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Food Security and the Role of Public Distribution System -A Case Study of KBK and Non-KBK Regions in Odisha

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ABSTRACT

This study was conducted to assess the functioning of the Public Distribution System (PDS) in Odisha one of the poorest state in India faced with multiple challenges of poverty, malnutrition, and hunger. The results, based on primary Survey from the village level indicate a positive turnaround in the functioning of PDS in the state. Although PDS is playing major role in providing food security to the poor household with significant contribution in calorie and protein intake in rural Odisha, but the proportion of undernourished and malnourished population is highest among poorest of poor households having highest PDS access.

Keywords: Public Distribution System, Food Security, Nutrient Intake, Odisha. JEL: Z18

1. INTRODUCTION

The public distribution system (PDS) in India has been in existence before independence and received key importance after the Bengal famine in 1940.Initially, it had a limited objective to meet the food requirements during war and famine periods. After the inception of the Five Year Plans during the fifties, the system has secured a prominent place in providing distribution of essential commodities at subsidised rates to ensure food security. It has become a key instrument in a country like India, where vast population has been living under poverty, and malnutrition, and is unable to purchase necessary commodities from open market George (1996) Parasuraman and Rajaretnam (2011).

With economic development taking place rapidly in the country, the role of the PDS has changed. Earlier, it was viewed as a mechanism to mitigate misery caused by food shortages. The situation was different in the past due to food deficiency. The PDS was used as a channel to distribute the grains imported by the government with basic funds or received as aid from abroad Sundaram (1990). The PDS was sustained largely by importof food grains under the PL 480 arrangement with the USA. The dependence on imported food grains in 1951 was as high as 60 percent and went up to 88 percent in 1961. In the subsequent years following the adoption of high yielding variety technologies under the green revolution, import consistently declined due to Gulati and Krishna (1975). The demand on the PDS and role expected from it is entirely different today. The country is reasonably self-sufficient in food grains, though a vast section of the population lacks economic access to the food. So the PDS has become important instrument to supply necessary commodities to the vulnerable section of society through fair price shops, mobile vans, co-operative societies and other government agenciesSurinder (1992). It isnow considered to be an instrument to achieve national objectives such as growth with stability, social justice and improvement in the consumption standards of the vulnerable sections of the society.

However, the PDS is afflicted with serious problems. Studies indicate that food not reach the people who really needs suggesting high inclusion and exclusion errors Khera (2011). Although India has the largest network of distribution system, loopholes such as underweighment, irregularities of FPS, distance of FPS from residential areas, less viability of FPS, diversion of food grain in open market, identification of the poor, targeting have become the major challenges to ensure food security, especially in the rural areasKhera(2013), Himanshu and Sen (2012, 2014) and Mahendra (1998, 2003).It has been realized that even after achieving self-sufficiency in food grains and other food commodities at the national level, ensuring food security at the household level continues to be a major challenge. India isstill home to one third of the world's undernourished children, with half of themeither with stunted growth or underweight, and about one third of Indian womenare underweight Joshi, Kadiyala, and Dev (2011).A shift from universal to targeted PDS in 1997 also faced criticism on account of the above mentioned factors.

As part of the reform process, and also implementation of the NFSA 2013, many states have initiated steps to improve the distribution of food. Odisha, one of the poorer Indian states have been making efforts in this direction. The PDS plays an important role inthe state to ensure food security to the poor and vulnerable sections of the society. Most of research work related to functioning of PDS reveals problems like diversion of food grain and exclusion of poor household from the ambit of ration scheme till mid 2000.However,based on the NSS data many authors have shown thatthe functioning of PDS has improved in terms of outreach and per capita consumption by beneficiaries over the period Chatterjee, Rehman, Nagavarapu and Sekhri(2014), Dreze and Khera and Puri (2013).

This paper aims to examine the impact of reforms in the PDS in providing food security to the households in the rural areas of Odisha. The food insecurity at the household level is estimated based on the nutrient intake of an individual by using the quantity of each food item consumed. The food conversion into calorie, protein and fat has been done on the basis of nutrient chart provided by the NSSO in report no. 540 on nutritional intake.Primary data was collected from 385 households in three villages, one from each district in rural Odisha based on census of household during 2014-15. The survey was carried out in KBK and Non-KBK regions, which is considered a poorest region of Odisha. The Koraput and Balangir districts are under KBK region and Nayagarh is under Non-KBK region. The nutrition requirement and undernourishment are estimated on the bases of Age, Sex and work adjustment recommended by ICMR-NIN, dietary allowance for Indians 2010.A multiple regression method has used to examine the determinants of energy consumption.

The paper is divided in five sections. Following introduction, section 1 highlights reforms in the Public Distribution System to evaluate the expected effects. Section 3 analyses monthly per capita consumption from PDS and other sources and section 4provides estimate on the level of nutritional intake and magnitude of undernutrition and malnutrition and the determinants of nutritional intake. The last section concludes.

2. REFORMS IN THE PDS IN ODISHA

In 2011, the food supply and consumer welfare department, under the Odisha government abolished private storage agencies and introduced departmental storage centre to deliver commodities at the door step for fair price shop in four districts on pilot basis. The system was scaled up further in twenty six districts in 2012. All the existing RRCs (Rice Receiving Centre) have been converted to Departmental Storage Centre (RRC-cum-DSC) for storing food grains. In all the districts food grains are transferred to fair price shops through empanelled level-II handling and transportation contractors. So far, 243 level-II handling and transportation contractors has been engaged throughout the state to deliver commodities to fair price shops by carrying it from departmental storage centres. Departmental storage system has been combined with door step delivery of food items to the FPS dealers to ensure reach of these items in remote locations. Even citizen participation has ensured by providing transportation information through SMS alerts to those who give their mobile phone number in the transparency portal of the website of the department.

