

# Food Subsidy

## Concept, Rationale, Implementation Design and Policy Reforms

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This paper counters negative advocacy about the food subsidy, the public distribution system, and farm price supports. It argues that the public food supply chain for market intervention has a favourable impact on the cost-benefit ratio, poverty reduction, calorie consumption by the poor and productivity-led agricultural growth. The paper proposes reforms for the six pillars of the public food supply chain. These include: an alternative poverty line concept that is linked to the minimum “norms” for calorie intake enabling a reduction of the exclusion and inclusion errors, procurement just for the PDS and buffer stocks to be purchased at a farm price that is fully cost-based, fair price shops with fixed and adequate time of operations, “indent” of the demand, doorstep delivery, and so on.

### 1 Introduction

This paper challenges the advocacy of relying on the private market by replacing food procurement, stocking and distribution via the Food Corporation of India (FCI) and the public distribution system (PDS) with food coupons. The advocates of direct cash transfers to the poor contend that the present food policy involving the FCI is inefficient and very costly, and, in any case, a minimum support price (MSP) is not needed now that most paddy and wheat land is under high-yielding varieties, and food distribution through the PDS is dysfunctional, leaky and unbeneficial compared to a direct transfer of the food subsidy (FS) (Dutta and Ramaswami 2001; Ganesh Kumar et al 2008). Our questioning is based on a perception that the FS results from the three interconnected public systems for procurement, farm price supports (FPS), and distribution, the vertically integrated supply chain for delivery of food to the poor (Figure 1, p 37). The public food support chain (PFSC) was initiated in the mid-1960s in the wake of two droughts, an opportunity to transfer new scientific knowledge and inputs for productivity-led agricultural growth, and discontinuation of the PL-480 food aid from the US. The first of these conditions periodically occurs, while the second one continues.

The concept of FS and its rationale are discussed in the following two sections. These set the stage for analysing the prevailing implementation design to identify policy reforms for the following: selection of PDS entitlement holders, food procurement and distribution, stocking needs and storage infrastructure, FPS, PDS entitlement and sale price, and PDS operations. Each of these six pillars of the PFSC is discussed in Sections 4 to 9. Our concluding observations are in Section 10.

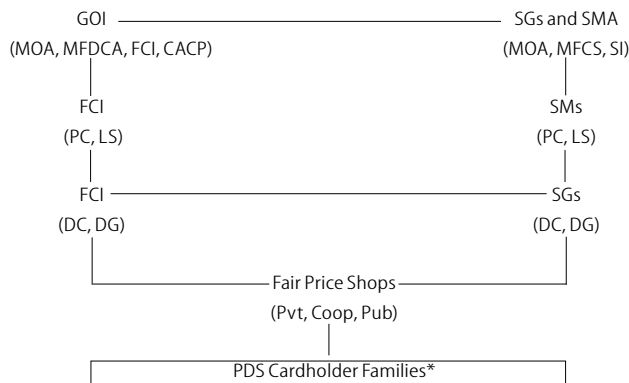
### 2 Concept

The definition of FS and the literature related to it reveal two important issues: one, FS has a financial as distinct from an economic perspective, and two, FS is “high” and/or “rising”. These are discussed sequentially.

The  $FS = (PP + PI + DC) - CIP$  wherein PP is procurement price; PI is procurement incidentals such as for labour, gunny bags, market fee, commission, interest, development cess, value-added tax (VAT), sales tax, administration, etc; DC is distribution cost, like that on transfer to the distribution centres, freight, transit losses, storage, storage losses, interest, administration, etc; and CIP is central issue price that is the sale price of food (George 1997; Sharma 2013; Swaminathan 1999).

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**Figure 1: Vertically Integrated Public Food Supply Chain**

- GOI = Government of India  
 MOA = Ministry of Agriculture  
 MFDCA = Ministry of Food Distribution and Consumer Affairs  
 FCI = Food Corporation of India  
 CACP = Commission for Agricultural Costs and Prices  
 PC = Purchase centres  
 LS = Local storage (FCI, CWCs, SWCs, pvt rented)  
 DC = Distribution centres (FCI, SGs)  
 DG = Depot godowns (FCI, CWCs, SWCs, pvt rented)  
 SGs = State governments  
 MFCS = Ministry of Food and Civil Supplies  
 SMA = Sugar manufacturers association  
 SI = Sugar industry (public, private, cooperative)  
 SMs = Sugar mills (public, private, cooperative)  
 CWCs = Central warehousing corporations  
 SWCs = State warehousing corporations

\* These are those who are identified based on a framework to determine the poverty line, headcount ratio and the number of "poor" families corresponding to the minimum calorie "norms" suggested in this paper.

This has a financial perspective and it is a "cost to the society". But for macro-policy formulation its economic perspective is a sine qua non. And it is derived by "excluding" transfer payments (TP) like land revenue, VAT, sales tax, development cesses and interest charges from PP, PI, DC, and CIP. Thus,  $FS' = [(PP + PI + DC) - CIP] - TP$ . The present value of  $FS'$  measures "economic cost to the society". But even such an elementary concept is not considered by policy planners and academia alike.

Several studies voice the concern that the FS cost is "high" and/or "rising" (Acharya and Agarwal 1994; Ganesh-Kumar et al 2008; George 1997; Himanshu et al 2013b; Sharma 2013; and Swaminathan 1999). But "high" cost cannot be viewed in isolation from the benefits. Another important reason is that it can be both on the left- and right-hand sides of the "U-shaped Average Cost – cost per unit of output" (AC) curve! If it is on the left, then the total FS cost (TC) is growing at a diminishing rate and hence AC is declining, i.e., "scale economies (SE)" exist. But if it is on the right, then TC is growing at an increasing rate and the AC is increasing, i.e., "scale diseconomies (SDE)" have set in (Desai et al 2001a).<sup>1</sup> This suggests a cause for concern. None of the studies cited above considers such an analysis. It must, however, be noted that Ganesh-Kumar et al (2008) and Swaminathan (1999) plot a graph for the total FS cost in "real terms" over 13 and 30 years, respectively. The former seems to indicate an inverted s-shaped curve in 1993-94 prices if the last two years of 2003 to 2005 are taken as outliers! The latter exhibits its asymptotic nature with 21 years of constancy and four years of decline in 1980-81 prices for 1966-67 to 1996-97. A similar graph of more recent FS data for 12 years in

Himanshu and Sen (2013b) in "current" and "constant" 2004-05 gross domestic product (GDP) deflator-based prices, when plotted, reveals an inverted s-shaped curve for 2001-02 to 2012-13 if the last one or two years are considered as outliers.<sup>2</sup> These findings may be interpreted to suggest that the "SE" prevailed.

