Workshop

On

Doubling Farmers' Income

(25th February 2019)






BACKGROUND MATERIAL

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Doubling Farmers' Income – Strategies

All the nations facing problems of poverty, hunger and malnutrition will need to accelerate their agricultural growth for achieving sustainable development goals (SDGs), especially while aiming at no poverty, zero hunger and safe environment for all (Paroda, 2017). The Green Revolution not only led to food self-sufficiency but also helped to reduce the poverty and hunger. And yet, despite fivefold increase in foodgrains production, as against a fourfold increase in population, India still has around 250 million people who live in poverty and about 45 million children below five years of age who are malnourished. Moreover, after 50 years of Green Revolution, India is also facing the second generation challenges like decline in the factor productivity growth, poor soil health, loss of soil organic carbon, ground and surface water pollution, water related stress, increased incidence of pests and diseases, increased cost of inputs, decline in farm profits and the adverse impact of climate change. On the demographic front, India adds annually almost one Australia (about 15-16 million) to its population. Thus, any progress gets nullified by an overall increase in population. Also, around 48% of the population is currently dependent on agriculture and allied fields and the agriculture sector contributes around 17% to national gross domestic product (GDP). Moreover, the public sector capital investment in agriculture and rural development has declined from almost 20% during Green Revolution period to currently less than 10%. In the process, many States have remained deprived of growth and development. As a result, most farmers are not benefitted especially since majority of them are smallholders and find agriculture not profitable any more.

Why Double Farmers' Income?

Past strategy for development of the agriculture sector in India has focused primarily on raising agricultural output and improving food security. The strategy involved a) an increase in productivity through better technology and varieties, and increased use of quality seed, fertiliser, irrigation and agro chemicals, b) incentive structure in the form of remunerative prices for some crop and subsidies on farm inputs; c) public investments in and for agriculture; and d) facilitating institutions. The strategy paid dividends as the country was able to address severe food shortage that emerged during mid-1960s. During the last half a century (1965 to 2015), since the adoption of green revolution, India's food production multiplied 3.7 times while the population multiplied by 2.55 times. The net result has been a 45 per cent increase in per person food production, which has made India not only food self-sufficient at aggregate level, but also a net food exporting country.

The strategy did not explicitly recognise the need to raise farmers' income and did not mention any direct measure to promote farmers' welfare. The experience shows that in some cases, growth in output brings similar increase in farmers' income but in many cases farmers' did not grow much with increase in output. The net result has been that farmers' income remained low, which is evident from the incidence of poverty among farm households. The NSSO data on Consumption Expenditure Survey for year 2011-12 reveals that more than one fifth of rural households with self-employment in agriculture as their principal occupation (such households fit into the definition of farmers) were having income less than the poverty line. The proportion of farm households suffering from poverty was quite high in some states (Figure – 1). The highest incidence was observed in Jharkhand where 45.3 per cent farm households were under poverty followed by Odisha wherein 32.1 per cent against the national incidence of 22.5 percent.

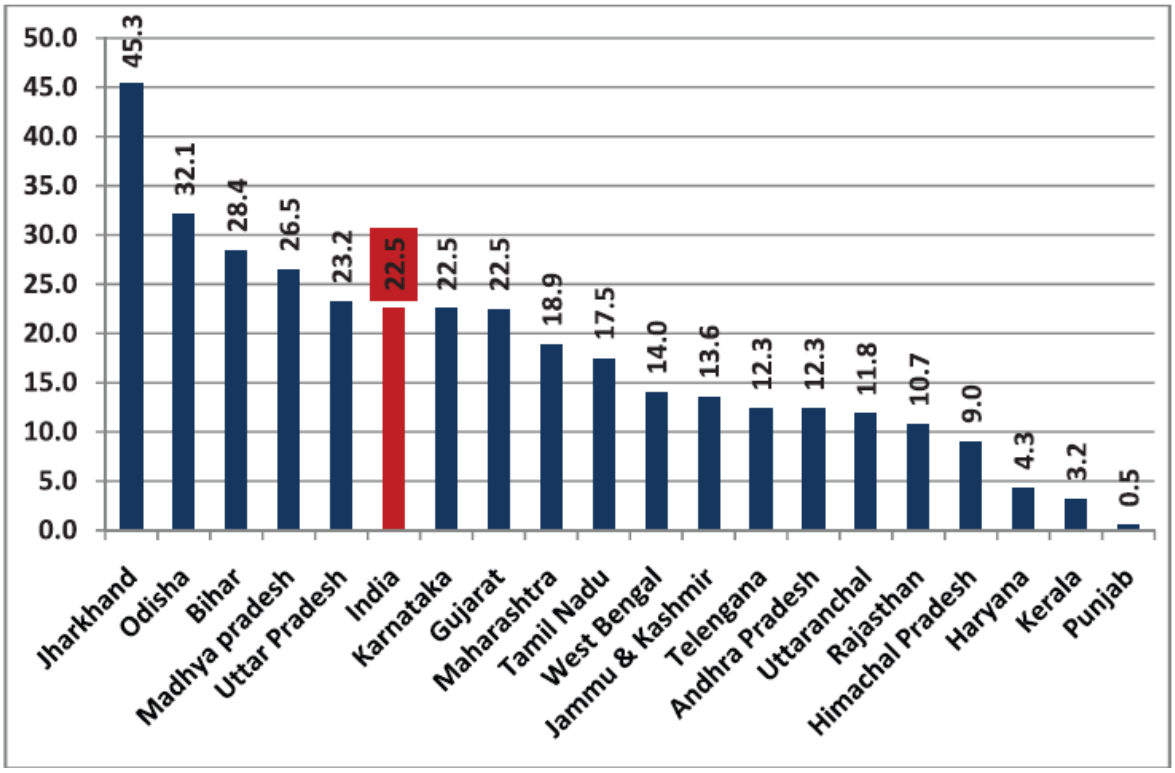


Figure – 1

Source: Estimated from unit level Consumption Expenditure Survey data 2011-12, NSSO.

Farmers' income also remained low in relation to income of those working in the non-farm sector. During early 1980s, farm income per cultivator was just 34 per cent of income of a non-agriculture worker. The disparity was quite large and required a policy response to raise farmers' income at a faster rate. This could be done in two ways – high increase in sectoral income and/or decline in number of farmers to share the total income of all the farmers'. However, this did not happen and the level of disparity remained unchanged in the following decade. After 1993-94, relative income of farmers worsened and reached one-fourth of income of non-agricultural workers. There was some improvement during 2004-05 to 2011-12, but no change over the 1983-84 level. The past four years (2012-13 to 2015-16) again witnessed deterioration in relative income of farmers.

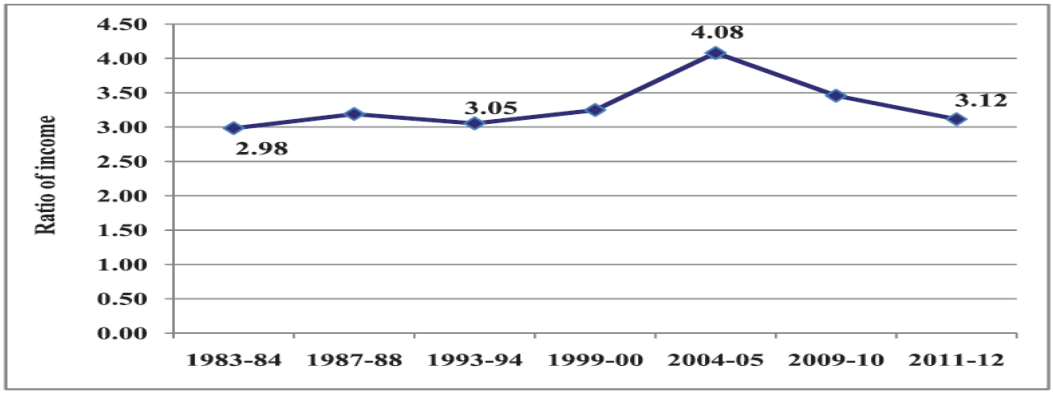


Figure – 2

Ratio of income per non agriculture worker to income per cultivator

Low level of absolute income as well as large and deteriorating disparity between income of a farmer and non-agricultural worker constitute an important reason for the emergence of agrarian distress in the country during 1990s, which turned quite serious in some years. The country also witnessed

a sharp increase in the number of farmers suicides during 1995 to 2004 - losses from farming, shocks in farm income and low farm income are identified as the important factors for this. This period coincided with the sharp slowdown in the growth of agricultural output. The low and highly fluctuating farm income is causing detrimental effect on the interest in farming and farm investments, and is also forcing more and more cultivators, particularly younger age group, to leave farming. This can cause serious adverse effect on the future of agriculture in the country.

Realising the need to pay special attention to the plight of farmers the Central Government changed the name of the Ministry of Agriculture to Ministry of Agriculture and Farmers Welfare in 2015. It is apparent that income earned by a farmer from agriculture is crucial to address agrarian distress and promote farmers' welfare. In this background, the goal set to double farmers' income by 2022-23 is central to promote farmers' welfare, reduce agrarian distress and bring parity between income of farmers and those working in non-agricultural professions. In this background the goal is set by the Prime Minister to double farmers' income by 2022-23 is central to promote farmers' welfare, reduce agrarian distress and bring parity between income of farmers and those working in non-agricultural profession.

Past Trend of Farmers' Income

The focus of Indian agriculture has been changing ever since the introduction of planning era (see, Deshpande, et al., 2004). Because of severe shortage of foodgrains production, an increased attention was given for augmenting productivity and production of foodgrains starting from late sixties to till eighties. Sustaining the growth of farm sector from the impact of WTO regime was the main focus during the nineties. As a result of production centered approach, the gross production of foodgrains and other agricultural commodities has increased significantly over the years; foodgrains production increased from just 51 million tonnes (mt) in 1950-51 to about 264 mt in 2014-15. Similar trend is noticed in many non-foodgrain crops as well (see, GOI, 2016). Today, India is not only a self sufficient country in foodgrains but also an exporter of foodgrains to many countries (see, Bhattacharya, 2004; Deshpande, et al., 2004).

Although over two-third of population are relying on agricultural sector for their livelihood, farm income related issues have somehow not received adequate attention in the policy circle till late nineties (see, Deshpande et al., 2004; Sen and Bhatia, 2004). Farmers were treated as mere agents of agricultural production over years. Their economic well-being never received due attention until late nineties, when farmer suicides and indebtedness became a widespread phenomenon. The scholars and policy makers began to take a serious note of this agrarian catastrophe only when the distress resurfaced again in the recent years in the farm heartlands of the country (see, Sainath, 2010). Serious deliberations on the issue of farm income and crop profitability have occupied the centre stage in the recent policy debates on agricultural sector especially from early 2000s. Experts across various quarters keep questioning on whether or not the income of the Indian farmers increased or are the farmers getting any profits from crops cultivation. As a major step towards understanding and studying the nature and causes of widespread farm suicides and to find out whether reduced income is the major reason for increased indebtedness among farm households, the Union Government appointed the Expert Group on Agricultural Indebtedness under the Chairmanship of Prof. R. Radhakrishna (GOI, 2007). Following this, many researchers also conducted detailed field level studies in this direction and have reported that decline in productivity, supply constraints in institutional credit, market irregularities, etc., are the major reasons for the sudden spurt in farm suicides and indebtedness (see, Deshpande, 2002; Deshpande and Prabhu, 2005; Reddy and Galab, 2006; Vaidyanathan, 2006; Narayanamoorthy 2006: 2007).

Comprehensive studies directly focusing on farm income at macro level in India were not available till the publication of Situation Assessment Survey (SAS) data (NSSO, 2005; 2005a). Because of the absence of data on farm income, most studies have used data from terms of trade computations between agriculture and other sectors to judge the performance of the sector (see, Kahlon and Tyagi,

1980; Gulati and Rao, 1994; Misra and Hazell, 1996; Misra, 1998). While some studies showed positive terms of trade, others found the same against the farm sector. The cost of cultivation survey (CCS) published by the Commission for Agricultural Costs and Prices (CACP) is another data source that was used by many scholars to understand the trends in farm income (Bhatia & Sen, 2004). CCS data in many ways are different from SAS data. While CCS data provides crop-wise cost and income details per hectare, SAS provided annual income from crop cultivation per household. A large number of scholars have studied the trends in farm income using CCS data over the years. For instance, with the help of CCS data from 1981-82 to 1999-2000, Sen and Bhatia (2004) concluded that the farm business income per farmer was miniscule and inadequate to pay even for the essentials (as cited by Chand, et al., 2015).

Assured prices appear to help the farmers for efficiently allocating the scarce resources among different crops (see, Schultz, 1964; Acharya, 1997; Deshpande, 1996; Rao, 2001). Studies have analysed the effectiveness of MSP on raising farm income using CCS data. Gulati (2012) argued that hike in MSP is necessary to get positive returns and also to propel the agricultural GDP. But, Bhalla (2012) counter argued that increasing MSP of paddy is "dirty economics and dirtier politics". With the focus on the impact of MSP on farm income, Dev and Rao (2010) have studied the profitability of paddy and wheat in detail using CCS data from 1981-82 to 2007-08 and found that the value of output has been more than the costs in both paddy and wheat throughout the period of analysis at the all India level. Similarly, utilising data from CCS for the period 1975-76 to 2006-07 by covering six important crops, Narayanamoorthy (2013) found an insignificant increase in profitability of foodgrain crops at constant prices mainly because of substantial increase in cost of cultivation (cost C2). The National Commission on Farmers (NCF) that looked into various aspects of farming in detail has also underlined that the returns from crop cultivation are very poor and inadequate (NCF, 2006). After the publication of SAS data, quite a few studies have been carried out specifically focusing on farm income. For instance, Narayanamoorthy (2006) analysed the level of farm income using SAS data across the major states and found that the annual average income from crop cultivation for the country as a whole was only Rs. 11,628 per household. That is, the per day income of the farmers' household was just about Rs. 32 during 2002-03, which was much lower than the average agricultural wage rate that prevailed at that time in the country. The pitiable condition of the farm households has also been clearly narrated using SAS data by the Expert Group on Agricultural Indebtedness under the Chairmanship of Prof. R. Radhakrishna (GOI, 2007).

But, Chand, et al., (2015) have questioned the validity of the estimates made based on CCS data. Their contentions are "……..the cost of cultivation data is representative of crops or crop complexes in major growing states, but it does not cover the entire country or the entire agriculture sector. Even the productivity of sample crops reported in COC data show significant difference from state averages. COC data also does not cover horticultural crops and several minor crops that constituted 38% of the total value of the crop sector in 2011-12. Further, the importance of horticultural crops has been rising, and their productivity in India is more than four times that of other crops. Their exclusion makes a significant difference to the level and growth in farm business income. Also, the data on income from the livestock sector is not appropriately captured in the cost of cultivation schedules, which do not intend to do so. Because of these reasons, farm business income derived from the COC data is not an adequate measure of actual farm business income in the country or a state. At best, these can be used as indicators of income from selected crops" (p.140).

Keeping in view the limitations of the existing estimates on farm income, Chand, et al., (2015) made an entirely new attempt to estimate the level of farm income for the country as a whole taking macro level data on National Income Accounting from 1983 to 2011-12. They estimated the farm income by deducting the GDP of agriculture and allied sectors from capital consumption and wage bill for hired labour employed in agriculture. As per this estimate, the real farm income earned by Indian farmers (at 2004-05 prices) increased from Rs. 2,11,000 crore in 1983-84 to Rs. 6, 25,536 crore in 2011-12. That is, per cultivator income increased from Rs. 16,103 to Rs. 42,781 during this

period. Interestingly, the annual growth rate of per cultivator farm income increased at a rate of 7.29 per cent during 2004-05 to 2011-12, which is more or less equivalent to the overall growth of the economy during this period. While these estimates appear to be systematic, one needs to look at it carefully whether the macro-level data based estimate can reflect the reality on farm income? This question arises due to three important reasons. First, the transaction cost involved in farming activities is huge (my field survey experience suggests that it will be around 20 percent of cost A2)1, which never gets included in the macro level cost. Second, the whole sale cost of inputs at the macro-level used in the estimate would be much lower than the retail price of inputs. For instance, the retail price of fertiliser sold in the district headquarter is lower than the price of fertiliser prevailing in the retail shop located at a village or block. Third, the managerial cost (CACP considers 10% of C2 cost as managerial cost) is another big cost which may not have also been included in the macro level cost used by Chand, et al., (2015). If we include these costs in the estimate, then there is a possibility that the farm income estimated by them would exhibit a declining trend.

Besides the issues concerning the estimate on farm income, many puzzles and myths pertaining to the income of the farmers need to be answered to better understand its reality. First of all, given the contesting estimates from different scholars, we must find out what is the actual level of income that farmers get from crops cultivation? What is the variation in the level of farm income across the states in India? Has the farm income increased over the years? If yes, has it increased consistently in all regions and crops? There is a myth that the income reaped by the farmers belonging to irrigated regions is higher than its counterpart, the less irrigated regions. Is it true? Is there any difference in profitability of crops cultivated under irrigated and less irrigated condition? There is another myth which has emerged in the context of alleviating agrarian crisis is that the farm income can be increased by augmenting productivity of crops. In this context the question crops up whether the farmers of high productivity states reaping higher profits than that of less productivity states in different crops? Is it true that farmers are unable to reap profit consistently throughout across years? What is the role of new technologies/methods in increasing the farm income? We seem to be having inadequate answers to these questions in the available literature. Unless these questions are adequately answered one may not able to say clearly about the state of farm income in India. In this paper, therefore, while making effort to answer these questions, an attempt has been made to bring out the real state of farm income in India mainly using data available from two important sources namely SAS and CCS.

Has the Farm Income Increased?:

In the absence of comprehensive farm income related data, various scholars have employed different methodologies/data sources to estimate the farm income. As mentioned earlier, many have used CCS data, while some have derived the farm income using agriculture GDP and related data. Divergent views are available from the existing studies on farm income, which has also been underlined earlier. While estimates of the existing studies have provided useful information, we have actual data on farm income fairly comparable[2] for two time points namely 2002-03 and 2012-13 from SAS published by NSSO (2005; 2014), which can reveal the reality about the state of farm income. SAS provides data on the annual income for farmer households by various sources namely wages, cultivation, farming of animals and non-farm business income. Using this data, the actual level of farm income reaped by the Indian farmers can be easily judged.

The concept of farm income has been used differently by different scholars. While questioning the validity of the income estimated through CCS data, Chand, et al., (2015) argued that farm income should include the income from the livestock sector as well. While their arguments is probably correct in a broader context, we must recognize the questions raised in the debate on farm income during the last decade or so. Farmers have been questioning the income realised from crops cultivation and not about the income from other sources. `Crop holiday' in paddy in Andhra

Pradesh have also been declared a few years back citing low income from crop cultivation. Similarly, farmers in various parts of India are demanding higher income from crops cultivation, but not from livestock or other sectors. The National Commission on Farmers (NCF) has also primarily referred to farm income as the income received from the crop cultivation. Therefore, in order to understand the ground reality of farm income, it is necessary to consider the income from crops cultivation which is an issue discussed intensively today.

It is therefore essential to look into the changes in the income from crop cultivation vis-à-vis other sources between the two time periods mentioned above utilising SAS data which is presented at constant value (at 1986-87 prices) in **Table 1**. It is clear that the annual income per farm household from cultivation has increased from Rs. 3,645 in 2002-03 to Rs. 5,502 (at constant prices of 1986-87) in 2012-13, an increase of about 3.81 percent per annum. But, the question which needs to be answered here is whether the income from crop cultivation increased at a faster rate as compared to other sources of income of farmer household. The answer is very clear; the increase in income from crop cultivation was not very significant as compared to the income realised through farming of animals. This means that the farmers who are relying purely on cultivation income not only earn less income but their growth of income is also very less in India during the last one decade or so.

The other puzzle which refuses to die down in the debates is whether the farm income of the irrigated region is higher than that of less irrigated region. It is an established fact that the productivity of any crop cultivated under irrigated region is higher than that of the less irrigated or un-irrigated region (see, Vaidyanathan, et al., 1994). Temporal and spatial data on crop productivity published by the Union Ministry of Agriculture reinforces this fact. But, unfortunately, farmers belonging to the irrigated region have also committed suicides citing poor returns from crops cultivation in the recent years. Farmers in Andhra Pradesh belonging to highly irrigated region have even declared `crop holiday' specifically because of poor income from farming. Given this unpleasant developments, there is a need to validate whether irrigated farmers reap higher profit than their less irrigated counterparts.

Data available for all the major states for two time points from SAS provides opportunity to look into this issue. Statistics provided in **Table 1** show that the average income from the cultivation for the States Having Above National Level Irrigation (SHANLI) is not substantially different from that of the States Having Below National Level Irrigation (SHBNLI) at both time points namely 2002-03 and 2012-13. During 2002-03, the average annual income of SHANLI was Rs. 4,636 per household, whereas the same was Rs. 4,115 for SHBNLI category, a difference of only about Rs. 521. Similar trend was also observed during 2012-13. Interestingly, quite a few states belonging to SHBNLI category were able to earn higher income from cultivation than that of the states coming under SHANLI category. This was not unexpected due to the fact that although the gross income from the crops cultivated under irrigated condition is higher because of higher productivity, increased cost of cultivation might have counterbalanced the net returns from crops cultivation .

Farm Income across States:

Although the issue of farm income has been discussed by researchers and policy makers extensively over one decade in India, the performance of various states in terms of farm income has not been adequately covered possibly because of data constraints. What is happening at the country level might not be the same across different states due to variations in cropping pattern, irrigation coverage, adoption of modern technologies, procurement policies, market arrangements, etc. It is always believed that the states with more area under commercial crops can generate higher farm

income than the states with larger area under foodgrain crops. But, this issue could not be answered convincingly due to data constraints so far. Now, the data available from SAS reports for two time points permit us to study this issue.

The annual income from cultivation per farmer household varies substantially across the states in India, as expected. During 2002-03, it varied from Rs. 10,616 per household in Punjab to Rs. 1,264 in Orissa at 1986-87 prices. Similarly, the same income varied from Rs. 19,396 per household in Punjab to Rs. 1,748 in West Bengal during 2012-13. Besides substantial variation in farm income among the states, it is found to be very low in most states where paddy is cultivated predominantly during both time points. For instance, during 2012-13, the average cultivation income for the country as a whole was Rs. 5,502 per household. But, it was much lower than this in states like AP, Orissa, Bihar, Tamil Nadu, UP and West Bengal where paddy has traditionally been cultivated predominantly; these states together accounted for 53 to 56 percent of India's total paddy area during 2002-03 and 2012-13 (GOI, 2016). This in a way supports the rising dissent of paddy farmers who have been arguing over one decade from now that the income from its cultivation dwindled substantially. It is true about other crops as well.