To monitor the supply chain system in PDS, a computerized supply chain management system is developed by OMEGA-TASAT. This software application covers all operations of deports which includes inward and outward movement of PDS commodities, collection from fair price shop and stock accounting. This software automatically produces management information system (MIS) reports for block level, sub division level district level and state level officers. All the receipts and issue of commodities by different agencies are recorded systematically in the system. This is done to curb corruption in the procurement and issue of commodities as part of reforms in the PDS. It has been found during the survey period from the officialsthat before 2004-05, the system was inflicted with massive corruption. It has drastically reduced because of the ICT revolution, under which the official has to enter all the business related to PDS commodities online. It has a centralized monitoring system by the Ministry of Food and Supply and Odisha State Civil Supply Corporation Limited. Some of the key reforms that the Odisha government has initiated towardsbringing reforms in the procurement and distribution systemare as follows.

2.1. Receipt of Custom Milled Rice

Odisha state civil supply corporation (OSCSC) is one of the leading procurement agencies in the state engaged to procure paddy from the farmers during kharif and rabi seasons in a year. Registered custom millers in the district or in neighbouring districts collect paddy from paddy procurement centres for processing as directed by the OSCSC. The millers deliver custom milled rice as per the delivery schedule given by the district administration in the delivery certificate. Miller has to deliver custom milled rice at the rice receiving centre (RCC) or depot in lots containing 20 MT/ 27 MT or any other size as specified by government/ OSCSC.

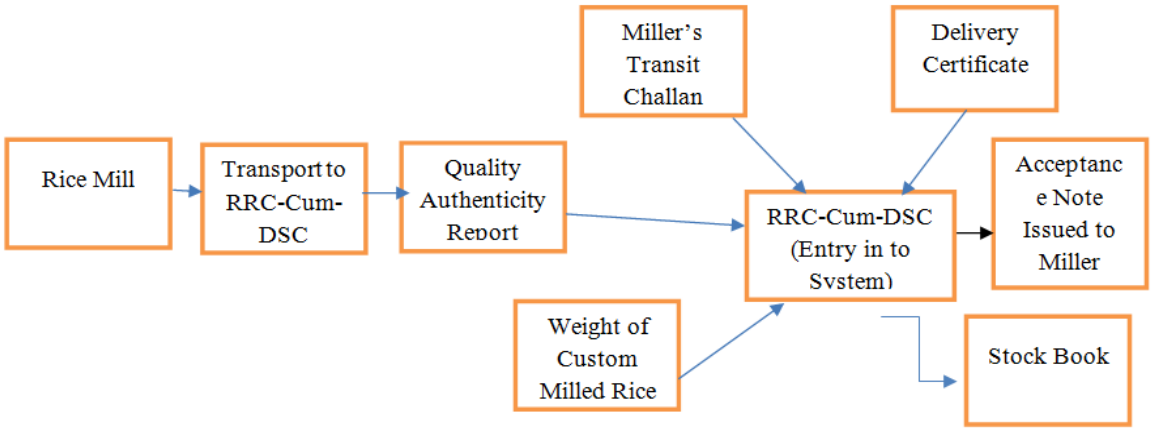

Figure 13.1: Process Followed in Receipt of Custom Milled Rice

The above figure shows different steps that need to be completed before receipt of custom milled rice which shows the transparency in the receipt process. When the truck with load arrives at the depot, representative of the miller submits miller's transit challan which is recorded in the software. Sample of rice is taken randomly to check the quality of rice and the result of each parameter found in testing is recorded in the system and then rice is taken for weighing if found acceptable. After receiving rice, acceptance note is issued to the miller for the delivery of custom milled rice. Rice receivedin a register, rice stock register and miller's performance register is updated automatically in the system. All other receipts from railway rack, inter-depot receipt and the sugar receipt at different zonal depot same process is followed by the receiving centres.

2.2. Issue of Grains to Fair Price Shop/ Gram Panchayat and Consumers

To avert diversion of grain to open market while lifting from depot to fair price shops, many states have introduced an online system. The state Chhatisgarh has gone one step ahead by monitoringthe grain loaded trucks through the GPS system. The process being adopted by Odisha is depicted in Fig.13.2.

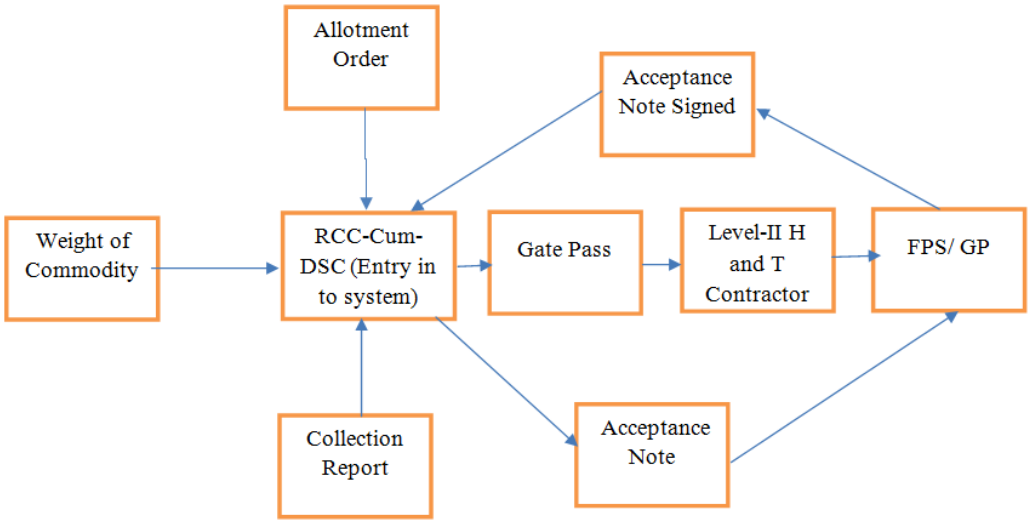

Figure 13.2: Process of Issuing Commodity to Fair Price Shop and Gram Panchayats

The depot- in-charged issues stock as per deposits made by the FPS and bulk consumer at the departmental storage centre (DSC) either directly by deposit slip or by online deposit. All the distribution and allotment order is recorded in the system. Depot-in-charge then verifies the collection report that is required amount against the allotted quantity is deposited by FPS/ GP and bulk consumer. After the verification the allotted amount of quantity is loaded in the vehicles of selected level-II handling and transporting contractor and sent for weighing. After weighing in front of FPS/GP/BC representatives it is recorded in the system. A gate pass is issued to the representative of transport contractor as a permission to carry the loaded commodities. An acceptance note is issued along with the gate pass. The beneficiaries receive information regarding the issue of commodity automatically through SMS and issue register, stock register and contractor's Performa automatically gets updated through the system. After delivery of the commodity at FPS/ GP/ BC, the n-charge of FPS/GP/BC fills in the acceptance note and returns back the signed copy to the depot. The acceptance detail against issued commodity is recorded in the system. Same process is followed in inter-depot issues and issues from railway rack in the state.