This also emerges from Sharma (2013) that studies the FS in "current prices". It is based on a multivariate Cobb-Douglas equation that considers foodgrain procurement and offtake volumes as determinants, among others, for 1992-93 to 2011-12. The latter has superior "SE" compared to the former, the partial scale parameters being 0.483% and 0.583%, respectively. Their sum being 1.066% implies constant returns to scale (CRS). As the estimated model has not imposed the restriction of one for the two outputs that the form of the equation, this implies the results may be taken as legitimate.

Even if the PFSC has "SDE", the moot option is to "shift" the total FS cost curve downward and to the right so that AC exhibits its declining nature. Such "shift" could be realised by its improved "reach", selection of below the poverty line (BPL) families, leakage, offtake by organising "indent" of the demand from the fair price shops and so on, as is discussed later.

### 3 The Rationale

Section 2 dealt with the rationale based on the concept of "SE" that also represents the "efficiency" criterion. Three more aspects of this criterion-based rationale are first discussed.

**FS Cost Per Rupee of Benefit (CBR):** Himanshu and Sen (2013b) show that this is  $< 1$  for as many as three of the four years studied. It considers the official unit subsidy (from central and state governments) as a cost. The benefit is defined as the NSS unit food transfer from the PDS valued at market prices (NUT). This is the implicit income transfer (ITT) concept.<sup>3</sup> The CBR for rice is Rs 0.952 for 1993-94, Rs 0.775 for 2009-10 and Rs 0.926 in 2011-12, while it is Rs 1.136 for 2004-05. For wheat the corresponding values are Rs 0.952, Rs 0.847, Rs 0.935 and Rs 1.163. The results for 2004-05 are largely because of the high exclusion errors of the Tendulkar poverty line (PL). Also, under the targeted PDS (TPDS) the above the poverty line (APL) families have been ineligible for sugar from 2001. These reduced the percentage of the population "reached" by the PDS in both the rural and urban areas (Himanshu and Sen 2013a). But in the subsequent years of 2009-10 and 2011-12, this increased dramatically. This is mainly attributed to the revival of the PDS by many state governments as discussed later.

**Productivity-led Farm Growth:** This is encouraged from the price risk cover, and also the assured food procurement at "full" cost, including return to the farmers' management input. Technical change-oriented agricultural growth shifts the production function upward and to the right with the consequent

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decline in real unit production cost as well as the price of food. In the post-Green Revolution period, yields of food and non-food crops have increased. Even the real price and unit production cost of wheat, rice, maize, and foodgrains have declined.<sup>4</sup> Such a reduction of unit production cost and the price of food is beneficial to the producers and consumers, the “poor” in particular (Desai 1994; Joshi et al 2001; Kumar and Mruthyunjaya 1992; Kumar and Rosegrant 1994; Mellor 1976; Rao 1994; Singh et al 1995).

**Employment-led Economic Growth:** This is facilitated from the “relative” factor prices being in favour of labour in the industrial, services and the agricultural sectors. Such economic growth also gets induced from the increased supply of wage goods (food and cotton textiles) due to the adoption of new technology. Economic growth is further encouraged from the increase in the demand for these goods, which incentivises their production. This process of induced growth would increase saving, investment, profit and GDP in the economy (Dantwala 1967; Desai 1997; Mellor 1976; Rao 1994). It would also alter the composition of economic growth in favour of the much deprived farm sector (Desai et al 2011).

The food policy underlying the PFSC is also justified by its positive impact on the equity criterion-based goals as revealed by the following discussion.

**Reduction in Absolute Poverty:** Desai and Namboodiri (1998) show that every 10% increase in “real” government expenditure on poverty alleviation programmes such as FS, employment guarantee, etc, reduced the headcount ratio (HCR) for the rural areas by 0.4% during 1961-62 to 1990-91. Moreover, this expenditure is the fourth most important variable among the nine factors that explain 89% of the variation in HCR.

**Impacting HCR from IIT:** Both, the studies of Dreze and Khera (2013) and Himanshu and Sen (2013a and b) consider this by modifying the PL to value PDS and the mid-day meal supplied food at market prices. They determine the difference in this between the National Sample Survey (NSS) households with and without PDS food purchases. This concept being the same in these studies, findings from the latter are considered as it has studied them for three years. The HCR for rural areas has a proportionate decline of 2.52%, 7.0% and 14.25% in 1993-94, 2004-05 and 2009-10, respectively. For the urban areas, the corresponding values are 3.94%, 5.5% and 10.88%, respectively. Such an increasing trend of decline in the rural HCR is found for 25 out of the 31 states and union territories.<sup>5</sup> But this holds for the HCR in urban areas for only 18 regions.

**Extent of Change in Calorie Consumption:** In rural areas calorie consumption improved over the three years under study in all the quintile classes, whereas in urban areas this holds for the lower four quintiles (Table 1 derived from Himanshu and Sen 2013b). Significantly, this is progressive, meaning thereby that it is higher in the lower quintiles in both the rural and urban areas for all the three years. But still the calorie intake per capita

per day (pcpd) in rural areas did not cross the minimum “norm” of 2,250 kcal till the “fourth” quintile in all the three years. This holds for the urban areas for the corresponding “norm” of 2,100 kcal till the “third” quintile in these years.

