

Reforming Indian Agriculture

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Reforms in four areas should be the priority if the current government's agenda of doubling farmer incomes is to be accomplished in the coming years. First, the focus of agricultural policies must shift from production per se to farmers' livelihoods. Second, policies to improve the allocation and efficiency of land and water are essential if these critical resources are to be conserved. Third, reforms are needed to help farmers cope with the growing risks of weather and price volatility. Fourth, agricultural markets must be opened to greater competition and provided with better infrastructure if farmers are to realise better returns for produce, without trading off the low-income consumers' nutritional security.

India's agriculture policies have had multiple mandates, including a production imperative (national food security), a consumer imperative (keeping food prices low for a large low-income population), and a farmer welfare imperative (large input subsidies and now income support through Pradhan Mantri Kisan Samman Nidhi [PM-KISAN]). The tensions between these mandates have resulted in costly, contradictory policies whose costs have been increasingly borne by farmers, the government purse, and the natural environment. The current government's agenda of doubling farmer incomes by raising productivity and cutting down costs, and going for diversification towards high value agriculture, is potentially a welcome departure in this context and we are guided by this shift. But given the many challenges facing the current government, why should agriculture and food be a top priority? First, more Indians depend directly or indirectly on agriculture for employment than on any other sector, with 80% of India's extremely poor people living in rural areas and most of them being marginal farmers, farm labourers (GoI 2013). Second, agriculture holds a key to reducing India's double burden of under- and over-nutrition, directly affecting public health and worker productivity. Third, agriculture has the potential to spur, rather than be a drag on India's overall gross domestic product (GDP) growth. Agricultural growth of 4% and more is achievable with the right reforms and would add at least a percentage point to GDP, increase exports and improve India's trade deficit. Fourth, India's vital land and water resources, which farmers used for agricultural production, must be utilised more sustainably, especially in the face of mounting scarcity, environmental degradation, and climate change.

Finally, history tells us that economic transformation in developing nations is propelled by increases in agricultural incomes underpinning industrial growth. The latest example being China (Gulati and Fan 2007). Raising farm productivity is critical for long-term increase in farmer incomes in India, as land fragmentation means that many Indian farmers are farming plots of such small sizes (especially those below 1 hectare) that even doubling their incomes would leave them with meagre earnings.

In this paper, we examine four areas that can contribute to the government's goal of doubling farmer incomes. First, we consider how the shift in policy focus from production per se to farm incomes can be best accomplished. Second, we focus specifically on policies that can improve the allocation and efficiency of the two key factors of production—natural resources that are so central for agriculture but are increasingly binding constraints, namely land and water. Third, we examine reforms

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to help farmers cope with the growing risks in agriculture from sudden changes in policies, weather variability and price volatility, all of which have put great stress on India's farmers in recent years. Fourth, we examine how markets for agricultural products can be improved to provide farmers with better prices for their produce while ensuring that the nutritional security for low-income consumers is not compromised. We conclude with some thoughts on the links between agriculture and the wider economy.

Doubling Farmers' Incomes

There are several distinct policy options for increasing farmer incomes: (i) subsidising input costs (such as water or fertiliser) to decrease production costs; (ii) increasing yields through better farming practices and timely availability of quality inputs, especially high yielding seeds and water; (iii) increasing output prices, through minimum support prices (MSP) and public procurement; (iv) getting a greater share of the marketing surplus for farmers; (v) improving the terms of trade between agriculture and non-agriculture; (vi) augmenting non-crop related agriculture income; and (vii) providing direct income transfers to farming households.

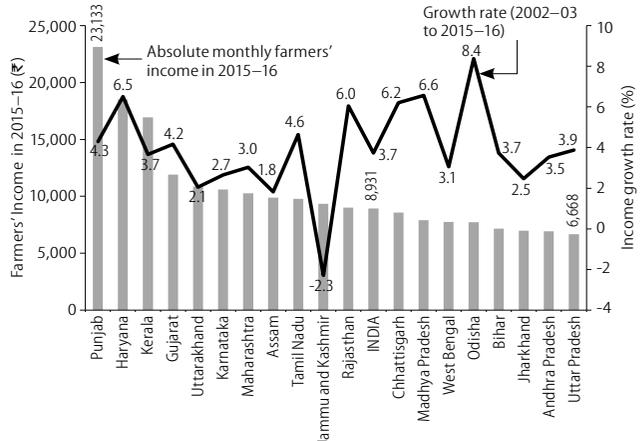
The Ashok Dalwai Committee Report (DCR, henceforth) on doubling farmers' income, released in September 2018, estimated that the income of an average farm family in 2015-16 was ₹8,059 per month, and the objective was to double it to ₹16,118 per month by 2022-23 in real terms (after discounting for inflation). This required a growth rate of 10.4% per annum for the next seven years until 2022-23.

