Agricultural Subsidies*

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Executive Summary

(i) Structural transformation by which shares of agriculture in income and employment decline is the outcome of a development process that raises incomes and living standards.

(ii) However, the process is uneven as a result of which the decline in agriculture's income share is faster than its decline in employment share. This results in a substantial disparity in worker productivity across sectors.

(iii) Farm subsidies cushion the pain of structural transformation. But can they completely offset it and can such subsidies adversely affect structural transformation itself? These are the questions addressed in this paper.

(iv) Drawing on the most recent estimates (not always for the same years), annual central government subsidies to farmers would be of the order of Rs. 120,500 crores as the sum of fertilizer subsidies (Rs. 70,000 crores, 2017/18), credit subsidies (Rs. 20,000 crores, 2017/18), crop insurance subsidies (Rs. 6500 crores, 2018/19) and expenditures towards price support (Rs. 24,000 crores estimated for 2016/17).

(ii) Annual State government subsidies are almost of an equal amount of Rs. 115,500 crores to as the sum of power subsidies (Rs. 90,000 crores, 2015/16), irrigation subsidies (Rs. 17,500 crores, 2013/14), and crop insurance subsidies (Rs, 6500 crores, 2018/19). In addition, in the year 2017/18, state governments announced loan waives totaling to Rs. 122,000 crores. Overall farm subsidies amount to 2-2.25% of GDP.

(iii) While the importance of subsidies to farmer livelihoods may vary by region, by crop and by farm size, they form a substantial part (20%) of aggregate farm income. Yet, even a substantial rise in subsidies cannot address the sectoral gaps in productivity (which are much too large) or compensate for small farm sizes. The latter is the fundamental constraint to farm incomes for a majority of workers in agriculture (landless and marginal farmers with ownership less than one hectare).

(iv) India's subsidies involve price interventions. Price subsidies have the advantage that they are automatically targeted to those who are users of the subsidized input (or producers of the price supported output). However, price interventions create inefficiencies because they embed incentives for fraud, diversion, and waste. Overtime, as price subsidies become deeper and entrenched, these inefficiencies accumulate and may ultimately pose a threat to the sustainability of subsidies itself. Hence, alternatives have to be explored and tried.

(v) Developing economies do not have the sophisticated database and state capacity to design and target direct transfers. The major constraint to designing and implementing direct transfers is the database. Ideally, the subsidy would go to the farm operator and would involve a cap based on the farm operator's wealth. The State, however, lacks the information to implement such an ideal subsidy. Land records are in the process of being computerized, with the progress uneven across states, but we are still some distance away from the goal of conclusive titling. But even when well done, these records would not identify farm operators and thus farm operators would be left out. The model Acts on land leasing and on licensing tenants (the Land License Cultivators Act) proposed by Niti Aayog deserves greater consultation with the States.

(vi) Power subsidies imperil our already stretched groundwater resources and directly attack the sustainability of our natural resources. Electricity consumption in Indian agriculture is far greater than in any comparable large country. Correspondingly, the Indian withdrawal of groundwater is more than that of China and the United States put together. Direct benefits transfer together with the separation of agricultural feeders and metering supplies are immediate policy imperatives. Unlike other subsidies that need to target direct benefits using some criteria such as land ownership, power subsidies have the advantage that they can be restructured to direct benefits on the basis of power connections.

(vii) Moving fertilizer subsidies to DBT would also stimulate efficiency improvements. If land records are in workable condition, these changes can be made. The stumbling block is Aadhar authentication. Investments have to be made to make this seamless and error-free.

(viii) Credit or interest subsidies have weak rationale. Formal sector interest rates have not been the constraint to increasing access to formal sector institutions. These subsidies would be better spent in strengthening the credit infrastructure and rural banking.

(ix) Irrigation subsidies are the symptom of a bigger problem: the poor quality of this important service. Cutting irrigation subsidies through user charges cannot be done without considering its place in the larger agenda of how surface irrigation systems can be more responsive and accountable to users and improve its quality.

(x) The subsidy that threatens to dwarf others is loan waivers. These may undermine the formal rural credit structure for some years to come. Their electoral appeal stems, in part, because farmers and the rural population are deprived of public services of education and health. The dependence on private fee paying institutions (for education and health) makes them even more vulnerable to the typically high risks of agricultural activity.

(xi) Crop insurance offers promise to be an important component of agricultural safety nets. The subsidy on this program is new enough that this program can be redesigned without provoking political opposition. The evaluation of this program suffers from a major constraint: of data. Compared to the expenditures on this program, an in-built evaluation that tracks the experience of about 10,000 farm households would cost very little and yet would quickly yield insights to maximize farmer benefit. Otherwise, what remains in public view are the gains recorded by insurance providers.

(xii) Only a part of food subsidy expenditures (about 20-30% typically but could be higher in peak stock years) may be considered as support to farmers. Such support arises essentially from excess procurement (i.e., procuring more than what is distributed), which subtracts supplies and pushes up prices. If government only bought what it sold through PDS, the gains to farmers would be small, if any.

(xiii) Excess procurement is costly to consumers and involves other kinds of waste that come in disposing off the stocks. This is generic to procurement-based price supports and such costs were also experienced in other countries that implemented these policies.

(xiv) Price deficiency payments are a substantial improvement on procurement-based price supports. However, in the medium to long run, they reproduce some of the distortions of the procurement system and become difficult to manage.

(xv) Direct benefit transfers will minimize the waste of price support policies. However, upfront costs will be high and it calls for a new architecture and substantial improvements in land administration.

(xvi) We should not lose sight of the fact that, by itself, even a large increase in subsidies will only go a small way in increasing income from cultivation and in closing the gap with average incomes per worker from non-farm work. Production and market risks are a burden to small farmers. However, it is the limited asset base (small plots or not even that) that is the fundamental constraint to farm incomes. Sustainable income growth will only come from diversification (from staples to non-staples and from farm to non-farm). The subsidy reforms mentioned here gain additional salience because they will remove the first order policy obstacles to optimal crop and occupation choice.

Agricultural Subsidies

1. Context: The Pain of Structural Transformation and Farm Income Support

It is well known that, in the development process, the share of agriculture in income and employment declines with economic growth. The migration of economic activity away from agriculture has its roots in productivity growth in the farm and non-farm sector. In practice, stepping up agricultural productivity has been a powerful mechanism especially in larger economies (Gollin 2009). Furthermore, it has also been noted that the structure within agriculture also changes – away from staples and towards income-elastic foods such as fruits, vegetables, milk, meat and eggs (Timmer, 1988). Engel's law drives the migration of economic activity away from agriculture within the overall economy and the migration of economic activity away from staple agriculture within the sector of agriculture. Meeting the demands for diversified consumption leads to greater incomes that in turn feeds back to consumption and its composition.

The process of economic advance described above has, at least, two key implications. First, the transformation of a staples dominated traditional agriculture to a diversified production structure is essential to sustain rising incomes. Second, a dynamic non-farm sector can lead to successful structural transformation only if it is matched by rising productivity in the food sector (unless the country can readily import food products). For policy, the corresponding implications are two-fold. While it may be sufficient to grow the production of income inelastic food staples according to the growth of population, the output of other income elastic agricultural goods must rise faster than population. Failure to achieve the latter will mean that a large labour force is locked into the production of staple foods slowing income gains. Thus, the development process stands on two pillars: the productivity of food staples and the migration of labour and other resources from food staples to other sectors within and outside agriculture.

However the structural transformation process is uneven. In particular, the relative decline in agricultural employment lags the relative decline in agricultural output. Figure 1 below plots the cross-country evidence. It can be seen that the relative shares converge at high levels of income. Otherwise, the employment shares remain well above income shares. As a result, except for the richest countries, income per worker in agriculture remains well below income per worker in non-agriculture.

## Figure 1: Structural Transformation Globally
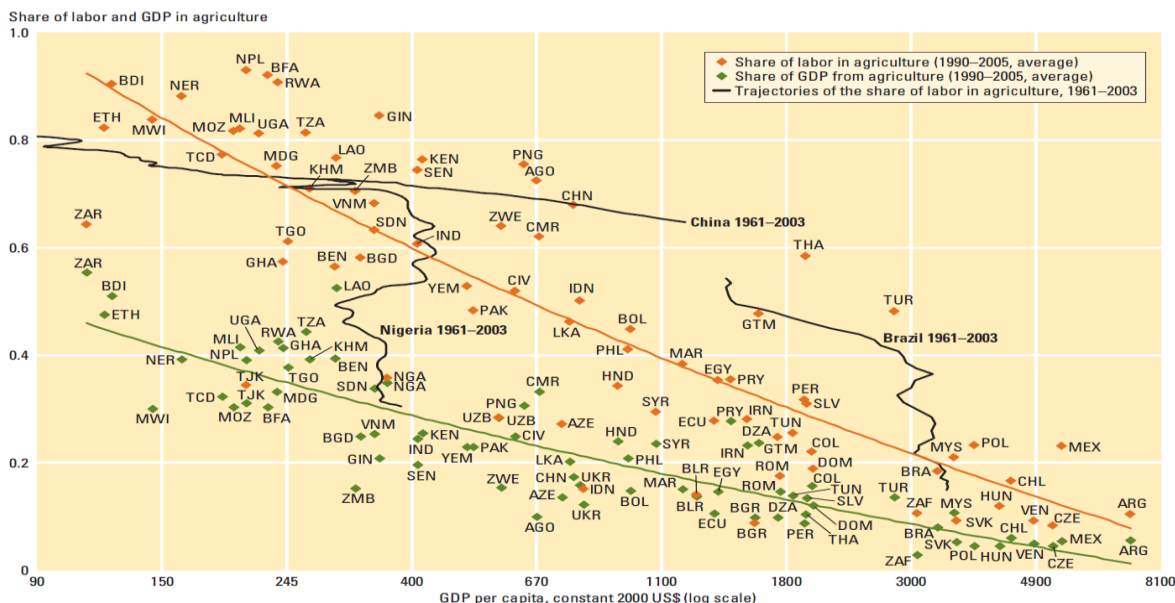
Source: Byerlee, de Janvry, Sadoulet, Townsend, and Klytchnikova (2008)

The movement in the sectoral disparity in income per worker in India is plotted in Figure 2. Figure 2 shows that the absolute gap between the shares has not changed. However, the relative gap in sectoral value added per worker has changed. The ratio of output per worker in non-agriculture to agriculture is the same as the ratio of two other ratios where the numerator is the ratio of the share of value added in non-agriculture to the share of value added in agriculture. The denominator is the ratio of non-agriculture's share in employment to that of agriculture.

In the early 1980s, the relative productivity gap was about 3.5 (60/40 divided by 30/70). By the early part of this decade the gap had gone up to more than 5.5 (85/15 divided by 50/50).[1] The rise in the relative productivity gap from the early 1980s to the early 2010s tell us something about the nature of Indian economic growth. While non-farm growth has pulled away successfully from the low rates that prevailed before, it has not been accompanied by a similar rise in output per worker in agriculture.

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[1] Ramesh Chand's (2017) estimate of the sectoral productivity gap is lower (3.12) because he compares the income per worker in non-agriculture to the income per cultivator in agriculture. The estimates in the text compute the income per worker in agriculture including cultivators and agricultural labor.

Figure 2: Structural Transformation in India
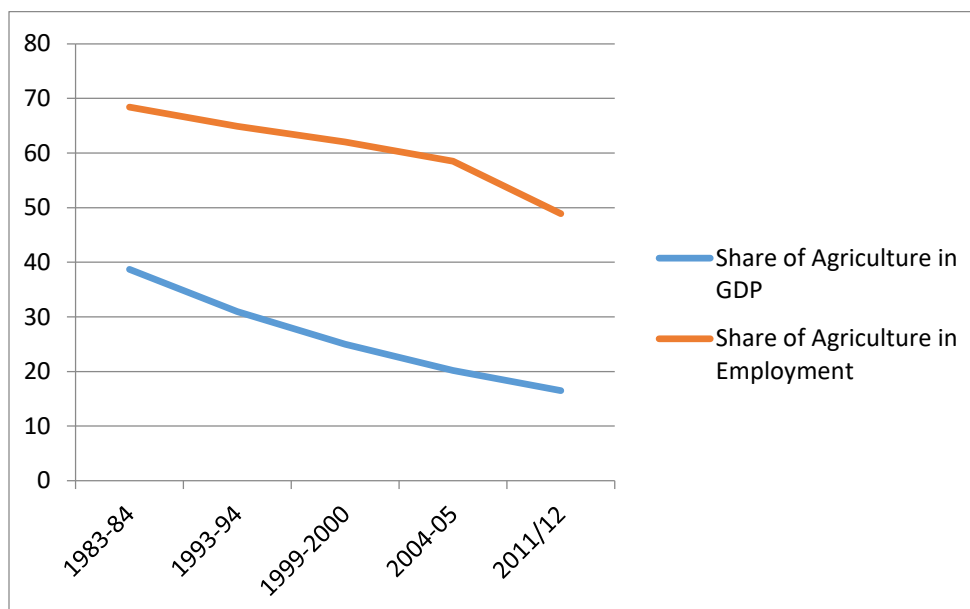
Source: Author's calculations based on CSO and NSSO data

The international evidence on this ratio is presented in Table 3 below. From the table it can be seen that productivity gap in India is among the highest in the world. Gollin, Lagakos and Waugh (2013) argue that the productivity gap calculated from income and employment shares may exaggerate the true gap because the agricultural labour force is typically worse educated and because labour in agriculture works fewer hours (on an annual basis) than labour elsewhere. They show, however, that while adjusting for these features reduces the gap, it does not eliminate it entirely. In the Indian case, accomodating for these differences reduces the productivity gap to 2.5 (Jat and Sundaram, 2018). However, it is not clear whether differences in hours worked should be adjusted given that lower hours worked in agriculture is largely because of seasonal factors and therefore may reflect involuntary under-employment. Adjusting for differences in human capital alone, the relative productivity gap is 3.75.

Table 1: Relative Productivity Gap Between Non-Agriculture and Agriculture

RAW AGRICULTURAL PRODUCTIVITY GAPS

	All countries	Quartile of income distribution			
		Q1	Q2	Q3	Q4
10th percentile	1.3	1.0	1.3	1.0	1.2
Median	2.6	1.7	2.7	2.8	4.3
Mean	3.5	2.0	3.2	3.4	5.6
90th percentile	6.8	4.0	6.6	7.1	12.5
Number of countries	151	38	38	38	37

Note: Income quartiles are determined using 2005 PPP GDP per capita. Q1 is the richest quartile and Q4 is the poorest quartile. The raw agricultural productivity gaps are defined as the ratio of value added per worker in the nonagricultural sector to value added per worker in the agricultural sector, without any adjustments to the underlying value added or employment data.