**Table 1: Extent (%) of Difference in Calorie Consumption (KCal Per Capita Per Day) between Households with and without PDS Food Purchase by MPCE Quintile Classes**

Years	MPCE* Quintile Classes									
	Rural					Urban				
	1	2	3	4	5	1	2	3	4	5
1993-94	+0.44	-2.29	-1.91	-1.34	-2.78	+4.29	+1.53	-0.59	-1.22	-1.29
2004-05	+4.95	+3.35	+0.59	+0.81	-1.06	+7.37	+4.82	+0.99	+1.72	-2.46
2009-10	+10.99	+9.21	+6.02	+5.10	+2.27	+13.76	+9.17	+6.37	+5.94	0.82

\*MPCE = Monthly per capita total consumption expenditure in rupees.

The preceding discussion provides the “basic” rationale for any subsidy: benefits to the society being larger than to the private enterprise.

#### 4 Selection of PDS Entitlement Holders

The paper recommends that PDS be restricted to the “poor” being identified based on a poverty line linked to the “nutritional” goals unlike the Tendulkar PL. This is because:

- (i) their demand for food is more “price inelastic” and “income elastic” – for rural areas price elasticity of demand for calories was -0.10% and income elasticity was 0.37%, while for the urban areas the corresponding values are -0.29% and 0.29% for households that did not buy PDS food in 2009-10 (Himanshu and Sen 2013b);
- (ii) the estimate of the number of “poor” people varies widely; for example, for 2011-12, Planning Commission states it to be 274 million (HCR: 21.9%), while the Ministry of Food Distribution and Consumer Affairs (MFDCA) which formulated the National Food Security Act (NFSA) implies it to be 826 million corresponding to 75% and 50% of the rural and urban people, respectively, being mandated for food security, and recently the Planning Commission informed the Supreme Court that the BPL population is 407 million (HCR: 33.6%) (GOI 2013; IANS 2011); and
- (iii) World Trade Organization allows assistance for public stockholding for food security and domestic food aid such as FS for the PDS if it is based on criteria related to the “nutritional” objectives (Desai 2002a).

But the Tendulkar PL concept begs the question of nutritional poverty as the committee justified it by arguing that the “observed” food consumption of the sample households suggests the calories “needed” by the poor! This is based on the “urban poor” as the reference group! This arbitrariness is compounded by identifying this group that corresponds to the “urban HCR” of 25.7%! This all-India “reference group” is visualised for both the rural and urban population in all the states to determine their PL. Thus, such a concept is highly prone to the exclusion and inclusion errors of selection (Vaidyanathan 2013).

Further, the committee considered that those “near” the selected PL in 2004-05 prices in “urban” areas reported a food consumption basket that implies 1,776 kcal pcpd which is close to 1,800 kcal recommended by the Food and Agriculture Organization (GOI 2009). This, however, refers to the minimum dietary energy requirement (MDER) for

“sedentary” activity! The minimum “norms” for calorie intake are considered because the incidence of undernourishment is higher and more widespread than that of malnourishment. Chand and Jumrani (2013) has developed these “norms” from the Indian Council of Medical Research’s study on nutritional needs and the recommended dietary allowances which are adjusted for differences in activity, age and sex of the people in rural and urban India based on data from 66th Round of the National Sample Survey Office (NSSO).<sup>6</sup> For minimum calorie requirements, these are 2,226 and 2,022 kcal for the rural and the urban areas, respectively. The corresponding figures for proteins are 48.47 and 48.86 grams. The “norms” for calorie may be rounded off to 2,250 kcal for the rural areas and 2,100 kcal for the urban areas.

Appendix 1 (p 44) discusses how these “norms” are utilised for estimating the PL, HCR, and the number of “poor” people for 2009-10.<sup>7</sup> Thus, for the rural areas the PL ( $E^*_R$ ) in 2009-10 prices is Rs 1,092 per capita per month (Rs 36.40 pcpd) with HCR of 52.56%, and the number of “poor” people are 433 million, while for the urban areas they are, Rs 1,553 ( $E^*_U$ ) (Rs 51.77 pcpd), 35.26%, and 129 million, respectively. This gives an all-India number of 562 million “poor” with an HCR of 47.72% of the population.

In Appendix 1 a framework is suggested to determine the state-specific PL and HCR though the minimum calorie “norms” must be the same. The needed data for this are available from the NSSO’s 66th and subsequent rounds. And, its application must be based on the data of each sample household rather than the data by decile classes considered in this paper. Such data analysis for each state should be the basis to derive the number of “poor” people in India. The implied number of the “poor” families for both the rural and urban areas can be derived from the average size of the sample households of the NSSO. For 2009-10 these are 95 million “poor” rural families and 31 million “poor” urban families. For all-India the number of “poor” families is 126 million. But, the Planning Commission reports 65 million BPL families for 2012 (GoI 2013).

The number of “poor” families estimated by the suggested method must be chosen as the PDS entitlement holders. The PDS cards issued to them should record the name, age, gender and occupation of the head of the household and his or her other members, residential address and the quantity of foodgrains and sugar entitlement based on the existing policy of 7 kg and 1.5 kg, respectively, per person per month (pppm). These PDS cards will replace the existing ones.<sup>8</sup>

The paper further recommends that the GoI in consultation with the state governments arranges to undertake the task of application of the framework as outlined above. And the state governments must be mandated to adopt their respective PL determined by this method.

## 5 Food Procurement and Distribution

The FCI is the sole agency of the central government for the purchase, storage, transportation, and distribution of food to implement the PDS and buffer stock operations for various states (Acharya and Agarwal 1994). It undertakes

these operations in coordination with the Union Ministries of Agriculture and Food Distribution and Consumer Affairs (MFDC), besides the state-level Ministries of Agriculture and Food and Civil Supplies (MFCS) which oversee the PDS outlets.

