are met.

These findings provide insights into how households perceive the effectiveness of the Targeted PDS in terms of food security. While a majority considers it moderately effective, a significant portion feels that it is either not very effective or highly effective. These assessments highlight the varying degrees of impact the Targeted PDS has on food security among different households and underscore the importance of continuous evaluation and improvement of the program to better meet the needs of vulnerable populations.

Factors Affecting Self-Assessed Food Security

The impact of various factors on the self-assessed effectiveness of the Targeted Public Distribution System (TPDS) in ensuring food security was investigated using an Ordered Probit regression model. Self-assessed food security served as the dependent variable, while factors such as the type of ration card holder, urban/rural location, caste group, landholding, distance to the Public Distribution

System (PDS), income, and household size were considered as independent variables.

Among the findings related to the type of ration card, households with Yellow Cards (AAY) had a significant percentage self-assessing as "Not secured," whereas Pink Card (Priority BPL) holders did not report as "Not secured" at all. Households with other types of cards fell in between these two extremes.

Regarding urban/rural location, urban households had a higher percentage self-assessing as "Not secured" compared to rural households, which had a higher percentage self-assessing as "Highly Secured."

The analysis also explored self-assessed food security levels based on caste group and landholding status, revealing further insights into how these factors are associated with food security perceptions.

Additionally, the impact of distance to the PDS was examined. Households living more than 1 km away had a higher percentage self-assessing as "Highly Secured" compared to those living less than 1 km away. This suggests that proximity to the PDS may influence how households perceive their food security in relation to the TPDS.

These findings demonstrate the complex interplay of various factors in shaping households' self-assessed food security levels and highlight the need for a nuanced understanding of the dynamics involved in the effectiveness of the TPDS in different contexts.

Additionally, the study offers insights into the mean differences in household size and log household income across different self-assessed food security levels, categorized as "Not secured," "Moderately secured," and "Very secured."

Regarding household size, households self-assessed as "Not secured" have an average size of approximately 5.57 members, with a small standard error of about 0.289. In contrast, those categorized as "Moderately secured" have a mean household size of approximately 4.97, characterized by a smaller standard error of

about 0.084. The "Very secured" category exhibits a mean household size of roughly 4.55, accompanied by a standard error of about 0.167. This suggests a descending trend in mean household size from "Not secured" to "Very secured" food security categories, indicating that households perceiving themselves as "Not secured" tend to have larger average household sizes compared to those in the other categories.

Shifting focus to log household income, households self-assessed as "Not secured" have a mean log household income of approximately 3.98, with a standard error of about 0.138. Among "Moderately secured" households, the mean log household income is approximately 3.99, marked by a smaller standard error of about 0.034. In the "Very secured" category, the mean log household income is roughly 3.73, with a standard error of about 0.063. Unlike household size, mean log household income shows relatively minor differences across the three food security categories. "Moderately secured" households display slightly higher average income levels compared to the other two categories.

These mean differences provide valuable insights for researchers and policymakers interested in understanding the relationships between household size, log household income, and self-assessed food security levels within the studied population. They illuminate potential factors that may influence food security outcomes, emphasizing the importance of considering household characteristics and income levels in food security assessments and interventions.

Further, the analysis employed an Ordered Probit regression model to investigate the factors influencing self-assessed food security among households.

Findings from the regression analysis reveal several significant factors affecting self-assessed food security as follows:

Ration Card Type: Holding Yellow Card (AAY) and Pink Card (Priority BPL) had a positive impact on food security. Households with these priority cards were more likely to report higher levels of self-assessed food security, indicating that government efforts to provide these cards have positively affected food security among vulnerable populations.

Rural/Urban Location: Rural households were more likely to perceive higher levels of food security compared to urban households. Factors contributing to this difference may include agricultural activities, access to government food distribution programs, and cost of living variations between rural and urban areas.

Caste Group: The SC/ST category showed a positive effect on food security, with higher self-assessed food security levels compared to households in the general category. However, the OBC category did not exhibit a statistically significant impact on food security, suggesting the need for further evaluation of policies targeting this group.

Landholding: Not holding any land positively influenced self-assessed food security, indicating that reduced agricultural dependence may contribute to a greater sense of food security. Households with some land reported lower food security perceptions.