Source: Gollin, Lagakos and Waugh (2013)

In many ways, the relative productivity gap is the central problem of Indian agriculture. Relative to output, Indian agriculture contains `too much' labour putting pressure on farm incomes and wages. What policies and investments can close the gap and increase incomes for about half of the work force? Clearly, a good part of the solution lies in creating productive non-farm jobs accessible to the farm labour force.

The rich countries put in place a variety of programs to support farm incomes. These programs have evolved from price supports, tariffs to direct supports. But as we have seen, the pain of structural transformation is felt even at much lower levels of income. As in other countries, the sectoral disparity in incomes is a point of social tension in India and fuels the political demand for farm income support so much so that farm subsidy is the most visible face of agricultural policy.

The rise of farm subsidies as a major component of agricultural policies has given rise to two major questions (among others). First, what ought to be the scale of subsidies? While the cost of support programs is a point of contention in rich countries as well, this question is naturally more salient in poor countries that have pressing demands on government expenditures from multiple under-funded priorities. In particular, policy makers have to be aware that

subsidies may crowd out agricultural investments and delay the structural transformation processes. The trade-offs are between the short run and the long run.

The second question is about the form of subsidies. When income support operates through subsidies on inputs or through higher prices for outputs, it can lead to negative externalities that directly threaten the agricultural resource base. In addition, it may discourage the migration of resources from staple foods to other activities and choke the income growth processes. The question is what investments and policies are necessary for the government to consider strategic approaches that would yield `smarter' subsidies that offer more bang for the buck.

We end this section with a caveat. Differences in income per capita between agricultural and non-agricultural households are smaller than the differences in output per worker. This is because agricultural households and especially those with limited land have generally also receive income from non-agricultural sources. Incomes are higher for agricultural households that are able to diversify and include income streams from non-agricultural sources (Nabard, All India Rural Financial Inclusion Survey, 2016-17). From the NSS survey of farm households of 2012-13, it can be seen that on average, less than half of income comes from cultivation.

Figure 3: Sources of Income of Farm Households
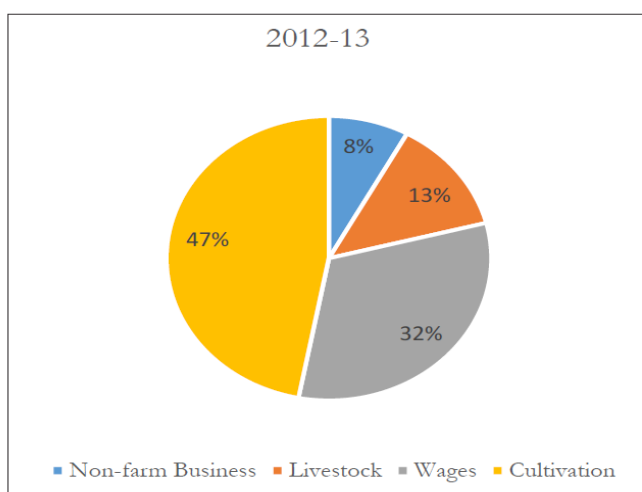
Source: The figure is reproduced from the Economic Survey of 2017-18.

2. Subsidy Levels and Their Contribution

(a) *Scale*

Table 2 provides a bird's eye view of the scale of major agricultural subsidies. In each instance, the subsidy represents the expenditure incurred by the respective government (state or central). Fertilizer, credit, irrigation and crop insurance are explicit subsidies in that the government provides budgetary heads to charge these expenditures. Power and price support subsidies are not official budget categories but estimated. It is worth clarifying that the Central food subsidy does not represent in its entirety the expenditures that support farm incomes. The food subsidy also includes expenditures towards the Public Distribution System (PDS) that offers subsidies to consumers. Hence the price support subsidy is only a component of the food subsidy. As it is not reported separately in official data, the price support subsidy is estimated in this paper.

The subsidies relate to the period around the mid-2010s. The figures are not expressed in constant prices. Doing so is not difficult but would not change the story because the period spans a maximum period of 4 years. With this caveat in mind, the total subsidy expenditure in 2017/18 was about Rs. 235,500 crores. The last row in Table 2 contains the expenditures on account of loan waivers for the year 2017/18.[2] With several state elections that year, this figure may not be representative as an annual average. Further, the figure represents the total commitment of the state but not the actual expenditure. The expenditures for loan waivers are phased in over several years.

Table 3 is a restatement of Table 2 when the subsidies are divided between the Central and State governments. With the loan waivers, subsidies from the State government form the bulk of expenditures. Without the loan waivers, the total subsidy expenditure is almost evenly divided between the Centre and States. The fertilizer subsidy is the major Central subsidy while the power subsidy accounts for most of the expenditures from the states.

The estimates in Table 2 compare well with other studies that report subsidies on input expenditures. This can be seen from Table 4. Overall, it can be seen that input subsidies are in

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[2] UP: Rs 36,000 crores, Maharashtra: Rs 34,000 crores, Punjab: Rs. 10,000 crores, Karnataka: Rs 42,200 crores

the range of rupees two lakh crores. Thus input subsidies alone are about 1.5% of GDP. The
loan waivers and output subsidies will take the aggregate expenditure to about 2-2.25% of GDP.

Table 2: Expenditure on Major Agricultural Subsidies (Rs. Crores)

Name	Source	Year	Magnitude
Fertilizer	Union Budget	2017/18	70,000
Power	Dharmadhikari et.al (2018) based on Power Finance Corporation data	2015/16	91,000
Credit	Union Budget	2017/18	20,000
Irrigation	Central Water Commission (2017)	2013/14	17,500
Crop Insurance	Union Budget	2018/19	13,000
Price Support	Author's estimate	2014/15-2016/17	24,000
Total (without inflating to 2017/18 price levels)			2,35,500
Loan waivers	PRS Legislative Research https://www.prsindia.org/policy/discussion-papers/state-state-finances-2018-19	2017/18	1,22,200

Source: Compiled from the sources mentioned in the Table. The price support subsidy are the author's
computations.

Table 3: The Division of Agricultural Subsidies Between the Centre and the States (Rs. Crores)

Central Government Subsidies	Amount
Fertilizer	70,000
Credit	20,000
Crop Insurance	6,500
Price Support	24,000
Total	1,20,500
State Government Subsidies	
Power	91,000
Irrigation	17,500
Crop Insurance	6,500
Loan Waivers	1,22,200
Total	2,37,200

Source: Same as in Table 3

**Table 4: Expenditures on Input Subsidies, Comparisons Across Studies**

Study	Year	Amount (Rs. Crores)
Bathla, Thorat, Joshi and Yu (2017)	2013/14	1,90,000
Chand (2018)	2015/16	2,05,400
OECD (2018)	2014/16	1,81,000
Aggregate from Table 2	2017/18	1,98,500

(b) *Comparison with Public Expenditures and Investments*

A recent study has examined the trends in spending on agriculture and irrigation, public investments (largely relating to major irrigation works) and input subsidies (Bathla, Thorat, Joshi

and Yu, 2017). These trends are based on data relating to expenditure by state and central governments.

Figure 3: Agriculture Expenditure and Input Subsidies (Rupees Billion in 2004/05 prices)
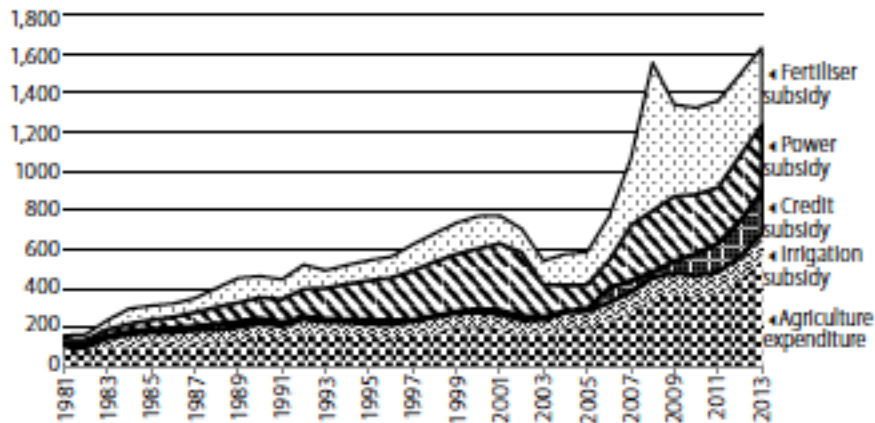
Source: Bathla, Thorat, Joshi and Yu (2017)

Figure 3, sourced from the study, shows that by 2013, all the input subsidies (fertilizer, power, credit and irrigation) put together exceed agricultural expenditure by a factor of 2. Figure 4 shows that input subsidies are about the same level as public investment in agriculture. As published by CSO, public investment in agriculture mainly measures investment in major irrigation schemes.

Figure 4: Input Subsidies and Public Investment (Rupees Billion)
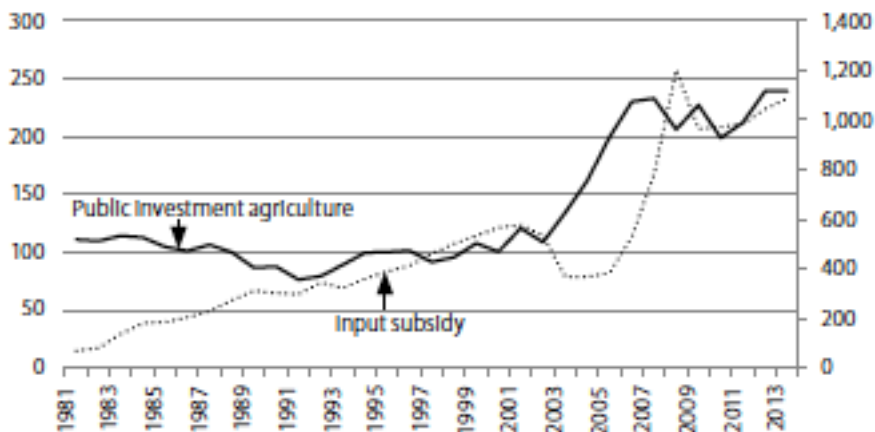
Source: Bathla, Thorat, Joshi and Yu (2017)

Figures 3 and 4 represent a critique of subsidies – that subsidies represent an opportunity cost of public spending and investment that are important to improve and sustain agricultural productivity. But to what extent do these input subsidies provide income support, which is arguably their major objective?

(c) *Income Support*

Table 5 presents estimates of subsidy per hectare and farm income per hectare for the mid-2010s. Normalized by land, the input subsidy per hectare of sown area in 2014 is about Rs. 7750 (measured in 2004/05 prices) and the price subsidy per hectare of sown area is Rs. 1050 rupees per hectare.[3] For the same year, Chand (2017) estimates total farmer income to be Rs. 597020 crores (also in 2004/05 prices) which amounts to Rs 42,644. Hence the farm subsidy expenditure amounts to as much as 21% of average farm income. This means that subsidies cannot be withdrawn without considerable hardship to the farm community.

Table 5: Subsidy Expenditure as a Proportion of Farm Income

For 2014/15	In 2004/5 prices
Input Subsidy per hectare (Bathla et. al, 2017)	Rs. 7750
Price support subsidy per hectare (Author's Estimate)	Rs. 1050
Total subsidy income	Rs. 8800
Farm cultivator income per hectare (Chand, 2017)	Rs. 42,644
Subsidy income/Farm Income	21%

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[3] The total input subsidy is a little less than Rs. 1200 billion while net sown area is about 140 million hectares.

According to the 2015/16 Agricultural Census, the average size of an operational holding was only 1.08 hectare and furthermore, about 68% of holdings were marginal (i.e., less than 1 hectares). If these holdings were to earn the average (of Rs. 42, 644), the agricultural income is barely enough to be economically viable. The all-India rural Tendulkar poverty line for 2004/05 was Rs. 477 per capita per month. This means that farm incomes for households with operational holdings less than 0.63 hectare will not be sufficient to keep them out of poverty. Chand (2017) estimates farm income per cultivator to be Rs. 44, 000 (in 2004/5 prices) in 2015/16. Given that input and output price subsidies are 21% of farm income, even an increase of 50% in subsidies will increase farm incomes only by about 10% which will not close the sectoral productivity gap substantially.

While subsidies are typically seen to compensate for low profitability in the farm sector, it is not clear that it is low profitability that is responsible for lagging farm incomes. Chand, Saxena and Rana (2015) show that farm income was as much as 70% higher than the cost of all variable inputs (including hired labour) in 2011/12. While such profitability was exceptional because of the unusually high farm prices that year, the profitability ratio was in the range of 40 to 50% in the 1990s and mid-2000s.

While the current downturn in commodity prices has adversely affected profitability, we should not lose sight of the tiny asset base of much of the farming population that remains the fundamental constraint. For marginal and small farmers, the ownership of land is so limited that farm incomes would continue to be low in both absolute and relative terms even if subsidies increased substantially.

It can be concluded therefore that that even though farm subsidy expenditure by the government is a substantial component of farm income, even a large rise in subsidies will have (a) limited impacts on farm distress because our farmers own tiny plots of land and (b) little impact on the relative productivity gap because the gap is too large. Thus, while subsidies are too important for farm incomes for them to be curtailed, they do not represent viable future directions for sustainable increase in farm incomes. The structural transformation processes continue to be the primary mechanisms for rapid income growth.

The above computations carry several caveats. First, the calculation of subsidies is not straightforward especially for power and irrigation.[4] Power subsidies, in particular, are likely to be overestimated because of upward bias in estimates of supply to agriculture. Second, the computation of farm income is not directly estimated from farm surveys but by combining information on aggregate value added, hired labour and days of employment and on wages from different sources. Third, the subsidy expenditure by the government may overstate (e.g., when subsidies leak to unintended groups) or understate the income support received by farmers (e.g., price supports as will be explained later). Fourth, the estimates of farm income and subsidies are aggregates for the sector (normalized with respect to land) and therefore, they are silent about the importance of subsidy transfers for farmers in different regions, belonging to different land size classes, growing different crops and operating different amounts of irrigated land. Fifthly, the input subsidies may change producer decisions and hence a simple comparison of income with subsidies and without subsidies is only an approximation. These caveats suggest that the computations done above be taken as indicative of the importance of subsidies to aggregate farm income (rather than to any particular farmer).

A robust lesson from economic theory as well as experience is that subsidies that involve the price system will distort the allocation of resources and lead to an efficiency loss. The questions, therefore, are: (i) how large are the efficiency losses and whether the equity gains are large enough to compensate these losses and (ii) how feasible are alternative subsidy mechanisms that reduce or minimize these distortions? The answers to these depend on the particular context and may therefore vary across the different types of input subsidy.