The FCI has departments such as procurement, stocking and storage, and distribution at its head and regional offices. These three functions being interlinked their decoupling under this umbrella has the potential to synergise the PFCSC management. Since 1997-98 decentralised procurement has been introduced by the state governments. Under this policy, the union government finances the cost incurred by the state governments (Himanshu and Sen 2013b; Sharma 2013). This is not consistent with the original policy of procurement which followed the new technology adopted by the farmers. It is so also because the costs of the FCI are financed by the union government. Further, the stocks procured by the state governments are under the management of the FCI. This food procurement policy must be discontinued. But where state governments can reach, for example, in some parts of the central and eastern India, the FCI should be enabled to continue procurement.

The FCI’s purchase centres participate in the auctions just as is required of the private agencies in the mandis to buy from the farmers who come to these markets. But farmers are free to sell to whomsoever they want to (FCI 2014). Paddy is similarly procured, but rice is purchased from the millers by the levy method. This levy varies from state to state. The purchase price of the FCI is linked to the rice recovery rate (Acharya and Agarwal 1994; George 1997). However, the levy method may be discontinued now that the probability of procuring the needed quantity of paddy, and hence rice, is better due to the spread of the Green Revolution. And, the FCI and its agents that procure rice from the millers should participate in the public auctions.

The procurement of sugar cane by sugar mills is at the state governments’ fixed advisory price (SAP). Their price is much higher and not linked to the sugar recovery rate as is the case for the price determined by the GoI. The price of the central government is recommended by its Commission for Agricultural Costs and Prices (CACP). This commission uses the data that are collected by scientific methods for the survey of a sample of farmers from different regions by the research centres sponsored and financed by the ministry of agriculture of the central government.

Sugar cane procurement by the sugar factories needs two reforms: One, GoI, in consultation with the CACP, may determine the fair remunerative price (FRP) for procurement based both on the “full” costs of cultivation and the sugar recovery rate “separately” for each major sugar cane-producing state. This is because both vary widely (Acharya and Agarwal 1994). Two, this FRP should be binding on the sugar mills as also the concerned state government instead of the SAP as is the case now.

The procurement quantum for foodgrains is whatever quantity farmers offer for the P/MSP fixed by the GoI; it is an open-ended procurement quantity rather than what is needed for the PDS and buffer stock. This need is estimated to be about

43 to 53 million tonnes as on July 1 (Chand and Birthal 2011). But, the actual stock on that date of 2012 was 82.4 million tonnes! Such excess stock implies transfer of the ₹s to the producers! (George 1997). Purchases more than what is needed for the buffer stock and PDS must be avoided. The recent past suggests that this could be 60 to 63 million tonnes. This quantity may be procured from the farmers at “full” (variable + fixed) costs, i.e., cost C2 for the cultivation of the crops in the terminology of the CACP. Such purchase price is the PP to be paid to the farmers.

But at this price they may offer more if the farm harvest price (FHP), i.e., the market price, is lower than the “variable cost” of production. If such an FHP environment arises, then FCI may purchase the additional quantity at a price that meets just these costs, i.e., cost A2 + cost of family labour utilised for cultivation of the crop. This price is the MSP. Such a price ensures that the farmers remain in business (Koutsoyiannis 1993). This additional buy must be within the 64 million tonnes of the present “covered” storage capacity with the FCI.

The advocacy of cost-based pricing is justified by economic theory as also the practice irrespective of whether farmers maximise profit or sales or are just the satisfiers (Koutsoyiannis 1993).

As regards the sugar procurement quantity, until recently the FCI purchased it to the extent of the levy on sugar mills at a price that is linked to the sugar recovery rate. Under the non-levy policy, it may utilise past experience of the quantity and price of purchase to develop its bidding strategy under the auction system. The FCI may bear in mind that it would need to buy a different quantity for the PDS as the suggested framework to determine the number of “poor” would estimate a larger number than what Tendulkar PL indicates. It must also maintain a buffer stock to achieve more stable prices for consumers (Acharya and Agarwal 1994). This may be 10 to 12 million tonnes.

The FCI arranges to distribute the food procured for the PDS to various states based on allocation targets given by the central MFDCA and the Planning Commission. In general this considers the latter’s estimate of the BPL population in each state. However, this needs reform. The allocation should be based on the consolidated statement of the “indent” that each PDS outlet gives to the MFCS in the state which, in turn, must send it to the central MFDCA as also the FCI. And, the PDS outlet must prepare the “indent” on the basis of the food entitlement (FE) stated earlier and the number of cardholder families it would serve.

## 6 Stocking Needs and Storage Infrastructure

The need for stocking food arises as its demand is continuous but supply is seasonal, once or twice in a year. This function is performed by the private sector, mainly for intra-year transactions. There is hardly an entity to carry inventory beyond a year for normal consumption, this in times when there might be a good or a bad harvest. Such inventory assists in stabilising food prices which have inherent fluctuations. The public holding of foods for a large country like China or India is a necessity

(Acharya and Agarwal 1994; George 1997; Chand and Birthal 2011) and this historical prudence holds even now.

The FCI performs this function to serve the PDS and meet the buffer stock needs. The stocks held for the former are termed as operational stocks, while that for the latter are called strategic buffer stocks (Acharya and Agarwal 1994). The present norms for these stocks for foodgrains are 23.5, 36.2, 26.9, and 25 million tonnes, respectively, as on the first date of the four quarters of the financial year. But the stocks, as on 1 July, were 82.4 and 73.9 million tonnes in 2012 and 2013, respectively. These stocks not only exceed the present norm of 36.2 but even the 43 to 53 million tonnes suggested by Chand and Birthal (2011) based on the negative deviation in cereals output underlying its trend during 1991-92 to 2010-11, allocation to the PDS, offtake, etc. Such massive “excess” stock is because of open-ended procurement, an unjustifiable nature and level of the P/MSP, reduced offtake due to the poor grain quality, etc (Sharma 2013).