Distance to PDS Shops: Proximity to PDS shops positively affected self-assessed food security, making it easier for households to access subsidized food items and improving their perception of food security.

Household Income and Family Size: Household income and family size did not have a statistically significant impact on food security among the studied households.

In summary, these findings highlight the effectiveness of government policies, such as priority ration cards and proximity to PDS shops, in promoting food security among vulnerable populations. The rural-urban divide, caste categories, and landholding status also play significant roles in shaping self-assessed food security. However, household income and family size did not emerge as significant factors in this context. These insights are valuable for policymakers and researchers in designing targeted interventions to enhance food security within the study area.

6.5 Households' Responses to Digitalization of the Public Distribution System (PDS)

The data presented in the analysis reflects households' responses concerning the digitalization of the Public Distribution System (PDS) and its potential to expedite the delivery of essential goods. The responses are categorized based on the type of ration card held by the households.

A notable proportion of respondents across different ration card categories expressed uncertainty about the impact of digitalization on PDS delivery speed. They were uncertain whether this shift towards digital processes would result in quicker and more efficient deliveries.

Conversely, some respondents from each ration card group held a positive outlook, believing that digitalization could indeed lead to faster PDS deliveries. They perceived the adoption of digital technologies as a means to enhance the overall efficiency of the PDS.

However, a substantial percentage of respondents, particularly among blue and pink cardholders, expressed scepticism. They doubted that the implementation of digital processes would lead to expedited deliveries. This scepticism highlights the need for clear communication and awareness campaigns when introducing digitalization initiatives within the PDS. Addressing the concerns of these ration cardholders is essential to ensure the successful adoption of digital technologies and to reap the potential benefits of increased efficiency in the PDS.

6.6 Impact of PDS on Nutritional Status

The responses gathered from households regarding the role of ration shops in improving nutritional status reflect diverse viewpoints. While a minority of respondents agreed that the distribution of quality goods through ration shops positively contributes to nutritional well-being, a similar percentage disagreed with this notion, expressing scepticism about the impact of ration shops.

The majority of respondents fell into the categories of "Somewhat agree" and "Agree," indicating a prevailing belief that ration shops do have a positive influence

on nutritional status, albeit with varying degrees of certainty. These households acknowledge the potential of ration shops to enhance nutritional well-being to some extent.

On the other hand, a smaller percentage of respondents either "Strongly disagreed" or "Disagreed" with the statement, suggesting dissatisfaction or doubt regarding the nutritional benefits of ration shops. Factors influencing this scepticism may include concerns about the quality of goods distributed, accessibility to the shops, or the adequacy of the ration in meeting nutritional requirements.

To address these diverse perspectives and concerns, it is crucial for governments overseeing the Public Distribution System (PDS) to prioritize the quality and variety of food items available in ration shops. Additionally, efforts should focus on raising awareness about the nutritional advantages of the PDS and improving the accessibility and affordability of essential goods. This comprehensive approach will help ensure that ration shops effectively contribute to improving the nutritional status of households, aligning with the broader goal of food security.

An assessment of the nutritional quality of food grains distributed through the Public Distribution System (PDS) reveals diverse perceptions among households. The majority of respondents view the nutritional quality as "Average," suggesting a perception of moderate nutritional value. However, a significant portion rates it as "Poor" or "Very Poor," indicating concerns about the nutritional adequacy of PDS food grains.

On the other hand, some respondents see the nutritional quality as "Good" or "Very Good," indicating a positive perception of the quality and nutritional benefits of PDS food grains. To address these varying perceptions and improve nutritional quality, initiatives to enhance the quality and diversity of food items within the PDS and raise awareness about their nutritional benefits are crucial.

Responses regarding the role of the Public Distribution System (PDS) in improving the nutritional safety of economically disadvantaged individuals vary. While a majority of respondents believe that the PDS contributes to enhancing

nutritional safety for the poor, a significant percentage remains uncertain or sceptical. This diversity of opinions highlights the need for effective communication and awareness campaigns to educate the public about the PDS's role in enhancing nutritional security and to address any misconceptions or doubts. It also underscores the importance of continuous evaluation and improvement of the PDS to ensure it effectively fulfils its mission of providing nutritional safety for economically vulnerable populations.