3. Fertilizer Subsidy

The expenditure on fertilizer subsidy is the largest input subsidy. For the year 2017/18, it is estimated to be about Rs. 70,000 crores. Of this, Rs. 50,000 crores are spent as subsidy on urea while the remainder is the subsidy on potash and phosphorous (DAP). As a percentage of

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[4] "The estimates on irrigation and power input subsidies are based on the unit cost and usage in agriculture. Credit subsidies represent interest subsidies (estimated as the difference between commercial interest rates and the interest rate farmers receive) multiplied by the value of outstanding loans. Default subsidies could not be estimated because data were not available on nonperforming assets in commercial banks. The estimates on fertilizer subsidies are taken from the Fertilizer Association of India and divided into states using the average price and consumption." (Bathla, Joshi and Kumar, 2017).

the cost of production, urea is subsidized to the extent of 75% while the subsidy on potash and phosphorous is about 35% (Economic Survey, 2015-16).

The difference between urea subsidy and that on other fertilizers also extends to the administrative arrangements. Each kg of potash and phosphorous fertilizer receives a fixed rupee amount as subsidy that is directly paid to the manufacturer. The final price is unregulated (although it is expected that it will be `reasonable) and determined in the market. The subsidy mechanism is more complicated for urea. The selling price of urea is statutorily fixed by the Government of India and the difference between the delivered cost of fertilizers at farm gate and selling price payable by the farmer is given as subsidy to the fertilizer manufacturer/importer by the Government of India. The subsidy amount varies between manufacturers depending on the energy norms applicable to them. Imports are canalized and only three agencies are authorized. The subsidy on imports varies with the consignment (Economic Survey, 2015-16).

Some of the important consequences of these subsidies are the following:

- Subsidies have lowered the relative price of urea with respect to the other fertilizers. As a result, the application of fertilizers is heavily skewed towards urea disturbing the nutrient balance in soils (see Economic Survey, 2015/16 for figures that demonstrate the overuse of urea relative to DAP and potash).

- The low subsidized price at which urea is sold has encouraged illegal diversions to industry and smuggling to adjoining areas in Nepal and Bangladesh. The Economic Survey of 2015-16 estimates such theft to be as high as 41% of the amount supplied.[5]

- As a result of the low price and the illegal diversions, farmers are rationed and not always able to buy all the urea they want. The excess demand has resulted in black markets and according to the Cost of Cultivation survey of 2013-13, 51% farmers end up paying prices higher than the statutory MRP. The across state variation is displayed in Figure 5. The black market prices are on average 61% higher than the MRP. The extent of overcharge varies by state and is displayed in Figure 6 which compares the average price of purchased urea with the MRP.

- The implication of the above is that the subsidy farmers receive is smaller than the fertilizer subsidy expenditures of the government of India.
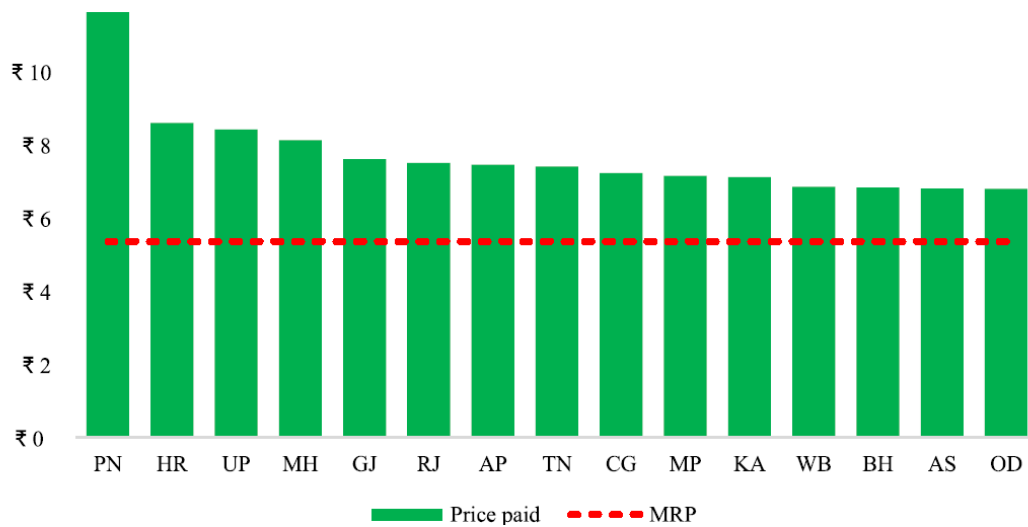
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[5] The Economic Survey (2015/16) estimates illegal diversion by comparing urea allocations with the urea use reported in cost of cultivation data.

Figure 5: Percentage of farmers purchasing Urea at prices higher than MRP
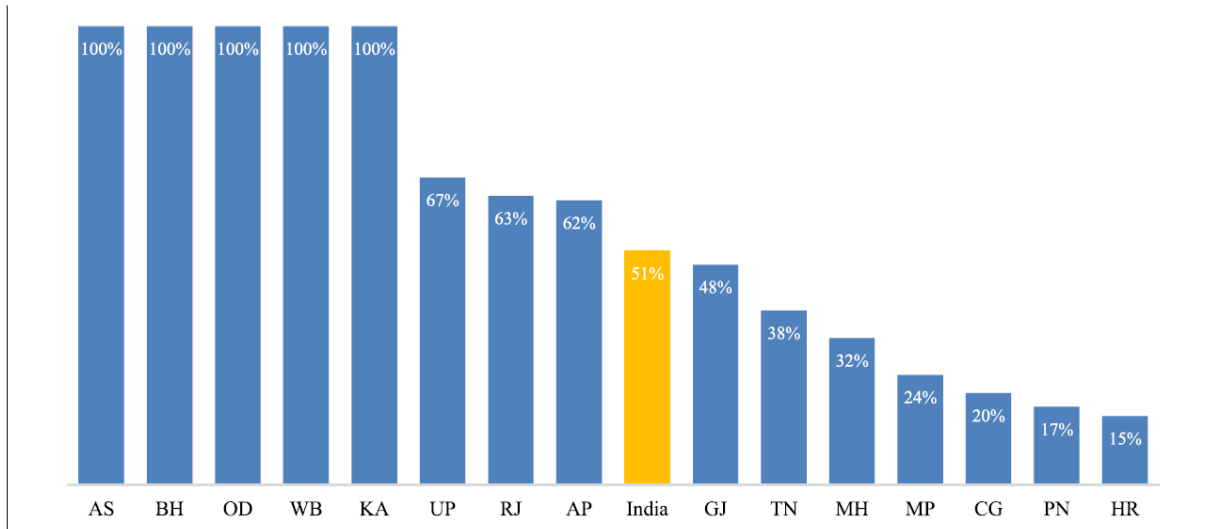
Source: Reproduced from Economic Survey 2015-16.

**Figure 6: Price Paid by Farmers for urea (per kg) and MRP**

Source: Economic Survey 2015-16

- The subsidy amount differs between firms and neutralizes the advantages of efficient firms. Apart from keeping inefficient firms to stay in production, the policy discourages capacity addition by the efficient firms. Figure 8 shows that greater are the costs of production, greater is the urea subsidy per metric ton is higher.

Figure 7: Subsidy Reimbursed to Firms and its Relation to the Cost of Production
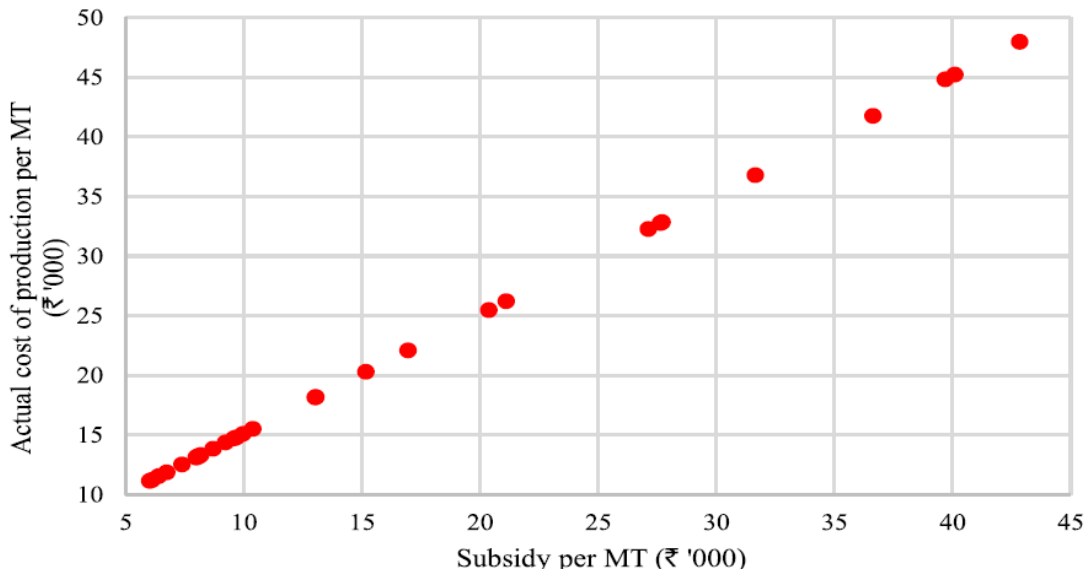
In sum, there is substantial leakage of subsidy because of illegal diversions, black marketing and inefficient firms.   All of these problems are baked into the fertilizer subsidy regime. The low retail price encourages illegal diversions and black marketing while the cost plus subsidy reimbursement leaks some of the subsidy to inefficient firms. As many farmers end up paying prices higher than MRP for urea, the subsidy received by farmers is lower than the budgeted; however, even then the urea subsidy has distorted fertilizer application to favour urea.

The big reform would be to do away with the price subsidy and offer cash transfers instead. Prices would be market determined as in the case of potash and DAP. This would put an end to illegal diversions and black marketing. As the subsidy is directly transferred to the farmer, the cost plus subsidy reimbursement would also end which would terminate perverse incentives to inefficient firms. Finally, as the cash transfer completely delinks the fertilizer application decision from the subsidy, the urea overuse problem would also be resolved.

The fertilizer subsidy policy takes a more cautious approach to reforms. The central government has mandated neem coating of fertilizers to prevent easy diversion to industrial use. A second component of policy is to move to a system of Direct Benefits Transfer (DBT). Fertilizer sales recorded on the basis of Aadhar authentication will be used to transfer subsidy to manufacturers. The key reform attempted here is Aadhar authentication (which should, in principle, be linked with land records) to keep out fraudulent transactions and prevent smuggling

across borders. After pilots in 17 districts, the DBT have been rolled out across the nation in kharif 2018. The pilots showed Aadhar connectivity and the incomplete state of land records to be a major constraint. As a result, the land record status is often not verified and sometimes even the Aadhar identification is bypassed. So in this transitional stage, it would be premature to expect large reduction in leakages. It should also be noted that the subsidy design does not remove the incentives to smuggle fertilizers across borders. The direct reimbursement to manufacturers continues to protect less efficient firms.

DBT of the kind seen in LPG requires investments to improve land records. In the meantime, the government can prepare the ground for DBT to farmers, by extending the nutrient based subsidy (fixed in rupees per kg) to urea and letting the price be determined by market forces.

4. Power Subsidy

Groundwater is the dominant source of irrigation (see Table 6) and it has expanded rapidly since the 1970s (see Figure 8).   Since electricity is used to pump water from underground aquifers, electricity use in agriculture and the number of electrified pumpsets have also increased rapidly. In 1979/80, the number of electrified pumpsets was a little less than 4 million. By 2017/18, the number had jumped to more than 21 million (see Figure 9). The share of agriculture in electricity supply was negligible in the early 1970s. By 2017, agriculture consumed 20% of all electricity supply – see Figure 10.

Table 6: Percentage of Irrigated Area by Source (2013/14)

|	
Tanks	2.70
Groundwater	62.32
Other sources	11.07
Canals	23.90

Source: Directorate of Economics and Statistics, Ministry of Agriculture and Farmer Welfare
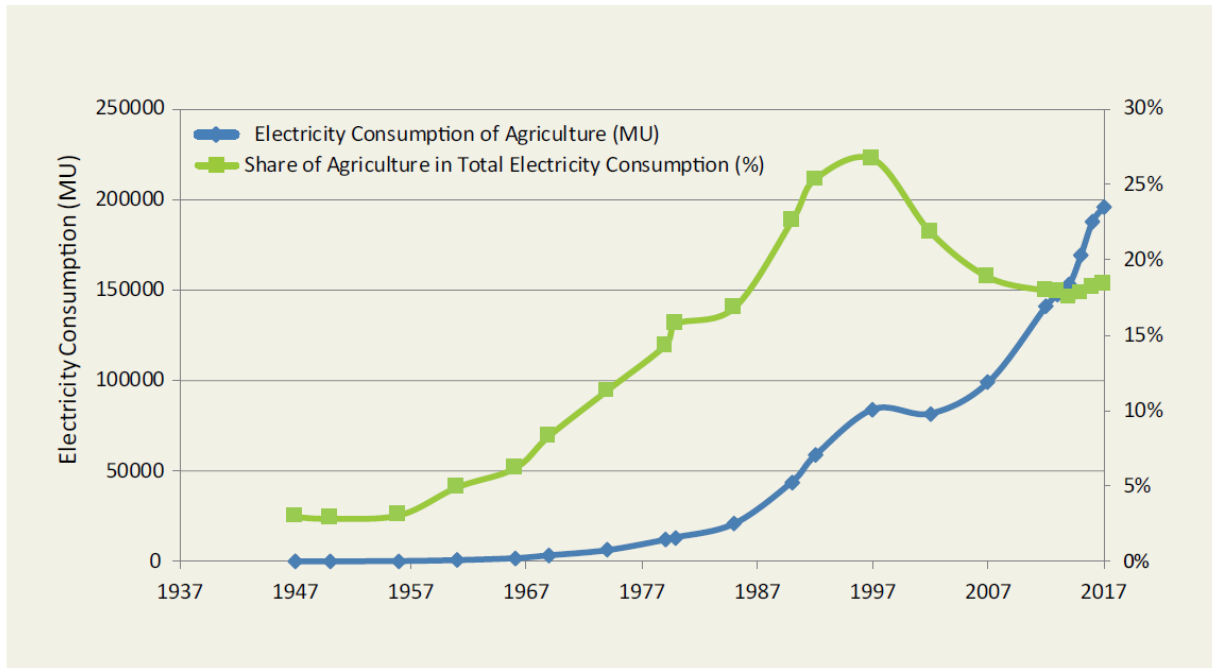
Figure 8: Area irrigated by source
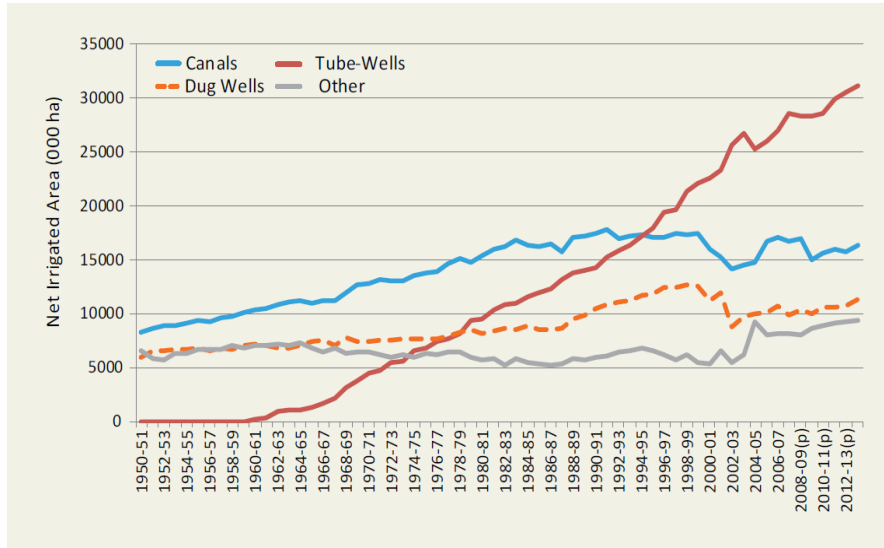
Source: Dharmadhikari et. al (2018), p 16 based on data from Directorate of Economics and Statistics, Ministry of Agriculture and Farmer Welfare