2.3. Collection of Amount from Fair Price Shop and Gram Panchayat

The fair price shop owner and Gram Panchayat representative are supposed to deposit the cost of allotted commodities like rice, wheat and sugar every month. Fair price shop may deposit the required amount either through demand draft or online deposit through bank.

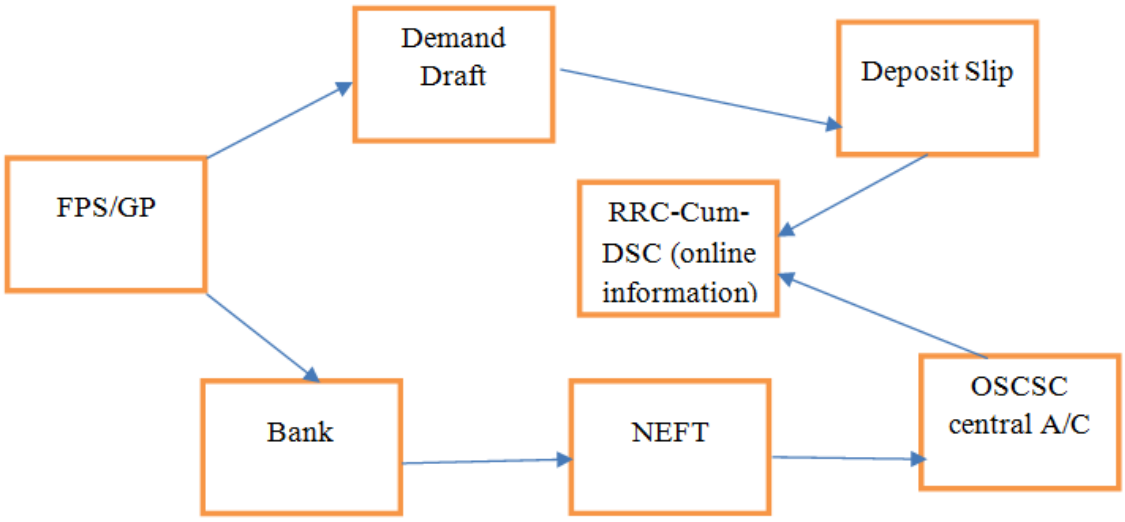

Figure 13.3: Process of collecting amount from FPS and GP

The GP and FPS owner personally visit the depot and submit demand draft along with the deposit slip. It is the responsibility of the depot in charge to submit all collected demand draft with deposit slips at the office of the CSO. In case of online payment, the GP and FPS owner transfer the cost of commodity to central Axis bank account of OSCSC through NEFT. Information regarding the deposits by GP and FPS is electronically transferred to the depot and all the payment information is gathered online. After going through all the process the fair price owner and GP representative get SMS alert or call from deport in charge about the clearance of allotment against their deposits within two or three days. After checking the quality and quantity the procurement inspector takes pictures of all three persons *i.e.* vehicle driver,

Level II contractor's representative and GP representative. These will go to the sub-collector and nearby police station. The loaded vehicle then moves from depot with gate pass and acceptance note to the fair price shop or gram panchayat. The respective gram panchayat member (three members nominated by gram sabha) receives commodity by doing initials on the acceptance note and return back to depot in charge. All the process gets entry into the system.

2.4. Data Audit and Reporting

The transactions related to issue and receipts done at depot level are captured by the data entry operator. As we know most of the software allows the data entry operator to edit already entered data to correct any erroneous entry. In this way anybody may make unwanted modification to the enter data intentionally by taking advantage of data editing facility. Data verification and auditing facility is provided in the system to restrict such unwanted data modification and to ensure the correctness of enter data into the system. After entry of every transaction computer generates an instrument and that is signed by the depot in charge as authorized signatory. A copy of each such instrument is kept by the depot in charge for future reference. At the end of the day, the depot in charge verify the enter data by comparing information in the instrument with the specific report generated by the system. If the data gets tallied, depot in charge mark the verified transaction as audited. Once audited by the depot in charge the transactions are locked and cannot be edited by the data entry operator any more.Similarly transaction of depot level be verified and audited at the district level by CSO-cum-District Manager on weekly basis. Once audited at the district level the data cannot be modified even by the depot in charge. By following this process there is very less chance of corruption inprocurement and distribution of commodities at the ground level with the help of information and communication technology.

2.5. Advisory and Monitoring Systems at Different Level

The most important factor for the success of PDS relies on the efficient and corruption free system at the grass root level. Sometimes it might happen that in village the most influential person tries to make pressure on the distributor and most of the monthly quota of poor household gets diverted to the non-poor effluent households. To make distribution system more effective and efficient, it needs to have good monitoring system at grass root level. It was observed in many villages in the KBK as well as non-KBK regions that the state has strengthened the monitoring system at grass root level. Odisha seems to be following the Chhatisgarh government's distribution model which is known as the best model in the country. To ensure efficient working of PDS at ground level, the government has formed different advisory and monitoring committee on the direction of food and supply ministry at block, town and gram panchayat levels. The subsequent section highlights the extent to which the reformed PDS has influenced consumption patterns in the KBK and Non-KBK regions in Odisha and contributed to food and nutritional security.