6.7 Policy Recommendations

This study undoubtedly proves that PDS is an effective tool in ensuring food security. If implemented properly, people, especially those at lower levels of financial status will get benefits from PDS.

Based on the findings of this study on the effectiveness of the Public Distribution System (PDS), few policy recommendations are listed to enhance the PDS and improve food security:

1. **Income-Based Entitlements:** Recognize the varying income levels of beneficiaries and adjust food entitlements accordingly. Increase food entitlements for middle-income households to bridge the gap between their needs and current entitlements. This will enhance the satisfaction level of middle-class individuals. Also, government should ensure that no vested interests play a role in properly identifying the beneficiaries.
2. **Quality Assurance:** Implement stringent quality control measures to ensure that the food grains and products distributed through the PDS meet established quality standards. Regular inspections and certifications can help maintain product quality.
3. **Dissemination of Information:** Enhance communication channels to provide beneficiaries with timely and accurate information about their entitlements each month. Utilize technology such as SMS notifications or mobile apps to keep beneficiaries informed.

4. **Nutritional Enhancement:** Collaborate with nutrition experts to improve the nutritional content of food items provided through the PDS. Introduce more diverse and nutrient-rich options to address nutritional deficiencies.
5. **Transparency:** Increase transparency in PDS operations by implementing digital tracking systems that allow beneficiaries to monitor stock availability, delivery schedules, and entitlements. Publish this information online and in local languages for accessibility.
6. **Prevention of Corruption:** Implement strong anti-corruption measures within the PDS, including regular audits and strict penalties for corrupt practices. Transparency in procurement and distribution can prevent corruption to a great extent. Involve civil society organizations and local communities in monitoring and reporting corrupt practices.
7. **Beneficiary Targeting:** Strengthen the identification and verification of beneficiaries to ensure that those in need receive the appropriate ration cards. Periodic reviews and updates of beneficiary lists are crucial to prevent ineligible individuals from taking advantage of the system.
8. **Social Safety Nets:** Consider supplementary programs to support the most vulnerable households, such as direct cash transfers or additional food assistance beyond the regular PDS entitlements.
9. **Feedback Mechanism:** Establish a robust feedback mechanism that allows beneficiaries to voice their concerns, complaints, and suggestions. Act on this feedback to continuously improve the PDS.
10. **Capacity Building:** Invest in training and capacity building for PDS staff to improve service delivery and ensure that beneficiaries are treated with respect and dignity.
11. **Regular Evaluation:** Conduct regular evaluations and impact assessments of the PDS to measure its effectiveness in achieving food security goals. Adjust policies and strategies based on evaluation results.

12. **Partnerships:** Collaborate with non-governmental organizations, community-based organizations, and local authorities to enhance the reach and effectiveness of the PDS.

By implementing these policy recommendations, governments can work towards a more efficient, transparent, and equitable Public Distribution System that effectively addresses food security concerns and meets the diverse needs of the populations.

6.8 Scope for Future Research

The Public Distribution System (PDS) has long served as a critical component of food security initiatives, aiming to provide essential food items to economically disadvantaged households across the nation. As an essential lifeline for millions, the PDS plays a pivotal role in addressing hunger, malnutrition, and ensuring that marginalized populations have access to basic sustenance. While the present study offers valuable insights into the effectiveness of the PDS in enhancing food security, it is crucial to recognize that the scope for further research in this domain extends beyond the current investigation.

As the present study focuses on specific dimensions of the PDS's impact on food security, it is imperative to acknowledge the existence of uncharted territories and unexplored facets. These unaddressed aspects present ripe opportunities for future research to broaden our understanding of the PDS's functioning and its implications on the well-being of beneficiaries.

In this context, this research envisions an expansion of the scholarly work to cover the following areas:

1. **Impact of Digitization on PDS:**

While the current study provides insights into the overall effectiveness of the PDS, the transformative impact of digitization remains an understudied dimension. Future research could undertake an in-depth analysis of the digitization process within the PDS to evaluate its impact on enhancing

effectiveness, improving service delivery, ensuring transparency, and preventing corruption.