Figure 9: Number of Electric Pumpsets
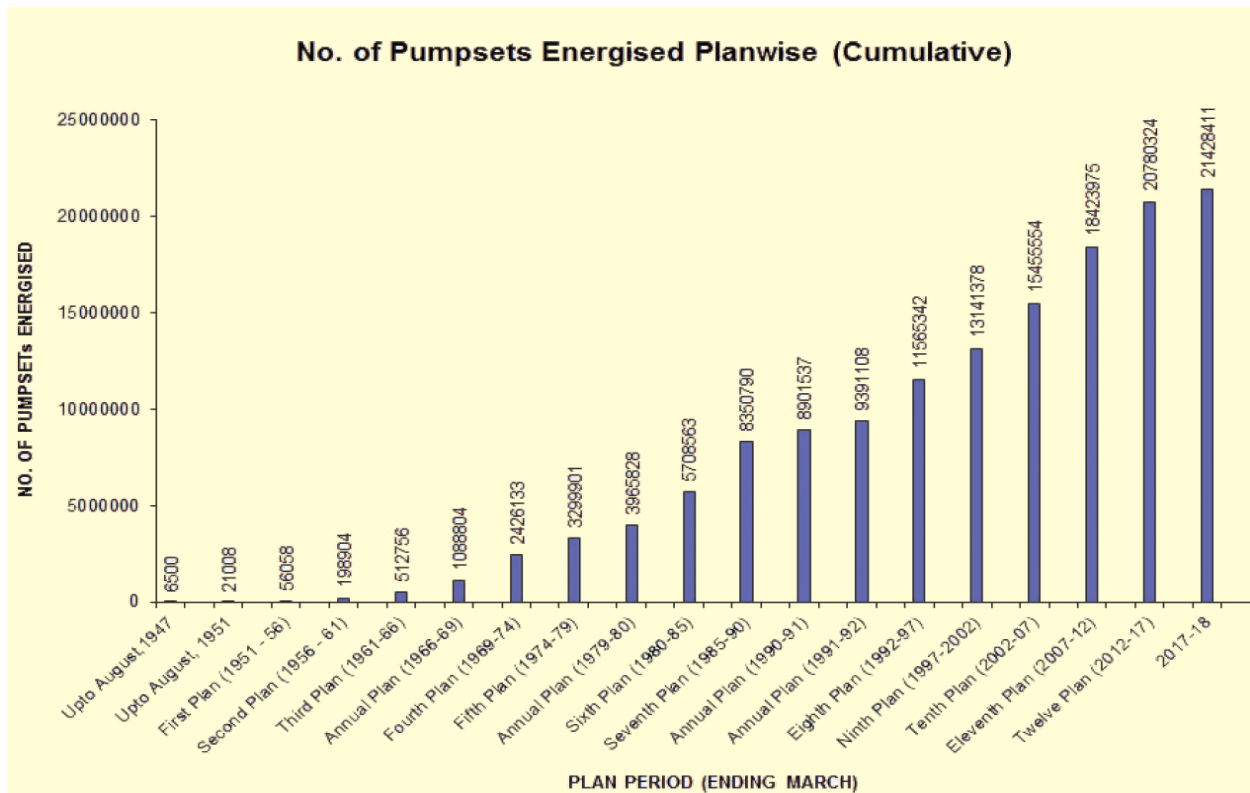
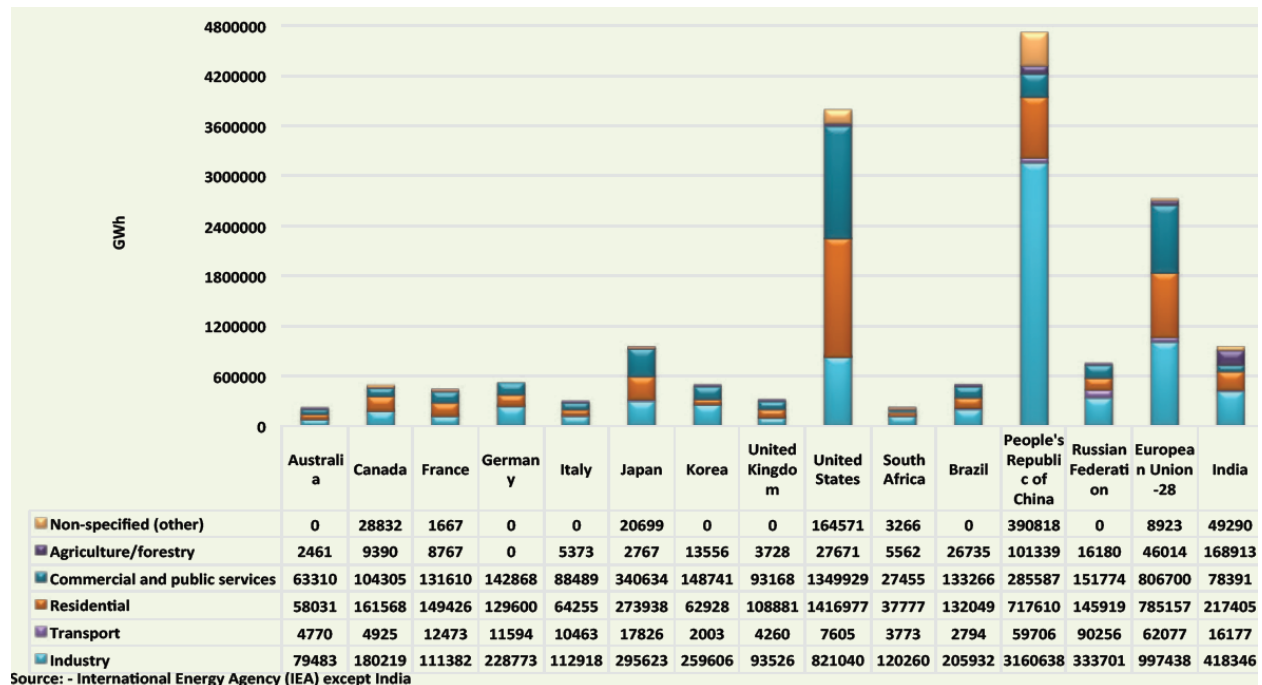Source: Annual Report of the Central Electricity Authority (2017/18)

Figure 10: Electricity Consumption in Agriculture

Source: Dharmadhakari et.al (2018) p 6

By international standards, electricity consumption in Indian agriculture is quite exceptional. Figure 11 shows that consumption in India easily outstrips comparable countries such as China, USA, Russia, Brazil. Figure 12 shows that despite a lower GDP per capita (that lowers the demand for electricity in non-agricultural sectors), the share of agriculture in total electricity consumption in India is of many orders magnitude greater than in the richer countries (China, USA, Russia, Brazil). As discussed later, agricultural consumption figures in India may be exaggerated by mis-reporting. However, even accounting this, the high electricity consumption in India reflects a unique dependence on groundwater irrigation. According to the FAO Acquastat database, India is the largest user of groundwater at 251 billion cubic meters (2008-12). Groundwater withdrawals are 113 and 105 billion cubic meters in China and USA respectively.

Figure 11: International Comparison of Electricity Consumption Across Sectors (Absolute Amounts)

	Australia	Canada	France	Germany	Italy	Japan	Korea	United Kingdom	United States	South Africa	Brazil	People's Republic of China	Russian Federation	European Union -28	India
■ Non-specified (other)	0	28832	1667	0	0	20699	0	0	164571	3266	0	390818	0	8923	49290
■ Agriculture/forestry	2461	9390	8767	0	5373	2767	13556	3728	27671	5562	26735	101339	16180	46014	168913
■ Commercial and public services	63310	104305	131610	142868	88489	340634	148741	93168	1349929	27455	133266	285587	151774	806700	78391
■ Residential	58031	161568	149426	129600	64255	273938	62928	108881	1416977	37777	132049	717610	145919	785157	217405
■ Transport	4770	4925	12473	11594	10463	17826	2003	4260	7605	3773	2794	59706	90256	62077	16177
■ Industry	79483	180219	111382	228773	112918	295623	259606	93526	821040	120260	205932	3160638	333701	997438	418346

Source: - International Energy Agency (IEA) except India

Source: Central Electricity Authority (2017)

Figure 12: International Comparison of Electricity Consumption Across Sectors (Proportions)

	Australia	Canada	France	Germany	Italy	Japan	Korea	United Kingdom	United States	World	South Africa	Brazil	People's Republic of China	Russian Federation	European Union -28	India
■ Non-specified (other)	0.00	5.89	0.40	0.00	0.00	2.18	0.00	0.00	4.34	4.07	1.65	0.00	8.29	0.00	0.33	5.20
■ Agriculture/forestry	1.18	1.92	2.11	0.00	1.91	0.29	2.78	1.23	0.73	2.84	2.81	5.34	2.15	2.19	1.70	17.81
■ Commercial and public services	30.43	21.32	31.69	27.86	31.44	35.80	30.55	30.69	35.64	22.06	13.86	26.61	6.06	20.57	29.81	8.26
■ Residential	27.89	33.02	35.98	25.27	22.83	28.79	12.93	35.87	37.41	26.99	19.07	26.37	15.22	19.78	29.01	22.92
■ Transport	2.29	1.01	3.00	2.26	3.72	1.87	0.41	1.40	0.20	1.53	1.90	0.56	1.27	12.23	2.29	1.71
■ Industry	38.20	36.84	26.82	44.61	40.11	31.07	53.33	30.81	21.68	42.52	60.71	41.12	67.02	45.23	36.86	44.11

Source: - International Energy Agency (IEA) except India

Source: Central Electricity Authority (2017)

If the level of groundwater extraction is high relative to recharge, it may be unsustainable. Figure 13 maps the `unsafe' areas where extraction is more than 70% of annual

recharge. It can be seen that except for the eastern part of the country, groundwater use is at unsustainable levels in the rest of the country.

Groundwater is a common property resource and without a strong governance framework it is likely to be exploited. A component of the governance framework is electricity pricing. Two features characterize electricity pricing for agriculture. First, except for West Bengal, electricity use in agriculture is largely unmetered and farmers are charged flat tariffs (depending on Kwh connection). Second, these flat tariffs are low and do not cover the costs of supply. In three states, Punjab, Karnataka and Tamil Nadu, the flat tariffs are zero.   Both of these features encourage the overexploitation of groundwater resources. Raising flat tariffs may reduce the number of new connections but conditional on a connection, the marginal cost of an additional unit of electricity is zero.

Figure 13: Groundwater Extraction Relative to Recharge
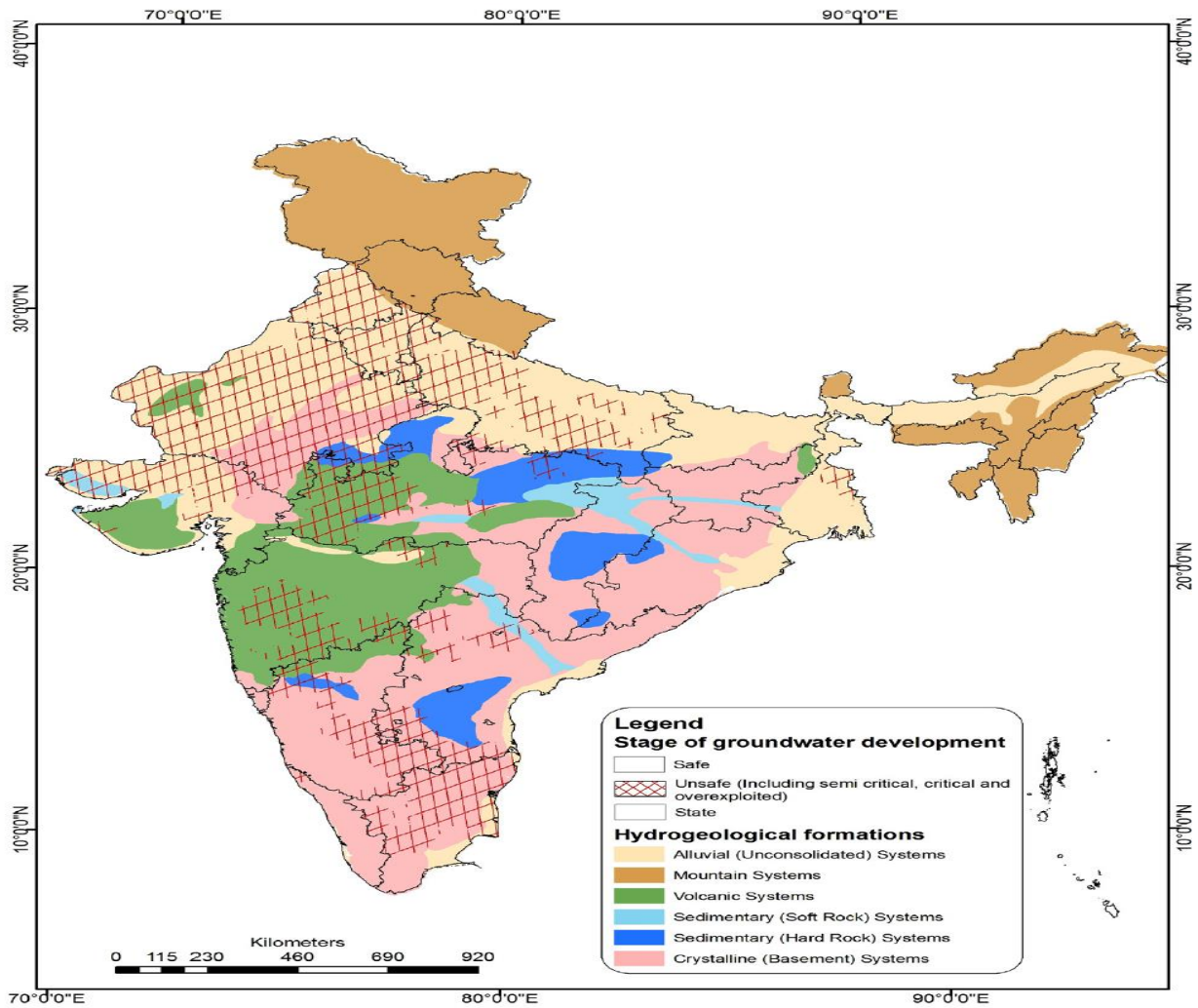
Source: Kulkarni, Shah and Shankar (2015)

Electricity prices and therefore, subsidies vary between states. These subsidies are borne by the state governments. Figure 14 shows the average tariff per kWh paid by farmers and the proportions of connections that are metered. During this period the average cost of supply was Rs. 6 per kWh.