The committee also looked at National Sample Survey Office's (NSSO) surveys on farm incomes for 2002-03 and 2012-13 and projected the data through 2015-16 based on overall growth trends. It not only found that farmers' real incomes grew by 3.6% per annum during this period, but also that the agricultural GDP growth rate hovered around 3.6% during that period, indicating that farmers' incomes increased broadly in line with the growth in agricultural GDP. The National Bank for Agriculture and Rural Development (NABARD 2018) conducted the NABARD All India Financial Inclusion Survey (NAFIS) of farming and non-farming rural households for the agricultural year July 2015-June 2016. The report (released in 2018) found that an average farming household in 2015-16 had an income of ₹8,931 per month, about 10% higher than the DCR estimates. This difference is due to the differences in the sampling frame and definitions of farming households in these two reports.

For our purpose, we compare farmers' incomes from the three main sources, namely NSSO 2002-03, NSSO 2012-13 and NAFIS 2015-16, and estimate their level, growth, and composition patterns to establish the trends before laying out any policy options. Figures 1 and 2 present these levels, trends, and composition in farm household incomes.

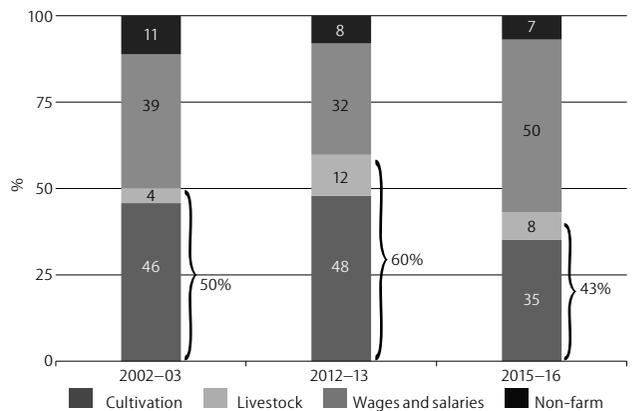
According to the NAFIS (2015-16) estimates, while the average farm income at the all-India level was ₹8,931 per month (a notch higher than that estimated by the DCR), this varied between ₹6,668 per month in Uttar Pradesh (UP) and a high of ₹23,133 per month in Punjab, a ratio of almost 3.5 times. The

Figure 1: Farm Income—Average in 2015-16 and CAGR between 2002-03 and 2015-16



Source: NSSO (2002-03), NSSO (2012-13), NAFIS (2015-16).

Figure 2: Sources of Average Farm Income, All India (%)



Source: NSSO (2002-03); NSSO (2012-13); NAFIS (2015-16).

overall compound average growth rate (CAGR) in real incomes was 3.7% at the all-India level (comparable to 3.6% estimated in DCR), and it varied between (-)2.3% in Jammu and Kashmir as high as 8.4% in Odisha, with UP at 3.9%. It may be important to note that where levels of incomes are low and agriculture productivity much below the frontier (like in UP, Bihar, Odisha, Jharkhand, etc), it is easier to increase growth rates significantly.

But what is more important for policy purposes is to note the sources (or composition) of income of an average farming household. Figure 2 shows that the income coming from cultivation and farming of livestock constituted about 50% of average farm income in 2002-03, which went up to 60% in 2012-13, but then dropped significantly to 43% in 2015-16. This sudden drop could be due to some variation in the NAFIS sample selection but more likely because the year 2015-16 was a severe back-to-back drought year. In such a drought year, when cultivation underperforms, farming households depend more on wages and salaries either by working on others' farms that may have irrigation facilities or outside the farming sector.

The reality is that income from agriculture alone will be small for the majority of Indian farmers. India has far too many people (45% of the workforce) currently in agriculture compared to its contribution in GDP (only 15%).¹ Global experience

shows that as the economy grows, people move out of farming (migrating to urban areas) and for those who remain, the share of non-farm income increases in farming households' total income (Gulati and Fan 2007). Employment and income opportunities increasingly come from small-scale industry (for example, town and village enterprises in the case of China), labour-intensive manufacturing, and the construction sector, including housing (Gulati and Fan 2007). While it will take time for the government in India to create an enabling environment for people to move out from farming to higher productivity jobs, there is considerable scope for increasing non-agriculture farm income.

The foremost asset of the farmer is land. The central government, in association with the state governments, should free up land markets, especially land lease markets, which can help provide farmers with a steady income, while maintaining asset security. In remote dry areas, leasing land to solar or wind power companies could provide farmers with relatively higher and steadier incomes than what their low productivity farms ever will (Gulati et al 2016). In other areas, farmers may choose to lease land to factories or for commercial development. Currently, strict land laws ostensibly designed to help farmers either lead to skirting the law or to unscrupulous land mafias preying on poor farmers. Empowering the farmer to lease land (as opposed to selling land) through legal changes and model contracts could help at least a section of Indian farmers who would not mind leaving agriculture if they had viable income options.