2. Quantitative Assessment of Food Security:

Though the current study employs qualitative methods to gauge food security perceptions, there exists a need for quantitative assessments. Future research can quantitatively assess food security by analysing the actual quantities of food provided through the PDS vis-à-vis the nutritional requirements of beneficiaries. This approach enables a more precise evaluation of food security gaps and their determinants.

3. Nutritional Analysis of PDS Food:

A deeper understanding of the nutritional quality of food items distributed through the PDS is essential. While feedback from beneficiaries is valuable, future research could employ scientific analyses to comprehensively assess the nutritional composition of PDS food products. Collaborative efforts with nutrition experts and laboratories can elucidate the nutritional adequacy of PDS items in meeting dietary guidelines.

By exploring these unexplored areas, future research can contribute significantly to the existing body of knowledge regarding the PDS's multifaceted role in ensuring food security. These avenues for exploration not only expand the scholarly discourse but also hold the potential to inform policy decisions, leading to the enhancement of food security initiatives that positively impact the lives of millions across the nation.

6.9 Conclusion

The effectiveness of the Public Distribution System (PDS) in ensuring food security in India in general and in Kerala in particular is a multifaceted issue. This study explored various aspects, providing valuable insights for policymakers and future research. PDS is found to be playing an important role in providing food security for the people in general. Majority of the sample units studied are utilizing

the services provided by PDS. However, there are variations in degrees depending on various factors such as income status and other socio-demographic features. However, it is undoubtedly proved that PDS is an effective food safety programme.

Income plays a significant role, with lower-income individuals perceiving the PDS as a lifeline, while middle-income groups felt their food entitlements were insufficient and hence showing their dissatisfaction about the effectiveness of PDS.

Quality concerns regarding the food grains supplied through the PDS highlights the need for quality assurance measures. Similarly, Information and general awareness remains to be a challenge, emphasizing the importance of improving communication about entitlements for various beneficiaries. People also feel that there needs to have transparency and anti-corruption measures to enable greater openness and integrity in PDS operations.

It can be recorded that the PDS is an effective government mechanism and if implemented properly with transparency and openness, this will play a vital role in eliminating poverty and ensuring food security for the people.

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APPENDIX

QUESTIONNAIRE

General Information

1. Your Name :
2. Your District :
- i. Malappuram
- ii. Palakkad
3. Sector of your Residence:
 - i. Rural
 - ii. Urban
4. Type of your ration card :
 - i. Yellow Card (AAY)
 - ii. Pink Card (BPL)
 - iii. Blue Card (APL)
 - iv. White Card
5. Gender of Household Head:
 - i. Male
 - ii. Female
 - iii. Other
6. Total Number of Members in the Household:
 - i. Up to 2
 - ii. 3- 5
 - iii. 6-9
 - iv. 10 and more
7. Your Religion:
 - i. Muslim
 - ii. Hindu
 - iii. Christian
 - iv. Other
 - v. No Religion
8. Your caste:
 - i. General
 - ii. OBC
 - iii. SC
 - iv. ST
9. Your Employment and Occupation
 - i. Daily wage worker
 - ii. Self employed
 - iii. Gulf migrant
 - iv. Private company job
 - v. Government job