The storage space with the FCI is 78 million tonnes that could possibly justify the procurement size that has been criticised. But, of this, 14 million tonnes storage is under the open and plinth space (Sharma 2013). Such storage space must be converted into fully covered space with machines, tools, and training of labour to use them. This would assist in eliminating physical losses, besides reducing damage to the commodities being stored. Of the 64 million tonnes of storage space, about 37 million tonnes are owned by the FCI. It must develop at least some of this into storage infrastructure. The FCI may access the government seed capital to borrow “indirect” rural credit. This is also recommended for its hired storage from the Central and the State Warehousing Corporations.

## 7 Farm Price Support

The present policy for this considers PP as the MSP. However, the paper makes a distinction between these two concepts. This is because FPS should visualise them to be the “floor” and “ceiling” prices that take account of the legitimacy of cost-based pricing. Thus, the PP should cover the “full” (variable + fixed) costs of production so as to represent the “ceiling”. And the MSP serving as the “floor” price must be based on only the “variable costs”. Both the central and the state governments should accept this.

The “variable costs” in the terminology of CACP mean Cost A2 + value of the family labour + 10% of their sum as return to the management input of the farmers. A2 Cost includes the value of market-purchased inputs like seeds, fertilisers, water, etc, at the prices farmers pay + the imputed value of home supplied inputs. The owned working capital is valued based on the prevailing interest rate for short-term “direct” rural credit, while the straight line method determines depreciation of farm implements, machinery and buildings. Family labour is valued at the prevailing wage rate for hired casual labour or the statutory minimum wage rate for agriculture, whichever is higher (Acharya and Agarwal 1994).

The PP being based on “full” (variable + fixed) costs, it refers to Cost C2. And, Cost C2 is Cost A2 + value of the family labour

used for crop farming + value of the owned fixed capital + value of family land for farming + 10% of their sum as return to the farmer's management input. The owned fixed capital is priced by the interest rate for rural credit to farmers. The family land is valued by the prevailing rent for leased-in land subject to the ceiling of fair rent stated in the concerned state's land legislation (Acharya and Agarwal 1994).

The principle of opportunity cost justifies two reforms: (i) family labour should be priced by the wage rate for hired farm casual labour, and (ii) the owned capital should be based on interest rates for the saving and fixed deposits of the financial institutions.

The High Level Committee for Long Term Grain Policy (HLCGP) of the MFDCA suggested that levies such as infrastructure development cess, etc, that the state governments collect from the market intermediaries, including FCI, may be included for determining the  $P/MSP$ . This is not justifiable as these are for the marketing functions of these agencies and not related to farming. The  $P/MSP$  is based not just on the Cost  $c_2$  but also adjusted to account for the price parities like inter-crop, output-input, terms of trade for agriculture (prices received to prices paid by the farmers, the net barter terms of trade (BTOT), and the world market price, fob if the commodity is net exported or cif if it is net imported).

But none of these price parities is needed. The GOI and CACP should accept this, based on certain principles outlined below. Before stating them, some findings from Sharma (2013) referred to earlier should be noted. One,  $P/MSP$  as a percentage of Cost  $c_2$  averaged 129 for wheat and 118 for paddy-rice. Two, the growth rate of this price in second half of the decade of 2001 was over 11% compounded annually for both these crops. Three, this price accounted for about 67% of the sum of  $PP$ ,  $P_1$  and  $DC$  for these crops. Four,  $P/MSP$  is the most important determinant of  $FS$  followed by the offtake quantity, procurement volume,  $DC$ ,  $P_1$  and lastly  $CIP$ . Also, the rise of the first four of the above leads to an increase in  $FS$ , while the same in  $CIP$  leads to a decrease in  $FS$ , as expected.

Inter-crop price parity is not needed as  $P/MSP$  is fixed for the competing crops. Output-input price parity (OIPR) like the BTOT for agriculture has an "a priori" ambiguous impact on supply as elucidated next. The official policy is to "add" some value to the  $P/MSP$  if OIPR and BTOT is  $< 1$ . But these parities may "increase or decrease" supply due to their substitution, income and wealth effects that work in opposite directions. When such relative prices improve, farmers' incentives to save/invest also improve; as a result their consumption is substituted by investment and supply increases. Also, the increase in relative prices improves returns to labour which would substitute labour for leisure with the consequent increase in supply. These are positive ( $>0$ ) substitution effects. But when relative prices increase, farmers' income also improves, which increases consumption, thereby decreasing the saving/investment and reducing supply (income effect  $<0$ ). The rise in their income could increase leisure as a result of which family labour-use may decrease and hence supply decreases, assuming family labour is not substituted by hired labour (wealth effect  $<0$ ).

Depending on the strengths of these effects, "net" aggregate impact on supply could be  $> 0$  or  $< 0$  or equal to 0. The policy cannot depend on such "uncertain" impact, more so as 75% of the studies on India show it to be "negative" ( $<0$ ) for the "effective" aggregate farm supply (marketed surplus) (Desai 2002a; Desai and D'Souza 1999).

About the world market price (WMP) parity, the present policy implies that if the  $FHP$  to  $WMP$  ratio is  $< 1$ , then  $P/MSP$  may be adjusted upward, and if it is  $> 1$ ,  $P/MSP$  may be lowered. But this is not desirable. One, India's crop price is lower because of its labour-intensive farming. Two, lower price implies competitive advantage for international trade. Three, when the  $FHP > WMP$ , then meeting the domestic food needs from imports would be expensive; when a large buyer like India enters the world food market, the price shoots up – this is logical as this market being an oligopoly, the seller would change the price rather than quantity as such a market cannot change both. Four,  $WMP$  parity advocacy assumes that this market is "perfectly competitive" (Desai 2002a; Nayyar and Sen 1994; Koutsoyiannis 1993). In this context,  $CACP$  may ensure that  $A_2$  and  $c_2$  costs-based pricing is such that the price structure for a given crop "approximates" to the  $MSP < PP < FHP < \text{wholesale price} < \text{retail price}$  in the domestic market.