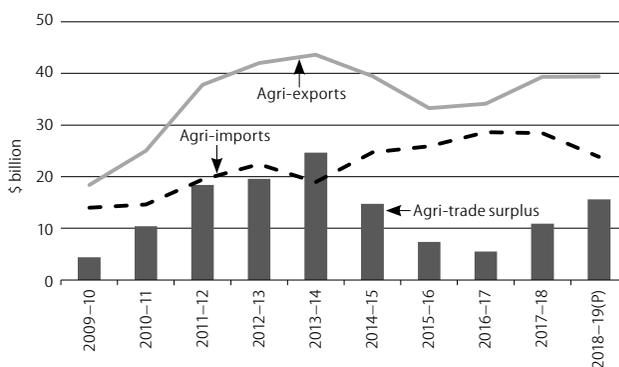
Another possibility is a large-scale programme to distribute solar water pumps (also known as photovoltaic water pumping) which, today, are operationally and financially sustainable. In parallel, free/subsidised electricity should be terminated, while at the same time allowing surplus power from the solar powered pumps to be sold back to the grid, which would help pay for the solar pumps. For farmers, this becomes an extra source of income, and at the margin, they have to decide which will fetch more income: selling power to the grid or pumping more water for their farm.

A third option is to develop value-added uses of biomass. Bamboo for construction and other applications, rice husk and bagasse-based mini-power plants, and ethanol from sugar cane and corn can all help augment farmer incomes in sustainable ways while developing more dynamic local rural economies.

Supporting Indian Farmers, the Smart Way

The most sustainable way to augment farmers' real incomes over the long term is through investments in productivity-enhancing areas, ranging from agricultural research and development (R&D), to irrigation to the development of rural and marketing infrastructure. Investments in increasing productivity can lower per unit costs, make Indian agriculture more competitive globally, increase agri-exports, and augment farmers' profitability and incomes. A troubling feature of the last five years is that Indian agri-exports have not only stagnated but declined from the peak of 2013–14 (Figure 3). While agri-exports more than doubled, from \$18.4 billion in 2009–10

Figure 3: Agri-exports between 2009–10 and 2018–19



Source: Calculated using data in Export Import Data Bank, Directorate General of Commercial Intelligence and Statistics (DGCISS).

to \$43.6 billion in 2013–14, they dropped to \$33.3 billion in 2015–16 and recovered only to \$39.4 billion by 2018–19.

While robust agriculture exports will increase the demand for India's farm output (and hence, incomes of farmers) whenever prices rise, the government has banned exports to protect Indian consumers. This, coupled with the Essential Commodities Act (ECA), has meant lower private investment in export infrastructure such as warehouses and cold storage systems. Instead of protecting consumers at the expense of farmers, the government should expand its repertoire of instruments for augmenting farmers' income.

India needs to address the composition of its agriculture export basket. Currently agricultural exports constitute 10% of the country's exports, but the majority of its exports are low value, raw or semi-processed, and marketed in bulk. The share of India's high value and value-added agriculture produce is less than 15% (GoI various years). While India should remove any restrictions on agriculture exports, it should also not subsidise scarce inputs such as water to promote exports such as rice.

Subsidies are a policy instrument to achieve certain goals. Many of them were instituted to incentivise farmers to take up the green revolution package at a time when raising total food production was the key policy goal. Later, subsidies were seen as ways of reducing the cost of production for farmers and thereby providing them with implicit income transfers as well as a way to check food price inflation and protect consumers. Today, India spends significant public resources on agriculture, especially on subsidies for agriculture inputs and price support for certain crops.

The range and costs of subsidies for agriculture are extensive: fertiliser subsidies in the central government budget for FY 20 are around ₹80,000 crore (GoI 2020a) (with pending bills of fertiliser industry at ₹39,053 crores cumulative by the end of 2018–19) (FAI 2019); power subsidy by states amounts to more than ₹65,000 crore;² subsidies on canal water are another ₹25,000 crore plus;³ and subsidies for crop insurance premiums and agri-credit are at interest rates of zero or highly subsidised rates of 7% and 4%. However, it has become apparent that subsidies are inflicting significant damage on different aspects of the economy, even as there are better policy options to achieve the government's own goals.

Fertiliser subsidies, for instance, have essentially subsidised either the consumers of staples and/or many high cost fertiliser plants, and led to massive overuse of nitrogenous fertilisers, leading to damaged soils and pollution of local waterbodies. Excessive use of urea (urea prices in India at about \$80/MT are perhaps the lowest in the world) (FAI 2018) has led to increased acidity in the soils even as they are highly deficient in micronutrients like zinc.⁴

Similarly, power subsidies have not only led to an alarming overuse of groundwater that is poised to become one of India's gravest challenges, but it has severely damaged the health of power distribution companies⁵ and retarded the growth of the industry, which is saddled with a high cost crucial input. For example, states like Punjab have seen depletion of groundwater table at the rate of almost 1 metre a year and more than 75% blocks in Punjab⁶ are overexploited.