Figure 14: Average Electricity Tariff and Proportion of Connections Metered (2012-14)
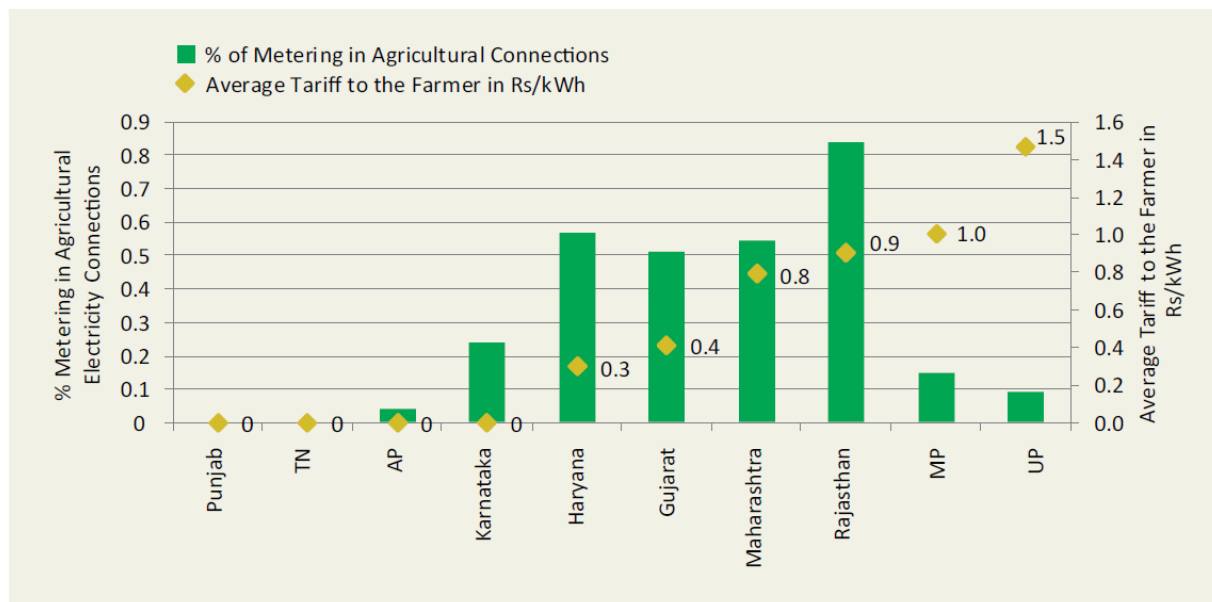
Source: Dharmadhikari et. al, Volume 2, p 6

Figure 14 indicates a substantial subsidy to the agricultural sector. There is no single official source for the total subsidy on power to the agricultural sector. Bathla, Joshi and Kumar (2017) comb through various data sources including state statistical abstracts to estimate the power subsidy as Rs. 2339 (2004/5 prices) per ha for the triennium ending 2014/15. This amounts to Rs. 81,500 crores in 2014/15 prices. Another indicative estimate comes from Dharmadhikari et. al (2018). From the reports of the Power Finance Corporation, they calculate the revenue gap as the product of sales to agriculture and the revenue shortfall where the latter is the difference between the revenue per unit of sales and the average cost of supply. They find the aggregate revenue gap to be Rs. 91,000 crores in 2015/16.[6] The two estimates are of similar order of magnitude and suggest that the power subsidy is comparable to the other `large' subsidies: fertilizer and food. The difference is that the latter two subsidies are borne by the Central government while the power subsidy is a charge on State finances.

The low and flat tariff structure of agricultural electricity supply is a plausible reason for excessive groundwater extraction although it is not probably the only or even the major factor. Other reasons such as price support policies that make water-intensive crops attractive and

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[6] The computation is done for the 10 states that account for 97% of all electricity consumption in 2013/14: AP, Gujarat, Haryana, Karnataka, MP, Maharashtra, Punjab, Rajasthan, TN and UP.

practices that reduce the effectiveness of canal irrigation and other forms of surface irrigation may also be responsible. Badiani and Jessoe (2017) estimate that a 10% increase in flat tariffs would on average reduce groundwater extraction by 1.8%. They are unable to report the effect of a more fundamental reform that is volumetric pricing because the data show no variation in unit prices across states (since it is mostly zero everywhere). It is likely that the responses to volumetric pricing would be much larger.

Besides groundwater extraction, the low and flat tariff structure has had other consequences. The fact that electricity supplies to agriculture are largely not metered has meant that there is no simple transparent way to estimate it. Indeed, it is a major caveat to the subsidy estimates provided above. It has long been suggested that DISCOMs have inflated the sales to agriculture to hide losses due to other inefficiencies including theft (Dharmadhikari et. al (2018), Monari (2002), Singh (2012)). The advent of regulatory tariff commissions has somewhat alleviated the problem. Dharmadhikari (2018) and Singh (2012) report many instances where regulatory oversight has led DISCOMs to revise downwards their estimates of losses from supply to agriculture. Nonetheless, the methodology of estimating losses varies between states and there is room for doubt about the accuracy of reported losses (Dharmidhikari et. al (2018).

Aggregate losses of power utilities were Rs 114,000 crores in 2014/15 and nearly Rs. 1,50,000 crores in 2015/16 (Central Electricity Authority, 2018). If the power subsidy to agriculture is in the range, Rs. 80,000 to Rs. 90,000 crores as suggested by the estimates discussed earlier, then the heavy subsidies to agriculture (and to other consumer categories) have strained the finances of the state electricity boards. The ripple effects of the poor financial position of the DISCOMs include pending dues to generation units, inability to borrow and discouraging private investment in generation.

The lack of resources with DISCOMs has also been blamed for poor quality of electricity supply to agriculture. Voltage fluctuations are common and lead to burnouts of transformers and pumpset motors. This disrupts timely power supply to agriculture. In addition, farmers suffer additional losses because of motor rewinding costs (Dharmadhikari et. al (2018), Monari (2002)).

Furthermore, the fact that DISCOMs lose money supplying power to agriculture means that they ration those supplies. Analyzing the data from the Minor Irrigation Census for 2013-

14, Dharmadhikari et. al (2018) point out that non-availability of power leads tube-wells to be underutilized and encourages investment in diesel pumps or buying water from farmers with higher capacity pumpsets. Finally, rationing electricity supply to nights makes operation of pumpsets more hazardous and is possibly a factor in the electricity related deaths that occur in rural areas (Dharmadhikari et.al, 2018).

The poor quality of electricity supply – in voltage fluctuations and limited hours of supply – and the associated costs that it implies means that the effective costs of electricity access to farmers are higher than the low tariffs that they pay.

Several states have segregated electricity supply to agriculture from electricity supply to consumers and other businesses in rural areas. The positive effect has been to ensure greater rural electricity supply improving the quality of life and facilitating non-agricultural economic activity. However, while the segregation has in some cases improved the quality of supply to agriculture, it has also enabled even tighter rationing of power supply to agriculture. Average daily hours of supply to agriculture are typically 10 hours or less (Dharmadhikari et. al, 2018).

The Ujjwal Discom Assurance Yojana (UDAY) aimed to improve the financial health of the DISCOMs by incentivizing State governments to take over the debt of these companies. It also envisaged that improvements in technical efficiencies, tariffs and metering would reduce the need for such bailouts in the future. However, as long as price subsidies continue, such hopes are likely to be misplaced. DISCOMs are likely to keep accumulating debt eroding their power of action. The way forward is direct transfers. Many models of this have been proposed. The essential idea is straightforward. The DISCOMs will be managed and be accountable as commercial entities. The subsidies will be the liability of the government and will take the form of a lump sum energy or income amount that depends on the size of operational holding (up to a limit). When the farmer receives a free energy quota, the opportunity cost of electricity use is the appropriately priced tariff.[7] That ensures greater sustainability in the use of electricity for groundwater extraction. Relative to fertilizer and food subsidies, direct transfers in electricity

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[7] For this happens, it must be that for any unused part of the quota, the farmer is reimbursed at the rate of the unsubsidized price.

are easier to implement because targeting which is so troublesome in the other cases is not at all an issue here.[8]

5. Credit and Irrigation Subsidies

Irrigation subsidies are the difference of irrigation expenditures for operations and expenditures and receipts from irrigation fees. They are borne by the States and vary considerably between them. There is no uniform basis for determining water rates and there is considerable variation between States. There is a long history of government committees examining the performance of irrigation systems. All of them note the enormous disparity between irrigation expenditures and revenues and urge rationalization of irrigation fees to reduce the difference. The main principle is that irrigation charges should cover operations and maintenance (O & M) expenses so that the financial basis for O & M is sound (Central Water Commission, 2017).   In current prices, the difference between working expenses and gross receipts amounted to about Rs. 17,500 crores in 2013/14 (Central Water Commission (2017), p 76).

The lack of revenue, it is feared, takes a toll on operations and maintenance. Like in the case of power subsidies, the formal cost of accessing irrigation water is low but the economic costs are higher – in terms of rationed and unpredictable supplies, poor maintenance of distribution networks and a lack of transparency in water allocation mechanisms. Successive Finance commissions have recommended minimum irrigation fees and volumetric water supply and pricing to water user associations. The proposed reforms by government committees (e.g., Government of India, 2011) envisage viable water prices together with institutional reforms to achieve greater efficiencies in utilizing available potential, in ensuring fair allocations in distribution and in mobilizing water users association to take ownership.

Credit subsidies are given by the Central government through the banking system. Farmers in good standing can receive short-term credit at 4% (against the usual rate of 9%). In addition, in order to enable post-harvest storage, the Central government also has a scheme of

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[8] This is because the electricity connection is installed in the field and so the subsidy recipient does not have to be verified as a cultivator.

post-harvest credit to small and marginal farmers of 2% for a period up to 6 months. For 2017/18, the budgetary outlay is Rs. 20,339 crores in current prices (Economic Survey, 2017/18). For earlier years (all in current year prices), see Figure 15 below.
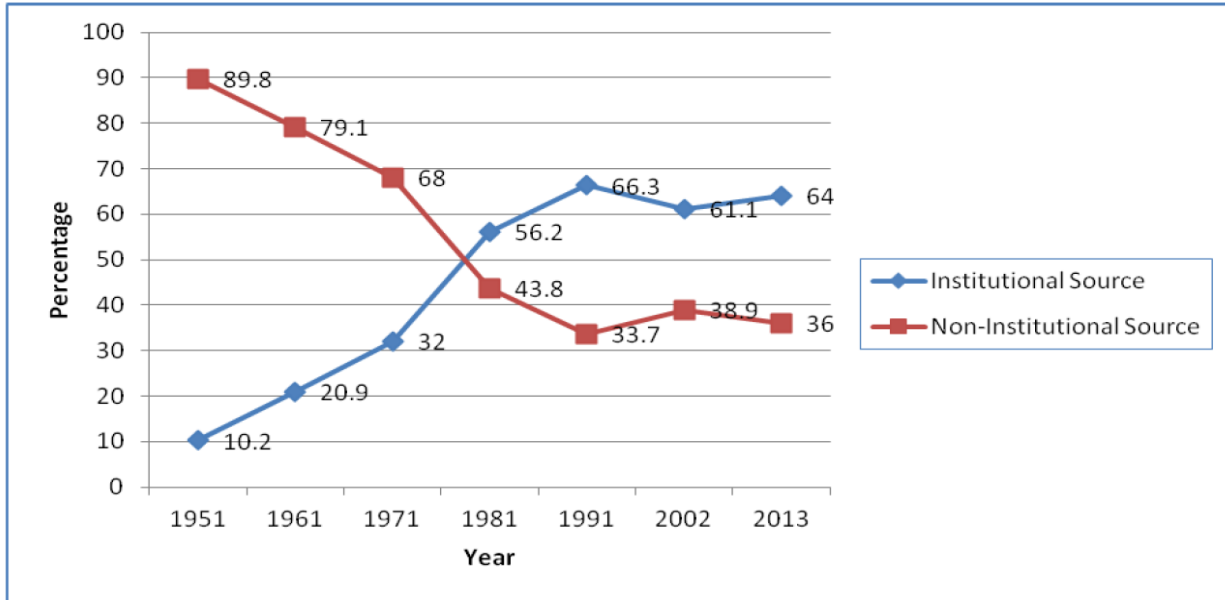
Credit subsidies are of recent origin (2006/07) but falls within a broad rubric of established policies supporting the growth of institutional credit to agriculture. Institutional credit rapidly displaced non-institutional sources in the early history of independent India but its share in total credit has been stagnant at about 65% since the early 1990s (see Figure 16 below).