Besides low income from cultivation, its growth is also not very appreciable among the major states between 2002-03 and 2012-13. The average growth of cultivation income for the whole of India is estimated to be about 3.81 percent per annum between the two periods, but it was less than that of the India's average growth rate in 11 out of 18 states reported in the **Table 1**. In states like Chhattisgarh, Karnataka, MP, Haryana, Punjab and UP, the cultivation income grew at a faster rate over the rate of national level average. To our surprise, the growth rate of income from cultivation was negative in states like J&K, Jharkhand, Bihar and West Bengal. This poor growth in income from cultivation might have affected the livelihood conditions of the farmers living in these states. On the whole, the analysis based on the data available from SAS clearly shows that the income from cultivation per farmer household was very low and its growth rate was also nowhere nearer to the growth rate estimated by Chand et al., (2015).[3]

Table 1: Average Annual Income per Farmer Household by Source across major Sates during 2002-03 and 2012-13

(Rs/ha at 1986-87 prices)

State	2002-03					2012-13					Compound Growth Rate (percent/annum)				
	Wages	Cultivation	Farming of Animals	non-Farm Business	Total	Wages	Cultivation	Farming of Animals	non-Farm Business	Total	Wages	Cultivation	Farming of Animals	non-Farm Business	Total
Andhra Pradesh	2419	2795	350	583	6147	4432	3611	1920	714	10677	5.66	2.36	16.74	1.86	5.15
Assam	3660	6741	530	959	11891	2554	7520	1427	455	11955	-3.22	1.00	9.41	-6.55	0.05
Chhattisgarh	2667	3051	-11	380	6087	3300	5977	-34	2	9245	1.95	6.30	00	-38.57	3.87
4. Gujarat	3480	4379	1712	527	10097	4791	5238	3446	679	14154	2.95	1.64	6.57	2.33	3.12
5. Jammu & Kashmir	7749	9126	1437	2332	20645	13100	5470	1430	2648	22648	4.89	-4.55	-0.04	1.16	0.85
6. Jharkhand	3476	3205	324	779	7783	3284	2591	2130	425	8430	-0.52	-1.91	18.69	-5.36	0.73
7. Karnataka	3954	4762	493	632	9841	4780	8804	1071	1116	15771	1.74	5.74	7.32	5.31	4.38
8. Kerala	7572	4213	579	2697	15062	9382	6305	1027	4516	21229	1.97	3.73	5.34	4.80	3.17
9. Madhya Pradesh	2107	3747	-854	380	5379	2379	7171	1307	230	11089	1.11	6.08	00	-4.45	6.80
10. Maharashtra	3006	4751	542	967	9265	3850	6886	963	1489	13189	2.28	3.43	5.36	4.01	3.26
11. Orissa	2155	1264	60	515	3995	3064	2513	2346	963	8886	3.25	6.44	39.52	5.84	7.54
12. Rajasthan	3502	1350	19	764	5635	4525	5604	1727	1268	13125	2.36	13.81	50.81	4.72	7.99
Average of SHBNLI	**3812 (40.91)**	**4115 (44.16)**	**432 (4.63)**	**960 (10.30)**	**9319 (100)**	**4953 (37.06)**	**5641 (42.20)**	**1563 (11.70)**	**1209 (9.04)**	**13367 (100)**	**2.41**	**2.91**	**12.41**	**2.12**	**3.33**
13. Bihar	1870	3182	997	760	6809	2363	3063	498	429	6354	2.15	-0.35	-6.11	-5.07	-0.63
14. Haryana	4770	5620	-888	1339	10841	6234	14048	4723	770	25775	2.46	8.69	00	-4.91	8.19
15. Punjab	5500	10616	888	1655	18658	8534	19396	2961	1357	32248	4.08	5.63	11.57	-1.79	5.10
16. Tamil Nadu	4157	2479	414	745	7794	5182	3423	1964	1895	12464	2.02	2.98	15.21	8.86	4.36
17. Uttar Pradesh	2103	3145	199	696	6143	2054	5098	970	671	8791	-0.22	4.49	15.46	-0.33	3.31
18. West Bengal	3337	2772	290	1422	7821	3796	1748	402	1161	7107	1.18	-4.11	3.02	-1.83	-0.87
Average of SHANLI	**3623 (37.43)**	**4636 (47.90)**	**317 (3.27)**	**1103 (11.40)**	**9678 (100)**	**4694 (30.37)**	**7796 (50.44)**	**1920 (12.42)**	**1047 (6.77)**	**15457 (100)**	**2.38**	**4.84**	**17.80**	**-0.47**	**4.35**
All India	**3081 (38.72)**	**3645 (45.82)**	**342 (4.30)**	**888 (11.16)**	**7956 (100)**	**3698 (32.23)**	**5502 (47.95)**	**1363 (11.87)**	**914 (7.97)**	**11475 (100)**	**1.67**	**3.81**	**13.38**	**0.27**	**3.39**

Sources: NSSO (2005a; 2014).

Notes: SHANLI - States having above national level of irrigation coverage in 2002-03; SHBNLI-States having below national level of irrigation coverage in 2002-03; Figures in brackets are percentages to total income.

Trends, Challenges, Pathway and Strategies

India experienced an impressive growth and productivity gains in agriculture since Independence reflecting our farmers' resilience against multiple odds and challenges. Despite a structural transformation post-Green Revolution, characterised by a consumer centric and food security policy objective, the regular distress and crises in the recent past pose a severe threat to income and livelihood security of farmers. The income realised from agriculture compared to non-agriculture, has been too low with a wide variation across regions. The average income of an agricultural household during 2012-13 has been estimated as low as at `6426 per month, marginally higher than the average consumption expenditure (`6223). Further, around 23 per cent of the farmers still live below the poverty line (DFI Committee, 2017). Estimates from the Central Statistics Office's (CSO) indicated that the annual growth in gross value added from agriculture has reduced drastically from as high as 6.9 per cent (October-December, 2016) to a mere 2.3 per cent (April-June, 2017) at 2011-12 prices in the recent past ten quarters. Shockingly, the growth was lower in nominal terms in comparison to real prices during the AprilJune, 2017 quarter indicating the creeping deflation in farm sector. In addition, the real farm revenue for a basket of pulses and vegetables estimated by the price multiplied with the quantity of market arrivals and deflated by the rural consumer price index has declined indicating the distress (Damodaran, 2017) and the difficulty it poses for the doubling objective within the stipulated period.

Farmers are at the epicentre of Indian economy and their livelihood upliftment is a step towards holistic development of the nation. Decline in productivity and income has a serious implication on rural household poverty, and other economic, social as well as sustainability indicators (Timmer, 1995; Datt and Ravallion, 1998; Mellor, 1999; Fan et al., 1999; Irz et al., 2001; Minten and Barrett, 2008; Byerlee et al., 2009; Muyanga, et al., 2010). Hence, increasing the income of farmers from different sources across holding size and region has become an utmost priority for the policy planners. Though, the state goes rhetoric about farmers' welfare since independence, its policies have always been consumer centric preventing the producers from relishing the fruits of their labour and hard work. The agriculture policies have led to a 'boom-bust' cycle in agriculture with a certain regularity that a year of drought leads to prices shoot up, area increase, abundant production, collapse of prices, area shrinkage and prices shoot up.

The Government, in its 2016-17 budget, with the intention of going beyond the food security objective, gave enough policy thrust on income security proposing to double the farmers' income (henceforth DFI) by 2022 (75th year of independence) indicated that it is not a mere rhetoric but a serious resolve. The present study analysed the current status of farmers' income across holding size and regions and attempted to decipher the scope and pathways for DFI through potential drivers. The spatial and temporal trends in farm household income from crop production, livestock farming, wages and non-farm activities have been analysed for better understanding of the present scenario. Second, a framework integrating technology, extension, institutions and policies to double the income by 2022 has been developed. The study also highlighted the strategies to double the income from wheat production, a major staple food crop.

Data and Methods

During the NSS 59th Round (January - December 2003), information on a majority of items have been collected in an integrated schedule covering some basic characteristics of farmer households and their access to basic and modern farming resources. The areas of interest included the educational level of farmer households, economic well-being of farmer households as measured by consumer expenditure, income and productive assets, and indebtedness; their farming practices and preferences, resource availability, and their awareness of technological developments and access to modern technology in the field of agriculture. In this survey, detailed information was collected on receipts and expenses of households' farm and non-farm businesses, to arrive at their income from these sources. Income from other sources was also ascertained, and so was the consumption expenditure of the households. Keeping in view the same objectives of NSS 59th Round survey, in NSS 70th Round survey, it was decided to repeat the Situation Assessment Survey during January to December 2013. The major changes made with respect to concepts in the schedule are given below: a) In contrast to the definition of farmer used in 59th Round, the necessary condition of 'land possession' has been dispensed with in this round. b) The nomenclature `Farmer household' has been changed to `Agricultural Household'. Accordingly the name of the schedule has been changed to `Situation Assessment Survey of Agricultural Households' c) References to 'Kharif' and 'Rabi' seasons have been removed. Instead it was decided to collect data for two halves of the agriculture year 2012-13 as July to December 2012 and January to June 2013. d) It was decided to collect actual expenditure (out of pocket expenditure) incurred by the household for running farm and non-farm business. Schedule has been designed for collection of information on aspects relating to farming and other socio-economic characteristics of agricultural households. The information has been collected in two visits for the same sample households. The first visit has been made during January to July 2013 and the second, during August to December 2013 in rural areas only.

The 70th round of NSS was conducted over the period ranging from January to December 2013 covering 35200 farmer households across all states and union territories of India in the first visit (January to July 2013) collecting information on farm household income for the reference period: July to December 2012. In the second round of the survey, 34907 households which had been covered in the first round were surveyed and information pertaining to the period January to June 2013 was collected. The data released in public domain during December 2014 provided the most recent estimates of incomes earned by farmer households.

Status of Household Income of Farmers

The realization of doubling the income of farmers comprise both farm and non-farm income (non-farm income includes income from non-agricultural economic activities like household and non-household manufacturing, handicrafts, repairs, construction, mining and quarrying, transport, trade, communication, community and personal services in the rural areas) in a span of six years since the announcement in 2016 requires a compound growth rate of 12.25 per cent per annum. At the present real income growth rate of 5.24 per cent, doubling would take around 14 years (Satyasai and Sandhya, 2016). Indian agricultural database lacks farmer income series and hence it becomes cumbersome to track the year to year changes in the household income. However, estimates from NSS data indicated that the compound annual growth rate (CAGR) of farmers' nominal income was 11.8 per cent between 2002-

03 and 2012-13 (Figure 1). Haryana registered the highest growth (17.5%) while West Bengal had the lowest (6.7%). However, in real income terms, the growth was found to be lower relative to nominal income, wherein, Odisha topped with a CAGR of 8.3 per cent. Livestock contribution resulted in a significant change for the state (Chandrasekhar and Mehrotra, 2016). It was closely followed by Haryana (8.0%), Rajasthan (7.9%) and Madhya Pradesh (7.3%), as against a national average of 3.5 per cent. Bihar and West Bengal experienced negative growth (real terms) in terms of farmers' income. Under a Business as Usual (BAU) scenario, nominal income of a farmer can double almost every eight years, whereas doubling of real income needs more than 25 years. Clearly, if the aim is to double the real income by 2022, the effort and resources necessary to achieve it would have to be at least three times that of the current BAU-scenario levels (Gulati and Saini, 2016).

In addition, survey data indicated that the farm income growth which is currently hovering around one per cent has declined since 2011-12 (Chand et al., 2015) and the growth in farm sector during April-June, 2017 quarter in nominal terms has been estimated as low as at 0.32 per cent which is significantly lower for the first time in relative to real prices growth of 2.34 per cent (Damodaran, 2017). State wise ratio between farmer's income between 2003 and 2013 from different sources and farm holdings (Table 2 to 7) indicated that nominal income has doubled in a majority while the real income has not. The implication is that price has been a major driver for income enhancement rather than physical output.

Analysis of disaggregated sources of farmers' income indicates that for a majority of states, the real income and nominal income had doubled in the case of marginal farmers. Income from crop production, wages and livestock farming have increased across farm holding size against the declining non-farm income. Barring a few states like Arunachal Pradesh, Goa, Mizoram and Uttarakhand, the rest have experienced doubling in both real and nominal income between 2003 and 2013.

Income share from livestock has witnessed an increase from 5 to 12 percent at national level supporting the findings of Thiagu (2015) and across holding size, it increased from 6 to 14 per cent in the case of marginal (< 1 ha), 5 to 11 per cent for small (1 – 2.5ha), 3 to 11 per cent for semi-medium (2.6 – 4ha), 2 to 7 per cent for medium (4.01 – 10ha) and 2 to 7 per cent for large (> 10ha) land holders. The income growth attained across farm holdings and across regions shall be attributed to the livestock farming (Chandrasekhar and Mehrotra, 2016).

The regional heterogeneity in farmers' income sources and variations within land classes indicate the need for region-specific and class-specific strategies to increase income. The trend between 2003 and 2013 show us that neither the farmers from a group of states nor of a specific land class performed exceedingly well with different income sources.The large farmers of Rajasthan and Uttar Pradesh, Medium farmers of Kerala, semi-medium farmers of Himachal and small farmers of Punjab had earned high through crops during the foresaid period.

The income growth in real terms has declined in Bihar and West Bengal registering a negative CAGR (Gulati and Saini, 2016). Despite the average increase in income was more than three times in nominal terms, from `2115 (2003) to `6426 (2013), in real terms the income doubling was not evident. At the national level, medium and large operational land holders with 4.01-10ha and >10ha, respectively have experienced a major shift in income (Chandrasekhar and

Mehrotra, 2016). Livestock emerged as a major source of income escalation across farm holding size (Figure 4a&b) and states in comparison to all other sources (Table 2 to 7).

The detailed estimates of the above information are given in Table 2 to 7.

Table 2: Ratio of household income between 2003 and 2013 for marginal land holders

Region	Nominal Income					Real Income				
	Wage	Crop	Livestock	Non-farm	All Sources	Wage	Crop	Livestock	Non-farm	All Sources
A & N Islands	2.26	2.95	0.79	2.45	2.34	2.12	2.76	0.74	2.30	2.19
Andhra Pradesh	3.67	3.37	5.24	1.84	3.54	2.04	1.87	2.91	1.02	1.96
Arunachal Pradesh	3.73	1.89	2.46	-1.34	2.59	3.13	1.59	2.06	-1.12	2.17
Assam	1.43	2.69	5.82	1.06	2.10	1.16	2.19	4.72	0.86	1.71
Bihar	2.33	2.28	1.69	1.01	2.02	1.67	1.64	1.22	0.73	1.45
Chandigarh	11.07	0.66	1.24	0.00	4.07	8.08	0.48	0.91	0.00	2.97
Chhattisgarh	2.11	6.29	-8.98	0.14	2.90	1.19	3.55	-5.07	0.08	1.64
Dadra & Nagar Haveli	2.48	2.37	1.54	27.63	3.02	2.33	2.23	1.45	26.00	2.84
Daman & Diu	3.56	1.36	1.03	3.31	3.11	2.56	0.98	0.74	2.37	2.24
Delhi	4.95	0.14	1.51	5.13	2.75	4.86	0.13	1.48	5.04	2.70
Goa	1.63	1.33	11.20	8.37	2.19	1.73	1.41	11.86	8.86	2.32
Gujarat	3.26	3.53	4.28	3.42	3.54	2.07	2.24	2.72	2.17	2.25
Haryana	2.82	2.21	-24.68	2.04	3.60	2.04	1.59	-17.80	1.47	2.59
Himachal Pradesh	2.61	4.36	5.06	1.95	2.99	1.84	3.08	3.57	1.38	2.10
Jammu & Kashmir	3.53	2.05	2.22	1.04	2.63	2.89	1.67	1.81	0.85	2.15
Jharkhand	1.89	2.62	28.18	0.96	2.80	1.16	1.61	17.26	0.59	1.71
Karnataka	2.34	4.44	6.66	2.08	2.90	1.70	3.22	4.83	1.51	2.11
Kerala	2.63	2.83	4.62	4.42	3.09	2.63	2.83	4.63	4.43	3.09
Lakshadweep	3.26	0.61	-0.52	0.25	2.57	1.33	0.25	-0.21	0.10	1.05
Madhya Pradesh	2.44	3.85	-51.47	1.29	3.29	1.30	2.05	-27.44	0.69	1.76
Maharashtra	2.64	3.70	6.98	4.04	3.28	1.87	2.63	4.95	2.86	2.32
Manipur	2.11	2.70	67.18	3.86	2.82	1.06	1.36	33.79	1.94	1.42
Meghalaya	.73	.34	4.65	4.31	3.00	2.45	1.54	3.06	2.84	1.97
Mizoram	1.62	2.29	1.11	0.99	1.85	1.04	1.48	0.71	.64	1.19
Nagaland	5.46	1.94	-517.17	0.27	3.97	4.93	1.75	-466.96	0.24	3.59
Odisha	3.23	5.18	45.26	3.36	4.75	1.90	3.04	26.59	1.97	2.79
Puducherry	3.19	0.77	3.54	1.86	2.78	2.86	0.69	3.17	1.66	2.49
Punjab	2.74	7.15	8.59	1.31	3.20	2.26	5.90	7.08	1.08	2.64
Rajasthan	2.38	4.00	25.08	3.51	3.22	1.32	2.22	13.95	1.95	1.79
Sikkim	1.86	2.62	1.61	10.97	2.23	0.99	1.39	0.86	5.83	1.19
Tamil Nadu	2.89	3.54	14.53	6.95	4.05	2.00	2.45	10.05	4.81	2.80
Tripura	3.27	2.94	4.50	1.53	3.05	2.33	2.10	3.21	1.09	2.18
Uttar Pradesh	2.46	3.38	9.18	1.79	2.94	1.96	2.69	7.30	1.43	2.34
Uttarakhand	2.15	2.25	3.30	1.27	2.24	1.63	1.71	2.50	0.96	1.70
West Bengal	2.53	1.68	3.96	1.49	2.13	1.99	1.32	3.11	1.17	1.68

Note: N.E. indicates the non-estimation due to non-availability of data

Table 3: Ratio of household income between 2003 and 2013 for small land holders

Region	Nominal Income					Real Income				
	Wage	Crop	Livestock	Non-farm	All Sources	Wage	Crop	Livestock	Non-farm	All Sources
A & N Islands	1.01	1.16	0.41	4.62	1.43	0.95	1.09	0.39	4.33	1.34
Andhra Pradesh	3.39	2.90	14.34	1.75	3.53	1.88	1.61	7.97	0.97	1.96
Arunachal Pradesh	0.93	6.60	2.43	0.13	2.32	0.78	5.53	2.03	0.10	1.94
Assam	1.88	2.99	5.38	1.13	2.79	1.52	2.42	4.37	0.91	2.27
Bihar	3.38	2.27	-2.29	5.88	1.76	2.43	1.63	-1.64	4.23	1.26
Chandigarh	0.72	0.72	13.86	0.00	1.55	0.53	0.53	10.12	0.00	1.13
Chhattisgarh	3.74	5.73	7.75	0.28	4.64	2.11	3.23	4.38	0.16	2.62
Dadra & Nagar Haveli	9.43	1.84	2.95	0.31	5.13	8.87	1.73	2.78	0.29	4.83
Daman & Diu	11.70	4.67	0.05	14.94	6.76	8.40	3.36	0.03	10.74	4.86
Delhi	1.58	5.48	1.67	N.E.	1.94	1.55	5.38	1.64	N.E.	1.90
Goa	1.65	2.06	0.00	0.04	0.50	1.74	2.18	0.00	0.04	0.53
Gujarat	1.73	3.23	4.80	4.61	3.15	1.10	2.05	3.04	2.93	2.00
Haryana	2.61	3.98	-11.40	1.04	5.00	1.89	2.87	-8.22	0.75	3.60
Himachal Pradesh	2.36	2.62	3.46	0.41	2.00	1.67	1.84	2.43	0.29	1.41
Jammu & Kashmir	4.31	1.11	2.90	1.11	1.93	3.52	0.91	2.37	0.91	1.58
Jharkhand	2.56	2.01	6.13	13.57	2.58	1.57	1.23	3.76	8.31	1.58
Karnataka	2.38	4.03	6.35	6.97	3.78	1.73	2.92	4.60	5.05	2.74
Kerala	3.87	2.49	-0.09	2.85	2.83	3.88	2.50	-0.09	2.86	2.84
Lakshadweep	N.E.	N.E.	N.E.	N.E.	0.00	N.E.	N.E.	N.E.	N.E.	N.E.
Madhya Pradesh	2.84	5.33	-2.39	1.06	5.52	1.52	2.84	-1.27	0.56	2.94
Maharashtra	3.30	3.92	5.23	5.82	3.90	2.34	2.78	3.71	4.13	2.76
Manipur	3.40	3.79	-75.72	0.72	3.90	1.71	1.90	-38.09	0.36	1.96
Meghalaya	6.38	2.54	6.14	1.40	2.96	4.19	1.67	4.03	0.92	1.95
Mizoram	3.94	1.43	0.84	-47.24	1.70	2.54	0.92	0.54	-30.44	1.10
Nagaland	3.07	1.74	-11.49	0.03	2.07	2.77	1.57	-10.38	0.03	1.87
Odisha	3.17	5.40	127.16	3.49	6.15	1.86	3.17	74.71	2.05	3.61
Puducherry	21.11	1.56	4.82	N.E.	3.62	18.91	1.40	4.32	N.E.	3.24
Punjab	4.63	4.40	2.72	2.19	4.06	3.81	3.62	2.25	1.81	3.35
Rajasthan	2.53	8.76	18.35	3.95	4.85	1.40	4.87	10.20	2.20	2.70
Sikkim	4.93	1.12	0.78	4.75	2.50	2.62	0.60	0.42	2.53	1.33
Tamil Nadu	1.96	4.84	4.47	9.62	3.55	1.36	3.35	3.09	6.66	2.46
Tripura	2.58	3.59	6.58	1.69	3.25	1.84	2.56	4.69	1.20	2.32
Uttar Pradesh	2.14	3.94	17.90	5.94	3.96	1.70	3.14	14.25	4.73	3.15
Uttarakhand	0.66	4.86	0.77	0.01	2.23	0.50	3.69	0.58	0.01	1.69
West Bengal	3.40	1.69	0.82	2.68	2.13	2.67	1.33	0.64	2.10	1.67

Note: N.E. indicates the non-estimation due to non-availability of data

Table 4: Ratio of household income between 2003 and 2013 for semi-medium land holders