Credit subsidies like loan waivers have damaged the banking system, again with negative spillover effects on the rest of the economy. On the other hand, output price supports in the form of minimum support price (MSP) basically apply to only a handful of crops, especially wheat and rice that are procured by the government in a handful of states. Sugar cane pricing is forced on sugar factories, even when sugar prices are low, leading often to large cane industry arrears (in March 2019, they touched ₹30,000 crore) and causing disruption in the sugar sector.

To be politically feasible, any solution to the subsidies crisis would need to address three policy goals: supporting food security and farm output; increasing farmers' incomes; and maintaining stable food prices. Given this, the solutions would need to focus on two key issues. First, to free up input prices to market levels, or charge at least full cost pricing for fertilisers, power, agri-credit, and canal waters fees; and earmark the resulting savings for expenditures on investments in agricultural R&D, irrigation, marketing infrastructure, building value chains by involving farmer producer organisations (FPOs) and linking farms to organised retail, food processing, and export markets. Second, towards direct income transfers to farmers' accounts leveraging the trinity of Jan Dhan–Aadhaar–Mobile (JAM).

Such shifts will curb leakages in the system, reduce inefficient use of scarce natural resources, be neutral between chemical-based agriculture and organic agriculture, help support sustainable use of scarce water supplies, and improve rural income inequality since larger farmers obtain a much larger fraction of current subsidies.

De-risking Agriculture

Indian agriculture is often labelled as a gamble. The droughts of 1965 and 1966, when foodgrain production dropped by a fifth (17 million metric tonnes [MMT]) between 1964–65 and 1965–66, are a grim reminder of the precarious past. The drought of 2002–03 saw a decline of foodgrain production by 38 MMT—more than double the debacle in the mid-1960s. But thereafter, Indian agriculture emerged as much more resilient to the droughts of 2009–10, 2014–15, and 2015–16, preventing

large drops in production (GoI 2019a). Irrigation investments, along with some buffer stocking for basic staples, helped India overcome any challenges on the food security front.

The core challenge of low incomes facing Indian farmers is compounded by the volatility of incomes. Farming, more than almost any other major economic activity, faces a host of risks. Managing these risks is critical to ensure sustained increases in farmer incomes.

Production risks: These largely stem from the vagaries of nature, ranging from rainfall volatility (floods and droughts) to hailstorms on the one hand and pests and plant diseases on the other, all of which affect both the quantity and quality of commodities produced.

On the supply side, the key policy to address rainfall volatility is, of course, irrigation. While there is a need to increase the coverage of irrigation and overall water storage capacity, building large dams and major canal networks have often languished for want of resources. The gestation lags are unduly long⁷ and costs per hectare are very high in some states, especially Maharashtra.⁸ It would be better that irrigation investments focus on building village level storage facilities, better surface irrigation management, and investments in drip irrigation, tile drainage, trap crops, etc, that can give results in a relatively short period of time.

The need to create local water storage capacity is manifestly apparent. The government can incentivise this by steering the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) to build and maintain local water storage facilities in each panchayat. There is also great need for institutional reforms on surface irrigation management, especially last-mile connectivity that needs to move out of irrigation departments to farmer-managed water users associations. Irrigation systems are much better managed when the principal user—the farmer—has a strong sense of ownership. Farmers are more willing to pay for irrigation services and for repair and maintenance of distribution systems if the water reaches their farms. The potential of drip irrigation applications is estimated at 27 million hectares, but farmer take up will be slow unless the cost of water reflects its long-term scarcity value.

However, improving the supply side will go only so far unless there is much greater attention on water demand management. Inefficient and misuse of scarce water will continue unless water and power are appropriately priced. Policies should incentivise less-water intensive crops, as well as seed varieties that are more tolerant of water stresses. There are two problem crops that gobble up more than half of India's irrigation water—rice and sugar cane. Rice in Punjab and sugar cane in western Maharashtra need a special focus, with a medium-term plan for diversification to low water-guzzling crops, such as maize, oilseeds, and pulses.

The provision of free electricity and the (over)exploitation of groundwater are inextricably interlinked and together shape crop choice, which is amplified by government procurement patterns. They cannot be addressed piecemeal. The

government must first stop the public procurement of water intensive crops in blocks where the water table is falling. Instead, it should sharply step up procurement of crops like pulses and millets that are much less water-intensive, as well as have high nutrition value. Simultaneously, it should encourage the private sector to buy and store these crops by abolishing/pruning the ECA. Free electricity should cease and be replaced—not supplemented—by cash transfer programmes. However, since free electricity is provided by states, while procurement is largely done by central agencies, the central government needs to condition its procurement on the states' efforts to cease the supply of free power to farmers.