3. HOUSEHOLD CHARACTERISTICS IN SURVEY AREA

This section analyzes the socio-economic profile of the households surveyed**.** In this study, the three villages selected for the survey are located in three different districts, namely Nayagarh, Balangir and Koraput. These districts represent the poorest districts in Odisha. The three districts represent all three regions of NSSO Koraput falls in the southern region, Balangirin the northern region and Nayagarh in the coastal region of Odisha. There is comparatively high poverty ratio in the selected districts than in any other district in Odisha. (Insert Table 13.1)

Table 13.1
Household Characteristics in Survey Area

District	*Nayagarh*	*Koraput*	*Balangir*
Village Surveyed	*Durgaprasad (Coastal Region)*	*Mali Doliamba (Southern Region)*	*Bomunda (Northern Region)*
Total Number of HH	150	136	99
Male Headed HH (%)	92.7	89	79.8
Female Headed HH (%)	7.3	11	20.2
Average Land Size (in Hectare)	.14	1.45	1.42
% of Landless HH	89.90	44.12	18.67
	Major Source of Income of HH		
Farm Cultivation (%)	5.3	88.2	58.6
Casual Labour (Agriculture and Non-Agriculture in %)	71.3	9.6	38.4
Illiterate Head of HH (%)	59.3	74.3	19.2
	Percentage of HH having Ration Card		
AAY	11.3	6.6	16.2
BPL	20	44.9	48.5
APL	47.3	0.7	17.2
No Card	21.3	47.8	18.2

Source: Computed From Field Survey

Table 13.1 shows that the percentage of male-headed households in the entire district is high as compared to female-headed in the study area. Balangir has the maximum female-headed households with 20 percent of the total households, followed by Koraput with 11 percent and Nayagarh with 7.3 percent. The distribution of households on the basis of the major sources of income in the study area reveals that majority of households derive their annual income from cultivation in the Koraput and Balangir districts, around 88.2 percent in Koraput and 58.6 percent in Balangir. In Nayagarh, 71.3 percent of households derive their annual income from casual labor in agriculture and other informal sectors like construction worker etc. However this is low in Koraput at 9.6 percent and similarly in the Balangir district with 38.4 percent households. It is clear that the majority of households in all districts derive their annual income either from agriculture, or from working as casual labourers in agriculture and other non-agriculture sectors. It seems that other sources of income like non-agriculture enterprises contribute very less in the income. Most of the households in the districts depend on agriculture directly or indirectly for their daily earning in the entire region of study area. Average land size is lowest in Nayagarh .14 hectare followed by Balangir 1.42 hectare and Koraput 1.45 hectare. The landless household is highest in Nayagarh (89.90 percent) followed by Koraput (44.12 percent) and Balangir has lowest at 18.67 percent.

The above table 13.1 also shows that the majority of the head of households are illiterate in Nayagarh and Koraput districts, *i.e.* 59.3 percent and 74.3 percent respectively. On the other hand, in the Balangir district, 19.2 percent of household heads are illiterate. It is evident from table 1.1 that the households owning AAY cards is highest in Balangir district at 16.2 percent, followed by Nayagarh district at 11.3 percent and then Koraput district at 6.6 percent. The maximum proportion of BPL cardholders is in Balangir with 48.5 percent of households owning BPL cards, followed by Koraput with 44.9 percent households and 20 percent households in Nayagarh. On the other hand, the proportion of households having APL cards that is generally issued to high-income households is highest in Nayagarh at 47.3 percent followed by Balangir at 17.2 percent and Koraput at 0.7 percent. In case of APL cardholders in Nayagarh, the households are entitled to get only wheat and kerosene from PDS as the government follows targeted public distribution system. However, all the APL and BPL cardholding households in Koraput and Balangir districts are entitled to receive rice at Rs.1, as the government follows universal PDS system. 47.8 percent of households in Koraput, 21.3 percent in Nayagarh and 18.2 percent in Balangir do not have any card, which implies that most of the households do not own ration cards in the villages. The proportion is very high in Koraput district, followed by Nayagarh and Balangir districts. During the survey period, it was observed that most of the joint families were separated into nuclear families after the BPL census. On the other hand, in the targeted system, the card cannot exceed the given target and this has become a major problem for the new households, as they are unable to obtain ration cards even after repeated applications. Most of the poor households seem to be out of the system after the BPL census in 1997.

4. MONTHLY PER CAPITA CONSUMPTION FROM PDS AND OTHER SOURCES

Table 13.2
Monthly Average Per Capita Consumption from All Sources in 2014-15

Commodities	*Nayagarh*	*Koraput*	*Balangir*	*All District*
		Consumption From PDS (in kg)		
Rice	2.92 (21.50)	4.95 (38.20)	7.06 (46.22)	4.70 (33.75)
Wheat/Atta	0.45 (43.98)	_	0.07 (3.84)	0.19 (26.45)
Kerosene	0.68	0.84	0.66	0.73
		Consumption From Open Market (in kg)		
Rice	7.3	0.22	4.3	4.03
Wheat/Atta	1.3	0.24	2.7	1.28
Kerosene	--	--	--	--
		Consumption From Own Source (in kg)		
Rice	--	6.38	2.28	2.84
Wheat/Atta	--	--	--	--

Source: Computed from Field Survey 2014-15
Figure in Parenthesis shows contribution of PDS in total consumption

We begin with an evaluation of the different sources of food grain consumption in the surveyed areas. As has been mentioned, rice is the staple food and is the only source of providing food security to people in the rural areas. Most of the rural poor are dependent on the PDS for their daily consumption of rice in the surveyed regions, especially the landless casual labourers in Nayagarh and Balangir. A household having big family size depends more on the open market. The monthly quota supplied through PDS is not enough for them to maintain their consumption. (Insert Table 13.2)

In Koraput and Balangir districts, some households used to produce rice in their own small land holdings. These households did not depend much on the PDS for consumption of rice. As is clear from Table 13.2, the average monthly per capita consumption from PDS commodities in the study area of three districts is 4.7 kg. The consumption of PDS rice in Balangir district is the maximum at 7.06 kg, which contributes 46.22 percent of total consumption followed by Koraput with 4.95 kg contributes 38.20 percent and Nayagarh with 2.92 kg contributes 21.50 percent of total consumption. In case of PDS wheat, the monthly average per capita consumption inNayagarhis 0.45 kg, followed by Balangir at 0.07 kg. However, it is almost nil in the Koraput district. The consumption of kerosene is highest in Koraput with 0.84 litre, followed by Nayagarh with 0.68 litre and then 0.66 litre in the Balangir district. Table also shows thatthe consumption of rice in the Nayagarh district from open market is higher than from PDS On the other hand, in the KBK districts, the consumption from open market is lower than from PDS. In case of wheat/atta, consumption from open market is higher than PDS in all districts. The consumption from own produce is nil in the Nayagarh district. It is 6.38 kg in Koraput and 2.28 kg in Balangir. (Insert Table 13.3)