Region	Nominal Income					Real Income				
	Wage	Crop	Livestock	Non-farm	All Sources	Wage	Crop	Livestock	Non-farm	All Sources
A & N Islands	7.24	1.69	15.26	65.40	5.87	6.78	1.59	14.31	61.31	5.51
Andhra Pradesh	4.11	2.30	8.35	-0.13	3.59	2.28	1.28	10.19	-0.07	2.00
Arunachal Pradesh	2.64	5.13	10.04	-146.62	6.49	2.21	4.30	8.42	-122.88	5.44
Assam	2.77	2.50	5.50	2.22	2.62	2.25	2.02	4.46	1.80	2.12
Bihar	7.22	2.20	2.32	2.27	2.65	5.19	1.58	1.66	1.63	1.90
Chandigarh	2.82	2.30	0.82	N.E.	1.52	2.06	1.68	0.60	N.E.	1.11
Chhattisgarh	3.47	5.38	-18.36	0.63	4.34	1.96	3.04	-10.36	0.35	2.45
Dadra & Nagar Haveli	9.56	1.37	2.37	0.00	3.61	9.00	1.29	2.23	0.00	3.40
Gujarat	3.44	2.92	4.42	3.36	3.26	2.18	1.85	2.81	2.13	2.07
Haryana	1.08	3.37	-19.21	0.06	3.48	0.78	2.43	-13.85	0.04	2.51
Himachal Pradesh	2.92	8.45	6.57	1.19	5.28	2.05	5.95	4.63	0.84	3.72
Jammu & Kashmir	0.65	2.43	2.61	88.60	5.62	0.53	1.98	2.13	72.35	4.59
Jharkhand	2.07	2.07	2.79	0.60	1.98	1.27	1.27	1.71	0.37	1.21
Karnataka	1.35	5.42	4.50	69.75	4.27	0.98	3.93	3.26	50.56	3.10
Kerala	0.63	2.30	0.55	-6.95	1.03	0.63	2.31	0.55	-6.97	1.03
Lakshadweep	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
Madhya Pradesh	1.96	4.62	-2.30	1.09	6.53	1.05	2.47	-1.23	0.58	3.48
Maharashtra	2.61	4.52	3.21	3.70	3.92	1.85	3.20	2.28	2.63	2.78
Manipur	2.15	5.21	-1.74	0.14	2.72	1.08	2.62	-0.88	0.07	1.37
Meghalaya	6.88	1.43	27.07	7.42	2.24	4.52	0.94	17.80	4.88	1.47
Mizoram	3.03	1.27	2.18	N.E.	1.70	1.95	0.82	1.41	N.E.	1.09
Nagaland	0.80	1.42	-1.41	0.01	1.02	0.73	1.28	-1.27	0.00	0.93
Odisha	3.20	6.72	-198.91	6.57	7.26	1.88	3.95	-116.87	3.86	4.27
Puducherry	0.34	3.94	5.11	0.00	0.89	0.30	3.53	4.57	0.00	0.80
Punjab	14.33	4.50	3.73	2.64	4.82	11.81	3.71	3.08	2.17	3.97
Rajasthan	2.88	5.81	15.96	5.06	4.95	1.60	3.23	8.88	2.81	2.75
Sikkim	5.59	0.90	1.19	6.34	2.44	2.97	0.48	0.63	3.37	1.29
Tamil Nadu	3.27	3.90	3.72	5.54	3.90	2.27	2.70	2.58	3.83	2.70
Tripura	N.E.	5.50	-15.44	N.E.	6.66	N.E.	3.92	-11.00	N.E.	4.74
Uttar Pradesh	1.89	4.64	11.04	3.88	4.43	1.51	3.70	8.78	3.09	3.53
Uttarakhand	8.52	0.63	4.71	0.00	0.58	6.48	0.48	3.58	0.00	0.44
West Bengal	3.02	1.59	-1.09	6.49	2.22	2.37	1.25	-0.86	5.09	1.74

Note: N.E. indicates the non-estimation due to non-availability of data

Table 5: Ratio of household income between 2003 and 2013 for medium land holders

Region	Nominal Income	Real Income

	Wage	Crop	Livestock	Non-farm	All Sources	Wage	Crop	Livestock	Non-farm	All Sources
A & N Islands	19.72	0.59	0.32	0.07	1.70	18.48	0.55	0.30	0.07	1.59
Andhra Pradesh	10.33	3.23	10.77	3.39	4.49	5.74	1.79	5.98	1.88	2.49
Arunachal Pradesh	193.17	2.84	-0.77	0.00	0.29	161.89	2.38	-0.64	0.00	0.24
Assam	0.79	1.74	7.97	0.12	1.51	0.64	1.41	6.47	0.10	1.23
Bihar	1.63	4.02	-0.17	0.34	3.11	1.17	2.89	-0.12	0.25	2.24
Chandigarh	0.00	5.41	3.65	N.E.	3.21	0.00	3.95	2.67	N.E.	2.34
Chhattisgarh	1.99	5.64	-0.48	3.14	5.01	1.12	3.19	-0.27	1.77	2.83
Dadra & Nagar Haveli	0.92	1.71	N.E.	N.E.	1.11	0.86	1.61	N.E.	N.E.	1.05
Goa	0.00	6.56	121.79	N.E.	4.61	0.00	6.94	129.02	N.E.	4.88
Gujarat	0.63	3.36	1.64	0.20	2.60	0.40	2.13	1.04	0.13	1.65
Haryana	4.89	6.36	-7.05	0.65	7.50	3.53	4.59	-5.09	0.47	5.41
Himachal Pradesh	5.08	1.20	4.05	-0.01	1.65	3.58	0.84	2.86	0.00	1.16
Jammu & Kashmir	0.78	1.04	-2.07	0.30	0.81	0.63	0.85	-1.69	0.25	0.66
Jharkhand	38.04	1.92	-0.15	0.78	76	3.30	1.17	-0.09	0.48	1.08
Karnataka	1.93	5.75	4.88	12.47	5.28	1.40	4.17	3.54	9.04	3.83
Kerala	6.23	8.52	4.07	2.46	6.61	6.25	8.54	4.07	2.46	6.63
Lakshadweep	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
Madhya Pradesh	1.55	5.33	-3.80	2.69	6.50	0.83	2.84	-2.03	1.44	3.47
Maharashtra	2.60	4.02	3.58	1.82	3.43	1.84	2.85	2.54	1.29	2.43
Manipur	0.43	2.57	N.E.	0.00	2.72	0.22	1.29	N.E.	0.00	1.37
Meghalaya	4.34	2.52	3.20	1.45	2.92	2.85	1.66	2.10	0.95	1.92
Mizoram	N.E.	0.44	N.E.	N.E.	0.51	N.E.	0.28	N.E.	N.E.	0.33
Odisha	1.15	5.04	-66.23	6.70	5.23	0.67	2.96	-38.91	3.94	3.07
Puducherry	N.E.	10.12	-11.62	N.E.	16.17	N.E.	9.07	-10.41	N.E.	14.48
Punjab	7.48	2.86	23.60	2.96	3.25	6.17	2.36	19.45	2.44	2.67
Rajasthan	4.73	10.04	8.41	4.57	7.48	2.63	5.58	4.68	2.54	4.16
Sikkim	0.32	3.61	1.48	N.E.	2.12	0.17	1.92	0.79	N.E.	1.13
Tamil Nadu	9.01	1.59	-17.80	7.48	2.45	6.23	1.10	-12.32	5.18	1.70
Tripura	0.77	0.92	-0.34	0.08	0.82	0.55	0.66	-0.24	0.05	0.58
Uttar Pradesh	3.62	3.83	8.67	9.42	4.01	2.88	3.04	6.90	7.50	3.19
Uttarakhand	N.E.	1.92	2.93	N.E.	2.06	N.E.	1.46	2.22	N.E.	1.57
West Bengal	31.83	1.97	-2.12	5.05	7.88	24.99	1.55	-1.67	3.97	6.18

Note: N.E. indicates the non-estimation due to non-availability of data

When it comes to livestock, earnings of the large farmers from Andhra Pradesh, had been higher, while that of the medium farmers of Punjab and small farmers of Odisha had improved substantially. Not just the crops and livestock but wages from the other farm and non-farm activities had also been observed to provide substantial income, especially to the medium and large farmers of Jharkhand and medium farmers of West Bengal. Interestingly, the farmers' income through self-employed nonfarm activities has improved well across different land classes in many of the states. Notable were the large farmers of Madhya Pradesh and Rajasthan, medium farmers of Karnataka and Uttar Pradesh, small farmers of Jharkhand and marginal and small farmers of Tamil Nadu. These patterns of earnings of agricultural households can effectively be used as a tool not just to figure out the way with which income can be increased but can also be used to focus a given class of farmers and the strategy to follow.

Table 6: Ratio of household income between 2003 and 2013 for large land holders

Region	Nominal Income					Real Income				
	Wage	Crop	Livestock	Non-farm	All Sources	Wage	Crop	Livestock	Non-farm	All Sources
Andhra Pradesh	2.48	3.00	44.15	0.01	4.26	1.38	1.66	24.53	0.00	2.37
Bihar	0.00	2.53	-0.18	0.00	1.95	0.00	1.82	-0.13	0.00	1.40
Chhattisgarh	0.00	6.51	0.00	0.00	5.96	0.00	3.67	0.00	0.00	3.36
Gujarat	0.46	7.87	16.71	N.E.	8.03	0.29	4.99	10.60	N.E.	5.09
Haryana	1.24	6.22	-2.32	0.00	5.75	0.90	4.48	-1.68	0.00	4.15
Himachal Pradesh	N.E.	203.24	5.76	N.E.	141.75	N.E.	143.20	4.06	N.E.	99.88
Jharkhand	35.24	0.18	0.47	N.E.	0.38	21.58	0.11	0.28	N.E.	0.23
Karnataka	1.68	2.74	4.73	3.17	2.82	1.22	1.99	3.43	2.30	2.04
Kerala	0.04	445.10	N.E.	N.E.	73.06	0.04	446.00	N.E.	N.E.	73.20
Madhya Pradesh	3.56	4.96	-3.02	14.50	5.65	1.90	2.64	-1.61	7.73	3.01
Maharashtra	1.88	5.66	-0.71	0.97	4.58	1.33	4.01	-0.50	0.69	3.24
Odisha	N.E.	92.13	-0.50	23.16	59.49	N.E.	54.13	-0.30	13.61	34.95
Puducherry	N.E.	N.E.	N.E.	N.E.	0.00	N.E.	N.E.	N.E.	N.E.	N.E.
Punjab	0.45	3.25	2.47	N.E.	2.92	0.37	2.68	2.03	N.E.	2.41
Rajasthan	2.99	25.00	-98.82	13.12	17.64	1.66	13.91	-54.96	7.30	9.81
Tamil Nadu	4.01	1.92	2.11	0.47	1.58	2.77	1.33	1.46	0.32	1.09
Uttar Pradesh	168.22	13.81	-0.60	5.24	14.38	133.87	10.99	-0.48	4.17	11.44

Note: N.E. indicates the non-estimation due to non-availability of data

Table 7: Ratio of household income between 2003 and 2013 for all holding size

Region	Nominal Income					Real Income				
	Wage	Crop	Livestock	Non-farm	All Sources	Wage	Crop	Livestock	Non-farm	All Sources
A & N Islands	2.32	1.82	1.71	4.42	2.30	2.17	1.70	1.60	4.14	2.16
Andhra Pradesh	3.81	3.39	12.26	1.69	3.95	2.12	1.88	6.81	0.94	2.19
Arunachal Pradesh	2.72	4.41	3.42	0.27	1.82	2.28	3.69	2.87	0.23	1.53
Assam	1.57	2.79	5.70	1.06	2.38	1.27	2.26	4.62	0.86	1.93
Bihar	2.57	2.25	0.78	1.36	2.02	1.85	1.62	0.56	0.98	1.45
Chandigarh	6.96	2.28	1.62	0.00	3.38	5.08	1.67	1.19	0.00	2.47
Chhattisgarh	2.67	5.26	3.56	0.29	3.69	1.51	2.97	2.01	0.17	2.09
Dadra & Nagar Haveli	2.83	1.63	1.58	10.63	3.03	2.66	1.54	1.48	10.01	2.85
Daman & Diu	3.51	1.51	1.01	3.26	3.07	2.52	1.08	0.73	2.34	2.21
Delhi	3.39	0.56	1.89	5.37	2.41	3.33	0.55	1.86	5.28	2.36
Goa	1.60	1.64	8.60	1.24	1.78	1.70	1.74	9.11	1.32	1.89
Gujarat	2.82	.09	4.12	3.35	3.19	1.79	1.96	2.61	2.12	2.02
Haryana	2.51	.83	-15.19	1.36	4.67	1.81	3.48	-10.95	0.98	3.37
Himachal Pradesh	2.57	.72	4.46	1.34	2.75	1.81	2.62	3.15	0.94	1.94
Jammu & Kashmir	3.47	1.52	2.20	2.42	2.47	2.84	1.24	1.80	1.98	2.02
Jharkhand	2.02	.04	16.63	1.30	2.58	1.24	1.25	10.19	0.80	1.58
Karnataka	2.15	.75	5.65	4.14	3.65	1.56	3.44	4.10	3.00	2.64
Kerala	2.63	3.12	3.73	3.65	2.99	2.63	3.13	3.74	3.66	3.00

Lakshadweep	3.29	0.61	-0.54	0.25	2.59	1.34	0.25	-0.22	0.10	1.05
Madhya Pradesh	2.68	3.49	-3.18	1.45	4.19	1.43	1.86	-1.70	0.78	2.23
Maharashtra	2.84	3.73	4.81	3.12	3.41	2.02	2.64	3.41	2.21	2.42
Manipur	2.54	3.86	824.87	2.36	3.45	1.28	1.94	414.91	1.19	1.74
Meghalaya	4.24	2.13	5.50	3.55	2.75	2.79	1.40	3.61	2.34	1.81
Mizoram	2.29	1.67	1.03	2.70	1.76	1.47	1.08	0.67	1.74	1.13
Nagaland	4.13	1.91	-43.63	0.14	2.96	3.73	1.72	-39.39	0.12	2.67
Odisha	3.13	5.09	72.85	3.78	5.06	1.84	2.99	42.80	2.22	2.97
Puducherry	2.08	1.95	3.08	2.15	2.02	1.86	1.75	2.76	1.92	1.81
Punjab	3.27	3.97	5.42	1.65	3.65	2.69	3.27	4.47	1.36	3.00
Rajasthan	2.74	7.14	16.45	4.07	4.73	1.52	3.97	9.15	2.26	2.63
Sikkim	2.25	1.85	1.48	7.70	2.20	1.20	0.98	0.79	4.09	1.17
Tamil Nadu	2.84	3.20	11.24	6.53	3.75	1.96	2.21	7.77	4.52	2.59
Tripura	3.11	.60	4.61	1.48	3.29	2.22	2.57	3.28	1.05	2.35
Uttar Pradesh	2.42	3.51	10.18	2.32	3.27	1.93	2.80	8.10	1.84	2.60
Uttarakhand	2.05	1.56	2.54	0.54	1.60	1.56	1.19	1.93	0.41	1.22
West Bengal	2.66	1.45	3.58	1.62	2.07	2.09	1.14	2.81	1.28	1.63

Challenges Ahead in Agriculture

The challenges in agriculture are many in the context of doubling income. To cite a few, competition for land, water and energy; increasing cropping intensity particularly in the Indo-Gangetic plains leading to irrational resource use; changing pest complex; degradation of natural resources like land and water; declining total factor productivity; and stagnating yield (Sharma et al., 2013).

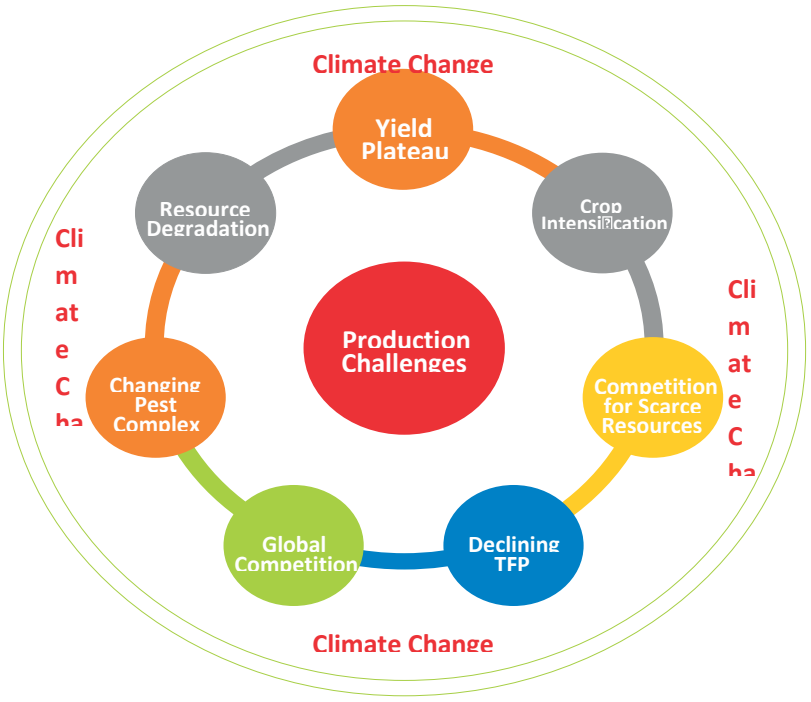


Figure 3: Interdependent production challenges in agriculture system

Indian agriculture not only faces the above routine challenges as it gets transformed but their intensity gets magnified *in lieu* of climate change. Agriculture not only affected by climate change but serve as a mitigator too. The production challenges are interdependent

wielding the influence at different magnitudes across regions which finally gets reflected at macro level with negative impact. Hence, framing adaptation and mitigation strategies for climate change becomes utmost priority in Indian agriculture in the perspective of increasing the farm household income. The complexity in addressing the production challenges embraced by the negative impact of climate change as shown in Figure 5 needs an in-depth understanding of the local situation for implementing relevant management strategies. The implementation strategies to be successful at micro level need the synergy between the local communities and authorities apart from the support from government in terms of policies and investment on R&D to perform cutting-edge research (Chadha et al., 2013). Further, price volatility (inputs and outputs) emerging from huge mismatch between supply and demand apart from risk and uncertainties in production have to be managed coherently adopting relevant farm practices (Sharma et al., 2015) and/or price risk management tools (Sendhil et al., 2013 & 2014a)

Pathway for Doubling the Farmers Income

The scope for DFI by 2022 exists with the following options viz., increasing the physical output from agriculture, diversification of enterprises, pricing mechanism, adoption of risk management tools, wage rate and salaries for farm labour as well as different sources of non-farm income (NITI Aayog, 2015; Chand, 2017; Saxena et al., 2017). A pathway has been formulated which is applicable to all commodities and sectors in agriculture (Sendhil et al., 2017a & 2017b). However, the implementation strategies should be region and need specific targeting different components in agriculture. The framework integrating technology, extension, institutions and policies to double the farmers' income has been depicted in Figure 6.

Figure 4: Pathway for doubling the farmers' income (DFI) by 2022

Technology: Technology - the outcome of science - enables increased output with the same input or realise the same output with reduced input. Productivity in a majority of the commodities has struck a plateau demanding barrier breaking intervention through cutting-edge sciences. The diversification of farm activities towards high value crops and enterprises can more than quadruple income from the same piece of land. Another augmenting factor for doubling farm income is through integrating crop production with allied and subsidiary enterprises in uncultivated lands.

Extension: Given the technology and resources, the output level can be enhanced by consolidating the existing potentials by bridging the yield gaps between agronomic potentials achieved in research and extension farms and the actual yields obtained in average farmer's fields. Around 30 per cent of the physical output can be increased which

will facilitate to increase the farmers' income without any additional investment, but just by adopting the recommended package of practises across different sub-sectors in agriculture.

Institutions: Irrigation is the best insurance against drought. The thrust of the state is to ensure 'Per drop more crop' through accelerated irrigation schemes supplemented by massive promotion of micro irrigation techniques for maximum coverage of irrigated crop area. As agriculture in India is a gamble with the monsoon, and the economic pursuit of the enterprise is worth if and only when adequate risk management options are available. The recent initiatives of the government that is likely to impact agriculture can be broadly classified as those can prevent the volatility in farm income and those can improve the farm productivity. Any amount of productivity increase unless accompanied by farm income increase either by direct price incentive or cost reduction or economy of scale or value addition or anything else will have no meaning for farmers. Ironically high production is always associated with low prices and vice versa. Hence, there is a need for innovative marketing that will link farmers to productivity tools and insurance. The Pradhan MantriKrishiSinchaiYojana (PMKSY) promotes more crop per drop as a national mission to improve farm productivity with a focus on massive expansion of micro irrigation at farm level and by closely monitoring 99 priority projects with a potential of irrigating over 7.6 million ha for a faster completion. These will reduce the monsoon dependency insulating from shocks and improve productivity.

Prime Minister's Crop Insurance Scheme, is based on crop income than cost of cultivation/credit and thus addresses volatility in farm income besides natural calamities and post-harvest losses unlike earlier schemes that covered only loss of yield or investment or capital besides. It is planned to enhance the coverage of the scheme to more than 50 per cent of the cropped area by next year. This coupled with land leasing laws will enable farmers including tenants to absorb risk and invest more into better farm techniques and crops. The recently initiated National Agricultural Marketing brings more than 500 markets on a single e-platform integrating markets sans middlemen and enabling farmers to bid their products to sell anywhere in India. But, the integration will have operational meaning for the farmers only when Agricultural Produce Market Committee (APMC) Act and Essential Commodities Act (ECA) are either revamped or done away with. This is very much evident in the difference in realization of the price potential between livestock products not covered under these acts and the fruits and vegetables covered under the APMC. Further, it will not suffice if commodities are delisted under APMC unless alternate marketing platforms are made available with attendant, scientific storage, processing and transport facilities were private can play a vital role.

Policy: Policy on agricultural commodities export and stocking have more often than not acted against the farmers' interest preventing them from par taking the benefits of free market. Whenever prices shoot up, banning or restricting export or limiting stocking of the commodity have been resorted to more as a panic reaction than a planned strategic measure. By these measures, India has gained notoriety for being an unreliable supplier for international market denying its farmers their due benefits from participating in the international trade. Besides, the uncertainties regarding stocking norms, no investment worth its while can ever happen on scientific storage, processing, value addition and contract farming. Unless agricultural commodities are freed from the ambit of Essential Commodities Act or the Act is repealed altogether, income from and investment on agricultural marketing is not possible. When there is a spike in prices, the difference between

modal market prices and MSP may be made up through direct transfer of deficiency payment to farmer.

Terms of trade is another important policy tool to enhance farmers' income by tweaking the prices of farm products compared to their non-agricultural counterparts but without stoking food inflation. Inflation in agricultural prices also leads to an enhanced real farm income if prices received by farmers increase at a faster rate in comparison to the prices paid by them. For the past few years, the wholesale price index or WPI based inflation of non-agricultural prices is declining, whereas that of the agricultural prices has been increasing by about 5 per cent (in the year 2015-16) implying a 5 per cent growth in real farm income. If technology and factor prices could result in per-unit cost savings, farmers' income would rise at a much higher rate than the rate of increase in output.