However, the production risks facing Indian agriculture are becoming more daunting with climate change. The Intergovernmental Panel on Climate Change (IPCC) has predicted that India will face greater frequency and intensity of droughts and floods over time. With temperatures rising by 1°C, estimates are that wheat production will drop by at least 5 MMT, and if temperatures rise by more than 2°C, the losses will increase more rapidly.

But more concerning is the uncertainty about the effects of climate change on the Indian monsoon, which is the lifeblood of the country. While there is little consensus on how well the models that best capture the effects in the 20th century will work in the hotter 21st century, monsoon meteorology's big challenge will be to improve predictions of intra-seasonal shifts together with improving models of changes in global climate. Given how much is at stake for Indian farmers, India needs to make concerted efforts towards building a strong scientific base in monsoon and climate modelling.

Crop insurance: Income losses due to production risks emanating from natural shocks are best addressed through crop insurance, which stabilises incomes during times of loss. The Pradhan Mantri Fasal Bima Yojana has been a worthy initiative, requiring all farmers taking an institutional loan to take insurance coverage under this scheme. Between kharif 2016 and rabi 2018–19, 115 million farmers enrolled in the scheme, of which nearly three-fourths had taken institutional loans. Almost 90% of the premium subsidy is given by the government (equally shared by the centre and the states).

But the scheme has faced teething problems and after a rapid rise, the coverage has in fact declined. The states, in particular, are held responsible for manipulation of crop-cutting experiments, tardiness in providing their share of premium subsidies (leaving the farmer effectively uninsured when afflicted by shocks), and delays in payment of compensation due to hurdles in damage assessment and disbursement of compensation (Gulati et al 2018).

The implementation challenges, however, can be addressed. Some of the steps taken by the central government—imposing a 12% penalty on insurance companies if the settlement takes longer than two months, and for state governments if they delay settlement beyond three months of the due date—are very much in the right direction and could be tightened further. But, it would be a severe mistake to make the scheme voluntary

even for those farmers who have obtained institutional loans. If fewer farmers are enrolled, it would raise actuarial premiums, and undercut the large insurance purpose.

Technology today allows air-based (drone or satellite) surveillance that can provide close to real-time crop damage assessment, which can be overlaid with farm plots and their owners, and can automatically make payments without multiple (and arbitrary) bureaucratic layers. These technologies can identify each farm, monitor the progress of crops on each plot on a weekly basis, and can be linked to the bank accounts and Aadhaar numbers of each farmer, reducing the scope for manipulation.

Agricultural R&D: In the long term, production risks can only be addressed by greater attention to agricultural R&D, preferably by putting it in a mission mode. Improving Indian agricultural productivity, which still lags considerably behind other countries such as China, as well as creating resilience to the looming challenges of rising temperatures, variable precipitation, water scarcity, and increases in pests and crop diseases, require a major thrust in agricultural science and technology.

A national mission could help overcome the weaknesses in existing institutions of agricultural research and technology. This is one area where India could fruitfully collaborate with some BRICS (Brazil, Russia, India, China and South Africa) countries, especially Brazil and China, and on water-saving technologies with countries, such as Israel and Australia. For a start, the government must fill senior vacancies at more than 100 institutes under the Indian Council of Agricultural Research (ICAR), the majority of which lack a director, a troubling testimony to how seriously policymakers actually care for building India's domestic research capabilities.

Finally, the government needs to be open to advances in science. There is a lot of ongoing research on drought-resistant seed varieties, both via normal selection processes as well as through gene-editing. India needs to invest much more in this type of R&D than has been the case so far. While it should promote organic farming based on the former, curbing publicly-funded research and the use of genetically modified crops will amount to a form of unilateral disarmament, not only exposing Indian farmers to much greater risks, but also to multinational corporations (MNCs) whose monopoly power will only amplify.

Market risks: Market or price risk refers to uncertainty about the prices farmers pay for inputs or the prices they receive for their farm output. Government policies have sought to address input price risks by price controls, especially on fertilisers and power. Ironically, output price risks are most acute precisely when farm output is good. Bumper harvests go hand-in-hand with falling output prices, and government policies have sought to address that via price support (MSP) for outputs. And in an open economy, sometimes the price shocks that emerge in global markets are imported into domestic markets.

Volatility in input prices is best handled through vigorous competition with many suppliers—and, when needed,

imports—so that monopoly rents are whittled away. Competition policy is the best antidote to price risks, whether for inputs or outputs.

In addition, farmers need to organise by forming (or joining) marketing cooperatives, such as FPOs to enhance their bargaining power and get better prices for their produce. This would also allow them to spread harvest and sales over the season by scheduling planting and storage. The government needs to incentivise and regulate the development of FPOs, not seek to form or control them directly.

Financial risks: Financial risk results when the farm business borrows money and creates an obligation to repay debt. Rising interest rates, the prospect of loans being called by lenders, and restricted credit availability are also aspects of financial risk.