## 8 PDS Entitlement and Sale Price

PDS FE has been gradually raised from 2 kg pppm to 5 kg pppm and now to 7 kg pppm as the demand for and supply of foods increased with the growth of agriculture, the economy and the population, besides the capacity of PFSC. The FE is mainly in the form of rice and wheat with their respective shares of 60% and 40%. The  $CIP$  for rice is Rs 6 and for wheat, Rs 5 per kg (Sharma 2013). The NFSA envisages FE of 5 kg with a  $CIP$  of only Rs 3 for rice, Rs 2 for wheat and Re 1 for coarse grains. This amounts to backtracking of the PFSC. This FE is only 50% of the need of 10 kg of wheat-equivalent that corresponds to the suggested minimum calorie intake "norms".

Some major states like Andhra Pradesh, Chhattisgarh, and Himachal Pradesh, which initiated reforms for the PDS in the early years of the decade of 2001-10 have changed the FE as also  $CIP$  (Khera 2011). A majority of these states have reduced FE to enlarge the "reach" of the fair price shops. This is because the BPL list of 2002 from the central government and the Planning Commission, which is binding on them, excluded the BPL families of the 1997 and 1991 surveys. Some of these states aimed to achieve this also from their budgetary resources.

Khera (2011) can form the basis to classify the nine states into the four "Scenarios" of change in FE and  $CIP$ . These are analysed for their bearing on five criteria: FE as a percentage of the food needed to attain the minimum calorie "norms" (ECNR),  $FS$ , IIT,  $FS \div IIT$  (CBR), and  $FS \div FE$  (AC - "SE") to determine a "Scenario" that is more preferable to another one, ceteris paribus (Table 2, p 42).

"Scenario" A is least preferable. This is because its impact on all the five criteria is adverse:  $FS$  would increase and IIT would decline as the percentage decline in average  $CIP$  is higher than that of the decline in average FE. As a result, CBR would increase.

**Table 2: Impact of Four ‘Scenarios’ of Reforms Related to FE and the CIP for the BPL Households on the Five PDS Performance Criteria**

Details	“Scenarios”			
	[A – AP, O, R, TN] Reduced Both FE and CIP	[B – BI] Reduced FE	[C – CH, JHR] Reduced CIP	[D – HP, UP] Unchanged FE and CIP
Features*:				
1 Average FE (kg pppm)	4.5(-35.71)	5.0(-28.57)	7.0	7.0
2 Average CIP Rs/kg	1.5(-75.00)	6.11	1.5 (-75.00)	5.73
3 Average qty of purchase (kg/mth)	22.0	11.2	29.1	33.9
4 Average of percentage of respondents reporting that they “normally” got the full FE	90.5	18.0	61.0	81.5
Criteria:				
1 Percentage of FE to 10 kg of wheat-equivalent needed to buy minimum calorie (ECNR)	45.0	50.0	70.0	70.0
2 Food subsidy (FS)	Increase	Decline	Increase	Unchanged
3 Implicit income transfer (IIT)	Decline	Decline	Increase	Unchanged
4 FS ÷ IIT, i.e., (CBR)	Increase	Unchanged	Unchanged	Unchanged
5 FS ÷ FE (AC-“SE”)	Worsen	Unchanged	Worsen	Unchanged

\*The figures are averages of the state-wise results in Khera (2011). This study is based on data for 2011 from the survey of 1,227 randomly selected households of 108 villages located in 36 blocks in 18 districts of the nine states. AP= Andhra Pradesh, O= Odisha, R= Rajasthan, TN= Tamil Nadu, BI= Bihar, CH= Chhattisgarh, JHR= Jharkhand, HP= Himachal Pradesh, UP= Uttar Pradesh. Figures in bracket are percentage changes in FE with respect to 7.0 kg, and those of change in CIP with reference to the CIP of Rs 6 per kg.

Also “se” worsens as the FS cost to FE ratio (AC) rises. Its ECNR is the lowest. Moreover, demand for basic foods being prices inelastic, the decrease in CIP cannot lead to much of an increase in such demand. This is revealed from its sharply lower monthly average quantity purchased under the “Scenarios” that have reduced CIP. Hence the “Scenario” D is most preferable. This also forms the basis to imply that the “Scenarios” of B and C are equally preferable as the CBR remains unchanged. And yet, “Scenario” B is more preferable to C as its “se” remains unchanged but that of the latter deteriorates.

The FE of 7 kg of foodgrains should be maintained. This is also justified from both the demand and supply sides of the reforms. It would encourage more adequate demand for the basic food. From the supply side, it would facilitate reaping the full “se” which makes FPS more viable. This is why the entitlement for sugar of 1.5 kg should be continued instead of 1 kg that states like Tamil Nadu have.

As regards CIP, one, it should be changed regularly rather than be kept static for as long as about 10 years since 2002. Two, states should be consulted and counselled “not” to reduce it to the level discussed above or keep it “price free” as is in some states in the south. Three, HLCGP’s recommendation that it should be 50% of (PP+PI+DC) must be adopted for both foodgrains and sugar. Even under the NFSA the same principle must be adopted.

**9 PDS Operations**

The fair price shops are issued licences by the MFCS of the state governments to sell foodgrains and other items to the PDS cardholders at the price fixed by the central government. They earn specified commission based on the quantities sold by them

(Acharya and Agarwal 1994). The number of fair price shops as of December 2012 was 5,15,000. They have reached 65.2 million BPL families with 360 million “poor” persons (IANS 2011). This is about 88% of 407 million “poor” that the Planning Commission has estimated. This is an impressive reach. But it also supports the claim that Tendulkar PL is prone to the exclusion error.