Strategies for Doubling Income

Income is the most relevant measure to assess the farmers' welfare and agriculture transformation. Even today, the highest returns on investment on per unit basis are from agriculture. What is lacking is the scale unlike corporate investment. Certainly, returns from cultivation alone will not help to achieve the set target of DFI. It has to be supplemented, in fact to a larger extent by livestock and other non-farm activities supported with policy intervention at all levels (Table 7 and 8) (Chand, 2017).

Table 8: Potential strategies to enhance annual farm household income

Parameter	Strategies	
Science &	• Adoption of improved varieties/breeds/strains for additional	
Technology	income e-Grid of all weather stations for providing location specific weather information Nutrients sale based on Soil health card programme Adoption of micro irrigation system to improve the water use efficiency	
Extension	•	Bridging the gaps between achievable (FLD) and potential yields
	•	More number of effective cluster demonstrations to bridge the information gap
	•	Village adoption to transfer the technologies developed by the research organizations
	•	Upscaling and out scaling of technologies through field days, exhibition and other activities
Policies	•	Rationalizing the subsidy on energy use.
	•	Enrolling more number of marginal and small holders under crop insurance scheme.
	•	Integrating all central and state subsidies in agriculture
	•	Formation of Crop Planning Department at national and state level.
	•	Additional investment on agricultural R&D to pave path for innovation.
	•	Setting up more organic food certification agencies

	•	Policy for setting up of FPO for block level seed production.
	•	Integrated land-use policy particularly for water
	•	Breaking of crop monotony and focus on diversification
Institutions	•	Setting up of Agribusiness Centres at district level
	•	Transparency and simplified procedures in electronic trading
	•	Developing comprehensive framework for community / corporate farming.
	•	More emphasis on e-learning in regional languages.
	•	Value chain development for primary commodities

Yield Improvement Strategies

Technology adoption helps in reducing yield gap at farm level. The estimates carried out between 2011-12 and 2013-14 show considerable yield gap across states among different crops (Figure 7). Yield gap in paddy varied around one-fourth to one third. The estimates with respect to the best performing farmers in major paddy growing states like West Bengal, Uttar Pradesh, Andhra Pradesh and Punjab are 33 per cent, 29 per cent, 29 per cent and 28 per cent respectively. In wheat, the estimates are slightly less (Sendhil et al., 2014b). For Punjab and Haryana, it stands at 19 per cent and 23 per cent, whereas for Uttar Pradesh and Madhya Pradesh, the corresponding figures are 27 per cent and 33 per cent. There exists considerable yield gap in coarse cereals and pulses. The states like Maharashtra and Karnataka in jowar, and Rajasthan in bajra have yield gap by more than 50 per cent. Among pulses, while yield gap stands at 32 per cent in Madhya Pradesh for gram, it stands at 45 per cent in Rajasthan and Maharashtra. In case of tur, the estimates stand at 60 per cent in Maharashtra and Karnataka. Cash crops like maize and cotton as well provide high yield gap estimates across states. The estimate for maize stands at 33 per cent in Andhra Pradesh, whereas it accelerates to 45 per cent and 58 per cent in Karnataka and Bihar respectively. In Rajasthan, the estimates stand highest to 63 per cent. Estimates for cotton stands at around 45 per cent in Gujarat and Maharashtra. In Andhra Pradesh, it is slightly less (38%). The estimates of sugarcane, the other major cash crop are 25 per cent, 35 per cent and 41 per cent respectively for Uttar Pradesh, Karnataka and Maharashtra.

The issue can be addressed by expanding irrigation, use of improved seeds in sowing and better credit access. For example, the paddy yield levels can be appreciably raised in West Bengal through irrigation, where just around half of the area is irrigated. The yield differential between irrigated and unirrigated farms is significant, and is more by six quintals per hectare in irrigated farms. Coarse cereals like jowar and bajra are barely irrigated in practice. Still, use of improved and hybrid seeds can help in bridging productivity gaps. The yield that the hybrids and improved seeds provide are relatively higher, and thus could be thought as a potential way of enhancing the productivity. Pulses are mainly grown as a rainfed crop. Despite, yield responses are positive and significant for irrigation, and better seeds provide better yields. The gram yield levels are higher by 2.0 and 4.6 quintals/ha in Madhya Pradesh and Rajasthan, and in case of tur, it is more than 5 quintals/ha in Maharashtra and Madhya Pradesh. Moreover, higher yields also correspond with improved seeds use. Hence, expanding irrigation and delivering improved seeds together could help in addressing yield gap in gram and tur successfully.

The strategy of irrigation expansion holds true for maize as well. Area covered under irrigation in major states like Andhra Pradesh and Karnataka are 50 per cent and 36 per cent respectively. The other major state, Bihar, also suffers with less use of improved seeds. Only two-third of the farmers use hybrids and/or improved seeds and the irrigation coverage is just 65 per cent. Being an input responsive crop, yield levels can be appreciably raised by better seed delivery and irrigation. Irrigated cotton farms produce higher yield than the rest. The variation in yield margins in irrigated farms are 11 qtl/ha and 6 qtl/ha in Gujarat and Maharashtra respectively. Sugarcane and wheat require special attention. Almost entire area is irrigated, and all the area under wheat is sown with improved seeds. Still, there exist yield differences across and within the states.

Around 47 per cent farm households operate on plot less than an acre with an average of 2200sq.m. of agricultural land as per the Agricultural Census (2010-11). This too is fragmented and about half of it has no access to irrigation. An NSSO (2003) survey indicated that many would like to quit farming as it is not sustainable and economical, which can only partially have obviated by increasing farm size by pooling. But land leasing is insecure, informal and inefficient as on date. The state should enable ease out without ceding away ownership and facilitate consolidate holdings for economic operation through land leasing laws coupled with direct transfer of benefits to the cultivator than the owner of the land.

Farm Income Odisha:

The Government of India, in its annual budget 2016-17, announced to double farmer's income by 2022. The shift of focus from agricultural output and food security to farm income is a welcome step given the low level of absolute as well as growth in farm income (Ranganathan, 2015; Chand et al., 2015). Now the question is how to double farmer's income? The answer to the question fundamentally lies on improved performance of agriculture in the country. Many studies have found a direct impact of improved agricultural performance (in terms of high growth rate of agriculture sector) on rural incomes (DFID, 2004; Bresciani and Valdes, 2007). We can expect such a relationship in India given that agriculture contributes significantly to rural income for all farm households in general (with a contribution of 41.4 % to total income) and for the bottom 20 per cent of farm households (nearly 50 %) in particular (Birthal et al., 2014). There are also evidences in literature which show that increased farm income results from high growth rate in agriculture and it eventually leads to higher poverty reduction (Ligon and Sadoulet, 2008; Montalvo and Ravallion, 2009; Ravallion and Chen, 2007; Kumar et al., 2011; Sharma and Kumar, 2011).

If high growth in agriculture increases farm income, then the next question is how to increase its growth rate? The sources of agricultural growth may stem from within and/or outside the agricultural sector (Chand et al., 2015). Factors such as increase in productivity, lower cost of production with efficient use of resources, increase in cropping intensity, diversification towards high-value crops, and diversification towards other allied enterprises like livestock, fishery, sericulture, etc. contribute towards higher agricultural growth from within. Shift towards non-farm enterprises and increase in real prices received by the farmers (better known as favourable terms of trade for agriculture) help in increasing agricultural growth rate from outside. Out of these strategies to increase farm income via higher agricultural growth, the present study focuses on the role of diversification towards high-value crops in increasing farm income. The relationship between crop diversification and

farm income has been analysed for Odisha where agriculture sector provides livelihood to 60 per cent of its population. The contribution of agriculture, forestry, and fisheries to the gross state domestic product (GSDP) has declined to 15.3 per cent in 2016. The percentage of cultivators to total workers in Odisha stood at 23.4 per cent, the percentage of agricultural labourer to total workers was 38.4 per cent, and 61.8 per cent workers are engaged in agricultural activities (Census, 2011). The state of Odisha is an agrarian state and it was only second, with 32.59 per cent incidence of poverty, to Jharkhand in the list of 14 poorest states in India in 2011-12 (GoO, 2013-14). To add to it, 32.1 per cent of its farm households were poor in 2011, which is just lower than Jharkhand where 45.3 per cent of farm households were poor (Chand, 2017). Crop cultivation in Odihsa is dominated by paddy. The percentage area under paddy to gross cropped area, total area under foodgrains, and total area under cereals stood at 46.23 per cent, 80.64 per cent, and 96 per cent, respectively in 2014-15 (GoO, 2016). However, the net returns from paddy are not remunerative even in states where its productivity is higher than Odisha. For example, farmers in Andhra Pradesh (AP), during 1975-76 to 2006-07, had suffered losses from paddy cultivation (Narayanamoorthy, 2013). So the economy of Odisha is facing the problem of overburdened agriculture which is worsening day by day with falling contribution of its agriculture to GSDP. And the predominant crop paddy is not that remunerative which opens up the scope for crop diversification in the state. Hence, the present study has investigated the impact of crop diversification on farm income across 30 districts in Odisha. The main hypothesis of the study is that 'highly diversified districts have higher farm income than least diversified districts have'.

Roadmap and Action Plan

The quantitative framework for doubling farmers' income has identified seven sources of growth. These are:

- Increase in productivity of crops
- Increase in production of livestock
- Improvement in efficiency of input use (cost saving)
- Increase in crop intensity
- Diversification towards high value crops
- Improved price realization by farmers
- Shift of cultivators to non-farm jobs

Initiatives by the Government

For quite some time now, the distress of small and marginal farmers has been drawing the attention of policy makers. In 2004, the Government had set-up a National Commission on Farmers, headed by Dr. M.S. Swaminathan. The Commission had submitted the reports in 2006 (Govt. of India, 2006) aiming at "faster and more inclusive growth". It came out with several useful recommendations to revitalize agriculture and protect farmers from vagaries of nature and price volatility. The key recommendations were: i) improving farmers' income from farm and non-farm sources, ii) enhancing efficiency in the use of resources, iii) minimizing expenditures on non-renewable inputs, and remunerative price to farmers at 50% higher than the minimum support price (MSP). Somehow, the last recommendation, which is directly linked to farmers' income, has not yet been implemented. On the contrary, the price fluctuations in the market of farmers' produce and the higher cost of inputs have caused widespread discontentment among

farmers, resulting in protests and even suicides, thus drawing an urgent attention of the policy makers to draw a strategy for doubling farmers' real income.

As a first step, the Government changed the name of the Ministry as: Ministry of Agriculture and Farmers' Welfare. It also initiated the programmes like Attracting Rural Youth in Agriculture (ARYA), MeraGaonMera Gaurav, National Skill Qualification Framework, Skill Training, Value Addition and Technology Incubation Centres in Agriculture (VATICA)', Knowledge Systems and Homestead Agricultural Management in Tribal Areas, Nutri-sensitive Agricultural Resources and Innovations (NARI), Climate-Smart Villages, Web and Mobile Advisory Services. The potential role of farmer producers organizations (FPOs) in innovation up scaling for increasing overall income has also been given due importance.

The present Government has taken many new initiatives for increasing the farmers' income such as: i) "per drop, more crop", ii) availability of quality seeds, iii) soil test based nutrient management- distribution of soil health cards, iv) post-harvest crop losses- large investments in warehousing and cold chains, v) value addition by the farmers, vi) creation of a national agricultural market, by removing distortions and having e-markets to link farmers to market, vii) Pradhan MantriFasalBimaYojana, viii) high priority to diversification towards high value activities – horticulture, dairying, food processing, poultry, sericulture, bee keeping and fisheries, etc.

Also, the Govt. in its budget of 2014-15 had established National Adaptation Fund for Climate Change, also a long- term Rural Credit Fund, provision of financial assistance of INR 5 lakhs for BhoomiHeenKisan though National Bank for Agriculture and Rural Development (NABARD), launching of soil health cards, Pradhan Mantri Krishi Sinchayee Yojana, Agri-Tech Infrastructure Fund. In its budget of 2015-16, the Government had emphasized on rural infrastructure development and created a Long-Term Credit Fund, Short-Term Cooperative Rural Credits Refinance Fund and Paramparagat Krishi Vikas Yojana to promote organic farming. Further, in the budget of 2016-17, a provision for Long-Term Irrigation Fund was made and the Union Budget of 2017-18 made some special provisions: i) allotted INR 10 lakh crores to ensure adequate flow of credit to under-service areas, ii) allotted INR 9,000 crores to increase the coverage under Pradhan Mantri Fasal Bima Yojana, iii) emphasized contract farming for strengthening and linking horticulture sector and agro processing units, iv) allotted INR 2,000 crores for dairy processing and infrastructure development to NABARD for modernizing milk processing units. Besides these, several other measures were taken in the past for promoting agriculture and farmers' income such as MGNREGA, RashtriyaKrishiVikasYojana (RKVY), etc.

The resources of NABARD are also being augmented substantially following Parliament's nod to a six-fold increase in its authorized share capital to INR 30,000 crores. The Development Financial Institution (DFI) is eyeing a balance sheet size of INR 7 lakh crores by 2023 as against INR 3.90 lakh crores as at present. The rural India focused DFI plans to achieve this balance sheet size by stepping up focus on providing support to irrigation projects, dairy farming, improving market infrastructure in rural areas (so that farmers get remunerative prices for their produce), enhancing credit flow to deprived areas such as central and eastern States, and support to rural housing.

Despite these initiatives, the agricultural economists have differing views. Some have even expressed doubts and consider the goal unrealistic and unachievable since there is negligible information available on farmers income and also there is no clarity as to how to double the income (Gulati and Saimi, 2016). This is because the real income in the past has increased only by 5.2% per annum between 2002-03 and 2012-13. At this rate, it may take at least more than

a decade to double the real income of farmers, unless a new and dynamic strategy is put in place and implemented in a Mission Mode (as suggested later) to achieve higher than 10% income per annum, which appears to be a gigantic task. NITI Aayog has indicated that doubling the farmers' income may take a little longer than the target year of 2022, unless needed reforms are expedited (Chand, 2017). Also, the combined effect of growth was found to be 75.1% in seven years and 107.5% in 10 years. According to him, if the farmers' income growth is considered to rise at the same rate as experienced between 2001 and 2014 (except price factor), the income will rise by 66% by 2022-23 and will possibly double in 10 years i.e., by 2025-26.

Strategy for Faster Agricultural Growth

It is quite clear that business as usual will not help in achieving the target of doubling farmers' income. Nor the suggestion by some to take farmers out of farming will help. What would farmers do without the new skills and where would they find employment? Instead, better to retain farmers in agriculture by making the profession more attractive and rewarding through diversified options, including post-production management and value addition related activities. Obviously, out of the box thinking with focused efforts on outscaling innovations linked to higher productivity, sustainability and profitability through most appropriate diversified, secondary and specialty agriculture linked to post-harvest management, especially around proper storage, value addition and better access to market - would help in doubling farmers' income.

It has also been established from past trend that to achieve 8% growth in GDP, a minimum of 4% growth in agriculture sector is a must. Hence, there is no room for complacency just because India had achieved Green, White and Blue Revolutions in the past and the problem of food scarcity has been resolved. On the contrary, the problems of smallholder farmers have magnified and the real income has declined. To reverse this trend, we shall need a clear strategy, including a Road Map, that can lead us to sustainable and profitable farming using innovative approaches to harness opportunities. Also, as stated earlier, accelerating agricultural growth is critical for achieving the Sustainable Development Goals (SDGs), especially to remove poverty, have zero hunger and ensure environmental security. Moreover, greater the emphasis on agricultural research for innovation, higher will be the growth of agricultural GDP (Pratt and Fan, 2010).

In fact, Green Revolution in itself was an innovation led initiative around use of high yielding dwarf wheat and rice varieties that responded favourably to higher inputs leading to quantum jump in productivity. The cradles of success were: i) political will, ii) good institutions and human resource, iii) availability of critical inputs (seeds, water, fertilizer, etc.), iv) enlightened extension workers and hardworking farmers, and, v) the partnership at the global level.

Considering the current challenges of factor productivity growth decline, depleting natural resources, increasing cost of inputs, higher incidence of diseases and pests, higher cost of inputs, less profit to farmers and above all the adverse impact of climate change, the task of increasing income, especially of 86% farmers who are small and marginal (Govt. of India, 2018), would require technologies by which they can save cost on inputs and have more income by higher productivity and by linking themselves to markets. Obviously, therefore, the strategy to double the income would demand sustainable intensification, diversification, improved resource use efficiency and resilience in farming that is economically rewarding. In this regard, the following three pronged strategy needs to be pursued seriously: z Improving productivity and production efficiency

z Agricultural diversification - including secondary and specialty agriculture z Policy support and linking farmers to market

Improving Productivity and Production Efficiency

Bridging the Yield Gap

India's cropped area has been stagnant around 141 m ha for over a decade now, whereas net irrigated area is currently 65.3 m ha and the gross cropped area is 195 m ha with cropping intensity of 135%. Of this, almost 55% is still rainfed. Since there is no scope for horizontal expansion any more, vertical expansion through increased productivity is the only way forward, for which considerable scope exists. In this context, has suggested a clear strategy was suggested for productivity enhancement state-wise/ crop-wise projecting an increase of 80 mt of foodgrains (Hooda Committee Report, 2010). Some States have productivity less than National average, whereas some can achieve yet higher productivity in view of rich resources and availability of technological options.

The existing yield gaps can also be bridged by increasing seed replacement rates/the area under seeds of improved varieties and especially hybrids, by adopting large scale use of biotechnology, including the use of genetically modified (GM) food crops and by adopting good agronomic practices, that are based on natural resource conservation, and both water and nutrient use efficiency.

Globally, use of GM crops has benefitted the farmers in reducing the cost on pesticides use and for increased productivity. More than 185.1 m ha area was globally cultivated in 2016 under GM crops, whereas India has so far released only cotton, covering around 11 m ha, with considerable benefits to millions of smallholder farmers. Moreover, it has reduced the use of pesticides by almost 40% and has increased both production and productivity of cotton leading to export worth around USD 3.0 billion annually. Thus, Government must come out with a clear strategy in support of using these innovations in crops like maize, soybean, canola, rice, brinjal, etc., which can help the farmers to raise their income while reducing the cost on inputs and getting higher productivity as well as income.

Conservation Agriculture

In addition, there is a possibility to increase cropping intensity through efficient water use. Also, there are options for improved input-use efficiency, especially of fertilizers, pesticides, energy, etc. to ensure resilience in agriculture. For this, conscious efforts are needed to swap unsustainable elements of the conventionaltillage-based monoculture production practice with temporally and spatially high productive, profitable and sustainable intensification, through large-scale adoption of conservation agriculture (CA) as a vehicle of change. It is well established globally over 180 m ha area that CA helps in achieving sustainable and profitable agriculture through three principles - minimal soil disturbance, permanent soil cover and proper crop rotation. The CA based management practices also help in adapting climatic risks and in lowering environmental foot prints. CA technologies have been developed, adapted and promoted since the past two decades, primarily to conserve resources and increase farm income. The CA based management optimization in the cerealbased cropping systems in South Asia has helped in increasing crop productivity, input-use efficiency with economic returns, improving soil health, increased adaptive capacity of production systems to climate risks, reducing emissions and enhancing soilcarbon sequestration (Jat*et al.*, 2016).

Conceptually, conservation agriculture based sustainable intensification (CASI) is not a single technology. It is an innovation for sustainable farming, assimilating effective germplasm/crops, integrated nutrient/pest management, minimal and efficient farm mechanization, and efficient soil and water management practices. Therefore, it requires application of farming systems' related coherent interventions that would increase both income and adaptive capacity of farmers for diversified as well as resilient agriculture. Additionally, its infusion is seen to sustain ecological services and in providing greater environmental benefits to a landscape (TAAS, 2017)

Scaling Innovations

There are some major innovations that currently need to be outscaled as a matter of priority, keeping in view the expected impacts on production and productivity. These are: i) hybrid rice - the current area coverage (over the last two decades) is only around 2.0 m ha, whereas scope exists for covering at least 10.0 m ha in next one decade; ii) single cross maize hybrids - the area covered under these hybrids presently is less than 60%, whereas scope exists to double the maize production in next decade provided >90% of maize area is brought under promising single cross hybrids; iii) the area under CA in rice-wheat cropping system in the Indo-Gangetic plains, is about 3.5 m ha only, whereas scope exists for almost 10.0 m ha. The CA innovation also has vast scope under rainfed farming covering around 55% of the total 141.0 m ha cultivable area in India; iv) protected cultivation - the current area under protected cultivation in India is only around 50,000 ha, compared to >2.0 m ha in China; v) microirrigation - out of total irrigated area of 64.7 m ha, the area so far covered under micro-irrigation is around 8.6 m ha only, which can certainly be doubled by 2022 provided direct subsidy support to the farmers is enhanced for adopting practices such as: drip, sprinkler, laser leveling, plastic mulching, raised- bed planting, direct seeding of rice etc. Also, the current initiatives by the Govt. to augment and complete irrigation schemes may add additional 2.0 m ha area under irrigation. However, for more efficient water use, both free supply of water and the flood irrigation practice will have to be stopped as a matter of national policy. It will also be a bold decision if the water is brought under concurrent list (ex. Israel) to resolve inter-state disputes and enhance water productivity in the larger national interest and to bring more area under irrigation.

Increasing Nutrient-Use Efficiency

One of the reasons of higher productivity in irrigated areas had been the increased use of chemical fertilizers. Today, India uses, on an average, around 105 kg/ha of nutrients and total consumption of chemical fertilizers is around 32 mt, of which nitrogenous fertilizers are around 25 mt. On the contrary, unfortunately the nutrient-use efficiency (NUE) is not more than 30%. Thus, increasing the fertilizer-use efficiency is one of the biggest challenges for which there is need to adopt innovative ways like use of seed-cum-fertilizer drill, adopting effective use of soil testing/ soil health cards and the decision support systems for soil/plant test based use of nutrients, use of *neem* coated urea for slow release and better uptake, use of customized fertilizers, fertigation, etc.

Agricultural Diversification Including Secondary and Specialty Agriculture

New Options

It must be understood well that unless smallholder farmers adopt diversified agriculture in a farming systems' mode, including both secondary and specialty agriculture, the expected doubling of their income will not be possible. Fortunately, India has made great strides in sectors like horticulture (now second largest producer in the world in fruit and vegetable production of more than 304.5 mt), livestock (White Revolution by achieving the highest milk production in

the world of 155 mt), and fisheries (Blue Revolution by achieving 11.0 mt of total fish production). All these sectors have shown much faster growth (>5.0 - 7.0%) compared to food grains over the last two decades. Also, considerable scope exists to increase the income of farmers by adopting agroforestry, rural based low cost primary processing for value addition, cool chain and by adopting secondary and specialty agriculture such as: protected cultivation, mushroom production, bee keeping, sericulture, growing low volume high value crops like nuts, spices, medicinal plants, nutri-crops, etc., seed production of vegetable hybrids, nursery raising to provide disease free saplings, fish seed production, growing of flowers, vegetable seedlings to promote peri-urban agriculture, use of plastic culture, post-harvest processing, rural based low cost value addition, cool chain, etc.