Table 13.3
Card wise Monthly Average Per Capita Consumption from PDS (in kg) in 2014-15

Commodities	*APL*	*BPL*	*AAY*
		Nayagarh	
Rice	--	7.50 (62.39)	12.3 (76.24)
Wheat/Atta	0.95 (71.21)	0.02 (0)	--
Kerosene	0.60	1.20	1.4
		Koraput	
Rice	8.0 (71.42)	8.85 (71.09)	13.93 (87.46)
Wheat/Atta	--	--	--
Kerosene	1.33	1.59	1.76
		Balangir	
Rice	9.3 (53.62)	7.92 (54.13)	10.0 (63.73)
Wheat/Atta	0.41 (16.66)	--	--
Kerosene	0.77	0.85	0.71
		All Districts	
Rice	1.87 (12.21)	8.24 (63.36)	11.74 (73.88)
Wheat/Atta	0.84 (66.60)	0.01 (0)	--
Kerosene	0.64	1.25	1.21

Source: Computed from Field Survey

Figure in Parenthesis shows contribution of PDS in total consumption

The average monthly per capita consumption by different cardholders reveals that the monthly per capita consumption of PDS rice by AAY cardholders is the maximum and contributes more than sixty percent of total consumption in all districts. Across the districts, the highest consumption is in Koraput with 13.93 kg, followed by Nayagarh with 12.3 kg and 10 kg in Balangir. In case of BPL cardholders, the monthly average per capita consumption of PDS rice is 8.85 kg in Koraput, 7.92 kg in Balangir and 7.50 kg in Nayagarh. The Odisha government follows universal PDS in KBK region and it is clear from Table 1.3 that in Koraput and Balangir districts, which fall in the KBK region, the monthly average per capita consumption by APL cardholders is 8.0 kg and 9.3 kg respectively. In the Balangir district, the average monthly per capita consumption by APL cardholders is more than the BPL cardholders.The average per capita consumption of wheat seems to be very low and only confined to the APL cardholder in all the districts. In case of kerosene, the monthly per capita consumption by AAY and BPL cardholders is high in all three districts. (Insert Table 13.4)

Table 13.4
Card wise Monthly Average Per Capita Consumption from Open Market (in kg) in2014-15

Commodities	*APL*	*BPL*	*AAY*
		Nayagarh	
Rice	9.0	3.7	2.7
Wheat/Atta	0.5	0.7	6.2
Kerosene	--	--	--
		Koraput	
Rice	--	0.1	--
Wheat/Atta	--	0.2	0.1
Kerosene	--	--	--
		Balangir	
Rice	3.5	3.2	2.6
Wheat/Atta	0.4	2.7	8.0
Kerosene	--	--	--
		All District	
Rice	7.9	1.9	2.1
Wheat/Atta	0.5	1.1	5.6
Kerosene	--	--	--

Source: Computed from Field Survey

Table 13.4 shows card wise monthly average per capita consumption from open market. It is clear that the consumption of rice from open market by APL cardholders is high in all districts, except Koraput, which is nil from open market. However, in case of wheat/atta, the consumption of AAY cardholders from open market is higher than other cardholders in all districts, except Koraput, where the consumption of BPL cardholders is higher than all other cardholders. Furthermore, consumption of rice from open market in all districts is the highest by APL cardholders, followed by the BPL cardholders. (Insert Table 13.5)

The card wise monthly average per capita consumption from own sources also shows that in both Koraput and Balangir districts, the per capita consumption by APL cardholders is the highest followed by BPL cardholders.

Table 13.5
Card Wise Monthly Average Per Capita Consumption from own Produce (in Kg) in 2014-15

Commodities	*APL*	*BPL*	*AAY*
		Nayagarh	
Rice	--	--	--
Wheat/Atta	--	--	--
		Koraput	
Rice	3.3	3.1	2.5
Wheat/Atta	--	--	--
		Balangir	
Rice	2.6	2.3	2.1
Wheat/Atta	--	--	--
		All District	
Rice	0.5	2.2	1.4
Wheat/Atta	--	--	--

Source: Computed from Field Survey

4.1. Per capita energy intake from PDS and Market (all sources)

This section examines the per capita per day energy intakes in terms of calorie, protein and fat of households from all sources and the contribution of different items, especially items supplied through PDS in the survey area. As per planning commission norms on calorie intake in rural and urban areas *i.e.*, 2400 Kcal and 2100 Kcal respectively, the average per capita calorie intake is lower than the requirement in all districts in the rural areas. The per capita protein intake is also lower than the ICMR recommended dietary allowances (RDA henceforth) for Indians in 2010.The per capita fat intake is higher than the RDA in all districts. Table 1.6 shows that the per capita calorie and protein intakes in rural areas are lower than the standard requirement, whereas the per capita fat intake is higher than the standard requirement as per ICMR RDA, if we consider that people indulge in sedentary work. (Insert Table 13.6)

It has been observed that most of the people in rural Odisha are indulging in hard physical work *i.e.* as agricultural and casual labourers. In this case, they require more calorie and protein. Although the work status has not been captured, the data shows that major occupation of the households is labour. Hence, 2400 Kcal calorie intake seems to be essential for the rural population engaged in the physical work.(Insert Table 13.7)

Table 13.6
Monthly Per Capita Per Day Average Energy Intake in 2014-15

District	*Calorie (Kcal)*	*Protein (gm)*	*Fat (gm)*
Nayagarh	2038.25	51.27	31.34
Koraput	2270.88	53.91	39.90
Balangir	2324.57	53.01	32.68
All District	2194.05	52.65	34.71

Source: Computed from Field Survey

Table 13.7
Card Wise Monthly Per Capita Per Day Average Energy Intake in field area in 2014-15