The PDS has been arduously built since the pre-Independence period. It is also known to be urban, regional, and class biased. Each is alleged to be a leakage (George 1997). But, the “leakage” has reduced from 54% in 2004-05 to 40% in 2009-10 and then to 35% in 2011-12 as shown by the ratio of the NSS consumption to the official offtake by the FPS (Himanshu and Sen 2013a and b). The urban bias no longer holds. Similarly, the claim of regional bias, i.e., south India being more effective, is only partly so (George 1997; Khera 2011). Class bias is still a problem!

Khera (2011) illustrates that the identification of the “poor” for TPDS has improved to reduce exclusion errors in states like Chhattisgarh, Himachal Pradesh, Jharkhand, Odisha and Rajasthan. What is recommended in Section 4 is relevant for this reform.

Khera (2011) has results on the percentage of the sample households reporting the days the fair price shops are open, their adequacy, and doorstep delivery of food to the fair price shops in nine states. These are averaged for the earlier stated four “Scenarios”. Their ranking based on these averages for each of these reforms reveals the following: “Scenario” B that includes Bihar is least preferable. The most preferred one is A which includes Andhra Pradesh, Odisha, Rajasthan, and Tamil Nadu. This is followed by “Scenario” D that includes Himachal Pradesh and Uttar Pradesh; and then C which includes Chhattisgarh and Jharkhand. But A and D interchange their rank if outliers like Andhra Pradesh and Tamil Nadu with their early story of better functioning FPS and Uttar Pradesh where FPS are not as effective as in Himachal Pradesh are excluded from their respective “Scenarios”. These three reforms are highly relevant not only for these nine states but all other regions.

Some other reforms which have been implemented are related to standard weighing practices, tools and equipments, sale of other items like kerosene, salt, sugar, and more recently, pulses and edible oil in Andhra Pradesh, Himachal Pradesh, and Tamil Nadu, computerisation of records of the FPS, and cooperatives, village panchayats and self-help groups (SHGs) replacing private FPS in states like Chhattisgarh and Himachal Pradesh.

Further, the fair price shops must be required to (i) “indent” the demand for foodgrains and sugar from the PDS cardholders for better vertical integration of the PFSC, and (ii) display the information about the stocks and the prices of the commodities, besides the time of their operations. Also, the entire PFSC must apply information technology tools including computerisation of transactions at all levels to facilitate better decision-making.

**10 Concluding Observations**

The paper advocates reforms for the PFSC based on its findings keeping in mind that (i) it is vertically integrated and has price, access risk cover and incentives for both consumers and the

producers; (ii) it has “SE”; (iii) it is further justified by its conducive impact on both efficiency and equity; and (iv) it needs reforms in the six critical elements that make up the chain, these in order to strengthen what has already been achieved, in addition to reducing the FS, the current account deficit, and especially, the fiscal deficit.

Regarding the six critical elements that make up the PFSC, first, selection of PDS entitlement holders must be based on the PL that is linked to the minimum “norms” for calorie consumption. The paper recommends a framework to execute this based on NSSO household-level data for each state. This would enable reducing exclusion and inclusion errors of selection of BPL families.

Second, food procurement and distribution must be only for the PDS and buffer stock needs. This could be in the range of 60 to 64 million tonnes of foodgrains and 10 to 12 million tonnes of sugar. The PDS stock must be distributed to its outlets based on their “indent” of demand derived from the FE of 7 and 1.5 kg for foodgrains and sugar, respectively, for the “poor” families they serve.

Third, on stocking needs and storage it is suggested that storage in the open and in plinth space must be eliminated. Also, the low efficiency storage infrastructure must be

modernised. The stocks have to be “restricted” to 64 million tonnes of the present covered storage space.

Fourth, FPS should be of two types, based “only” on the cost of cultivation. The PP at which the above-stated procurement is undertaken must be based on the “full” costs C2. The MSP must be based “variable” costs A2 + the imputed value of family labour for farming. Procurement at this price is suggested for the additional quantity only if and until such a price environment prevails. This may be sold later in the open market in the lean season to contain food inflation.

Fifth, the present FE should be maintained. It meets the nutritional “norms” better and provides the potential to reap full “SE” for the FPS. The CIP must be changed regularly. It may be raised to 50% of the procurement and DCS including the PP.

Sixth, for PDS operations, supply-side reforms like doorstep delivery, standard weighing practices, use of modern tools and equipment, fixed days, and adequate time of functioning of FPS must be extended to all the regions. Computerisation at all levels of the PFSC is essential.

The GoI, state governments and the FCI are urged to strengthen synergy to evolve a consensus on the reforms proposed for the PFSC.

#### NOTES

- 1 Considering the theory of costs, it is postulated that the declining nature of the AC represents “scale economies” (SE) in TC. These economies arise when TC increases less than proportionately for a proportionate increase in output (i.e.,  $< \text{or} = 1$  but  $> 0$ ). This is the elasticity of TC with respect to the output. In this situation AC is smaller than/equal to the marginal cost (MC) as elasticity is  $(MC \div AC)$ . This suggests increasing/constant returns to scale (I/CRS). If AC is larger than MC, then this elasticity is  $> 1$ . This means “scale diseconomies” (SDE) and that the returns to the scale are decreasing (DRS). It holds only if TC grows at an increasing rate meaning thereby that AC is increasing. Underneath this is the “inverted S-shaped” TC curve. An empirical validation of such a cost curve requires estimation of the cost function of one of the four functional forms of log-log inverse, transcendental, cubic, and translog. However, the nature of change in AC (declining/constant/increasing) in “constant and/or current” prices is an unequivocal measure of the “SE”.
- 2 This graph is available on request from the second author of this paper.
- 3 Ganesh-Kumar et al (2008) and Ramaswami (2002), respectively, show that the CBR of the PDS is  $> 1$  for 1999-2000 and 1993-94. The former does not define benefit, while the latter defines it as IIT of the PDS purchases. But the study is based on the market price as revealed by the unit value of the food purchases of the households in the 30th percentile of the distribution of unit values by quarter in which they are surveyed by the NSSO (Dutta and Ramaswami 2001). This is unlike the mean and median of the unit values of all sample households considered, respectively, by Himanshu and Sen (2013a and b) and Dreze and Khera (2013). Such market price is likely to be lower than these values. This suggests that the IIT would be smaller and hence the CBR would be higher

than implied by these two studies. Ramaswami (2002) then goes on to suggest the role of the private market for food procurement and distribution with food stamps to serve the PDS. But the study contradicts its own assessment that such a market would not find this profitable. It further recons that this market would not lead to food consumption by the “poor” that could be consistent with the equity concerns of food market intervention!