These new options would certainly provide opportunities to enhance farmers income substantially, and shall attract youth (including women) to agriculture provided right knowledge is disseminated, competent human resource is built and enabling policy support and incentives are provided. Youth can also play an important role as technology provider, input supplier, besides being a rural entrepreneur. For increasing income, farmers would also need a change in their attitude/perception towards adoption of diversified agriculture to make a difference.

Innovations in Extension

In fact, enlightened farmers of India are more interested today in getting right knowledge rather than to have subsidy. In this context, agricultural extension would certainly need transformation. The public extension system did play a key role during the Green Revolution phase, but it remained confined mainly to the irrigated areas. The success then was also due to holy alliance among researchers, extension specialists, farmers and policy-makers. At that time, the technology dissemination approach remained 'top-down' focusing on demonstrations on individual farmers fields. As already mentioned, the current scenario of Indian agriculture is confronted with multi-faceted challenges arising out of inefficient management of natural resources (soils, water, agrobiodiversity). All these have led to considerable deceleration of factor productivity and decline in farm profitability. Apparently, this complexity cannot be overcome by routine transfer of technologies. Rather, more serious efforts are now needed towards translational research requiring out scaling of innovations through 'Out of Box' extension systems. Also, conscious deployment of rural youth, women and progressive farmers would help in speedy transfer of technology and the needed impact on livelihood of smallholder farmers.

Moreover, farmers' welfare needs to be ensured through 'Farmer First' approach to benefit equally both producers and consumers. Further, in view of diverse demand of new innovations, new products, new information and new extension services, there is a need to shift from "top-down" to "bottom-up" approach, involving farmers' participation at the grass-root level, while ensuring confidence building among farming communities to take risk and adopt more scientific and resilient agriculture. In the process, knowledge sharing on good agricultural practices (GAP), without dissemination loss, and incentives for timely supply of inputs become highly critical to double farmers' income. At the same time, partnerships among key stakeholders, especially the private sector, become vital for promoting agricultural growth. In the process, care is also needed to overcome complacency that has crept in the public extension system, therefore, necessitating much greater vibrancy in the National Agricultural Research and Extension System (NARES); requiring active involvement of stakeholders (especially the private sector, NGOs and the farmers) and a policy shift in the extension approach towards farming communities rather than individual farmers.

Attracting Youth to Agriculture

Empowering youth (men and women) through vocational training and building a cadre of 'Technology Agents' to provide technical backstopping as well as custom-hire services to the smallholder farmers would go a long way in linking research with extension, and thereby accelerating agricultural growth (TAAS, 2015). There is also a need to link now the 'land with lab', the 'village with institute' and the 'scientists with society' to ensure faster adoption of efficient resource utilization technologies which would benefit both the producers and consumers. In the suggested transformation process, the Agriculture Technology Agents will need to become "job-creators" and not "job-seekers" and provide best technologies as well as quality inputs on farmers' door steps. Another important action that can change the game is to promote establishment of 'Agri-Clinics', where technology agents are able to join hands in providing single window system of advisory services to farmers.

Another helpful approach would be to involve innovative young farmers as knowledge providers. Their own innovations, once recognized, could help in out scaling economically efficient farming practices. The concept of demand-driven extension approach around integrated farming systems should henceforth be pursued.

Policy Support and Linking Farmers to Market

National Mission on Farmer First

As stated earlier, a large number of initiatives and new schemes have been started by the Government to support farmers, but there appears a need to have better coordination and convergence mechanisms to ensure effective outcome and impact. Accordingly, concerns for collaboration, convergence and synergy need to be addressed along with issues of optimizing institutional arrangements of prevailing pluralistic agricultural extension and farm advisory. Agricultural extension system urgently needs a radical change. For this, a policy reorientation towards farmers' welfare through innovative and efficient technology delivery system, remunerative rural based low cost value chains, and assured market linkages would help in achieving 'Farmer First' objective. For this, a 'National Mission on Farmer First', by additional funding support and by integrating different inter-related on-going programmes under the Ministry of Agriculture and Farmers' Welfare (MA&FW) and other Ministries be established to meet the objective of doubling farmers' income. The proposed National Mission can oversee the coordination and convergence of various inter-Ministries programmes and have a key role to promote innovations through KrishiVigyanKendras (KVKs), Agriculture Technology Management Agency (ATMA), Agri-Clinics, Agriculture Technology Information Centres (ATIC) and active involvement of private sector institutions. Hence a Mission on Farmer First , with an initial allocation of INR 10,000 crores, be mandated to promote establishment of Agri-Clinics, by encouraging well trained group of young individuals as small scale private entrepreneurs. At least one Agri-Clinic per district could be targeted to begin with, linked to performance based incentives and funding support in a phased manner, Also, under this Mission, a Farmers' Innovation Fund (FIF) be established for the validation and refinement of cost saving/ efficient technologies for out scaling. This Mission should also be mandated to support the self-help groups/associations of progressive farmers/cooperatives or even farmers' producer companies to link them with markets. In addition, it must oversee and support the initiatives related to knowledge/technology sharing and capacity building by the private entrepreneurs using ICT, media, TV, smart phones, market advisory services, etc. As the information needs of the farmers are exploding, which is presently accessible to only 45% of farmers, innovative ways need to be

found out with greater involvement of youth in agriculture. The initiative of DD Kisan, as a dedicated channel for farmers, is indeed a good beginning, but its programmes need to be made more innovative and attractive, especially to attract youth around new options by which they can enhance income while adopting sustainable and diversified agriculture. Penetration of mobile phones and the use of internet in rural areas be another goal under the proposed Mission on Farmer First.

It is a fact that despite being the custodian of the country's food security, Indian farmers, especially smallholders (around 86%) are stuck in a low-income syndrome. As already stated, their per capita income (INR 15,000 per annum), is just one-fifth of the national average. Only around 7% of marginal farmers earn more than INR 50,000 per capita per year. In their case, moreover 60% of the income comes from non-farm sources. Also, they are engaged in diversified agriculture like animal husbandry, horticulture, growing cash crops etc. Unfortunately, allocation of research and development (R&D) resources to these allied sectors like livestock, fishery. agroforestry are not proportionate to their actual contribution to agricultural GDP, which as a matter of policy needs urgent attention (Govt. of India, 2018) .

Increasing Funding Support

As already emphasized, in the long run, the boost to farmers' incomes must come from technological breakthroughs that raise yields and resource-use efficiency, reduces cost on production and ensures resilience in agriculture (Govt. of India, 2018). It is also a fact that those developing nations that have supported well their agricultural research for development (AR4D), have made faster progress. China currently spends almost twice than India on agricultural R&D, whereas challenges before Indian agriculture are equally daunting (Lele, 2017). Current funding of 0.4% of its agricultural gross domestic product on agricultural research for development (AR4D), in indeed much less than many developed and developing countries. This, therefore, calls for an immediate increase in resource allocation (almost three times) to address the emerging challenges in agriculture. India would do much better if Government allocates a minimum of 1.0% of its agricultural GDP on research for development.

It is also clear that for successful scaling of innovations, there is a need for enabling policies such as: i) institutional policies for facilitation of farmers collectives like, self-help groups (SHGs), Cooperatives, FPOs (commensurate with legal framework), establishment of cadre of agribusiness professionals at the village level, creation of Agri-Clinics, provision of credit at low interest rates (<4%) to the farmers across value chain, machine rental services, etc.; ii) promotion of ecoregional research, marketing and trade policy, agroprocessing, value chain development, sustainable livelihood, new funding models for translational research by the State Governments, etc.; iii) price policies like minimum support price (MSP) for most crops/commodities, incentive support around efficiency, avoidance of risk through provision of insurance, compensation for ecosystem/environmental services, etc; iv) investment policies to ensure higher capital investment (around 15-20%) in the States needing critical infrastructure like roads, irrigation, power, markets etc.; gradual reduction in subsidies but linked to incentives that are performance oriented, promoting private sector, etc; and v) policies on land and water use that encourage more efficient use of these natural resources. There is also considerable scope for attracting private sector and youth for developing whole sale markets, warehouses, cold storage facilities, rural based agroprocessing infrastructure, promoting micro-irrigation system, sale of quality inputs, and providing agricultural extension services.

Market Reforms

It is urgent that perishable commodities like fruits and vegetables are immediately delinked from centralized sales through Mandis, as at present, by revisiting and amending the Agriculture Produce Marketing Committee (APMC) Act. The initiative to implement the new Model APLM Act 2017 is a right step but its implementation by all States is to be facilitated and monitored by NITI Aayog. Also, for the proposed electronic network for agricultural marketing (e-NAM), it is necessary that movement of agricultural produce is not restricted by the State Governments. Even we need bold Export-Import (EXIM) policy keeping in view the long-term goals to take advantage of globalization of agriculture. Present short- term policies of allowing sometimes the exports and sometimes abruptly putting restrictions on exports is counter productive. This has happened in the recent past by imposing restrictions on export of cotton, meat, foodgrains, etc. Even creating positions of Agricultural Attachee in the Embassies of selected countries would be of great help in boosting agricultural exports, thus benefitting indirectly the farmers.

Land laws for tenancy, contract/collective farming, long lease (so that farmers/tenants are encouraged to invest on land development), consolidation of holdings, with no more fragmentation below 1.0 ha, being uneconomical, etc., must be revised and put to implementation at the soonest possible. Also, the implementation of Model Land Leasing Act (2016) be a high priority for which State Governments have to move faster. Similarly, for better value and efficient use of precious water resource, both pricing of water and banning of flood irrigation system be considered, and incentives for micro-irrigation for greater area coverage be a national priority. Obviously, bold policy decisions are, therefore, required or else business as usual will not help.

Given the limits on landholdings, income growth has to be by raising cropping intensity, improving resource-use efficiency and agricultural diversification. Expansion in agriculture needs to exploit intensive cultivation, as only 40% of crop land is cultivated more than once. This can be enhanced by improving farmers' access to quality seeds of short-duration high-yielding crop varieties/hybrids and by adopting efficient cropping systems that are more sustainable. More area coverage under quality seeds of improved varieties and hybrids would need reforms, as proposed under Seed Bill-2004, which is pending for long for Parliament's approval. The needed incentives and hand-holding of Private Seed Sector, especially for making available seeds of promising hybrids of different crops, would go a long way in bridging the existing yield gaps and for increasing farmers' income.

The focus should also be on diversification towards high value crops/commodities, especially horticulture by bringing minimum of 10% area in each of the States, Also, increased support to animal husbandry and fishery sectors in a Mission Mode will be of great benefit. Demand for these commodities is growing fast, and there is considerable potential for their value addition, including the export. These enterprises have, however, not received much policy support, except horticulture, as stated before. For example, animal husbandry receives just five per cent of the total public investment and institutional credit to the agricultural sector, though it contributes more than 30% to agricultural GDP. Higher allocation of resources would thus be justified, as stated before, to accelerate the growth of these highly potential sectors. Further, there is a need to create required infrastructure, focusing on improving complementarities, since lack of any of these may restrict farmers from capturing the benefits of investment in others. A typical case is that of Bihar and North-eastern States, where despite some improvement in road network, farmers have not benefited much owing to poor electricity supply, irrigation infrastructure, marketing facilities, etc.

Linking Farmers to Market

There is no doubt that linking farmers to markets (LFM) is critical for improved livelihood of smallholder farmers and beneficial for the consumers. Smallholders are more efficient in production, yet they face serious disadvantage mainly on account of marketing their produce. As a result, smallholders are often bypassed in the process of transformation of agriculture, agrifood and marketing systems. Although, it is relatively easy for smallholders to diversify towards high-value crops owing to their higher resource flexibility and better family labour availability, yet they face disadvantage in terms of scale in production and market. Moreover, they have small marketable surpluses that are costlier to trade in the distant urban markets due to higher transportation and transaction costs. Hence, efforts to improve productivity on small farms may not directly result in higher income unless these are appropriately linked with markets. Their integration in markets or value chains would thus require pro- smallholder policies that create an enabling environment for attracting various stakeholders to act together in processing, marketing and also sharing the benefits on account of emerging market opportunities. As earlier stated, these include innovative institutional mechanisms, better infrastructure, greater involvement of private sector, easy access to agricultural and market related information and risk management mechanisms and above all a favourable business environment through stable marketing and trade policies (TAAS, 2013).

Conclusion

The low level of farmers' income and year to year fluctuations in it are a major source of agrarian distress. This distress is spreading and getting severe over time impacting almost half of the population of the country that is dependent on farming for livelihood. Persistent low level of farmers' income can also cause serious adverse effect on the future of agriculture in the country. To secure future of agriculture and to improve livelihood of half of India's population, adequate attention needs to be given to improve the welfare of farmers and raise agricultural income. Achieving this goal will reduce persistent disparity between farm and non-farm income, alleviate agrarian distress, promote inclusive growth and infuse dynamism in the agriculture sector. Respectable income in farm sector will also attract youth towards farming profession and ease the pressure on non-farm jobs, which are not growing as per the expectations.

Doubling farmers' income by 2022 is quite challenging but it is needed and is attainable. Three pronged strategy focused on (i) development initiatives, (ii) technology and (iii) policy reforms in agriculture is needed to double farmers' income.

- The rates of increase in sources underlying growth in output need to be accelerated by 33 per cent to meet the goal.
- The country need to increase use of quality seed, fertiliser and power supply to agriculture by 12.8, 4.4 and 7.6 per cent every year.
- Area under irrigation has to be expanded by 1.78 million hectare and area under double cropping should be increased by 1.85 million hectares every year.
- Besides, area under fruits and vegetables is required to increase by 5 per cent each year.
- In the case of livestock, improvement in herd quality, better feed, increase in artificial insemination, reduction in calving interval and lowering age at first calving are the potential sources of growth.

Research institutes should come with technological breakthroughs for shifting production frontiers and raising efficiency in use of inputs. Evidence is growing about scope of agronomic

practices like precision farming to raise production and income of farmers substantially. Similarly, modern machinery such as laser land leveller, precision seeder and planter, and practices like SRI (system of rice intensification), direct seeded rice, zero tillage, raised bed plantation and ridge plantation allow technically highly efficient farming. However, these technologies developed by the public sector have very poor marketability. They require strong extension for the adoption by farmers. R&D institutions should also include in their packages grassroots level innovations and traditional practices which are resilient, Sustainable and income enhancing.

ICAR and SAUs should develop models of farming system for different types of socioeconomic and bio physical settings combining all their technologies in a package with focus on farm income. This would involve combining technology and best practices covering production, protection and post-harvest value addition for each sub systems with other sub systems like crop sequences, crop mix, livestock, horticulture, forestry. Such shift requires interdisciplinary approach to develop on knowledge of all disciplines.

About one third of the increase in farmers' income is easily attainable through better price realization, efficient post-harvest management, competitive value chains and adoption of allied activities. This requires comprehensive reforms in market, land lease and raising of trees on private land. Agriculture has suffered due to absence of modern capital and modern knowledge. There is a need to liberalise agriculture to attract responsible private investments in production and market. Similarly, FPOs and FPCs can play big role in promoting small farm business. Ensuring MSP alone for farm produce through competitive market or government intervention will result in sizeable increase in farmers' income in many states.

Most of the development initiatives and policies for agriculture are implemented by the States. States invest much more than the outlay by the Centre on many development activities, like irrigation. Progress of various reforms related to market and land lease are also State subjects. Therefore, it is essential to mobilise States and UTs to own and achieve the goal of doubling farmers' income. If concerted and well-coordinated efforts are made by the Centre and all the States and UTs, the Country can achieve the goal of doubling farmers' income by the year 2022.

How doubling of farmers' income is possible even with small landholdings: Model Experiment in Odisha

A unique 'small farmers, large field' model experiment in Odisha shows the way forward for achieving economies of scale and reducing cost of cultivation.

India's policy focus recently changed from increasing farmers' output to their incomes. This is much needed, as farm profitability in India is among the lowest in emerging Asian economies. The strategies proposed for doubling farmers' income include planting better seed varieties/hybrids, improved production practices, diversification towards high-value crops, development of infrastructure and market linkages, and providing access to institutional credit. However, a major impediment to the success of these strategies is small farm sizes. NITI Aayog member Ramesh Chand, in a 2017 policy paper, advocated collective action for minimising the scale disadvantages faced by small and marginal farmers. The Farmer Producer Organisation/ Company approach is one way to enable them to improve their bargaining power, by pooling resources and linking them to the market.

The Small Farmers, Large Field (SFLF) model is founded on the same principles of aggregation and achieving economics of scale, through strengthening backward and forward integration along the supply chain and lowering costs by synchronising key agricultural operations from field preparation to harvest. The SFLF was conceptualised in Vietnam in 2011. One indicator of success is the total area under it rising from 8 hectares to 196,000 hectares between2011 and 2015. SFLF model has taken different forms in Vietnam. Some are formal, with farmers physically pooling their land and setting up companies that operate like private businesses. The shareholders here are farmers themselves. But there are also many informal SFLF entities, wherein farmers have retained their individual holdings and come together only for synchronisation and harmonisation of select agricultural operations to improve efficiency and lower costs.

In the 2016/17 rabi season, we piloted an informal version of the SFLF model in Taraboisasan village near Bhubaneswar. Our first exercise was to explain to farmers there the SFLF concept and its benefits. Many of them were not convinced; they felt that it would mean giving up the freedom to do farming on their own. However, some of the progressive farmers helped us in convincing their colleagues of the potential benefits from working together. Finally, 54 of the 90 farmers in the village agreed to participate in the pilot project. These farmers, with a

combined landholding of 90 acres, selected an eight-member committee to coordinate with the project team.

The first significant decision the farmers made was to grow a single paddy variety and procure its seeds from a certified producer. In the previous season, they cultivated as many as five varieties and sourced the seeds from diverse entities. That included saved seeds of their own or taken from other farmers, and also fresh material procured from a government-owned agency or research institute.

COST & RETURN FROM SFLF vs. NORMAL FARMING

ITEM	RABI 2015 - 16	RABI 2016-17
Yield (quintal/acre)	22	28 (average)
Price (rupees/quintal)	1250	1380
GROSS INCOME (rupees/acre)	27,500	38,640
COST (in Rs)		
Seed	320	320
Seed treatment	40	40
Nursery bed preparation	400	250
Land preparation	2400	2200
Irrigation	2000	2000
Crop establishment	2100	1900
Gap filling	400	400
Manual + chemical weeding	1050	790
Fertiliser + application	2500	2750
Pesticide	1400	870
Harvesting (machine hiring cost)	2500	2000
Storage cost	260	290
TOTAL COST	₹15,370	₹13,810
NET RETURN	₹12,130	₹24,830

The second step that the farmers took was setting up mat nurseries to prepare paddy seedlings in nine patches, with the largest one serving 30 acres. It took some effort to assemble the farmers into nine groups, based on their individual field locations, irrigation tube-wells, and relationship with one another. Earlier, the 54 farmers were individually raising nurseries on small pieces of land. That, as the secretary of the SFLF Committee BimbadharBiswal noted, made it extremely difficult for tractors to operate. Moving around within small pieces of land also consumed extra fuel, which wasn't the case now.

We worked with the committee to also line up input suppliers and service providers, to negotiate lower rates. The SFLF group assessed the fertiliser requirement of every farmer and placed a single order with the Indian Farmers' Fertiliser Cooperative (IFFCO). IFFCO was then induced to supply fertilisers at below its normal retail price and deliver it at the farmers' doorstep.

Before the season started, we invited local rice millers and explained our pilot project to them. They were willing to pay a premium for the paddy produced, due to the ease of milling a single variety. We further facilitated a meeting between a combine harvester service provider and the SFLF committee. He agreed to charge Rs 2,000 per acre, as against the Rs 2,500 rate that the same farmers had paid the previous season. The farmers also spent less on nursery bed and land preparation, crop establishment, and purchase of herbicide and pesticide. They incurred more cost only on fertiliser and storage of the harvested paddy. The expense on fertilisers was higher, despite lower prices negotiated with IFFCO, only because farmers believed that the high-yielding 'Bina 11' variety being grown by them required additional nutrients. They, therefore, applied more quantity of fertiliser than before. Storage costs, too, went up simply because the average paddy yield was 27 per cent higher, hence requiring more number of bags than earlier!

Before harvest, we contacted the same millers. The SFLF committee chose the one based on both the paddy price he was offering and his reputation. The price they got was Rs 1,300 per tonne higher than the prevailing market price. Based on data from each participating farmer at the end of the season, we estimated their average per acre profit at Rs 24,830, as compared to Rs. 12,130 in the 2015/16 rabi season.

But monetary benefits apart, there was also time and energy savings. The participating farmers were vocal about the time they saved by having group seedbed nurseries and synchronised transplanting. They also mentioned the time and money saved from fertiliser being delivered at their doorstep. In the 2017/18 kharif season, the number of farmers went up from 54 to 77, with many from the nearby hamlet joining the group. The total acreage, too, rose to 171 acres.

The above SFLF model seems an attractive option for small farmers to increase incomes. They are able to achieve scale through harmonising and synchronising select farming operations and enhancing their bargaining power in input purchases as well as output sales. But our experience suggests that the scalability of this model is not automatic. Any new group formed will require hand-holding, facilitation and technical support for one or two seasons. But once that is in place, it can sustain for a longer time.

Doubling Farmers' Income

(An Extract of Sh Ashok Dalwai Committee Report)

Agriculture, especially in India, is a domain which not only touches a very large number of lives directly, but can also impact the strategic geo-political significance of the country, to shape its global character in the coming decades. Agrarian societies are a source of agricultural raw material that can feed humans, animals and industries on a sustainable basis. Hence, these societies will find renewed global predominance, as the world faces growing populations & industrial demands, and this will happen in the backdrop of climate change. Communities will not merely think global to act local, but will think global and also act global, as inter-linkages across the continents get strengthened.

The secondary and tertiary sectors - industries and services need sustenance, by way of food and other raw materials, which will require building greater empathy, collaboration and coordination with the source of such goods - the farmers. India has already commenced on this path, by redefining agriculture, and approaching this important sector from the perspective of its primary actors, the farmers.

The Inter-Ministerial Committee on Doubling Farmers' Income (DFI) recognises agriculture as a value led enterprise and suggests empowering farmers with "improved market linkages" and enabling "self-sustainable models" as the basis for continued productivity-production and income growth for farmers. This builds the basic strategy direction for five primary concerns: optimal monetisation of farmers' produce, sustainability of production, improved resource use efficiency, re-strengthening of extension and knowledge based services and risk management.