District	*APL*	*BPL*	*AAY*	*NO Card*
		Calorie(Kcal)		
Nayagarh	2037.32	1982.72	2467.73	1864.22
Koraput	2749.12	2272.85	2815.91	2170.82
Balangir	2494.90	2279.42	2636.7	2006.66
All District	2143.96	2212.50	2606.71	2059.81
		Protein (gm)		
Nayagarh	52.51	48.75	59.53	46.50
Koraput	59.34	52.32	65.54	53.09
Balangir	57.27	50.12	64.79	46.22
All District	53.94	50.79	62.82	50.18
		Fat (gm)		
Nayagarh	36.77	26.25	24.89	27.51
Koraput	63.63	35.60	37.53	43.91
Balangir	32.65	29.35	46.01	29.75
All District	36.28	31.43	35.64	37.13

Source: Computed from Field Survey

Table 13.7 shows the card wise per capita monthly average energy intake in all the districts. It indicates that the average energy intakes of AAY cardholders in all districts are more than other cardholders, and are more than the minimum requirement in rural area as per planning commission norms. The average energy intakes by BPL cardholders are less than that of the APL cardholders. It is also clear that the calorie intake of APL cardholders is more than the minimum requirement in Koraput and Balangir districts, but it is less in the Nayagarh district, where APL households do not get rice from PDS under targeted PDS system.

On the other hand, the government follows universal PDS in Koraput and Balangir districts, where APL households also gets rice from PDS at the same price as BPL and AAY households. The monthly per capita expenditure on fruits and vegetables is high in two districts, Nayagarhand Koraput. However, Table 13.8 shows that cereal and cereal substitutes are the major source of calorie and protein intake in all districts. It also shows that cereal (wheat + rice) supply through PDS scheme highly contributes to nutrition intake in rural Odisha. (Insert Table 13.8)

Table 13.8
Percentage Share of Different Food Item in energy Intake in field area in 2014-15

Nutritional Intake	*Cereals and Substitute*	*Pulses*	*Milk and Milk Product*	*Meat and Fish*	*Fruits and Vegetables*	*Others (Edible Oil, Sugar)*
			Nayagarh			
Calorie	68.04(16.67)	7.61	1.94	1.50	10.44	10.82
Protein	63.27(16.20)	15.85	2.46	8.95	9.34	0.03
Fat	10.3 (3.06)	6.00	5.16	6.91	6.99	63.5
			Koraput			
Calorie	67.64 (23.98)	4.37	2.05	2.01	9.28	14.62
Protein	65.14(22.70)	9.63	3.11	11.94	9.15	0.06
Fat	6.6 (2.44)	3.28	6.60	6.75	18.32	57.1
			Balangir			
Calorie	75.48 (32.23)	7.61	.71	.84	3.57	13.76
Protein	71.42 (31.25)	18.11	0.80	5.93	3.67	0.05
Fat	9.8 (4.37)	6.81	1.48	4.64	1.26	75.99
			All District			
Calorie	69.82 (31.68)	6.31	1.66	1.51	8.26	12.92
Protein	66.03 (22.36)	14.23	2.26	9.23	7.81	0.04
Fat	8.86 (3.18)	5.3	4.72	6.66	9.52	64.5

Source: Computed from Field Survey. Figure in Parenthesis shows contribution of PDS food grain (Rice + Wheat)

Table 13.8 shows the contribution of different food items in macro energy intake. We note that cereal and cereal substitutes contribute 60 to 70 percent in calorie and protein intake in all field areas. Cereal and its substitutes appear to be a major source of calorie and protein intake in rural Odisha. The contribution of cereal and cereal substitutes in calorie and protein is 68.04 percent and 63.27 percent respectively in the Nayagarh district. In the Balangir and Koraput districts, contribution in calorie is 75.48 percent 67.64 percent respectively, and contribution in protein is 71.42 percent and 66.14 percent respectively. In case of cereal, contribution of PDS cereal is higher in the Koraput and Balangir districts as compared to the Nayagarh district. This is due to the different policies followed by the government in different regions. The card wise study shows that the contribution of PDS cereal in calorie and protein intake is the highest amongthe AAY cardholders. This indicates how important PDS is in rural areas for the poorest of the poor households.

From the above analysis, we can see that the contribution of PDS cereal in calorie and protein intake is higher in Koraput and Balangir districts as compared to the Nayagarh district. This is because the government follows universal PDS scheme in KBK (Balangir and Koraput district) region. Although the average nutrition intake is lower than the minimum requirement in all districts, it is still high in the area where government follows universal PDS scheme as compared to the targeted PDS. The study also shows that the average nutritional intake of the poorest of the poor households holding AAY cards is more than the minimum requirement in rural Odisha, and this is possible only because of the efficient and transparent public distribution system in rural Odisha.

4.2. Prevalence of Under Nutrition and Malnutrition in the study regions

This section analyses the nutrition requirement as per ICMR norms and prevalence of under nutrition and malnutrition on the basis of ICMR, as well as FAO norms, in the selected regions. The study strive to find out the per capita per day energy requirement by making adjustment on the basis of demographic features of households such as age, sex and work and actual intake by households on the basis of consumption of different items. Table 13.9 shows the average actual intake and requirement and prevalence of under nutrition and malnutrition in the field area in all three districts. It is observed that the per capita average actual intakes of both calorie and protein are less than the requirement in all the districts. Furthermore, the prevalence of undernourished population is the highest in Nayagarh with 57 percent of total population, followed by Balangir with 55 percent and Koraput with 38 percent, on the basis of ICMR norms. On the basis of FAO norms, it is lower in both Nayagarh and Koraput districts, but is the same in the Balangir district when compared with analysis on the basis of ICMR norms. The proportion of malnourished population is the highest in the Balangir district with 52 percent of the population, followed by Nayagarh with 48 percent and then Koraput with 31 percent. The ratio of undernourished and malnourished population in the Koraput district appears to be lower than the other two districts. (Insert Table 13.9)

Table 13.9
Nutrition Intake Requirement and Prevalence of Under Nutrition in Field Area in 2014-15

District	*Calorie (Kcal)*		*Protein (gm)*		*Undernutrition*	*Malnutrition*
	ICMR-NIN Norms	*Actual Intake*	*ICMR-NIN Norms*	*Actual Intake*	*ICMR-NIN Norms (in percent)*	*ICMR-NIN Norms (in percent)*
Nayagarh	2801	2041	62	51	57 (44)	48
Koraput	2908	2300	64	54	38 (10)	31
Balangir	2859	2325	62	53	55 (55)	52
All District	2854	2206	63	53	50 (35)	43