Despite the presence of a welter of government programmes, official credit for agriculture varies widely across the country. The introduction of Kisan Credit Cards has given farmers working capital options, although efficient implementation is still some ways away. In some cases, the financial cycle of banks does not synchronise with the agricultural cycle, which leads to pressures on farmers to repay before harvest. Delinking the two would help farmers.

Given the small size of most Indian farms and the need to increase mechanisation and raise productivity, steps should be taken to improve leasing and rental options rather than purchase machinery, equipment, or land. An important source of financial risk is the government itself, in particular uncertainties surrounding government actions. Export controls, sudden imports, and the level of price support payments are examples of government decisions that can have major unexpected impacts on farmer incomes.

Finally, good risk management depends on accurate information, which requires reliable data. The rapid spread of smart phones means that information technology-enabled farm services (including market price data) from government and private sources, extension workers, and other farmers, can now be disseminated rapidly, which should also help in managing risk.

Improving Agriculture Markets

Farmers' income can improve substantially if they are able to capture a greater share in the supply chain from farm gate to consumer. For this to happen, farmers must have the freedom to sell what they want, where they want, and when they want without any restrictions on sale, stocking, movement, and export of farm produce. These will require legal and institutional changes, major investments in market infrastructure and storage (including cold-chain storage), and incentives for the creation and operation of infrastructure by FPOs.

There is a growing evidence that farmers and traders across the country are capable of integrating digital technology and online platforms into their marketing practices. However, there must be a clear recognition that agricultural markets are highly specific, diverse, and differentiated in terms of their

structure and organisation across different agroecological regions and commodity systems. When farmers are able to access multiple market sites, their bargaining power increases, not just in terms of selling price, but also in other crucial ways such as lower commissions, more accurate weighing, and faster payment.

Hence, regulatory reform to open up the current Agricultural Produce Market Committee (APMC) mandi system to the competition from multiple channels and sites of exchange—including local traders, private corporations, cooperatives, producer companies, and other physical and electronic spot markets—is exceedingly important. Farmers should have access to multiple market sites, and especially to inclusive multi-buyer local wholesale markets that operate around the agricultural year.

Problems and prospects of e-NAM: The introduction of the electronic national agriculture market (e-NAM)—an online trading platform for agricultural commodities in India—is a step in this direction. However, its effects have been underwhelming due to three major bottlenecks: (i) time cost of transactions, (ii) quality assessment challenges, and (iii) transportation logistics.

Farmers' time is valuable. In the current system, farmers bring their produce to a mandi, traders bid for the crop, the transaction is completed within an hour, and the farmer can go home. Payment from the commission agent might happen later but the farmer does not have to wait in the mandi for long hours. In the current version of e-NAM (Stage 1), open outcry auctions are being replaced by electronic auctions but traders are still not allowed to bid across mandis.

Two points need emphasis. First, just because traders enter bids through a computer, this does not increase competition—after all they can still talk to each other and collude. The switch to e-auctions is not bringing in new traders to participate. Second, the market is not allowed to clear until all electronic bids have been submitted for all lots of produce that have been brought into the mandi for the day. This process takes anywhere between six and eight hours and all the while, farmers have to wait in the mandi with their crop. It also increases congestion in mandis. Hence, farmers prefer to sell outside e-NAM and the uptake of a “good policy” remains low. The waiting time for farmers should be voluntary and they should know the highest bid on their lot at any time. Whenever they think they have a good enough price, they should be allowed to take that offer and leave.

The real benefits of e-NAM will be realised when traders from any mandi can bid in any other mandi (even one outside their state). The current plans are that in the second stage of e-NAM, bidding would be allowed across mandis within a state and then in the third stage, trades across mandis throughout the country would occur. However, this is unlikely to happen unless a key constraint—reliable, real-time quality assessment—is addressed.

Traders in Chennai will only bid for paddy in a mandi in Bhatinda, if they know the quality of paddy on sale. This

differs by each lot of crop the farmer brings to a mandi. In the absence of any reliable alternative mechanism for quality assessment, the traders have to physically show up in the mandi and verify it themselves (or through a representative). This means that even if mandis were electronically connected, trades across mandis will not occur and markets will remain fragmented. The same constraints also force traders to show up in a mandi (to physically verify crop quality) in the current stage of e-NAM. What all this indicates is the dire need to fix quality standards and set up dispute settlement mechanisms if the dispatched quality differs from what is shown on the computer while bidding.

Finally, transportation is a major bottleneck. Suppose a trader sitting in Lucknow buys 100 quintals of soya bean from Harda mandi in Madhya Pradesh. Who ensures transportation? The trader may not have local contacts. Will the burden fall on the farmer? What if the quantity bought was low or diversified across crops? Therefore, to integrate national markets—and for farmers to get higher prices—it is important to have traders who can arrange for quality assessment and transportation remotely. Remote bidding and quality assessment can reduce transaction costs and increase competition, but bottlenecks in the transportation sector will have to be addressed, perhaps by creating an Uber-like transportation platform for trucking.