The Committee identifies and focuses on seven major sources of growth (Volume II), operating within (6) and outside (1) the agriculture sector. The priority assigned to each will vary depending on the status of agricultural development in States and Union Territories. These sources are:

Within the agriculture domain

- Improvement in crop productivity.
- Improvement in livestock productivity.
- Resource use efficiency or saving in cost of production.
- Increase in cropping intensity.
- Diversification towards high value crops.
- Improvement in real prices received by farmers.

Outside the agriculture domain

Shift from farm to non-farm occupations.

In Volume-II of its Report, the DFI Committee tables the "growth targets" for doubling farmer's real income while improving the ratio between farm and non-farm income from *60*:*40* as of now, to *70*:*30* by 2022-23. It suggests the following strategy:

a) Adopting a "demand-driven approach" for efficient monetisation of farm produce and to synchronise the production activities in Agriculture & Allied Sectors.

b) Improving and optimising input delivery mechanism and overall input efficiency [technologies, irrigation methods, mechanisation, Integrated Pest Management (IPM), Integrated Nutrient Management (INM), farm extension services, adaptation to climate change, integrated agri-logistics systems, Integrated Farming Systems Approach, etc.].

c) Offering institutional credit support at the individual farmer and cluster levels.

d) Strengthening linkages with MSMEs (micro, small and medium enterprises), so as to accelerate growth in both farm as well as non-farm incomes along with employment creation.

Farmers' income is directly related to cost of agricultural production (including input costs) and profitable monetisation of the agricultural produce, through effective market linkages. The DFI Committee Report, in Volumes III–XIII, deliberates upon specific economic activities and topics that have a durable impact on increasing farmers' income. Some of these are categorised as follows:

i. **Demand Driven Agricultural Logistics System** for post-production operations such as produce aggregation, transportation, warehousing, etc.

ii. **Agricultural Value System** (AVS) as an integration of the supply chain and to drive market led value system – District level, State level and National Level Value-System Platforms to promote individual value chains to collaborate and integrate into a sector-wide supply chain.

iii. **Farmer-centric National Agricultural Marketing System** by restructuring for a new market architecture, consisting of Primary Retail Agriculture Markets (PRAMs/GrAMs numbering 22,000) and Primary Wholesale Agricultural Markets (APMCs/APLMs-other markets numbering around 10,000), as also secondary & tertiary agricultural markets, all of which are networked by online platforms to facilitate a pan-India market access; as also integrating the domestic market with export market by considering the latter as a targeted market activity and not just an add-on.

iv. **Developing Hub and Spoke System** at back-end as well as front-end to facilitate and promote an Agri-Value System (AVS) (which includes a combination of input providers, farmers, transporters, warehousing, wholesalers, food and agro-processors, retailers, etc).

v. **Marketing Intelligence System** to provide demand led decision making support system - forecasting system for agricultural produce demand and supply, and crop area estimation to aid price stabilisation and risk management.

vi. **Promoting Sustainable Agriculture** – Climate Resilient Agriculture, Rainfed Agriculture, Conservation Agriculture, Ecology Farming, Watershed Management System, Integrated Farming System, Organic Farming, Agro-Climatic Regional Planning, Agricultural Resources Management and Micro-Level Planning, etc. While the above alternate systems are to be adopted & scaled up, with due validation of theprotocols & outcomes by NARS (National Agricultural Research System), the modern agro-chemical based cultivation practices shall be promoted based on the principle of evidence based, minimal/integrated and efficiency targeting resource use (eg., Soil Health Card recommendations as the basis for soil nutrient management). It is essential that sustainable agriculture is not limited to the practice of alternate production systems in certain geographies alone, but goes beyond into larger cultivation practices by incorporating evidence based and good agricultural practices.

vii. **Effective Input Management** achieving Resource-Use-Efficiency (RUE) and Total Factor Productivity (TFP) – Water, soil, fertilisers, seeds, labour-farm mechanisation, credit and precision farming, so as to reduce farm losses, while ensuring sustainable and eco-friendly practices.

viii. **Enhancing Production through Productivity**– to achieve & sustain higher production out of less and release land and water resources to diversify into higher value farming for enhanced income.

ix. **Farm Linked Activities** including secondary and tertiary sector activities of KVIC (Khadi and Village Industries Commission) and MSME (Micro, Small and Medium Enterprises) scales, for promoting near-farm and off-farm income generating opportunities as well as to facilitate more of the produce capturing more of the market value.

x. **Agricultural Risk Assessment and Management** including drought management, demand & price forecast, weather forecast, management of biotic stress including vertebrate pests, access to credit among farmers for farming operations; providing long term credit, post-production finance to preventing distress sale by farmers, and crop & animal risk management through insurance.

xi. **Empowering Farmers** through Agricultural Extension, Knowledge Diffusion and Skill Development.

xii. **Research & Development and ICT** designed to support the Doubling of Farmers' Income strategy in the short run, and help accelerate the pace of income enhancement on a sustainable basis in the long run.

xiii. **Structural and Governance Reforms in Agriculture,** including building a database of farmers, facilitating farmer & produce mobilisation, institutional mechanism at district, state & national levels for coordination & convergence, digital monitoring dashboard at district, state & national level for seamless & real-time monitoring of field delivery, utilising Panchayat Raj Institutions, and farm income measurement as key delivery channels for transparent and inclusive development.
It also calls for paying special attention to non-timber forest produce (NTFP) to support tribal farming communities to capture higher value and non-farm incomes therefrom

Sustaining Income Growth – Five Pillars
The recommendations that emanate from the preceding 13 different volumes, delineated under different themes, strive to align with one or more of the five pillars, that the DFI Committee identifies, as essential to doubling farmers' income, and sustaining a steady income growth in the long run. These include:
i. Increasing productivity as a route to higher production.
ii. Reduced cost of production / cultivation.
iii. Optimal monetisation of the produce
iv. Sustainable production technology.
v. Risk negotiation all along the agricultural value chain

Annexure - A

Farmers' Income in Base and Target Year (Rs.)

States/UTs	Base Year: 2015-16 (at 2015-16 Prices)			Target Year: 2022-23 (at 2015-16 Prices)			Target Year: 2022-23 (at Current Prices)		
	Farm	Non-Farm	Total	Farm	Non-Farm	Total	Farm	Non-Farm	Total
Andhra Pradesh	54,135	49,957	104,092	105,768	70,295	176,063	148,827	98,912	246,707
Arunachal Pradesh	124,461	51,691	176,152	235,803	72,735	308,538	331,798	102,345	435,240
Assam	64,300	21,662	85,962	131,406	30,481	161,887	184,901	42,890	22,7791
Bihar	26,116	19,201	45,317	49,256	27,018	76,274	69,307	38,017	104,307
Chhattisgarh	46,172	24,892	71,064	102,941	37,381	140,321	144,848	52,598	194,654
Goa	41,581	76,829	118,410	93,654	108,106	201,760	131,781	152,116	263,595
Gujarat	72,969	45,074	118,043	148,142	66,101	214,243	208,451	93,011	296,994
Haryana	136,622	50,603	187,225	272,381	71,204	343,585	383,268	100,191	471,797
Himachal Pradesh	51,933	62,943	114,876	104,340	88,567	192,907	146,817	124,623	258,787
Jammu & Kashmir	53,391	118,825	172,216	115,272	167,198	282,470	162,199	235,265	363,661
Jharkhand	49,060	35,760	84,820	102,283	56,926	159,210	143,923	80,101	219,802
Karnataka	97,547	56,852	154,399	204,891	79,997	284,888	288,303	112,564	386,045
Kerala	54,452	101,336	155,788	105,092	142,590	247,682	147,874	200,639	327,708
Madhya Pradesh	89,434	27,354	116,788	201,813	48,309	250,122	283,972	67,975	342,626
Maharashtra	60,885	39,148	100,033	119,069	55,085	174,153	167,541	77,510	242,736
Manipur	61,973	60,916	122,889	114,052	85,715	199,767	160,483	120,609	271,193
Meghalaya	109,707	70,677	180,384	218,237	99,450	317,687	307,081	139,936	434,666
Mizoram	76,612	51,882	128,494	168,688	73,002	241,690	237,360	102,722	337,359
Nagaland	58,666	78,473	137,139	110,467	110,419	220,886	155,438	155,371	303,799
Odisha	34,463	28,822	63,285	78,192	40,556	118,747	110,023	57,066	157,018
Punjab	160,683	70,222	230,905	343,236	98,809	442,045	482,968	139,035	555,958
Rajasthan	52,270	40,644	92,914	103,885	57,190	161,075	146,176	80,472	225,014
Sikkim	49,129	71,504	120,633	91,766	120,172	211,938	129,124	169,094	293,824
Tamil Nadu	57,511	76,057	133,568	125,486	107,019	232,505	176,571	150,587	318,223
Telangana	63,492	22,799	86,291	117,931	32,081	150,012	165,941	45,141	214,332
Tripura	54,642	24,320	78,962	122,575	40,501	163,076	172,475	56,989	223,875
Uttar Pradesh	56,785	22,188	78,973	104,906	31,221	136,127	147,613	43,932	189,452
Uttarakhand	18,862	42,971	61,833	34,946	60,465	95,411	49,173	85,080	125,978
West Bengal	24,441	54,267	78,708	45,164	76,359	121,523	63,550	107,444	160,269
And. & Nic. Ils	57,417	94,895	152,312	135,448	133,526	268,975	190,590	187,885	354,670
Chandigarh	31,571	306,791	338,362	59,822	431,686	491,508	84,175	607,426	623,686
Dadra & Nagar H.	8,806	100,196	109,002	18,757	140,986	159,743	26,393	198,381	202,084
Daman & Diu	24,665	84,402	109,067	52,639	118,762	171,400	74,068	167,110	219,375
Delhi	13,204	262,822	276,026	32,685	369,817	402,503	45,992	520,370	506,306
Lakshadweep	66,496	173,899	240,395	125,418	244,693	370,111	176,475	344,307	485,360
Puducherry	62,431	41,221	103,652	144,613	68,128	212,741	203,485	95,863	290,144
All India	**58,246**	**38,457**	**96,703**	**116,165**	**56,529**	**172,694**	**163,456**	**79,543**	**242,998**

Annexure - B

Targeted Real Annual Growth Rate in Income (%)

States/UTs	Farm Income Growth	Non-Farm Income Growth	Total Income Growth
Andhra Pradesh	10.04	5.00	7.80
Arunachal Pradesh	9.56	5.00	8.34
Assam	10.75	5.00	9.47
Bihar	9.49	5.00	7.72
Chhattisgarh	12.14	5.98	10.21
Goa	12.30	5.00	7.91
Gujarat	10.65	5.62	8.89
Haryana	10.36	5.00	9.06
Himachal Pradesh	10.48	5.00	7.69
Jammu & Kashmir	11.62	5.00	7.32
Jharkhand	11.07	6.87	9.41
Karnataka	11.18	5.00	9.15
Kerala	9.85	5.00	6.85
Madhya Pradesh	12.33	8.46	11.49
Maharashtra	10.06	5.00	8.24
Manipur	9.10	5.00	7.19
Meghalaya	10.32	5.00	8.42
Mizoram	11.94	5.00	9.45
Nagaland	9.46	5.00	7.05
Odisha	12.42	5.00	9.41
Punjab	11.45	5.00	9.72
Rajasthan	10.31	5.00	8.18
Sikkim	9.34	7.70	8.38
Tamil Nadu	11.79	5.00	8.24
Telangana	9.25	5.00	8.22
Tripura	12.23	7.56	10.92
Uttar Pradesh	9.16	5.00	8.09
Uttarakhand	9.21	5.00	6.39
West Bengal	9.17	5.00	6.40
Andaman & Nicobar Islands	13.04	5.00	8.46
Chandigarh	9.56	5.00	5.48
Dadra & Nagar Haveli	11.41	5.00	5.61
Daman & Diu	11.44	5.00	6.67
Delhi	13.82	5.00	5.54
Lakshadweep	9.49	5.00	6.36
Puducherry	12.75	7.44	10.82
All India	**10.36**	**5.66**	**8.64**

AGRICULTURAL MARKETING
- (Reforms of APMC Act & E-NAM)

Efficient markets offer efficient price discovery and level playing field for all the actors. The developments in Indian agricultural marketing and emphasizes on implementation of e-NAM to achieve the goal of doubling farmer's income through the development of Infrastructure, Institution and Information for it may be one of the noble steps to enhance the income of the farmers.

India is predominantly an agrarian economy, with agricultural sector engaging about 48% households in India are agricultural households (NABARD survey conducted in 2016-17), whose monthly income is Rs. 3140 from crop cultivation alone (NABARD 2018). On supply-side, India is global leader in production of pulses and milk, second in fruits and vegetables, tea, sugarcane and cotton and third in cereals. This is quite a rosy picture. Indian agriculture has become increasingly market oriented and commercialized. In the early 1950s, about 30-35% of food grains output was marketed, which has increased to more than 70% in recent years. At the same time, there are huge post-harvest losses, 10-25% for perishables like milk, meat, fish and eggs. The estimated losses in fruits and vegetables are even higher, 30-40%. These adversely affect the Indian economy. Another estimate indicates an annual loss of Rs. 92,651 crores which is almost three times as high as the budget for the agriculture sector in 2016-17. Thus, specifically the functioning and efficiency of agricultural markets is required to be ensured as it has positive impact on agricultural growth, technology adoption, area expansion, fertilizer use and irrigated area.

A brief history of Agricultural Marketing and its Reforms in India

For a long time, a traditional market system was existent in India. It was characterized by the village sales of agricultural commodities, post-harvest immediate sale by farmers etc. In 1928, the Royal commission has pointed out the problems of traditional marketing such as high marketing cost, unauthorized deductions, and prevalence of various malpractices. This led to the demand of having regulated markets in India.

The regulated market aims at the elimination of unhealthy and unscrupulous practices, reducing market costs and providing benefits to both producers as well as the sellers in the market. In the post independence period i.e. during the sixties and seventies, most of the states enacted the Agricultural Produce Market Regulation Acts (APMR Acts). It authorized the States to set up and regulate marketing practices in wholesale markets. The objective was to ensure that farmers get a fair price for their produce.

However, regulated markets had some drawbacks such as:

- Under this regulation, no exporter or processor could buy directly from farmers. It discouraged processing and exporting of agricultural products.
- Under the act, the state Government could only set up markets, thus preventing private players from setting up markets and investing in marketing infrastructure.
- Formation of cartels with links to caste and political networks resulting in price variations.
- An increased number of middlemen formed a virtual barrier between the farmer and the consumer.
- The licensing of commission agents in the state regulated markets has led to the monopoly of the licensed traders acting as a major entry barrier for new entrepreneurs.

- The fragmentation of markets within the State hinders the free flow of agro- commodities from one market area to another and multiple handling of agri-produce and multiple levels of mandi charges end up escalating the prices for the consumers without commensurate benefit to the farmer.

Amendments in APMC Acts

- Consequently, the inter-ministerial task force on agricultural marketing reforms (2002) recommended the APMC Act be amended to **allow for direct marketing and the establishment of agricultural markets by the private and co-operative sector** to provide more efficient marketing and creating an environment conducive to private investment.
- In response, the Union Ministry of Agriculture proposed **a model act** on agricultural marketing in consultation with State governments for adoption by the States. (Here, you should note that agriculture is a state subject and hence Central government can only give guidelines. It is within the powers of state government to decide whether to make amendments or not.)

Model APMC Act 2003 – Salient features:

- As per the act, the State is divided into several market areas, each of which is administered by a separate Agricultural Produce Market Committee (APMC) which impose its own marketing regulation (including fees).
- Apart from that, legal persons, growers, and local authorities are permitted to apply for the establishment of new markets for agricultural produce in any area.
- There will be no compulsion on the growers to sell their produce through existing markets administered by the Agricultural Produce Market Committee (APMC).
- Separate provision is made for notification of 'Special Markets' in any market area for specified agricultural commodities.
- Provision for Contract Farming, allowing direct sale of farm produce to contract farming sponsor from farmer's field.
- Single point levy of market fee on the sale of notified agricultural commodities in any market area.
- Provision made for resolving disputes arising between private market/ consumer market and Market.
- Provides for the creation of marketing infrastructure from the revenue earned by the APMC.

National Agriculture Market (NAM)

The motivation for a unified market platform can be traced to the Rashtriya e-Market Services (ReMS), an initiative of Karnataka State Agricultural Marketing Board with National e-Markets Limited (NeML), erstwhile National Commodity and Derivatives Exchange (NCDEX) Spot Exchange.

NAM, announced in Union Budget 2014-15, is a pan-India electronic trading portal which seeks to connect existing APMCs and other market yards to create a unified national market for agricultural commodities.

Features of NAM:

- NAM is a "virtual" market but it has a physical market (mandi) at the back end
- NAM creates a unified market through online trading platform both, at State and National level and promotes uniformity.
- The NAM Portal provides a single window service for all APMC related information and services.
- While the material flow of agriculture produce continues to happen through mandis, an online market reduces transaction costs and information asymmetry.

However, in order for a state to be part of NAM, it needs to undertake prior reforms in respect of

- A single license to be valid across the state.
- Single point levy of market fee.
- Provision for electronic auction as a mode of price discovery.

The model APMC act that promoted the participation of private sector has not been implemented by all the states and the monopoly of APMC continues and hence the challenges for effective implementation of the refoms in APMC Act still persists in India. However, in current days of mass production and marketing which is being replaced by customer-based or market-driven strategies, an effective marketing extension service is the need of the hour.

Agricultural market regulations

Agricultural market regulation in India has come a very long way since its humble beginning in 1886 when the British rulers set up first regulated market at Karanjia under the then Hyderabad residency order. The Berar Cotton and Grain Market Law of 1897 was the first legislation on market regulation for agricultural commodities. However, the legislation was highly biased towards the commercialization of cotton in India to ensure the stable supply of cotton as a raw material to the textile mills at Manchester at below world price. By its genuine intent, the aforesaid marketing legislation was purely regressive in the sense that the farmer's economic aspirations and development of marketing infrastructure was neglected in it. Therefore, this marketing board was an inefficient marketing arrangement. The then Bombay Government was first to enact the Cotton Market Act in 1927. This was the first law in the country that attempted to regulate market with a view to evolve fair marketing practices. Thereafter, Agricultural Produce Marketing (Commission) Act was enacted in 1938 by the Ministry of Food and Agriculture, Government of India and subsequently the state level agricultural market regulations were enacted. But the spread of regulated markets were highly biased towards the cotton growing states and not much progress was made until independence of the country in 1947. Till the mid- 1960s, market regulations were primarily meant to facilitate smooth functioning of markets and to keep a check on activities that were considered inimical to producers and/or consumers. Subsequently, the country opted for a set of direct and indirect interventions in agricultural markets and prices, initially targeted at procurement and distribution of wheat and paddy. This gradually expanded to cover several other crops/ products and aspects of domestic trade in agriculture. It indicates that regulation of agricultural markets and the actual regulatory policies put forward two ideologies of agricultural marketing among the policymakers. The first reflects that the agricultural markets in India are ill-functioning and thus requires state intervention to stabilize prices. Contrast to it, the second ideology reflects that these markets are so competitive that new kinds of institutions are required to meet emerging challenges.

Most of the states enacted Agricultural Produce Markets Regulation Acts (APMRA) during the sixties and seventies and put these in operation. All primary, wholesale, assembling markets were

brought under the ambit of these Acts. Well-laid out market yards and sub-yards were constructed and for each market area, an **Agricultural Produce Market Committee (APMC)** was constituted to frame the rules and enforce them. Thus, the organized agricultural marketing came into existence through regulated markets. The APMRA brought radical changes and significant improvement in almost all aspects of marketing of farm produce.

The policy emphasis in the 1960s and 1970s on government intervention to resolve market failures gave way in the 1980s to market-oriented liberalization to 'get prices right' and more recently, to a focus on 'getting institutions right'. However, many gains brought by APMRA to improve competitiveness of agricultural markets got diffused over time and market infrastructure did not keep pace with volume of market arrivals. The facilities provided in markets remained not only inadequate, but also deteriorated in many cases. The regulations had lost the relevance with change in economy and agriculture in terms of production and diversification. Excessive intermediation worked to the disadvantage of producers and consumers and favored only middlemen. Trade liberalization as a consequence of economic reforms of 1991 and need to adjust to WTO (1995) agreements has serious repercussions on Indian agriculture. The economic reforms have divulged Indian agricultural markets to the cut throat international competition which necessitated domestic trade liberalization to improve domestic competitiveness. Subtle changes in non-agricultural sector due to the economic reforms at the same time sheared the necessity of reforms in agricultural trade too.

Consequently, Government of India initiated several measures to improve the agricultural marketing system and constitute an Expert Committee in 2002 who have noticed that the regulated markets have helped in mitigating market handicaps of producers/sellers at wholesale assembling level but the monopolistic practices and modalities of regulated markets have prevented the development of free and competitive trade in agricultural markets. The Committee recommended various reforms in State Agricultural Produce Marketing Regulation Act and the Essential Commodities Act to root out the restrictive provisions coming in the way of efficient and competitive trade. After deliberate discussion on these recommendations, a Standing Committee of state ministers under the chairmanship of the then Union Minister of State for Agriculture, on 29 January 2003. Thereafter, Model Law on Agricultural Marketing was framed with consultation of states. The Model Agricultural Marketing (Development and Regulation) Act (2003) was circulated among states to implement and to incentivize states to amend their APMC Acts on the lines of the Model Act. Some investment subsidy on market infrastructure development projects was also provided under central assistance.

These economic incentives were thought of providing thrust to adjust to the provisions of model law. However, after a decade, there existed variation in adoption of the contents and coverage of reforms under the APMC Acts/Rules across the states. Contrary to these, it was reported that, entry of private players in agricultural marketing benefitted farmers by increasing competition. The status of implementation of model law was slow and uneven due to reluctance on part of state governments to amend their respective APMC legislations. APMC Acts were passed by the states during our socialist past restrict the choice of farmers to sell their produce in terms of place as well as person by creating regulated barriers. Some states have created entry barriers for private players to establish the markets by prescribing either prohibitive license fees for setting up such markets, or the minimum distance between private markets and APMC markets. The transaction of trade at private market was less than 10%. The Model Act prohibits commissions in any transaction of agricultural produce from the farmers; however in practice, these range from 1 to 2.5% for food grains and 4 to 8% for fruits and vegetables. There are also wide variations in market fees, from 0.5 to 2.0% of the sales. The market fee and commissions add 15-20 % to the farm gate price. In addition, there are 5-6 intermediaries between the primary producer and the consumer. The total mark up in the chain adds 60-75 %. These result into

higher transaction costs and lower price realization by farmers. It is evident that these legal provisions have created a fragmented and monopolistic agricultural market with high entry barriers.