vi. Retired

vii. Unemployed

10. Your Educational Qualification:

i. Below SSLC

ii. SSLC

iii. Higher Secondary

iv. Degree and above

11. Your holding Cultivable agricultural land:

i. No land

ii. Less Than 10 Cents

iii. 10 to 20 Cents

iv. 20 to 50 Cents

v. 50 Cents to 1 Acre

vi. More Than 1 Acre

12. Do you have any other real assets including buildings?

i. Yes

ii. No

13. Average Monthly income of the household :

14. Average Monthly Expenditure of the Household :

15. Average Monthly Expenditure on Food items

16. Total Kilogram of Rice being purchased in a Month:.....

17. Total Kilogram of Wheat being purchased in a Month:.....

Effectiveness of PDS

18. Total kilogram of rice you get from PDS in a month

19. Total kilogram of wheat being purchased by you from ration shop in a month

20. Are you regularly using your ration card to purchase food articles from the Public Distribution System (PDS)?

i. Not regularly

ii. Regularly

21. What are the items you get from ration shop? 1. Rice 2. Wheat

3. Ragi and other Millets 4. Pulses 5. Sugar 6. Kerosene

7. Atta

22. What is the total kilogram of sugar you get from the ration shop in a month?

23. What is the total kilogram of pulses you get from ration shop in a month?

24. What is the total quantity of kerosene you get from ration shop in a month?

25. Are you clearly aware of the total quantity of food grain you are entitled per month from the ration shop?

i. I am not clearly aware

ii. I am somewhat aware

iii. I am clearly aware

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26. What is the total quantity of rice you buy from the shops other than ration shop in a month
27. What is the total quantity of wheat you buy from the shops other than ration shop in a month
28. What is the total quantity of pulses you buy from the shops other than ration shop in a month
29. What is the total kilo of sugar you get from the ration shop in a month?
30. What is the total kilo of sugar you get from the ration shop in a month?
31. What is the average price you pay for one kg sugar from outside?
32. What is the average price you pay for one kg sugar from outside?
33. How satisfied are you with the distribution timing of food grains at the ration shop?
- i. Not satisfied
 - ii. Moderately satisfied
 - iii. Highly satisfied
34. How satisfied are you with the availability of food grains at the ration shop?
- i. Not satisfied
 - ii. Moderately satisfied
 - iii. Highly satisfied
35. How satisfied are you with the behavior of the ration shop dealers?
- i. Not satisfied
 - ii. Moderately satisfied
 - iii. Highly satisfied
36. What is the distance to the ration shop from your home?
37. How much time does it take for your transactions to be complete at the ration shop?
38. How satisfied are you with the quality of food grains supplied at the ration shop?
- i. Not satisfied
 - ii. Moderately satisfied
 - iii. Highly satisfied
39. What are the reasons for your dissatisfaction with the quality of food grains supplied from the ration shop? You can choose more than one.
- i. Rotten food
 - ii. Broken grains
 - iii. Poor colour or adulterated food
 - iv. Insect infested food
 - v. poor taste of food
 - vi. high moisture content in the food
40. How important is ration shop (PDS) in meeting your family needs?
- i. Not at all important
 - ii. Somewhat important

- iii. Important
- iv. Very important
41. The government introduced Target PDS to ensure minimum required food grains for people living below the poverty line. Please rate your opinion on a scale of 1 to 3 regarding whether the Targeted PDS ensures food security in your household:
- i. It is not secured
- ii. It is moderately secured
- iii. It is very secured
42. How satisfied are you in the availability and quantity of food grains from PDS?
- i. Not satisfied
- ii. Moderately satisfied
- iii. Highly satisfied
43. Do you face any sort of uncertainties from ration shops (PDS) such as lack of availability of food grains, changes in quantity or exclusion of any items being supplied through ration shops?
- i. No
- ii. Sometimes yes
- iii. Yes
44. How satisfied are you in digitization of PDS Delivery?
- i. Not satisfied
- ii. Moderately satisfied
- iii. Highly satisfied
45. Do you think that the digitization has helped in enhancing the speed of delivery?
- i. Never
- ii. Not sure
- iii. Yes
46. Do you think that the digitization of ration shops has made the distribution process very transparent and that you are able to ensure that you receive items as per the government allocation?
- i. Never
- ii. Not sure
- iii. Yes
47. What do you think are the problems associated with PDS? (Tick the appropriate ones, you can choose more than one)
- i. Lack of availability of food grains
- ii. Lack of quality of food grains
- iii. Lack of nutritional quality in food grains
- iv. wastage of food grains
- v. not sure about monthly provisions
- vi. changes without prior information

- vii. corruption
- viii. non-transparent approach of ration shops
48. How do you perceive the ration card issued to you?
Please tick the most appropriate answer.
- i. Official ID card
- ii. Government support to access food safety
49. Mark your response to following statement: food being served through PDS helps in improving nutritional status of households.
- i. Strongly disagree
- ii. Disagree
- iii. Agree
- iv. Somewhat agree
- v. Strongly agree
50. What is your perception about the nutritional qualities of the food you get from ration shop?
- i. Very poor
- ii. Poor
- iii. Average
- iv. Good
- v. Very good
51. Considering the price and accessibility of food items through the ration shops, do you think that the public distribution system plays a role in improving the nutritional safety of poor people?
- i. No
- ii. Not sure
- iii. Yes