Source: Computed From Field Survey (Figure in bracket shows as per FAO norms)

Table 13.10 shows the situation among different cardholders in all three districts. It also shows that the per capita actual intake of calorie is lower among all cardholders across the districts, except in Koraput. In case of APL cardholders, the average per capita actual intake is higher than the requirement only in the Koraput district, as per ICMR norms. However, in case of protein, APL cardholders in both the Nayagarh and Koraput districts show higher actual intake compared to requirement, while the actual intake is lower than the requirement for all other cardholders in all districts. It seems that 40 to 60 percent of the population is undernourished and malnourished with varying proportion across different card types in all the districts. The proportion of undernourished and malnourished population is highest among AAY cardholders as compared to other card holders in all the districts. In case of Nayagarh district, undernourishment and malnourishment is high in the households without ration cards on the basis of ICMR norms. By applying FAO norms, the proportion of under nutrition seems to be much lower than that with ICMR norms, except in the Balangir district where it has increased in case of BPL households. (Insert Table 13.10)

Table 13.10
Card Wise Nutrition Intake and Requirement and Prevalence of Under Nutrition in Field Area in 2014-15

Card Type	*Calorie (Kcal)*		*Protein (gm)*		*Under nutrition*	*Malnutrition*
	ICMR-NIN Norms	*Actual Intake*	*ICMR-NIN Norms*	*Actual Intake*	*ICMR-NIN Norms (in percent)*	*ICMR-NIN Norms (in percent)*
			Nayagarh			
APL	2253	2040	50	53	47 (40)	40
BPL	3047	1986	68	49	62 (47)	53
AAY	4054	2473	89	60	60 (44)	51
NO Card	3121	1866	70	46	81 (52)	66
			Koraput			
APL	1640	2023	33	59	0 (0)	0
BPL	3364	2298	74	52	43 (14)	38
AAY	3976	2833	86	66	72 (0)	72
NO Card	2352	2200	51	53	30 (7)	20
			Balangir			
APL	3185	2495	69	57	56 (36)	56
BPL	2853	2280	62	50	57 (61)	52
AAY	2776	2637	61	65	61 (46)	61
NO Card	2640	2007	58	46	41 (61)	41

Source: Computed From Field Survey (Figure in bracket shows as per FAO norms)

Table 13.11 shows the nutrition requirement, actual intake and prevalence of under nutrition and malnutrition among different social groups in the field area. It is clear from the table that the actual intake is less than the requirement for calorie and protein as per ICMR norms in all districts among all social groups. On the basis of ICMR norms, the proportion of undernourished population is the highest in OBC at57 percent, followed by ST at 49 percent, other caste at 40 percent and then SC at 39 percent. (Insert Table 13.11)

Table 13.11
Social Group Wise Nutrition Intake and Requirement in Field Area in 2014-15

Social Group	*Calorie(Kcal)*		*Protein (gm)*		*Undernutrition*	*Malnutrition*
	ICMR-NIN Norms	*Actual Intake*	*ICMR-NIN Norms*	*Actual Intake*	*ICMR-NIN Norms (in percent)*	*ICMR-NIN Norms (in percent)*
			Nayagarh			
ST	-	-	-	-	-	-
SC	-	-	-	-	-	-
OBC	2807	2048	62	51	56 (44)	48
Other	2654	1880	57	52	77 (35)	42
			Koraput			
ST	2555	2072	56	50	35 (19)	29
SC	-	-	-	-	-	-
OBC	3020	2486	63	59	100 (0)	100
Other	2969	2338	65	55	38 (8)	30
			Balangir			
ST	3261	2580	71	59	56 (57)	49
SC	2376	2028	51	46	39 (83)	39
OBC	2638	2182	57	49	58 (44)	58
Other	-	-	-	-	-	-
			All District			
ST	3029	2413	66	56	49 (44)	42
SC	2376	2028	51	46	39 (83)	39
OBC	2769	2082	61	51	57 (44)	51
Other	2953	2316	65	54	40 (10)	31

Source: Computed From Field Survey (Figure in bracket shows as per FAO norms)

Further, the malnourished population is the highest in OBC at 51 percent, then ST at 42 percent, SC at 39 and others at 31 percent in all districts. On the basis of FAO norms, the proportion of undernourished population is less than that as per ICMR norms, except in case of SC population, where it has increased from 39 percent to 83 percent. In all the districts, there does not seem to be a huge difference between the proportion of undernourished and malnourished population among all social groups. Under nutrition, caused due to deficiency of calorie, is less among the socially deprived population such as SC and ST, while it is higher in OBC and other social groups. However, malnourished population, resulting from deficiency of protein, is high among the socially deprived population i.e. OBC, ST and SC in all districts.

Table 13.12
Determinants of Nutrition Intake in 2014-15

Dependent Variable Per Capita Nutrition Intake (Log Calorie and Log Protein)				
Explanatory Variables	*Poor*		*Non-Poor*	
	β Coefficient	*Sig. Level*	*β Coefficient*	*Sig. Level*
Income	.045	0.639	.293	0.000
Cereal Consumption PDS	.429	0.000	.078	0.009
Cereal Consumption Market	.419	0.000	.108	0.004
Land Size	.201	0.301	.071	0.859
HH Size	-.856	0.000	-.580	0.000
Social Group (base Others®)				
ST	.303	0.131	.256	0.136
SC	.089	0.742	.407	0.023
OBC	-.163	0.286	-.004	0.962
Education of HH Head (® Literate)	.029	0.855	.060	0.238
HH Head Age	-.260	0.125	-.042	0.618
Constant	11.57	0.000	9.11	0.000
R2	0.81		0.29	
No. of Observation	55		330	
Results by using Dummy for Poor and Regions				
	β Coefficient		Sig. Level	
Income	0.216		0.000	
Cereal Consumption PDS	0.126		0.000	
Cereal Consumption Market	0.187		0.00	
Land Size	0.012		0.779	
HH Size	-0.688		0.000	
Social Group (Others®)				
ST	0.242		0.089	
SC	0.388		0.020	
OBC	0.036		0.704	
Education of HH Head (® Literate)	-0.010		0.860	
HH Head Age	-0.031		0.705	
Non-Poor (® Poor)	-.243		0.020	
Koraput	.155		0.265	
Balangir	.057		0.521	
Constant	9.633		0.00	
R2	0.41			
No. of Observation	385			

Source: Computed from Field Survey. ® Indicates Reference Variable.