The basic objectives for setting up a network of physical markets, namely, ensuring reasonable gain to the farmers by creating an environment of fair play of supply and demand forces, regulating market practices and achieving transparency in transactions, have not been achieved. In some cases, new conditions have been attached to reforms which defeated the very purpose of the reforms. Later, some of the legislative reforms prior to Model Act were undo by central government rules like licensing requirements, stock limits and movement restrictions in respect of purchase, sale, supply, distribution or storage for sale of agricultural commodities, which were removed in 2002.

Subsequently, the changes in rules of game have given opportunities to unorganized market functionaries like commission agents and traders to organize themselves forcing the changes in process guidelines ultimately favored themselves. **Year 2007 witnessed circulation of model APMC rules** across the states for implementation but there was wide variation in adoption of content and coverage of reforms. Later, Ministry of Agriculture, Government of India set up an Empowered Committee of State Ministers in-charge of Agricultural Marketing on 2nd March, 2010 to persuade various states to implement the reforms in agriculture marketing through adoption of Model APMC Act. The Model Act suggests reforms necessary to provide a barrier free national market for the benefit of farmers and consumers. It also suggests measures to effectively disseminate market information and to promote grading, standardization, packaging, and quality certification of agricultural produce. The Committee in its report (in 2011) recommended for i) coherence of state APMC Acts and rules in line with Model Act and rule; ii) provision of multiple and competitive marketing channels to farmers; iii) integration of mandies with electronic spot exchange; iv) private investment in agricultural markets; v) infrastructure project status for agricultural markets; vi) waiving off of marketing fee on perishables like fruits and vegetables; vii) promotion of direct marketing as well as contract farming, etc.

Karnataka model for agricultural marketing

The state of Karnataka is pioneer in adopting these amendments and innovated its tendering process to bring transparency, competitiveness and efficiency in the regulated markets. The Karnataka state with the assistance of National Commodity and Derivative Spot Exchange (NCDEX) has replaced its manual tender system by electronic tender system for price bidding in selected regulated markets in the state. The plan aimed at vertical as well as horizontal integration of all regulated agricultural markets (APMCs) with supporting infrastructure for seamless flow of produce, finance and information across different stakeholders in the trading environment. The model was actualized through a joint venture of state government and NCDEX i.e. Rashtriya e-Market Services (ReMS) Private Limited Company.

ReMS provides the package of services which include auction as well as post-auction facilities (weighing, invoicing, market fee collection, accounting); assaying facilities; warehouse-based sale of produce; commodity funding and price dissemination . The e-tender system was first introduced in 2006-07 on pilot basis for paddy in the Mysore regulated market, which was further extended to 11 commodities in 2010. However, the unified online agricultural market initiative was launched in Karnataka on 22 February 2014. A total of 105 markets spread across 27 districts have been brought under the Unified Market Platform (UMP) as of March 2016.

This initiative provides a unique identification number to every lot brought by the farmers to the APMC market. The farmer can use the option of using either common platform or the

platform of commission agent to auction his produce. The lots ready for auction are assayed for their quality and the information about quality and quantity is put on the portal of ReMS. The registered buyers or traders on ReMS who are interested in purchase of produce are required to get the unified market license. Any prospective buyer can bid for the produce online from anywhere using her/ his credentials with ReMS. A trader can revise the bid upward any number of times before closure of the bidding time. After closure of auction period, the bids are flashed on television screens put up in the mandies and on the portal of ReMS. Thereafter, the producer/seller is required to give his acceptance for the bid. A seller has the autonomy to reject the bid, in which case a second round of bidding takes place on the same day and in the same way. A bidder is required to keep a pre-bid margin of 5% of value of the lot marked for sale with ReMS before opening of the tender. ReMS charges 0.2% of the value of the transacted produce for providing various online services. The important feature of the model is that the participation in UMP is not restricted to Karnataka. Traders from other states and bulk institutional buyers are also registered with ReMS. The UMP received overwhelming response from farmers in the state and it shows impressive results in a short period. Auction and sale of farm produce is not restricted to traders within the market. Thus, the possibility of tacit understanding to suppress prices received by farmers or cartelization has been eliminated.

E-NAM:

The Cabinet Committee on Economic Affairs approved the central sector scheme for promotion on the national agriculture market through Agritech Infrastructure Fund with a budget allocation of Rs. 200 crores on July 1st, 2015. The scheme aimed at setting up of a common e- platform in 585 selected wholesale regulated markets across the country. It envisages expanding Karnataka's UMP model at the national level in a bid to cover the entire country. The Government of India has given a real push to the effort by launching the electronic trading platform for National Agriculture Market (e-NAM) on April 14, 2016.

Salient features of E-Nam

- A national e-market platform for transparent sale transactions and price discovery initially in regulated markets. Willing States to accordingly enact suitable provisions in their APMC Act for promotion of e-trading by their State Agricultural Marketing Board/APMC.
- Liberal licensing of traders / buyers and commission agents by State authorities without any pre-condition of physical presence or possession of shop /premises in the market yard.
- One license for a trader valid across all markets in the State.
- Harmonization of quality standards of agricultural produce and provision for assaying (quality testing) infrastructure in every market to enable informed bidding by buyers. Common tradable parameters have so far been developed for 69 commodities.
- Single point levy of market fees, i.e on the first wholesale purchase from the farmer.
- Provision of Soil Testing Laboratories in/or near the selected mandi to facilitate visiting farmers to access this facility in the mandi itself. The Strategic Partner (SP) may be responsible for development, operation and maintenance of the platform. The broad role of the Strategic Partner is comprehensive and includes writing of the software, customizing it to meet the specific requirements of the mandis in the States willing to integrate with NAM and running the platform.

A common market means a market within which there are no institutional or legal barriers to the free circulation of products, so that the producer or the traders can sell with the same freedom across the state borders as they can within their own states. National Agriculture Market (NAM) is a similar pan-India electronic trading platform which networks the existing APMCs to create a unified national market for agricultural commodities. In reality, the common agricultural market like NAM can benefit different stakeholders engaged in value chain of agricultural commodities. The farmers can have benefits of wider choice of buyers for their produce which would positively influence their net income; consumers can also have more alternative for same product with varying prices and qualities; bulk buyers and exporters can reduce their intermediation cost by directly participating in trade without being physically present in the market and direct interface of bulk buyers with the sellers without any intermediation. Therefore, the efficiency of agricultural marketing system is expected to be increased with the NAM platform. Technically, NAM envisages spatial market integration, reduction in transaction costs and has direct implications on price signals and price discovery, farmer's income and market liberalization as well. Spatial integration of APMCs and uniformity in price (excluding of transportation cost) across the markets will reduce the scope of arbitration by the traders which will create win-win situation for both the farmers and consumers.

Status of implementation of e-NAM

As on March, 2018, 585 wholesale regulated markets/ Agriculture Produce Market Committee (APMC) Markets have been integrated with e-market (e-NAM) platform in 16 States and 2 Union Territories (UTs), who have carried out requisite reforms in their State Agriculture Produce Marketing Committee Act (APMC Act).

Challenges in implementation of e-NAM

The major challenges in the implementation of e-NAM can be viewed mainly on the grounds of Infrastructure, Institution and Information.

Infrastructural impediments includes poor quality of rural road, inadequate scientific storage and warehousing, limited number of cold storage, lacking refrigerated vans, low market density, assaying and grading facilities in some markets only, limited capacity of these equipments to deal with high volume of agricultural commodities in the peak season, different standards for agricultural commodities, fragmented APMCs, lack of synergy between marketing organizations and service providers, involvement of traders in the marketing of agricultural produce, poor internet connection, inadequate number of computers, servers and kiosks in the market, interrupted power supply etc.

Institutional impediments includes lack of orientation of states to adopt and amend their APMC Acts for making provision for single point levy in the market; single trading license & e-trading and delay in notification of same are the major legal hiccups in the implementation of e-NAM. On the other hand, inadequate skilled manpower in the APMCs, limited number of trained traders to trade in the electronic platform and low literacy level of farmers are among the important human resource bottlenecks.

Informational impediments includes low awareness of the farmers about the e-NAM, limited knowledge of e-tendering process, lack of awareness about the benefits of e-NAM and farmers apprehension about the less price for their produce if their produce found to be of sub-standard quality on assaying.

Suggestions

Institutions and infrastructure are two basic prerequisites to be given more emphasis for successful implementation of the scheme. The states/union territories where APMC acts are non-functional or partially adopted, should gear up its administrative machinery for suitable amendments in their respective APMC Act to make provision for e-NAM for benefiting their farmers. States which do not have APMC act are required to think of adopting it as APMCs might ensure at least minimum support price to farmers. Skilled manpower may be hired for operation of electronic trading, Emphasis on developing suitable technologies and startups may be given to address the problems of faster and accurate assaying of large number of lots during harvest season for successful implementation of e-NAM. The problem of higher cost of running the assaying laboratories can be minimized by automation of the process and scaling up the volume of trade on e-platform. Public and private entities should be attracted to invest in market infrastructure and market development process. Although, APMC Act 2003 has provision of private markets and involvement of private players in the development of agricultural market, only limited number of private players got attracted so far which needs be addressed with appropriate policies.

The modern technologies can play vital role in providing level playing field for all size farmers and in developing smart micro-mandies near to the farmers. More efforts should be given to strengthen the scientific storage and warehousing facilities, development of rural roads and logistic network for transportation of agricultural produce. Quality certification plays an important role in online trading, thus the assaying and certification infrastructure in the enrolled mandies must be upgraded. Standard practices/protocols if any, for proper synergy between marketing organizations and
service providers should be strictly adhered to. To increase the volume of trade on electronic trading
platform and increase farmers participation in e-NAM, more awareness programs are needed to be organised. Attempts must be made to document and disseminate at least one success story of local farmer benefitted via trading on e-NAM. It will create trust among the farmers and will add to speedy spread of information about the benefits of e-NAM. To develop the skills of traders to adjust to new system, mandatory hands on training must be given to them free of cost in the districts. To increase the participation of small and marginal farmers with small marketable surplus on e-trading platform, farmer's cooperatives/farmers companies/FPOs should be given the license to trade on e-NAM if they are adequate in their portfolio to manage the task.

Conclusion

A unified platform like National Agricultural Market (NAM), although facing initial hiccups for successful implementation and lesser density of e-NAM across the existing regulated markets, there is tremendous scope for its further expansion and modernization. The common agricultural platform integrated with modern technologies will be an important catalyst to ensure best price to the producers for their produce and will also ensure the variety of quality products to the consumers. For the expansion in the volume of trade in e-NAM platform efforts must also be channelized towards development and upgradation of scientific warehouses, cold storage, refrigerated vans for perishables, awareness and training to the participants in the marketing process, high speed internet connectivity to the markets and among different components of the market. The benefits of e- NAM would be visible once it is implemented fully in the true sense as it has been conceptualized and its results will definitely be reflected in the increase in the income of the farmers.

Role of commodity Derivatives Market in Doubling Farmers' Income

Introduction

The income earned by a farmer from agriculture is crucial to address agrarian distress and reduce poverty in India. The goal set to double farmers' income by 2022 is central to improve farmers' welfare in terms of bringing parity between income of farmers and those working in non-farm sectors. To achieve this annual growth of 10.4% in farmer income between now and 2022 is required to be maintained.

The report of NITI Aayog (March 2017) with regard to "Doubling Farmer Incomes: Rationale, Strategy, Prospects and Action Plan" finds that about one-third of the increase in farmer income is easily attainable through better price realization, efficient post-harvest management, competitive value chains and adoption of allied activities.

Importance

The commodity derivative markets (CDM) can be one of the effective platforms to achieve the above stated goals as because there are three developments that have changed the contours of commodity markets in recent years and created the right environment for a commodity exchange (CE) to move centre stage.

First, many commodities such as oilseeds, cotton, coarse grains and pulses have undergone substantial structural reform in recent decades. Extensive liberalization has seen part-withdrawal of government procurement agencies in several crops. As a result, the supply chains to which farmers were accustomed have in many cases ceased to operate. Thus, Farmers have become increasingly exposed to high price volatility risk. Further, Access to markets has become less predictable, as the access to the services like market information, storage and logistics, finance, extension services and input supply etc. provided by the public-sector bodies has been decreasing compared to the past..

Second, crop diversification has been promoted to improve the economic and environmental sustainability of agriculture. The objective is reducing dependence on limited and volatile income streams, by diversifying into new crops with unrelated price development. Farmers moving away from traditional crops need access to new fully functional markets and value chains that may not be readily available.

Third, there have been significant advances in information and communications technology (ICT) in recent years that can significantly reduce the high transaction costs faced by the poor, rural farmers/community. The synergy of exchange, warehouses and a modern information/communication system make it possible to build a new ecosystem by bridging the efficiency gap between unresponsive/ non-competitive agriculture and flexible/ profitable agriculture. Technology is a means to re-invent the agri-commodity business.

Benefits from ICT

- Online, electronic nationwide trading to integrate fragmented markets and improve price formation

- Electronic price dissemination networks to reduce information asymmetries and empower Farmers
- Satellite-enabled exchange connectivity to overcome infrastructure deficiencies
- Technology-enabled distribution partnerships to deliver exchange services to hard-to-reach commodity producers
- Integrated collateral management – including electronic warehouse receipt systems – to improve logistics efficiency and reduce handling costs
- Real-time reporting of market participants' positions and credit balances, enabling more effective regulatory oversight
- Village-level learning programmes for capacity-building and human resources development

Role of CDM/CE

The role of largest agri-commodity exchange as a trade-facilitating institution is catalyzing growth in farmer incomes by increasing market access, reducing post-harvest information asymmetry, and offering protection against price volatility.

Structural changes in agricultural markets – especially liberalization, crop diversification and decreasing pace of government procurement system – have left farmers more vulnerable. The presence of a mature SEBI-regulated national agricultural commodity exchange, coupled with progress in information and communications revolution, has benefited the entire commodity supply chain, including farmers, by offering a price discovery mechanism, reducing price volatility, and hedging of risk. The Commodity Exchanges NCDEX, MCX (deals with trading of few selected Agri. Commodities) and other exchanges are dealing with the forward/Futures trading of agricultural selected commodities based on certain specific parameters, criteria and norms. Farmer Producer Companies and Cooperatives have emerged as viable aggregation vehicles for small and marginal farmers to participate directly on the NCDEX / MCX platform to realize better prices and manage risk through informed judgement. It is reported (by NCDEX) that farmers dealing with exchange for trading their produces have received on an average around 15-25% higher net price realization. Further, in addition to this around 3% savings in costs from direct market access is accrued to the farmers. For instance, the agri. Commodity exchange like NCDEX and others are undertaking a range of multifaceted developmental activities to upgrade post-harvest practices, build capacity for marketing, disseminate information, and harness innovative bank credit and trade finance mechanisms to make the higher income of the farmers possible.

Government policy (mainly through the NABARD assistance) supports the formation of FPOs in India which may pave the way to achieve scale and deepen the benefits for small farmers connecting through the FPO route for their commodity trading with the Exchange i.e. through Commodity Derivative Markets. The Exchanges like NCDEX / others are also making efforts to link small-holder agriculture, commodity supply chains, processing industry, finance and government policies in a reliable and transparent way in order to double farmer incomes.

The main role of an exchange is to foster market transparency and price discovery, reduce opportunities for collusion among market actors, provide more accurate information to all market players and moderate agricultural commodity prices in case of high volatility.

Commodity exchanges are, therefore, intended to contribute to increasing market efficiency in commodity supply chains by reducing transaction costs, promoting transparency and institutional

development, and encouraging adherence to standards. The exchange leverages technology to broaden market access and allow trading at lower cost, in a greater number of contracts and instruments, at faster speeds, with enhanced trading and clearing functionality along with more robust regulatory and self-regulatory architectures, so that small and marginal farmers are able to benefit from participation.

Integrated Farming System

Introduction

Integrated Farming is a approach of Making the most out of a patch of land, smallholder farmers in India are mainly to adopt integrated farming system to sustain themselves and the environment

There are 115 million operational holdings in the country and about 80 % are marginal and small farmers. To fulfill the basic needs of household including food (cereal, pulses, oilseeds, milk, fruit, honey, meat, etc.), feed, fodder, fiber, etc. warrant an attention about Integrated Farming System (IFS). Undoubtedly, majority of the farmers are doing farming since long back but their main focus was individual components but not in a integrated manner.

The Research organizations (at center and state level) have been making a lot of efforts aiming at increasing the productivity of different components of farming system like crop, dairy, livestock, poultry, piggery, goat keeping, duckery, apiculture, sericulture, horticulture, mushroom cultivation etc. individually but lacking in their integration by following farming system approach.

The integration is made in such a way that product of one component should be the input for other enterprises with high degree of complimentary effects on each other. It is observed from various studies that the benefits of productivity improvement by 30-50% depending upon the number and kind of enterprises and their management. The integrated farming system is useful to realize better productivity, profitability and sustainable production systems that would help to solve the fuel, feed and energy crisis, create more employment avenues, ensure regular income and encourage agricultural oriented industry.

The growth rate of agriculture in the recent past is very slow inspite of the rapid economic growth in India. The growth rate of food grain production is not as desired relative to the population growth. It is projected that in our country population will touch 1370 million by 2030 and to 1600 million by 2050. To meet the demand, we have to produce 289 and 349 mt of food grains during the respective periods. The current scenario in the country indicates that area under cultivation may further dwindle and more than 20% of current cultivable area will be converted for non-agricultural purposes by 2030.

The operational farm holding in India is declining and about are below the size of 1 ha. Due to ever increasing population and decline in per capita availability of land in the country, practically there is no scope for horizontal expansion of land for agriculture. Only vertical expansion is possible by integrating farming components requiring lesser space and time and ensuring reasonable returns to farm families. The Integrated Farming Systems (IFS) therefore assumes greater importance for sound management of farm resources to enhance the farm productivity and reduce the environmental degradation, improve the quality of life of resource poor farmers and maintain sustainability. In order to sustain a positive growth rate in agriculture, a holistic approach is the need of the hour. Farming system is a mix of farm enterprises in which farm families allocate resources for efficient utilization of the existing enterprises for enhancing productivity and profitability of the farm. These farm enterprises are crop, livestock, aquaculture, agro-forestry, agri-horticulture and sericulture.

In such diversified farming, though crop and other enterprises coexist, the thrust is mainly to minimize the risk, while in IFS a judicious mix of one or more enterprises along with cropping there exist a complimentary effect through effective recycling of wastes and crop residues which encompasses additional source of income to farmer. IFS activity is focused around a few selected interdependent, inter-related and interlinking production system based on crops, animals and related subsidiary professions. Integrated farming system approach is not only a reliable way of

obtaining fairly high productivity with considerable scope for resource recycling, but also concept of ecological soundness leading to sustainable agriculture.

Goals of Integrated Farming System

The goals of IFS broadly are-

- Maximization of yield of all component enterprises to provide steady and stable income.
- Rejuvenation / amelioration of system's productivity and achieve agro-ecological equilibrium.
- Avoid build-up of insect-pests, diseases and weed population through natural cropping system management and keep them at low level of intensity.
- Reducing the use of chemicals (fertilizers and pesticides) to provide chemical free healthy produce and environment to the society.

Advantages of Integrated Farming System

• Increased productivity through increased economic yield per unit area per time by virtue of intensification of crop and allied enterprises.

• Improved profitability achieved mainly by way of reduced costs due to recycling of wastes of one enterprise as energy inputs for other systems.

• Greater sustainability in production on farm due to integration of diverse enterprises of different economic importance. Recycling of wastes being in built in the system, this helps to reduce dependence on external high-energy inputs thus conserving natural and scarce resources.

• Integration of different production systems provides an opportunity to solve malnutrition problem due to production of variety of food products.

• The recycling of wastes for production helps to avoid piling of wastes and consequent pollution.

• The farming system provides flow of money to the farmer round the year by way of disposal of eggs, milk, edible mushroom, honey, silkworm cocoons etc. This will help resource poor farmer to get out from the clutches of moneylenders/agencies.

• Because of the linkage of dairy/mushrooms/sericulture fruit crops/vegetable crops/flower cultivation etc. cash available round the year could induce small and marginal farmers adopt new technologies such as fertilizer, pesticides etc.

• Recycling of organic wastes reduces requirement of chemical fertilizer. Further, biogas production can meet household energy requirement. Thus, IFS, goes a long way in solving energy crises.

• Fodder/pasture/tree species included in the system help to get more fodder and thus solve fodder crises to some extent.

• Silvi component used in the system provides fuel and timber wood.

• Inclusion of timber component in the farming system reduces pressure on forests.

• Diverse components integrated can provide enough scope to employ farm labour round the year.

• Integrated farming system forces the entrepreneur to know more things and hence improves the literacy level.

• IFS provide opportunity for the growth of agri-oriented industries.

• There is also advantage of increased input use efficiency.

• Overall benefit of IFS is improved standard of living of the farmer because of the products like edible mushroom, fruits, eggs, milk, honey, vegetables etc.

Components in IFS

* Agriculture * Fish farming

* Horticulture * Duck rearing

* Forestry * Pigeon rearing

* Apiary * Mushroom cultivation

* Sericulture * Azolla farming

* Dairy * Kitchen gardening

* Poultry * Fodder production

* Goat rearing * Nursery

* Sheep rearing * Seed Production

* Piggery * Vermiculture

* Rabbitory * Value addition

Elements Of Integrated Farming System

Following elements may be included in IFS demonstrations depending upon the individual farmers resources, interest and opportunities.

• Watershed

• Farm ponds

• Bio-pesticides

• Bio-fertilizers

• Plant products as pesticides

• Bio-gas

• Solar energy

• Compost making (Vermi, Japanese, Improved etc.)

• Green manuring

• Rain water harvesting

Possible output of integrated farming system

Since Integrated Farming System (IFS) is an interrelated complex matrix of soil, water, plant, animal and environment and their interaction with each other enable the system more viable and profitable over the arable farming system. It leads to produce the quality food. To strengthen the food chain, it is essential to eliminate nutritional disorder which has been realized on account of appearing deficiency of mineral nutrients and vitamins in food being consumed. Horticultural and vegetable crops can provide 2-3 times more energy production than cereal crops on the

same piece of land and will ensure the nutritional security on their inclusion in the existing system. Similarly inclusion of bee-keeping, fisheries, sericulture, mushroom cultivation on account of space conservative also give additional high energy food without affecting production of food grains. The integration of these enterprises will certainly help the production, consumption and decomposition in a realistic manner in an ecosystem.