Figure 15: Expenditures on Interest Subvention to Farmers, 2007/8-2015/16 (Current Prices)
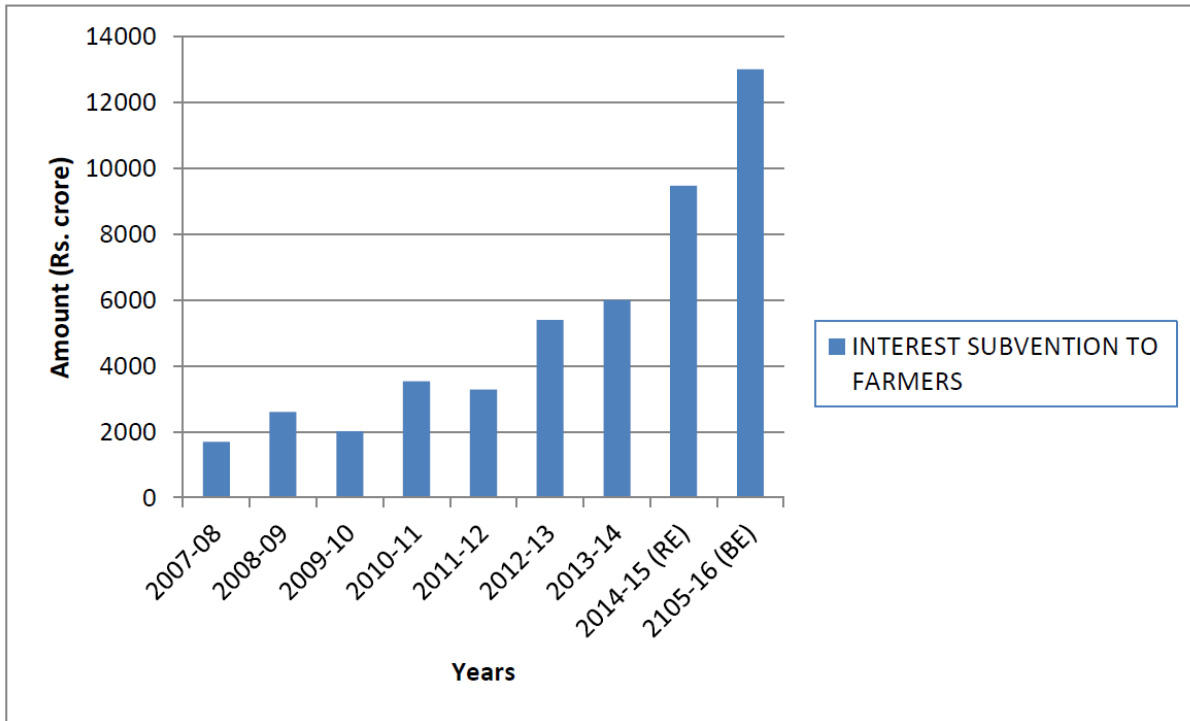
Source: Hooda and Terway, 2015

Figure 16: Share of Institutional Credit in Total Debt Outstanding of Cultivator Households

It is unlikely, however, that credit subsidies alone, can increase the share of institutional credit. This is because the interest rate is not the binding constraint to greater adoption of institutional credit. About 67% of the credit from non-institutional sources carried an interest rate of 20% or more. On the other hand, 97% of institutional credit was lent at less than 20% (Hooda and Terway, 2015). The rationale for credit subsidies is, therefore, weak. It does represent an income transfer to beneficiaries; however, the scale of program is small relative to total agricultural income to be a significant source of such transfer. Hooda and Terway (2015) also show some indirect evidence for diversion of the subsidized credit to non-agricultural uses.

Credit subsidies pale in comparison to the *ad hoc* loan waiver decisions of state and central governments. Phadnis and Gupta (2018) document 18 instances of loan waivers coming from state and central governments in the period 1987 to early 2018. Figure 17 below quantifies the scale of these waivers as a proportion of state/central budgets.

Figure 17: Loan Waiver Allocation as a % of State/Central Budget
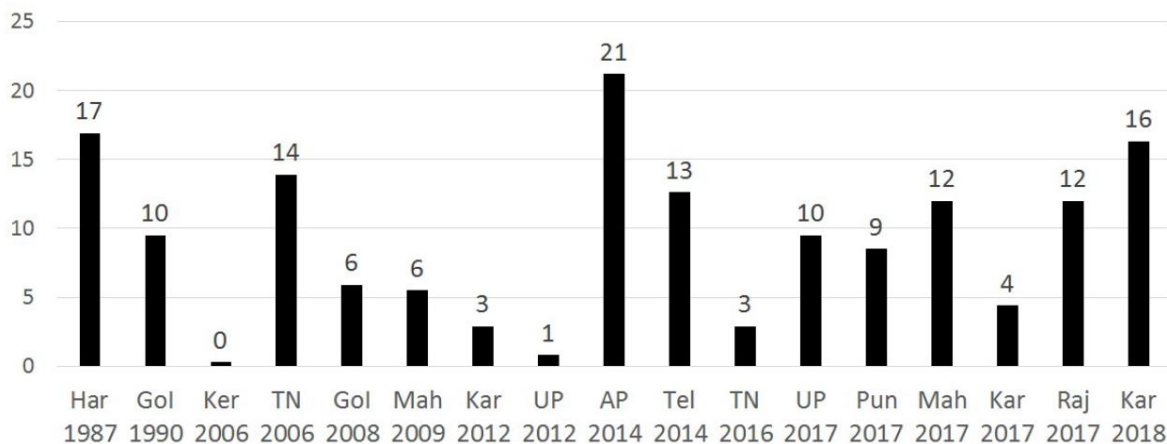
Source: Phadnis and Gupta (2018)

Phadnis and Gupta (2018) show that the only consistent predictor of loan waivers is the electoral cycle. They also show that of the 8 loan waivers granted in the period 2014-18, the smallest waiver was 188% of the state agricultural budget while the highest waiver was 669% of the state agricultural budget.

The benefits from loan waivers have been shown to go to larger farmers. More importantly, they have a damaging effect on rural credit institutions and tighten the credit rationing from institutional sources. While analysts can lament these policies, their political appeal demonstrates the lack of a good safety net for the typical risks of agricultural activity.

6. Crop Insurance

In 2018/19, the budgetary allocation to crop insurance was Rs. 13,000 crores accounting for 28% of the allocation to the Ministry and Farm Welfare. Crop insurance together with interest rate subsidies (Rs. 15,000 crores) account for nearly half of the budgetary allocation of Rs. 57,600 crores to the Ministry.

The insurance unit for crop insurance is a `notified' area such as the village panchayat. For this area, a threshold yield is computed based on past data. The percentage shortfall from this threshold yield is multiplied with a sum assured to determine the claim payable to all farmers within the notified area. If the shortfall is zero or negative, no claim is paid. Such an `area yield' insurance scheme has been available for many years. The Pradhan Mantri Fasal Bima

Yojana launched in agricultural year 2016 departs from the past practice in the following ways (a) a decrease in the premium rates by fixing them at 2% of the sum insured for kharif crops, 1.5% of sum insured for rabi crops and 5% for horticultural crops (b) enhancing the levels of sum assured to be commensurate with the cost of cultivation (c) by scaling up the program and systematizing it substantially through a web portal that standardizes data input and definitions (d) by involving private insurance companies in the delivery of insurance products through open competitive bidding.

The difference between the premiums of the lowest bidder and the government mandated subsidized rate is the subsidy expenditure of the government (scaled to the land under the program). The subsidy expenditure is equally shared between the State and Centre. The program is a complex partnership between the Centre, the State and the insurance companies and breaks new ground in shared governance. On average, government subsidy is about 83% of premium cost (Gulati, Terway and Hussain, 2018). The program has stumbled because of the extensive demands it makes for coordination among stakeholders. States have to notify the program and declare the crops to be insured well in advance. Past data on yields have to be supplied to the prospective insurers by them as well. States have to float tenders for clusters of districts and select the lowest cost bidder. Finally, the average yields for the `notified' area have to be collected by crop cutting experiments and accordingly the claims have to be adjudicated. Scientific yield assessment is the stiffest constraint to scaling up the program. The operational guidelines require 4 crop cutting experiments at the village panchayat level. Overall, this may over 40 lakh crop cutting experiments in kharif and rabi (Aggarwal, et.al, 2016). Since this will have to happen at roughly the same times, the task of creating suitable capacity and coordinating it is a demanding challenge.[9] In the two years since it has been launched, delays and incomplete information/data have happened at each stage. As a result, some farmers have not received claims in timely fashion.

While greater experience can smoothen some of these operational glitches, what has gone unnoticed is the absence of an in-built evaluation design. By their very nature, the utility of insurance programs to its beneficiaries cannot be judged within a year or two but may be apparent over a crop cycle of 4-5 years. However, for this to happen, it is vital that a sample of

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[9] Aggarwal et.al (2016) recommend exploring alternatives to crop cutting experiments ranging from remote sensing, photography using drones and crop modeling.

sufficient size (say 10,000 farmers) be tracked over time. The costs of such evaluation are trivial given the scale of the program but such data will be invaluable in understanding how these programs benefit farmers and in working tweaks or design changes to make them more effective. The importance of such knowledge can be judged from the fact that while the program is mandatory for loanee farmers, the take-up of the program is low among non-loanee farmers (for whom the purchase is voluntary) despite highly subsidized premiums. Panel data of the nature suggested above can identify reasons for the low take-up and inform policy of what can be done to make this more cost-effective.

7. Food Subsidy

Magnitudes

The principal instruments of food policy in India are price supports (combined with public procurement) and subsidized food distribution to the poor. The procured grain (rice and wheat) is supposed to feed into subsidized distribution. However, as procurement happens in only a few months while distribution is continuously distributed through the year, stocks have to be held to synchronize the two. Besides these operational stocks, some stocks are also held emergency reserves.

The Food Corporation of India (FCI) implements the food policy. The costs of purchasing the grain (including the minimum support price, *mandi* fees and taxes, packaging and transport, the costs of holding operational stocks and establishment costs) are known as the `economic cost'. The central government fixes a Central Issue Price (CIP) at which grain is sold to the states for distributing the subsidized grain. Under the National Food Security Act (NFSA), the central issue prices are Rs 3 for wheat, Rs. 2 for rice and Rs. 1 for coarse cereals.

The FCI, thus, incurs two types of costs: the cost of running the procurement and distribution system (approximated by the difference between the economic cost and the CIP) and the cost of holding stocks (beyond those required for operations). The reimbursement of these costs by the Government of India (GoI) is the food subsidy.

While the above is the broad story, there are some nuances as well. Four of them are worth pointing out. First, although the lion's share of sales is accounted by the PDS, some stocks are also sold to welfare programs such as mid-day meals, nutrition programs. In specific

years, stocks may also have disposed off by open-market sales and/or exports. Second, while FCI bears the primary responsibility for procurement, states can also opt to use their machinery for procurement under the decentralized procurement scheme. In 2016/17, about 20% of the food subsidy funds were directly released to the states. Thirdly, the GoI does not always release the full amount of the subsidy claimed by the FCI. In that case, the residual expenditures are carried by the FCI on its balance sheet till the claims are reconciled. Finally, some state governments incur significant subsidy expenditures on their own. This happens when these states have a greater coverage or a higher subsidy rate than provided by the National Food Security Act.

Figure 18-20 plots the Central government expenditures on the food subsidy from 1972 to 2016 normalized in different ways. Figure 18 displays the food subsidy expenditures in 2004/05 prices. Figure 19 represents the real food subsidy expenditures in per capita terms while Figure 20 is the ratio of food subsidy expenditures to GDP (both in nominal terms). All of them tell the same story: an increase in the trend level of food subsidy expenditures from the early to mid-1990s.

The secular rise in food subsidy expenditures is because of an expansion in the scale of the program. This can be seen in Figure 21 below. At the beginning of the 1990s, the scale of the program amounted to about 20 million tons. By mid-2015, procurement was about three times greater – at about 60 million tons.

A second striking feature of Figure 21 is that PDS sales have been consistently below procurement since 1989. Ordinarily, this would have resulted in an ever-increasing pile of stocks. Figure 22 displays the movement of government stocks. It can be seen that secular trend is upwards. The period since the early 1990s has seen three peaks each greater than the one before – in mid-1990s, in early 2000s and then around 2010. The level of stocks has also shown sharp dips after these peaks as it was disposed off in exports, open market sales and ad-hoc welfare programs. Figure 23 supplies the reason why procurement has been higher than PDS offtake and why government stocks have been trending upward. Real procurement prices were decreasing till about 1990 after which they have been increasing. Notice that while the trend is upwards, real prices have fallen in some years. This usually happens when stocks hit their peak levels and the Central government gets serious about reducing it.

Figure 18: Food Subsidy Expenditures of the Government of India (Rs. Crores in 2004/05 prices)
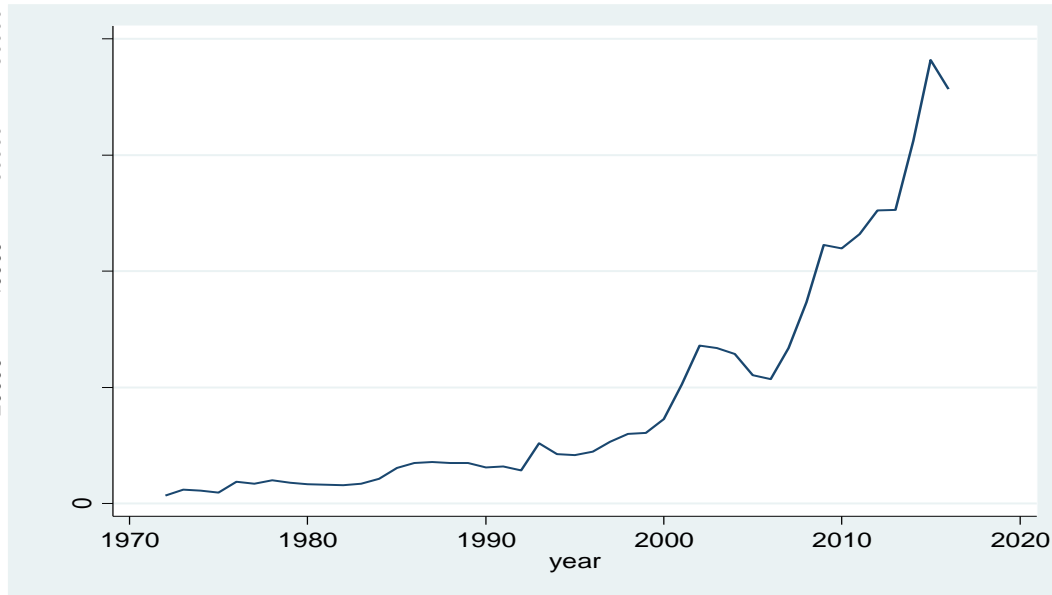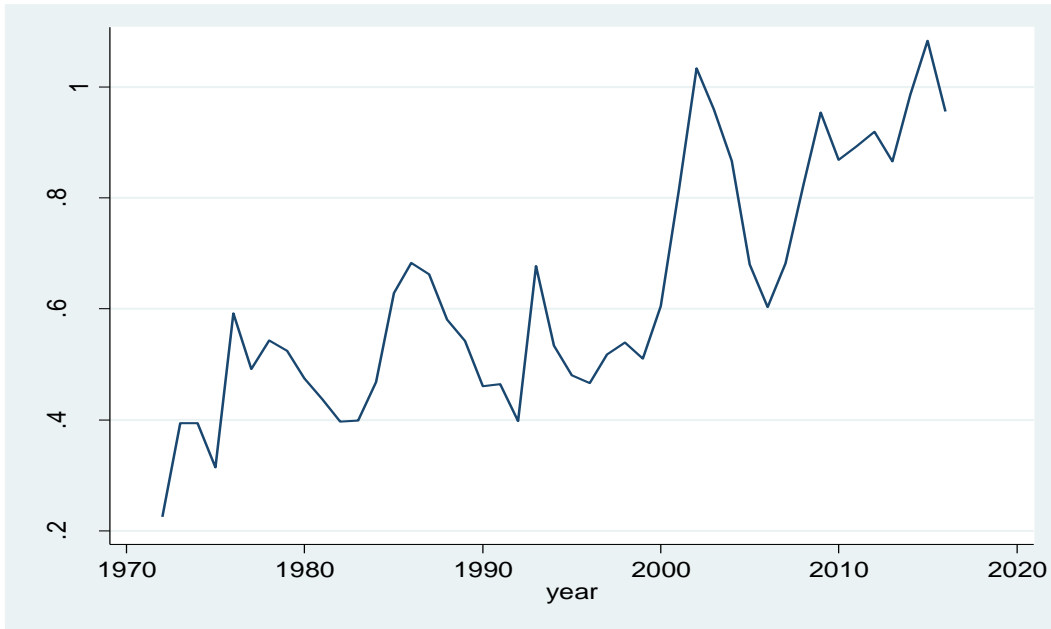