The study has observed that the households with APL cardholders are better off in terms of nutrition intake in all the districts. In Nayagarh the households having no card are worse off than the cardholders. They can not avail the PDS commodities. Moreover being landless these households have maximum level of undernourished population (81 percent) as compared to Balangir and Koraput where it is 41 and 30 percent respectively. The analysis across the social groups shows that a high proportion of the population is undernourished and malnourished. Among all the social groups, the SC and ST, i.e. the socially deprived sections, appear to be better off in terms of nutrition outcome as compared to the OBC's in all the districts, which can be attributed to PDS.

5. DETERMINANTS OF NUTRITIONAL INTAKE

This section estimates the key determinants of nutritional intake for poor and non-poor households in the three most poor districts of Odisha. It is hypothesized that availability of food under PDS will have a positive impact on nutritional intake of the poor households more. The other determinants can be annual income from all sources, household size, age, education of head of household, size of land holding, monthly per capita consumption of cereal and caste status. A multiple linear regression model has been used where nutritional intake (calorie and protein) is taken as the dependent variable.

The empirical evidence shows that household size and cereal consumption from both PDS and open market is major determinants the nutritional intake of poor household in field area. Cereal consumption from open market and PDS has positive impact on nutrition intake with elasticity value 0.419 and 0.429 respectively at 1 percent level of significance. The education level of head of household, land owned by household and income also shows positive impact, however it is statistically insignificant. (Insert table 13.12)

The house hold size and age of head of household shows negative impact on nutritional intake with elasticity value -.856 and -.260 respectively but age of head of household and caste status of household is statistically insignificant. On the other hand the regression result for non-poor household shows same result, but the elasticity value of PDS cereal is less as compared to poor household. The above regression result in table 6.35 shows that elasticity value of cereal consumption from PDS in case of poor household is more than open market consumption, however in case of non-poor household elasticity value of open market cereal consumption is more than PDS cereal consumption. It shows the importance of PDS cereal in providing food security to the poor in rural Odisha. The above table also analyzes regional variations in nutrition intake by using dummy for regions and poor instead of having separate equations for poor and non-poor. The result shows no change in relationship only the magnitude of coefficient has changed for all explanatory variables which show lower when dummy is used for poor household. Result shows that nutritional intake of non-poor household is 0.243 less than poor household, however it is statistically insignificant. Regional variation in nutritional intake shows that in Koraput and Balangir nutritional intake is .155 and 0.57 respectively higher than Nayagarh, however it is statistically insignificant. The regional variation shows that region which follows universal PDS scheme nutritional intake is higher as compare to targeted PDS. It is clear that income of household, cereal consumption from open market and PDS and household size are major determinants of nutrition intake both for poor and non-poor households. Out of all determinants it seems that the consumption of cereal from PDS is major determinant of nutrition for poor households.

6. CONCLUSION

The main objective of this paper was to examine the functioning of the public distribution system and its contribution to food and nutrition securityinthe KBK and Non-KBK regions in Odisha.The study also analyzed the factors that determine food security of the selected households and the contribution of the PDS.The data is gathered from 385 households in 2014-15 through village census.

It is found that cereal is the major source of nutrition intake in rural Odisha and PDS plays an important role in food security of the households. The average intake of calorie and protein in universal PDS system in Koraput and Balangirregionis more than the targeted PDS system in Nayagarh region, suggesting that universal PDS is more effective than the targeted in providing food security. Average per capita consumption from PDS is highest in Balangir (7.06 kg) followed by Koraput (4.95 kg) and Nayagarh (2.92 kg). On the other hand the contribution of PDS cereal in total energy intake (Calorie, Protein and Fat) is also highest in Balangir (67.85 percent) followed by Koraput (49.12 percent) and Nayagarh (35.93 percent).

The average calorie intake of AAY is more than the requirement but in case of all other card holders it is lower than requirement, which reveals importance of PDS cereal in providing food security to the vulnerable section of society. Age and sex adjusted nutrition requirement and actual intake shows that actual intake of APL household is more than requirement and for all other cardholders actual intake is less than requirement in all districts. Prevalence of undernourishment among poor households is more than the rich households in the study area.

The econometric analysis of determinants of food security shows that annual income of household and cereal consumption from open market and PDS are main factors which have positive impact on nutrition intake of poor as well as non-poor households. Other factors such as education level and land owned by household shows positive impact on nutritional intake but are statistically insignificant. On the other hand, household size, caste status and age of head of household has negative impact on nutritional intake, however it is statistically insignificant in case of age and caste status. One key finding of the regression analysis is that the elasticity value of cereal consumption from PDS is high and positive among all other variables for poor households, which shows the importance of PDS cereal for poor to maintain nutrition norms for healthy life.

To sum up the reform measures initiate by the state government in ensuring food security call for applause and should be replicated in states that are yet to implement the "National Food Security Act" and reform their respective distribution systems. Many studies have emphasized on dietary diversification to ensure appropriate nutritional intake of large segments of poor population.This may be an important step to be taken up in states where revamped PDS is firmly making a ground, such as inTamil Nadu, Gujarat, Madhya Pradesh, Chhattisgarh and Bihar.As a prerequisite, it is imperative to hasten implementation of the NFSA across the country. Provision has been made under the NFSA to provide one additional coarse cereal viz. millet along with wheat and rice, which can further enhance the nutritional security of the poor households.Though wheat and rice contribute significantly to energy intake, the time has come to increase our focus on coarse cerealsand pulses to improvise adequate intake of protein. Serious deliberations are required to makethis possible through the PDS, which is going to cater to a sizeable population in the near future. As elicited above, the AAY households have a greater access to PDS but the problem of undernourishment is more serious among them.

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