To help e-NAM perform to its full potential, the Government needs to push the creation of assaying, sorting, and grading infrastructure at the mandis. This will help reduce variance in the quality of produce from mandi to mandi, and encourage retailers and processors to procure through e-NAM. In addition, the government needs to ensure wider adoption of electronic negotiable warehouse receipts (e-NWRs) to help further strengthen the market.

The Agricultural Produce and Livestock Marketing (APLM) Act, 2017 needs faster adoption at the state level. Its recommendations, including single levy of market fee, single licences for traders, and de-listing perishables from the ambit of the APMCs, will improve market access and realisation for farmers. These gains, however, will be limited unless accompanied by: (i) the removal of a host of statutory restrictions on commodity trade—whether on sale, stocking, movement, or export—that governments indiscriminately impose; and (ii) concomitant public investments in enhancing the system's regulatory capacity, dispute settlement mechanisms in e-commerce platforms, and core market and logistics infrastructure. It is certainly the case that the government will continue to play a role in the procurement, stocking, and distribution of certain major commodities, but this should be done in a way that works with—rather than against—markets.

Finally, it needs to be emphasised that markets cannot function effectively unless the institutions governing agri-marketing in India, especially the ECA and APLM Act, are changed to give full freedom to the private sector to directly buy the produce from farmers, stock it as much as they feel appropriate, and sell it anywhere in India or abroad. Only light monitoring of stocks for information is needed for government policy,

which can be done by registering warehouses and asking them to file the stock levels on a weekly basis.

Conclusions

This paper has argued that fundamental reforms are needed if rapid increases in farmers' incomes are to occur in ways that are fiscally and environmentally sustainable. Given the strong political mandate of the current government, and the large number of states where the Bharatiya Janata Party (BJP) is in power (either directly or through the National Democratic Alliance partners), this is a golden opportunity to put agriculture on a more sustainable and higher growth trajectory for the long term.

Agriculture is a state subject but where the central government has had—and will continue to have—a large role. Reforms can only succeed if the central and state governments work closely together in a spirit of “cooperative federalism.” The formation of a committee of chief ministers for the “transformation for Indian agriculture” is a welcome step. Going forward, it would be helpful if the government created a more permanent agri-reforms council on the lines of the goods and services tax (GST) council.

Changes in policies will be piecemeal and half-hearted unless there are two fundamental ideational changes. First, who is the main focus of agriculture policies: the consumer or the producer (the farmer)? Second, farmers should not be patronised as helpless frail creatures, but as entrepreneurs who need supportive institutional and policy frameworks to thrive. The sad reality is that the Indian farmers' interests have been made subservient to the interests of consumers. Unless farm policies put the producers' interests foremost, little will change in practice. Subsidising the poor (or rich) consumer is not the responsibility of the farmer.

The focus for the central government will need to be twofold: first, actions that it can unilaterally take to raise agricultural incomes; and second, actions to influence state government actions to improve agriculture, remembering that agriculture is a state subject and that many of the important levers—water, power, irrigation, extension, etc—are controlled by the states. While the fate of agriculture will still largely be determined by the states and state-level politics, the centre can nonetheless initiate immediate actions, many of which are politically not difficult. These suggestions should be thought of as a package, which will have an impact if implemented holistically, and not in isolation.

The implementation of an income transfer scheme for farmers, for instance, must be accompanied by reducing damaging subsidies in power, water, and fertiliser and keeping the real prices of subsidised grains under the National Food Security Act (NFSA), 2013 constant. To lock in rice at ₹3 per kg, wheat at ₹2 per kg, and coarse grains (millet) at ₹1 per kg for perpetuity, no matter what happens to the state of the world, has fostered a cereal tyranny that has deeply damaged Indian agriculture. It may be time to revisit these issue prices and link them to the MSPs, say at least half of MSP, and look to NFSA's provision to revise them after three years of its initiation.

At the same time, India needs to start thinking about agriculture policies in the broader context of natural resource management. India is a natural resource constrained country. These constraints are becoming more severe due to massive increases in population and the greater consumption that inevitably accompanies growth and income increases. But, they are being magnified by distortionary policies and will become even graver as the existential threats posed by climate change become more manifest.

Land in India is scarce and its opportunity cost in low productivity agriculture is high. Its unavailability for higher value-added activities, whether commercial or industrial, slows down exit options, trapping them into ever more precarious lives. But, perhaps, the natural resource that will be most impaired and poses the most peril for India's future is

water. From declining water tables to contentious river-basin sharing to intermittent and poor quality of water supply in urban areas, the crisis is not somewhere in the future—it is already upon the country. Agriculture policies to discourage over-use and waste of water are necessary not just for the viability of agriculture but for the country's very future.