- 4 Ramaswami (2002) reports that the annual compound growth rate of the real WSP of wheat and rice increased in the decade of the 1990s compared to that of the “two” decades of 1971-90. However, the study shows a decline in the real price of wheat in these “two” decades.
- 5 Dreze and Khera (2013) analyses such a poverty-reducing impact of the IIT of the PDS food purchases for rural areas in 2009-10 at the all-India level as well as for 20 major states. This is based on both the Tendulkar PL and the state-specific pre-Tendulkar PL that is anchored to the “norm” of 2,400 kcal. The former has a proportionate decline of 11% compared to 16% for the latter at the all-India level. State-wise results are not referred to as the study does not use state-specific Tendulkar PLs unlike that for the other PL.
- 6 Chand and Jumrani (2013) reveals that 67% of the rural people and 58.7% of the urban people consumed calories less than the recommended “norms”. The corresponding figures for protein are much lower: 36.7% and 43.8%.
- 7 These estimates are based on NSSO data on household consumption expenditure for the modified mixed reference period (MMRP). The data for foods like edible oil, vegetables, fruits, eggs, spices, fish and meat, etc, that are purchased in bits is recorded for the “last seven days”, while that for items of clothing and bedding, footwear, education, institutional medical care, and durable goods is recorded for the “last 365 days”, and that for other

food and non-food items is recorded for the “last 30 days”.

- 8 The new cards may be issued by the district collectorate and the district development or panchayat office in the rural areas and by the municipal corporation in the urban areas instead of the Ministry of Food and Civil Supplies as they implement development programmes. These cards may be leveraged to the National Population Registry to authenticate the right of “poor” families to food supplies from the PDS outlets.

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**Appendix 1: Framework to Determine the PL and the HCR Linked to the Minimum Calorie ‘Norms’**

Equations (1) to (4) present this framework for the concept of poverty linked to the nutritional goal for a robust estimate of the Poverty Line (PL), the HCR and the number of “poor” people consuming less than the minimum calorie intake “norms” (Ali et al 1981; Chand and Jumrani 2013; Goreux 1960; Iyenger 1968). And it is applied to the “All-India” data for the MMRP for the calorie consumption and total consumption expenditure of the rural and the urban households from the 66th round (2009-10) of the NSSO.

Equation (1) specifies the Engle function for the calorie demand considering the log-log-inverse (LLI) form of the equation whose estimation provides the basis to determine the PL in constant prices of 2009-10 associated with the minimum calorie intake “norms”:

$$\ln C_{ij} = \alpha_j + \beta_j \ln E_{ij} + \pi_j 1/E_{ij} + U_{ij} \dots(1)$$

where  $C_{ij}$  = calorie consumption (kcl) per capita per month in the  $i$ th decile class of the  $j$ th region,  $i=1, 2, \dots, 10$  decile classes, and  $j=1$ -rural, 2-urban regions;

$E_{ij}$  = monthly per capita total consumption expenditure (MPCE – Rs) of the  $i$ th decile class for the  $j$ th region;

$U_{ij}$  = error term for the  $i$ th decile class for the  $j$ th region; and,  $\alpha_j, \beta_j$  and  $\pi_j$  are the parameters to be estimated by the OLS method.

The Engle function considers total consumption expenditure instead of income to spend on calorie demand as it represents a notion of the permanent income that affects demand for any item more than the current income. The LLI calorie demand function gives its elasticity that varies with the MPCE, as is expected. It is given by  $[\beta_j - \pi_j/E_{ij}]$  which

must be  $> 0$  as calorie is not an inferior good. This elasticity for the rural areas is 0.352 as against 0.266 for urban areas. However, the difference between these two areas is sharp for the marginal (incremental) change in demand for calorie for a “given” change in MPCE; for every rupee of increase in the MPCE it being 21.51 kcal pcpm for the rural areas as compared to the corresponding 8.54 kcal for the urban areas. MPCE elasticity estimates are similar to those of Himanshu and Sen (2013b).

The PL ( $i$  e,  $E^*_R$ ) that corresponds to the minimum calorie “norm” of 2,250 kcal per capita per day (pcpd) for the rural areas is determined from the estimated Equation (1) for them by a process of iterations. Similarly the PL ( $i$  e,  $E^*_U$ ) that corresponds to the 2,100 kcal pcpd “norm” for the urban areas is obtained from such an equation for them.

For measurement of the HCR corresponding to the two PL so determined it is assumed that the distribution of the people in different decile classes is log normal (LND) as represented by the Equation (2):

$$E_{ij} \sim \hat{\sim} (\mu, \Omega) \dots(2)$$

where  $\mu$  and  $\Omega$  are the parameters of the LND. The mean value of  $E_i$  for the  $j$ th region is given by

$$E(E_i) = \exp(\mu + \frac{1}{2}\Omega^2) \dots(3)$$

Combining the equations (2) and (1), the proportion of the people BPL ( $i$  e, HCR) is determined from  $E^*_j$

$$HCR_j = \int_0^{E^*_j} (E_{ij}) dE_{ij} \dots(4)$$

where  $E^*_j$  = MPCE<sub>j</sub> associated with the minimum “norms” for calorie consumption for the  $j$ th region.

The HCR so determined for the  $j$ th region is then applied to the “all-India” population to estimate the number of “poor” people in that region.