Source: Author's computations using official data

Figure 19: Per capita food subsidy expenditures of the Government of India (Rs. crores in 2004/05 prices)
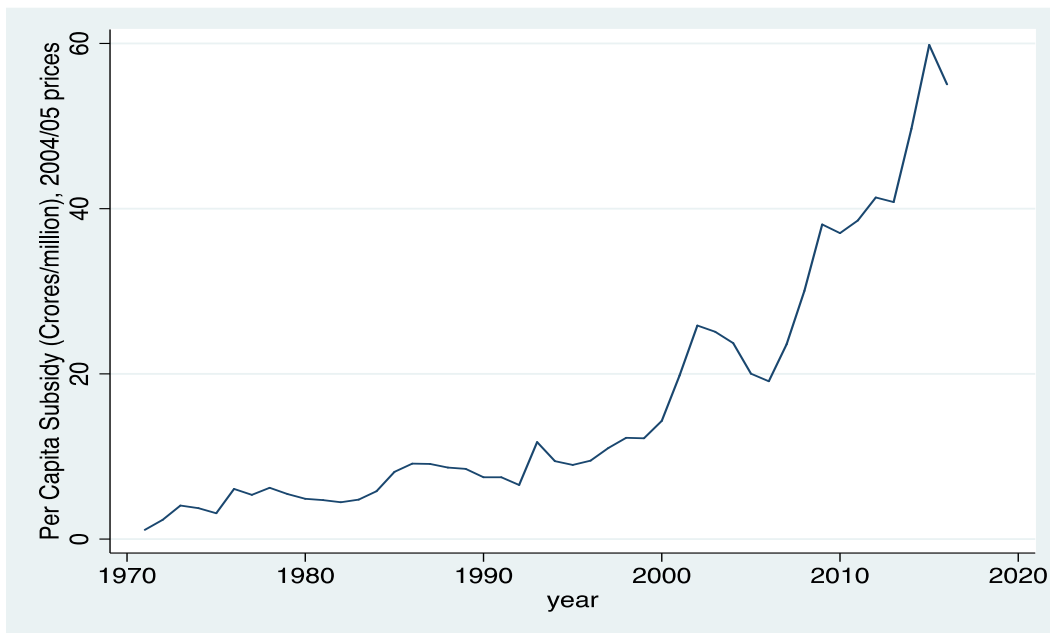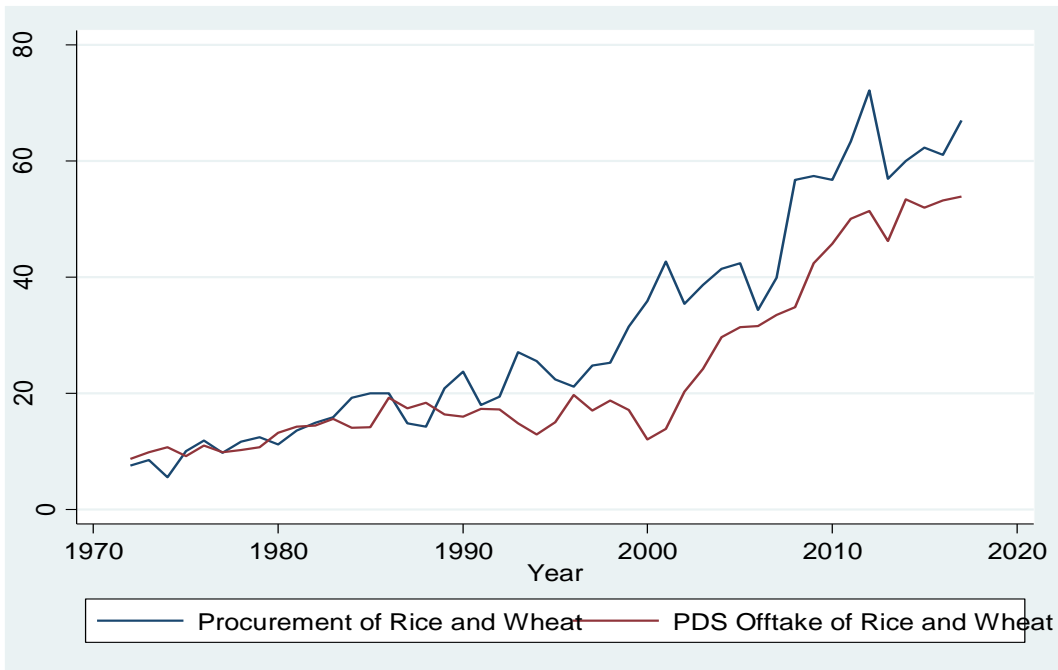

Source: Author's computations using official data

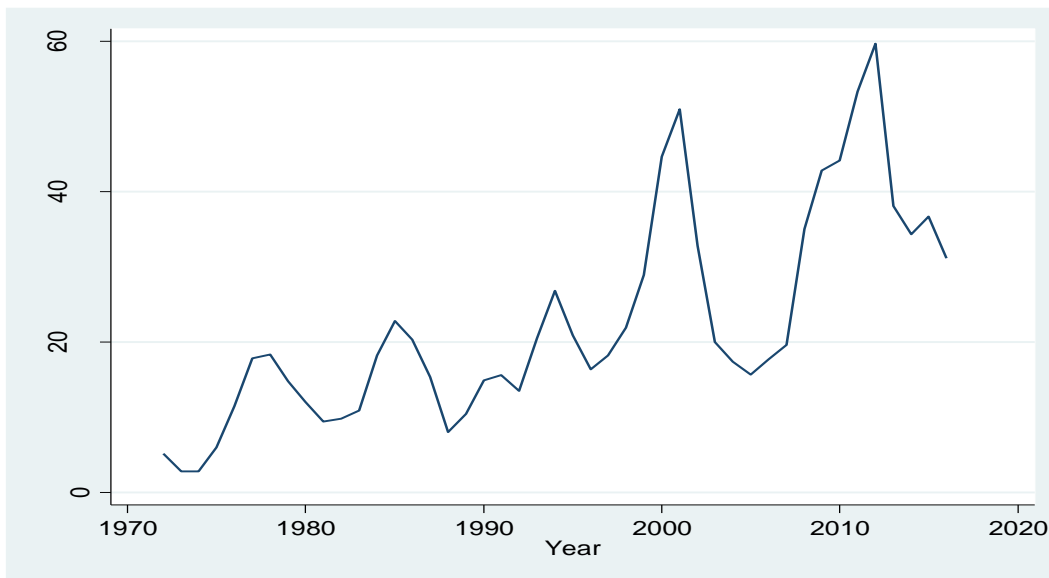**Figure 20: Food Subsidy Expenditures as Proportion of GDP**

Source: Author's computations using official data.

Figure 21: Procurement and PDS Offtake of Rice and Wheat, 1972-2016 (million tons)
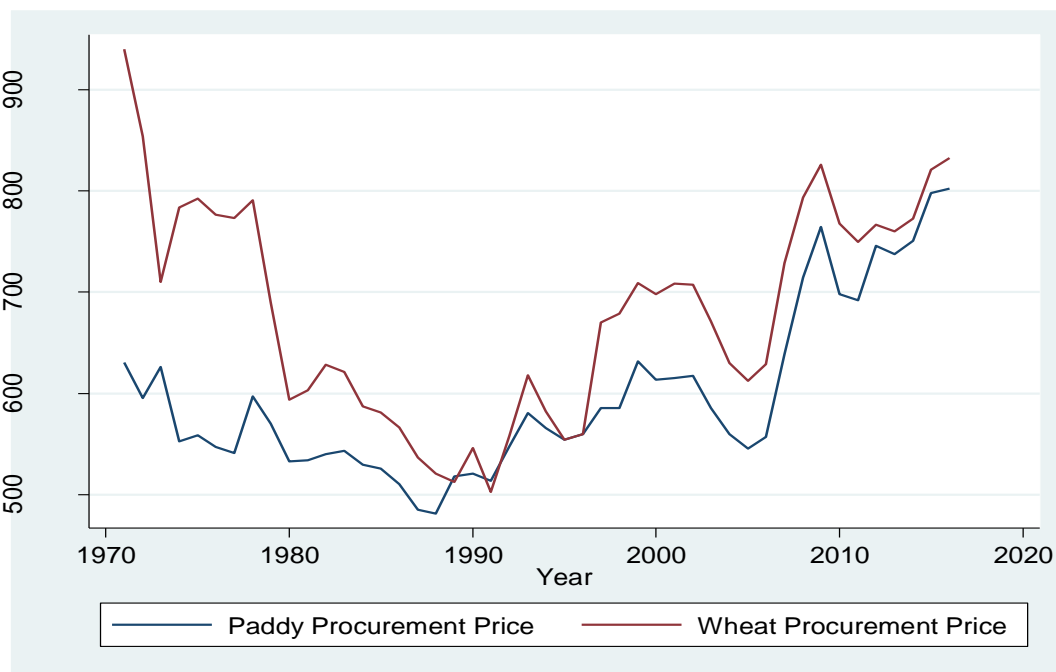

Source: Official data sourced from various issues of Economic Survey, Government of India

Figure 22: Financial Year Ending Government Stocks of Rice and Wheat (Million tons)

Source: Official data sourced from various issues of Economic Survey, Government of India

Figure 23: Procurement Prices of Paddy and Wheat (deflated by the wholesale commodity price index)

Source: Author's computations using official data on procurement prices and commodity price index.

Estimating the Producer Subsidy Component

In terms of welfare impacts, we can think of three stakeholders: producers, consumers and the government. In so far as tax revenues finance food subsidies, one could also consider the impact of higher taxes and the welfare cost of distortionary taxation. These impacts are not considered here. The impact of consumers is not within the scope of this study. For understanding the impact on producers, consider the following line of reasoning.

Suppose a largely closed economy where, in the absence of intervention, food prices are determined by domestic supply and demand. Now consider an intervention where the government purchases grain from farmers and supplies it to consumers at below market prices. For the moment, also suppose the government sets the procurement price such that it acquires exactly that much as necessary to supply to consumers. The question is how the post-intervention grain market prices relate to the no-intervention grain market prices.

In the intervention economy, market supply is the difference between aggregate supply and procurement while the market demand is the difference between aggregate demand and procurement (since all of procurement is recycled back to consumers). But this means the equilibrium price matches aggregate supply and aggregate demand, same as in the case of the pre-intervention economy. Such an analysis is wrong on one count. In so far as the subsidy on grain purchases translates to an income effect, the aggregate demand for grain would be higher in the post-intervention economy. However, it is well known that the income effect for grain is quite low. Neglecting this channel, we obtain the result that an intervention that distributes all procured supplies does not change market prices.

Producers gain only when government procurement exceeds PDS. This subtracts supplies from the market and pushes up the price higher than the `counter-factual' no intervention equilibrium price. In truth, some (but not all) of the excess procurement leaks back into the market because of ad-hoc welfare programs and open market sales. This may moderate the price increase and the gains to farmers. Thus it can be seen that the excess procurement trends in Figure 21 represent consistent gains to rice and wheat producers since the early 1990s. How large are these impacts? This is a hard question because it requires comparison of the procurement price to the price that would have obtained without intervention (that is

unobserved). However, knowledge of supply and demand elasticities can yield back of the envelope calculations.

In equilibrium, the minimum support price (MSP) or the procurement price p_m must satisfy

$$D(p_m) + x = S(p_m)$$

Let the supply and demand elasticities be denoted by ε_s and ε_d respectively
Where D and S are demand and supply functions and x is the excess procurement.
Differentiating with respect to x, it follows that[10]

$$\frac{dP_m/dx}{p_m} = \frac{1}{Q(\varepsilon_s - \varepsilon_d) + x\varepsilon_d}$$

The above expression quantifies the percentage change in supply because of a small change in excess procurement. Starting from a situation of zero excess procurement, the percentage increase in price because of excess procurement becomes

$$\frac{dP_m/dx}{p_m} = \frac{1}{Q(\varepsilon_s - \varepsilon_d)} \qquad (1)$$

When multiplied by excess procurement, the above expression provides an approximation to the price change (relative to the no-intervention price) because of it.

To compute the above, both the output and excess procurement series are transformed to three year moving averages to lower measurement errors. Elasticities of supply and demand for rice and wheat are drawn from Kumar et. al (2010) and Kumar et. al (2011) and are summarized below in Table 7.