Finally, it needs to be recognised that growth and employment opportunities outside agriculture are critical for long-term improvements in farmers' incomes. Relentless population pressures have meant that most Indian farms are too small to provide viable incomes. Ironical as it may seem, the long-term future of Indian farmers fundamentally depends on getting many people out of farming. The problem of small and fragmented landholdings as a severe constraint on farmer incomes has long been acknowledged.

NOTES

- 1 Press Note on First Revised Estimates of National Income, Consumption Expenditure, Saving and Capital Formation 2018–19, Ministry of Statistics and Programme Implementation (MOSPI).
- 2 It was around ₹67,000 crore in 2015–16 as calculated from Power Finance Corporation's report (2017).
- 3 Estimated irrigation subsidy for FY 20 for all states and union territories taken together comes to around ₹27,421.5 crore (calculated from the data in "State Finances: A Study of Budgets 2019," Reserve Bank of India).
- 4 Working group report for fertiliser sector—Twelfth Plan (GoI 2020b).
- 5 State power utilities (SPU) of only two states (Delhi and West Bengal) were making profits without subsidy till 2013–14. All the other SPUs were operating in loss with or without subsidy (Gulati and Banerjee 2018, observation made from the data in GoI [2014]).
- 6 Out of 138 assessed blocks of Punjab 109 were categorised as "over-exploited" as in 2017 (GoI 2019b).
- 7 There are many irrigation projects which are being dragged for three decades or more like Sardar Sarovar in Gujarat, Gosikhurd in Maharashtra, Indira Sagar in Madhya Pradesh, Polavaram in Andhra Pradesh, etc.
- 8 Maharashtra's cost per ha of irrigation potential creation was ₹13.5 lakh for the period 2002–03 to 2013–14 (in 2017–18 prices), as against the all-India average of ₹4.5 lakh/ha for that same period (Gulati et al forthcoming).

REFERENCES

- FAI (2018): *Fertiliser Statistics 2017–18*, New Delhi: Fertiliser Association of India.
- (2019): *Annual Review 2018–19*, New Delhi: Fertiliser Association of India.
- GoI (2005): *Income, Expenditure and Productive Assets of Farmer Households*, NSS Report No 497 (59/33/5), National Sample Survey Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.
- (2011): Report of the Working Group of Fertiliser Industry for the Twelfth Plan (2012–13 to 2016–17), Department of Fertilisers, Ministry of Chemicals and Fertilisers, Government of India, New Delhi.
- (2013): *Key Indicators of Situation of Agricultural Households in India*, National Sample Survey Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.

- (2014): *Annual Report (2013–14) on the Working of State Power Utilities and Electricity Departments*, Power and Energy Division, Planning Commission, Government of India, New Delhi.
- (2019a): *Agricultural Statistics at a Glance 2018*, Ministry of Agriculture, Cooperation and Farmers' Welfare, Government of India, New Delhi.
- (2019b): *National Compilation on Dynamic Ground Water Resources of India, 2017*, Department of Water Resources, RD & GR, Ministry of Jal Shakti, Central Ground Water Board, Faridabad, Government of India.
- (2019c): *State Finances: A Study of Budgets*, Reserve Bank of India, Government of India.
- (2020a): *Expenditure Budget 2020–21*, Government of India, https://www.indiabudget.gov.in/expenditure_budget.php.
- (2020b): *Soil Health Card Website*, Government of India, <https://soilhealth.dac.gov.in/>.
- (various years): EXIM Data Bank, Government of India, commerce-app.gov.in/eidb/.
- Gulati, A and S Fan (2007): *The Dragon and the Elephant*, Johns Hopkins University Press.

- Gulati, A, S Manchanda and R Kacker (2016): "Harvesting Solar Power in India," ZEF Working Paper 152, and ICRIER Working Paper 329.
- Gulati, A, B Sharma, P Banerjee and G Mohan (forthcoming): "Getting More from Less: Story of India's Shrinking Water Resources," NABARD and ICRIER Report, Indian Council for Research on International Economic Relations, New Delhi, pp 170.
- Gulati, A and P Banerjee (2018): "Irrigation and Power Subsidy in India," *Supporting Indian Farms the Smart Way*, Ashok Gulati, Marco Ferroni and Yuan Zhou (eds), New Delhi: Academic Foundation.
- Gulati A, P Terway and S Hussain (2018): "Crop Insurance in India: Key Issues and Way Forward," *Supporting Indian Farms the Smart Way*, A Gulati, M Ferroni and Y Zhou (eds), Academic Foundation.
- NABARD (2018): *All India Rural Financial Inclusion Survey (NAFIS) 2016–17*, National Bank for Agriculture and Rural Development, Mumbai.
- Power Finance Corporation (2017): *Report on the Performance of State Power Utilities 2013–14 to 2015–16*, <https://pfcindia.com/Home/VS/29>.

EXPANSION

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