**Table 7: Demand and Supply Elasticities of Rice and Wheat**

	Rice	Wheat
Own price elasticity of demand	-0.25	-0.34
Own price elasticity of supply	0.24	0.22

Source: Kumar et. al (2010) and Kumar et.al (2011)

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[10] $(S'(p_m) - D'(p_m))(dp_m/dx) = 1$. The above follows noting $S = Q$ and $D = (Q - x)$

The price impacts of excess procurement are displayed in Figure 24 for the period 1991-2016. Over the entire period, the average impacts are roughly similar. Government intervention has raised rice and wheat prices 13% higher than in a no-intervention economy. These are also first order approximate impacts on farm profits.[11]

Figure 24: Price Impacts of Excess Procurement (%, 1991-2016)
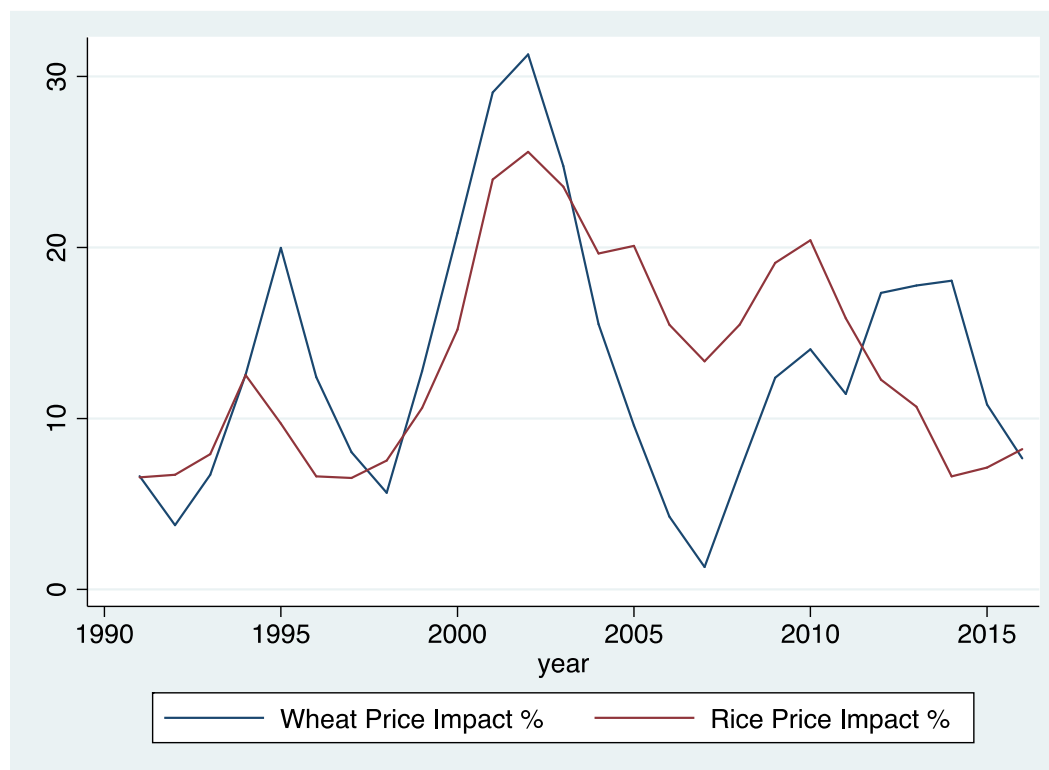
Source: Author's Computations

The expenditure required to achieve the price increase for producers is not the entire food subsidy. As discussed earlier, if a government merely buys what is enough for distribution, then the producers do not receive any support even though the government incurs a sizeable expenditure on subsidizing consumers. The expenditure on price supports flows from excess procurement. Here we provide rough indicative estimates of the magnitude of that expenditure. It consists of two components. First, is the cost of purchasing and holding excess procurement. This can be computed as the product of excess procurement and the economic cost associated with procurement. If it is added to storage, then the storage costs have to be added to it. As against this, the government also receives some revenues when it sells excess procurement (i) to

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[11] If supply response were zero, the first order impacts are exact. In partial equilibrium, these are also lower bounds since supply expands only if more profits are to be made. In general equilibrium, the prices of inputs may rise.

welfare programs at subsidized price (ii) in open market sales and (iii) in export markets. Hence the loss from excess procurement is the difference between the costs of purchase and storage and the revenue from disposing it off. From such a data analysis, Ramaswami, Seshadri and Subramaniam (2018) report the average loss per ton of excess procurement of wheat to be close to Rs. 5300 and of rice to be Rs. 11200 per ton (all in 2004/5 prices) for the early years of the 2010s.[12] When multiplied by the average excess procurement over the period 2013/14-2016/17, the total loss comes out to be a little over Rs. 9,000 crores in 2004/05 prices or Rs. 16500 crores in 2015/16 prices.[13]

To this we must add a second component. This is the higher price that the government pays for every unit of output that is distributed. The price impacts computed in Figure 24 can be combined with the PDS offtake to obtain the second component. This is shown in Table 8 below. Rows 1 and 2 display the average PDS offtake and excess procurement in the recent past. Row 3 uses equation (1) to compute the increase in market price due to an excess procurement of 1 million tons (average of the years 2013/14 to 2016/17). Row 4 is the product of Row 3 and the average excess procurement in Row 2 to obtain the percentage price increase due to excess procurement. This is combined with the procurement price in 2015/16 (row 5) to obtain the counter-factual no-intervention price (row 6), the increase in price due to intervention (row 7) and hence the increase in cost of PDS supplies (row 8).

Table 8: The increase in cost of PDS supplies because of excess procurement (2015/16)

	Rice	Wheat
1. Average PDS sale (2013/14-2016/17)	29	22
2. Average Excess Procurement (million tons), 2013/14-2016/17	4.74	7.06
3. Price Impact for 1 mill ton: %	1.93	1.93
4. Total price impact: 2 x 3	9.13	13.61
5. Procurement price (2015/16), per ton	14100	14500
6. No-intervention market price, per ton	12920	12763
7. Increase in price, per ton	1180	1737
8. Increase in cost of PDS supplies (Rs. Million)	34217	38208

Adding both components, the total expenditure on producer support in 2015/16 is about Rs. 23,600 crores.

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[12] The loss is averaged for the period 2010/11 to 2014/15. This number is not available for subsequent years.
[13] The average annual excess procurement is 5.5 million tons for wheat and 5.8 million tons for rice.

The Problems with the Procurement Led Model

Excess procurement is a method to support farm prices and incomes. However, building up stocks indefinitely is not sustainable. Moreover, subtracting supplies from the market constitutes an economic loss to consumers. There are further losses from storage costs and the unintended subsidies to exporters and domestic firms when stocks are auctioned off at losses. In 2017, the Central government extended the procurement model to pulses. The stupendous response from farmers caught the government off-guard and the government was unable to guarantee MSP for all purchases even after purchasing about 1.5 million tons in 2017. The episode offers two lessons (a) First, open-ended procurement needs elastic fiscal resources and the presence of purchase agents and associated infrastructure. Even in foodgrains, where the commitment is firm, the model has worked well only in some parts of the country. Some success in extending the model to under-served markets was achieved by delegating the logistics to State agencies. However, that success, in turn bloated procurement and stocks and one of the first acts of the present NDA government was to curtail the practice of some State governments to announce a bonus over the Central procurement price. (b) Second, without disposal in alternate markets (exports, input to industry, welfare programs), much of the stock remains with the government depressing future prices and making intervention even more pressing.

Procurement based price support policies were extensively used in the rich countries. All of these countries, however, experienced the same problem: of excessive accumulation of stocks. A review in 1985 of U.S. price support policies concluded that "...using grain reserves to support farm income in the face of excess productive capacity results in large stock accumulation..." (Langley, Reinsel, Craven, Zellner, and Nelson (1985)). In the United States, the wheat and corn loan rates (that implicitly served as support prices) exceeded their respective farm prices every year from 1952 to 1960. As a result, wheat stocks increased from 320 million bushels to over 1.1 million bushels. The situation was similar for corn. It noted that the costs associated with long-term storage including quality deterioration, storage and interest costs \have raised further questions whether grain reserves are a cost-effective means for achieving farm support."

In the European Union, producer prices were maintained at desired levels by a combination of import levies, export subsidies and purchases by public authorities. Predictably, "...by the 1990s, this policy had incurred huge costs for storage and export subsidies provoking a

reconsideration of the policies and a long reform process that began in 1992" (Deuss, 2014).
Import restrictions and government purchases at a support price were also the principal
instruments for producer support in Japan during the period 1965-80. The rapid increases in the
rice purchase price led to vast stocks by the end of the 1960s. At this time, government losses on
the purchase scheme amounted to 5% of the national budget. Thereafter, a policy correction
allowed stocks to deplete but by the late 1970s, the same phenomenon repeated itself (Otsuka
and Hayami (1985)).

In each of these cases, the excess stocks were channeled to foreign markets (subsidized
exports or in-kind aid), special nutrition programs, or allowed to degrade sufficiently to be sold
as feed. Notwithstanding these measures (that mirror also the government response in India), the
costs became sufficiently high that the developed country developed a two-fold policy response
to the stock accumulation problem. Policies began to emphasize schemes that did not involve
excess procurement such as deficiency payments and direct income transfers. Deficiency
payments, however, do incentivize farmers to produce more and the problem of excess supply
(because of government support) does not go away. For this reason, developed country farm
support programs also emphasize supply controls as a condition for receiving government
transfers. Currently, the decoupling of income support from output decisions through direct
payments to farmers has gained prominence in the domestic policies of developed countries
(Anderson, Rausser, and Swinnen (2013)). Such support is exempt from the restrictions on farm
subsidies mandated by the WTO trade agreement.

Besides India, some other developing countries have also travelled the path of
procurement based price supports. China is a case in point. China introduced minimum
procurement prices for rice and wheat in 2004-05 to act as a floor over market prices. In 2008,
China began raising the minimum prices for rice and wheat annually. Through subsidized loans,
the government encourages local authorities to buy grain at price supports. From 2008 to 2013,
Chinese support prices (in U.S. dollars) rose over 60 percent for wheat and corn, 90 percent for
indica rice, and 100 percent for japonica rice. The share of grain purchased using such policy
loans exceeded 25 percent of grain produced in most years from 2005 to 2012 and reached 38
percent in 2008 (Gale (2013)). In 2008, China added price supports for corn, soybeans, and
rapeseed. Domestic purchases and stockpiling shielded Chinese producers from the steep decline
in global corn prices in late 2008. Additional price supports were introduced in 2009 for pork

and in 2011 for cotton to keep domestic prices on a steadily rising path so as to prevent further erosion of net returns to farmers. A policy of keeping support prices for cotton above international prices led to China holding 57% of the world's stocks in 2013 after which the government started a process to unwind these stocks.

Alternatives to Procurement

The alternative that is already at work is the Bhavantar initiative of the Madhya Pradesh government where the government compensates farmers for the difference between the MSP and market price. Such price deficiency payment schemes have long been a mainstay of agricultural support policies in the developed world. The first merit of deficiency payments is that the government does not need to procure any more. The logistics challenge is therefore more manageable. This form of price support also avoids the inefficiencies that arise when State agencies physically handle the commodity. A second advantage is that since the intervention does not deduct supplies, consumers are better off. It also avoids the deadweight losses with storage and its disposal in alternate markets. A third advantage is that because there is no stock overhang, farmers do not lose from the resulting depressed prices.

The initial run of the Bhavantar scheme threw up some challenges in terms of coverage of eligible farmers and more seriously in terms of suspected collusion among traders that suppressed market prices. These problems apart, the history of price deficiency supports in the developed countries offers some lessons. Farmers typically respond to price supports by allocating more land and resources to the supported crops. Market prices drop and the subsidy payout quickly become much larger than anticipated. Managing them leads to second order policies. In commodities that are not competitive in world markets, tariff walls have to be raised and imports kept out. As even this is not often enough – the developed countries also instituted supply controls – either the payout was contingent for a benchmarked level of output or the payout was conditional on leaving land idle. This will have to be a feature of Bhavantar type schemes as well. Producers will have to register and supply quotas will be allocated according to land holdings.

In principle, as mentioned earlier, consumers will be better off because of lower market prices. However, scarcity of budgetary resources may force the government to minimize the gap between the MSP and the market price by restricting supply both from abroad and domestically.

For oilseeds and pulses that are not internationally competitive, these curbs will increase prices domestically. A deficiency payments form of price support, therefore, substantially improves on procurement-based supports but is also expensive and wasteful as well. It is also a political trap as evident from the experience of rich countries.

The first best policy is to offer support through direct transfers. The advantage is that it avoids the deadweight losses of procurement models and the economic losses from supply controls implicit in price deficiency payments. However, direct transfers will not come cheap. India's gross cropped area is about 190 million hectares. If Rs. 10,000 is offered per hectare to *all* farmers, the subsidy will cost close to Rs. 200,000 crores. By restricting it to small farmers or by imposing a maximum payout, the cost will be lower. Costs will also be lower if the payments are linked to net sown area. These are upfront costs. By contrast, price supports, whether based on procurement or deficiency payments will have lower upfront costs but have complex dynamic effects on markets, politics and rest of the economy. Relative to price supports, there is one disadvantage of direct transfers if it is tied to land ownership – that it offers no support to tenant farmers. Ideally, support should be linked to operational holdings – however, our land records, incomplete as they are, are even more deficient with respect to tenancy.

8. Concluding Remarks

It is well known that sustainable increase in farm incomes rests on the twin pillars of the development processes: greater farm productivity and a dynamic non-farm sector. However, the structural transformation process is uneven and the stickiness of labour in the farm sector leads farm incomes to substantially lag nonfarm incomes. Subsidies and farm support is a response to the political tensions that stem from sectoral disparities.

There is also a narrative that sees subsidies as a just response to the policies of governments that tax farmers. The taxation is implicit. Export restrictions and domestic regulations on marketing such as the Essential Commodities Act depress prices to below the levels prevailing in world markets. A recent report (OECD, 2018) estimates the taxes to be larger than the aggregate of input subsidies. These estimates can, however, be disputed. India is

a large country in international trade and a simple comparison of domestic prices with world levels is not an adequate guide to the extent of taxation. Secondly, it is not clear whether the depressed domestic prices are due to policy or because of high transport costs from the hinterland to the ports. This is relevant for a large continental economy such as India.

Notwithstanding these caveats, the policy implications of restrictive trade and marketing policies are clear. Export restrictions are meant to protect consumers. While poor consumers deserve a safety net, it is iniquitous that the burden on it should fall on poor producers. A taxpayer funded safety net is the appropriate policy response here. Without that, agricultural markets are always hostage to *ad-hoc* interventions that not only tax producers but also discourage private investments in market infrastructure relating to storage, preservation and transportation.

The relatively slow processes of structural transformation make them invisible to politicians and their constituents alike. If subsidies dominate policies and agriculture budgets, that undermines sustainability not only in the long-run but also in the medium-run. Whether this is the case in India is debatable because it turns on whether one views farm income support at 2=2.5% of GDP as affordable. Farm income derives a considerable portion from subsidies. Curtailing them would cause hardship especially because farm incomes are low.

An unambiguous conclusion is the damage from price subsidies. Besides the fact that price subsidies may leak to unintended beneficiaries, they promote unsustainable use of water resources. The need to preserve our resource base is the strongest argument for income support to be refashioned as direct support.

The transition to direct transfers has been initiated in some states. The policies, as of now, are intended as add-ons and do not replace the distortionary subsidies on power and other inputs. The data base on land ownership and use is also inadequate to implement such policies sensitively. This will have to be a priority item for investment in the immediate future.

For the 141 million workers in agriculture who own no land and for the majority of 118 million cultivators that own less than 1 hectare of land, incomes from farming will continue to be low and precarious, no matter how much we spend on subsidies. It would be wise, therefore, to consider farm subsidies in the wider context of safety nets that would be relevant universally.

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