Likewise, it is pre-requisite in farming system to ensure the efficient recycling of resources particularly crop residues, because 80-90% of the micronutrients remains in the biomass. In the Indo-Gangetic plains, where rice straw is not recycled in an effective way and even in Punjab where rice cultivation is practised on 2.6 m ha produces about 16 m tonnes of paddy straw which is destroyed by burning. To curtail such precious input loss, the use of second generation machinery for efficient crop residue management to conserve moisture, improve soil micro-organism activities, regulate soil temperature, check soil erosion, suppress weed growth and on decomposition improves soil fertility. Its beneficial effect can also be accrued by incorporating with the soil. The crop residue can be used as floor thatch for cattle shed, composting, growing mushroom and for dry fodder also. Multiple use of water for raising crops, fruits, vegetables, and fishery may also enhance the water productivity. Likewise, in villages, the sewerage water can be purified through Hydrilla biomass before its release to fish pond. Besides, the community land in the villages, which are accessible to better use, must be used for productive purpose. Therefore, adoption of concept like social forestry, water harvesting and recycling fishery, and stall feeding to the animals (goatery / piggery) will add to the profit margin with other numerous indirect benefits of employment and improved ecology of the area. Such types of enterprise integration generate additional income varying from Rs 20, 000- 25,000/ha under irrigated and Rs 8,000-12,000 under rainfed ecosystem. The income enhancement due to integration of processing and on-farm value addition by 25-50%, yield improvement on account of improved soil health by 0.5-1.0 tonne/ha, cost reduction by Rs.500 - 1,000/ha and employment generation by 50-75 man days/household have also been observed.

Productivity enhancement by IFS

In view of serious limitations of horizontal expansion of land for agriculture, only alternative left is vertical expansion through various farm enterprises requiring less space and time but give high productivity and ensuring periodic income especially for the small and marginal farmers. The highlights about the research investigations carried out in India towards farming system outcome are discussed to conceptualize its significance towards farming community livelihood. In a study conducted at ICAR Research Complex, Goa, it was revealed that rice-brinjal crop rotation is the best in terms of productivity and profitability owing to higher yield of the brinjal. The system yielded a total productivity of 11.22 t/ha rice grain equivalent yield with a net return of Rs.46, 440/ha. Further, with the integration of mushroom and poultry production (based on the resources availability within the system) the system productivity was increased to 21, 487 kg/ha especially with rice-brinjal rotation leading to an additional returns of Rs 30,865/ha with integration. In addition, the system approach was found to sustainable as reflected from the changes in soil organic carbon and indicated by sustainability yield index.

In Tamil Nadu, the IFS increased the net return on an average of Rs 31,807/ha/year over the arable farming (Rs 19,505/ha/year). While in Goa, when coconut was inte- grated with crop, vegetables, mushroom, poultry and dairy enabled to enhance Rs 17,518/ha/annum over the cashewnut cultivation alone. In Madhya Pradesh, the integrated farming gave a margin in net return of Rs 17,198/ ha/year over the arable farming. In Uttar Pradesh, the average enhancement in return was Rs 45,736/ha/annum over the existing crop-based farming system.

In Haryana, conducted studies of various farming systems on 1 ha of irrigated and 1.5 ha of unirrigated land and found that under irrigated conditions of mixed farming with crossbred cows yielded the highest net profit (Rs 20,581/-) followed by mixed farming with buffaloes (Rs 6,218/-

) and lowest in arable farming (Rs 4,615/-). In another study conducted with 240 farmers of Rohtak (wheat-sugarcane), Hisar (wheat-cotton) and Bhiwani (gram-bajra) districts in Haryana which represented zones of different crop rotations revealed that maximum returns (Rs/ha) of 12,593, 6,746 and 2,317 were obtained from 1 ha with buffaloes in Rohtak, Hisar and Bhiwani, respectively. The highest net returns from Rohtak was attributed to the existence of a better soil fertility type and of irrigation facilities coupled with better control measures compared to other zones. In terms of total man days, Rohtak had the highest employment potential followed by Hisar and Bhiwani. The employment potential under mixed farming conditions was predominantly from livestock rather than crop production

Another study involving cropping, poultry, piegon, goat and fishery was conducted under wetland conditions of Tamil Nadu. Three years results revealed that integration of crop with fish (400 reared in 3 ponds of 0.04 ha each), poultry (20 babkok layer bird), pigeon (40 pairs), and goat (Tellichery breed of 20 female and 1 male in 0.03 ha deep litter system) resulted in higher productivity, higher economic return of Rs 1,31,118 (mean of 3 year). Integration of enterprises created the employment opportunities where in comparison to 369 mandays/year generated in cropping alone system, cropping with fish and goat created additional 207 mandays/annum The resources were recycled in such a way that fish were fed with poultry, pigeon and goat dropping. Similarly, extra poultry, pigeon and goat manure and composted crop residue of banana and sugarcane were applied to the crops . The four conventional cropping system tried were rice-rice-blackgram, maize-rice-blackgram, maize-ricesunhemp and rice-rice-sunhemp.

It is observed from some studies that rice + Azolla-cum-fish culture is one of the economical option in certain area. Monoculture system rely mainly on external inputs while in integrated system, recycling of nutrients takes place that help in reducing the cost of production for economic yield. The fish in rice field utilized the untapped aquatic productivity of rice ecosystem as the rice bottom is highly fertilized on account of the production of zoo and phytoplankton and these resources are fully utilized by the fish. The studies clearly advocated the beneficial effect of Azolla on rice+fish. The gross income obtained in rice + Azolla + fish was 25.7 % more over the rice crop and 6.9 % more over the rice + fish. The net income followed the same trend. Thus rice + Azolla + fish on an average gave Rs 8,817/ha more over the rice monoculture and Rs.3,219/ha over the rice + fish. This model was proposed for extensive scale adoption in Tamil Nadu.

Farming system is a resource management strategy to avail maximum efficiency of a particular system. Studies conducted at ICAR Research Complex for Goa revealed the higher energy use efficiency of IFS with rice. The mean total energy input varied considerably among the systems. Integration of poultry and mushroom enterprise with rice-brinjal system required highest energy input (52,030 MJ/ha) and followed by rice groundnut system integrated with mushroom and poultry (46,077 MJ/ha). However, rice cropping alone without any rice based crops or enterprises recorded the least requirement of energy. The energy output was maximum (1,65,334 MJ/ha) under rice-brinjal + mush room + poultry with 3.18 system energy efficiency mainly due to the lesser energy input involved in contrast to energy rich output enterprises. The output of all multi – rice based enterprise was reasonably good varying from 1,00,911 to 1,05,627 MJ/ha excluding brinjal crop based farming system. It is thus evident that efficient utilization of scarce and costly resource is the need of the hour and can be accrued by following the concept of IFS through supplementation of allied agro-enterprises.

Conclusion

Results discussed revealed that IFS enables the agricultural production system sustainable, profitable and productive. Further, it is evident that profit margin varied with the ecosystem (rainfed/irrigated), management skill, and socio-economic conditions. Simultaneously it takes

care of the food and nutritional security of the farming family.Therefore, there is an urgent need to promote the IFS concept under all agro-climatic conditions of the country.

The further thrust of IFS is

• There is a need to create the database on farming system in relation to type of farming system, infrastructure, economics, sustainability etc. under different farming situation.

• Need to develop research modules of farming system under different holding size with varying economically viable and socially acceptable systems.

• The assessment and refinement of the technologies developed at research station at cultivators' field.

• Need to prepare a contingent planning to counteract the weather vagaries/ climate threats under different farming situation.

• Need to prepare a policy draft for the consideration of planners for its promotion at large scale with nominal financial assistance either through short/ medium/ long term loans and other promotional advantage

Integrated Farming- An overview of system and incentives (subject to change time to time)

Broad Activity	Sub Activity	Pattern of Assistance	Name of Scheme
Crop Based Integrated Farming System	Cropping System (CS) with rice, wheat, coarse cereal/oil-seed/ibre/pulse based two crops.	50% of input cost limited to Rs. 10,000/-per ha with permissible assistance of maximum 2 ha/ beneficiary.	National Mission for Sustainable Agriculture (NMSA)
	Horticulture Based Farming System (Plantation + Crops/Cropping system)	50% of input cost limited to Rs. 25,000/- per ha with permissible assistance of maximum 2 ha/ beneficiary.	NMSA
	Tree/Silvi-Pastural/in-situ/ex-situ conservation of Non Timber Forest Produce (NTFP) (Plantation + Grass/ Crops/Cropping System)	50% of input cost limited to Rs. 15,000/- per ha with permissible assistance of maximum 2 ha/ beneficiary.	NMSA
Livestock based farming system	CB Cows + Mixed farming + Fodder Buffalo +Mixed farming +Fodder Cow/ buffalo+dairy+fodder cow/buffalo + small ruminants	50% of input cost of cropping system including cost of animals with one year concentrated food limited to Rs. 40,000/- per ha (2 milch animals + 1 ha CS) with permissible assistance of maximum 2 ha/beneficiary.	NMSA

	Small Ruminant + Mixed farming + Pasture Poultry/duckery + Mixed Farming Poultry/duckery + Fishery + Mixed Farming	50% of input cost of cropping system including cost of animals/birds with one year concentrated food limited to Rs. 25,000/- per ha (10 animals/50 birds + 1 ha Cropping System (CS) with permissible assistance of maximum 2 ha/ beneficiary.	NMSA
	Fishery Based Farming System	50% of input cost of cropping/vegetable system including cost of ish farming limited to Rs. 25.000/- per ha with permissible assistance of maximum 2 ha/beneficiary	NMSA

INTEGRATED FARMING IN INDIA – A SUCCESS STORY

Since his teens, Anjaneya has been actively involved in his two-acre family farm in Haliwana village, Karnataka, India. Now in his forties, he feels rejuvenated and has begun a new wave of innovations on his farm, even after all these years. In August, 2017 Anjaneya began applying Integrated Farming System (IFS) practices to his farm and he's excited that the change is finally paying off, helping him to secure his livelihood and enabling him to further invest in his farm.

Indian agriculture faces a serious challenge due to a recent decline in the size of land holdings. According to the Indian Agriculture Census, the size of the average landholding has declined from 2.28 hectares in 1970 to 1.16 hectares in 2010. This trend has made it increasingly difficult for farmers – particularly small and marginal farmers like Anjaneya – to run a sustainably profitable farm, and, should it continue, farmers would be reduced to working a mere 0.68 hectares by 2020 and only 0.32 hectares by 2030.

As landholdings dwindle in size and India's farmers and consumers grow more concerned about the environmental toll of their agricultural systems, farmers are beginning to doubt whether the strategies of the green revolution era are still applicable to the future they want to create for their land and their food. More and more Indians are advocating for alternative practices, such as natural and organic farming.

IFS presents an opportunity to align traditional knowledge with holistic farming techniques in order to develop a new strategy for living with nature, nurturing it for sustainable production and livelihoods. Project Saathi – a four-year Local Economic Development project implemented by Techno Serve with the support of Cargill – aims to support smallholders in the Davangere District of Karnataka by training farmers in best practices for agricultural development and diversification. Based on initial surveys, the Techno Serve team decided to focus on increasing the profitability of small landholdings by teaching farmers IFS techniques that are designed to require less space and time, and that ensure reasonable returns to farming households.

A happy and confident Anjaneya reports, "the Saathi project team met me and discussed in detail about IFS. They guided me on better planning of my land with a combination of agriculture, horticulture, forestry, and livestock. The project team also guided me on good agricultural practices and farm management, including the selection of suitable varieties of vegetables, staking

tomato and beans, proper spacing for good growth of plants, and optimum utilization of my land. I am so happy that I got additional income within six months of practicing IFS."

Integrated Farming Systems, a Holistic Approach to Sustainable Agriculture

Using IFS, Anjaneya has been able to better allocate resources, efficiently utilizing his existing systems while simultaneously enhancing their productivity and profitability, and reducing risk. A bird's eye view of Anjaneya's two acres would reveal 1.5 acres of areca nut, banana, and legumes, with vegetable crops covering the remaining land. Drip irrigation systems water Anjaneya's crops without wasting a single drop of water. Along the border of his plot he has planted silver oak, *Sesbania*, castor, and drumstick trees. It's a pretty bounty, but more than just crops they are also an interconnected system that helps his farm to thrive.

Within the plot, the legumes fix nitrogen into the soil, boosting the health and harvest of the vegetables that feed Anjaneya's family (and his cattle). Anjaneya owns three cows, which he feeds with paddy straw and green leaves from the border crops of his farm. These trees also create a fence to prevent the cattle from extending their grazing to the more tempting farm plot, and provide firewood and a natural trellis that Anjaneya uses to grow creeper plants. In addition to improving the nutritional diversity of his family's meals, these plants also provide premium prices, all through the power of carefully planted trees.

Increasing Profitability with Integrated Farming Systems

In addition to increasing his production and targeting premium crops, Anjaneya is also improving his farm's profitability by using IFS to save resources and money. Manure from his livestock is saved and used to produce vermicompost. This compost uses certain worm species to create nutrient-rich soil for his farm, and also helps him to minimize his use of chemical fertilizers. This strategy helps Anjaneya to improve his yields while saving money on inputs, and is better for the health of his family and the planet. With healthy soil, Anjaneya's land can support more crops, and TechnoServe teams advised him to intercrop his farm with vegetables such as tomato and spinach, and to add banana trees to his areca nut plantation.

These integrated approaches to farming have not only transformed Anjaneya's agricultural mindset, but have changed the business dynamics on the farm, yielding better returns. Anjaneya has already sold more than $500 worth of vegetables in the local market and expects sales of over $5,000 from his bananas over the course of the year.

Looking toward a more prosperous future, Anjaneya plans to invest this increased income in mechanized farming equipment that will help him to more efficiently scale IFS on his farm. He also plans to rent the machines to other farmers, and ultimately aims to improve the quality of children's education through his new financial stability.

Anjaneya's success story has motivated other farmers in his village as well. The growth of his farm showcases the key opportunities of IFS: stabilizing income, rejuvenating soil, improving productivity, strengthening resistance to pests and diseases, and generating chemical-free, health-conscious produce that benefits the environment and society. Five other farmers in his area have now taken up IFS, with Anjaneya providing valuable periodic guidance to ensure that the farms are progressing well.

The Saathi Project works in 27 villages in the Davangere district and has enabled 95 farmers to implement IFS across 670 acres of land, using the model to combine traditional agricultural practices with more profitable techniques for a better future for farms, families, and the environment.

Soil Health Card Scheme

Soil Health Card (SHC) Scheme is a Government of India's scheme promoted by the Department of Agriculture & Co-operation under the Ministry of Agriculture and Farmers' Welfare in 19 February 2015 with a plan to issue the cards to 14 crore farmers. . It is being implemented through the Department of Agriculture of all the State and Union Territory Governments. A SHC is meant to give each farmer soil nutrient status of his/her holding and advice him/her on the dosage of fertilizers and also the needed soil amendments, that she/he should apply to maintain soil health in the long run.

SHC is a printed report that a farmer will be handed over for each of his holdings. It will contain the status of his soil with respect to 12 parameters, namely N,P,K (Macro-nutrients) ; S (Secondary- nutrient) ; Zn, Fe, Cu, Mn, Bo (Micro - nutrients) ; and pH, EC, OC (Physical parameters). Based on this, the SHC will also indicate fertilizer recommendations and soil amendment required for the farm.

The card will contain an advisory based on the soil nutrient status of a farmer's holding. It will show recommendations on dosage of different nutrients needed. Further, it will advise the farmer on the fertilizers and their quantities he should apply, and also the soil amendments that he should undertake, so as to realize optimal yields

It will be made available once in a cycle of 3 years, which will indicate the status of soil health of a farmer's holding for that particular period. The SHC given in the next cycle of 3 years will be able to record the changes in the soil health for that subsequent period.

Soil samples will be drawn in a grid of 2.5 ha in irrigated area and 10 ha in rain- fed area with the help of GPS tools and revenue maps. The State Government will collect samples through the staff of their Department of Agriculture or through the staff of an outsourced agency. The State Government may also involve the students of local Agriculture / Science Colleges.Soil Samples are taken generally two times in a year, after harvesting of Rabi and Kharif Crop respectively or when there is no standing crop in the field.

Soil Samples will be collected by a trained person from a depth of 15-20 cm by cutting the soil in a "V" shape. It will be collected from four corners and the centre of the field and mixed thoroughly and a part of this picked up as a sample. Areas with shade will be avoided. The sample chosen will be bagged and coded. It will then be transferred to soil test laboratory for analysis. It is a facility for testing the soil sample for 12 parameters as indicated in reply to question number 2. This facility can be static or mobile or it can even be portable to be used in remote areas.
The soil sample will be tested as per the approved standards for all the agreed 12 parameters in the following way:

- At the STLs owned by the Department of Agriculture and by their own staff.
- At the STLs owned by the Department of Agriculture but by the staff of the outsourced agency.
- At the STLs owned by the outsourced agency and by their staff.
- At ICAR Institutions including KVKs and SAUs.
- At the laboratories of the Science Colleges/Universities by the students under supervision of a Professor/ Scientist.

A sum of Rs. 190 per soil sample is provided to State Governments. This covers the cost of collection of soil sample, its test, generation and distribution of soil health card to the farmer.

Performance

As of July 2015, only 34 lakh SHC were issued to farmers as against a target of 84 lakh for the year 2015–16. The number grew up to 1.12 crore by February 2016. As of February 2016, against the target of 104 lakh soil samples, States reported a collection of 81 lakh soil samples and tested 52 lakh samples. As on 16.05.2017, 725 lakh Soil Health Cards have been distributed to the farmers. The progress made during 2017-18 are:- **Cycle-I :** Target for samples collection and testing-2,53,49,546**:** Samples Collected-2,53,49,546* , Samples Registered - 2,81,81,940**, Samples Tested - 2,53,49,546*, Test Results Entered - 2,43,88,976**. For printing and distribution of SHCs - 10,73,89,421: SHCs Printed - 10,73,89,421* , Farmer details entered-7,96,87,907**,SHCsDispatched-10,73,89,421*, SHCs on portal-6,61,81,621**.**Cycle-II:** Target for samples collection and testing - 2,73,99,247**:** Samples Collected- 2,65,35,491*, Samples Registered - 1,86,06,106**, Samples Tested-2,38,22,886*, Test Results Entered - 1,55,23,304**. Target for printing and distribution of SHCs-12,04,52,133,SHCsPrinted-8,26,19,866*, Farmer details entered -8,74,98,352**, SHCs Dispatched-7,79,03,429* , SHCs on portal - 7,08,41,110** (* Information as reported, ** Information available on portal)

Benefits

- The farmers will be notified about the soil type and they can plant crops accordingly.
- The authorities provide a report to the farmers once in 3 years after observing the soil regularly. This makes the farmers not to be concerned about the cultivation even if the soil changes due to natural factors.
- The farmers are also given advice by the experts to improve the productivity of the crops and the necessary methods that have to be practised in order to implement the changes.
- The Government sees that the same person is carrying out all the soil analysis so that there can be further changes that can be made if required.
- The farmers will be informed about the needed nutrients in the soil.

As the scheme aims to promote soil test based and balanced use of fertilizers to enable farmers to release higher yields at lower cost along with creating awareness for the growers about the appropriate amount of nutrients for the concerned crop depending on the quality of soil, it is expected that. Productivity improvement of farmers through judicious use of inputs will take place which will help them to enhance their income.

National Horticulture Mission (NHM)

National Horticulture Mission (NHM) is an Indian horticulture Scheme promoted by Government of India. It was launched under the 10th five-year plan in the year 2005-06.While Government of India contributes 85%, 15% share is contributed by State Governments.

Objectives of the Mission

The NHM's key objective is to develop horticulture to the maximum potential available in the state and to augment production of all horticultural products (fruits, vegetables, flowers, coco,

cashew nut, plantation crops, spices, medicinal aromatic plants) in the state. Other objectives include:

1. To provide holistic growth of the horticulture sector through an area based regionally differentiated strategies
2. To enhance horticulture production, improve nutritional security and income support to farm households
3. To establish convergence and synergy among multiple on-going and planned programmes for horticulture development
4. To promote, develop and disseminate technologies, through a seamless blend of traditional wisdom and modern scientific knowledge
5. To create opportunities for employment generation for skilled and unskilled persons, especially unemployed youth

Impact of the Mission

India has witnessed voluminous increase in horticulture production over the last few years. After the launch of National Horticulture Mission (NHM) in 2005-06, significant progress has been made in area expansion under horticulture crops resulting in higher production. Over the last decade, the area under horticulture grew at an average rate of around 2.7% per annum and annual production increase at an average rate of around 7.0% per annum. So horticulture production in the country has been increasing since implementation of NHM. For holistic growth of the horticulture sector covering fruits, vegetables, root and tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo, Government has launched Mission for Integrated Development of Horticulture (MIDH), a Centrally Sponsored Scheme during XII Plan w.e.f. 2014-15. The Mission subsumes the earlier missions like National Horticulture Mission (NHM), Horticulture Mission for North East & Himalayan States (HMNEH), National Bamboo Mission (NBM), National Horticulture Board (NHB), Coconut Development Board (CDB) and Central Institute for Horticulture (CIH), Nagaland. All States and UTs are covered under MIDH.

The mission envisages production and productivity improvement of horticulture crops including fruits and vegetables through various interventions. Activities such as production of planting material, vegetable seed production, coverage of area with improved cultivars, rejuvenation of senile orchards, protected cultivation, creation of water resources, adoption of Integrated Pests Management (IPM), Integrated Nutrients Management (INM), organic farming, including insitu generation of organic inputs are taken up for development of fruits and vegetables. Capacity building of farmers and technicians are also provided for adopting improved technologies. The scheme also envisages creation of infrastructure for Post Harvest Management (PHM), Good Agricultural Prices (GAP), Centre for excellence for horticulture and marketing for holistic growth of horticulture sector.

Contract Farming

Contract farming can be defined as agricultural production carried out according to an agreement between a buyer and farmers, which establishes conditions for the production and marketing of a farm product or products. Typically, the farmer agrees to provide agreed quantities of a specific agricultural product. These should meet the quality standards of the purchaser and be supplied at the time determined by the purchaser. In turn, the buyer commits to purchase the product and, in some cases, to support production through, for example, the supply of farm inputs, land preparation and the provision of technical advice.

Contract farming- Business Models

Informal model - This model is the most transient and speculative of all contract farming models, with a risk of default by both the promoter and the farmer". However, this depends on the situation: interdependence of contract parties or long-term trustful relationships may reduce the risk of opportunistic behaviour. Special features of this CF model are:

- Small firms conclude simple, informal seasonal production contracts with smallholders.
- The success often depends on the availability and quality of external extension services.
- Embedded services, if at all provided, are limited to the delivery of basic inputs, occasionally on credit; advice is usually limited to grading and quality control.
- Typical products: requiring minimal processing/ packaging, vertical coordination; e.g. fresh fruit/ vegetables for local markets, sometimes also staple crops.

Intermediary model - In this model, the buyer subcontracts an intermediary (collector, aggregator or farmer organization) who formally or informally contracts farmers (combination of the centralized/ informal models). Special characteristics of this CF model are:

- The intermediary provides embedded services (usually passing through services provided by buyers against service charges) and purchases the crop.
- This model can work, if well-designed and if incentive-structures are adequate and control mechanisms are in place.
- This model can bear disadvantages for vertical coordination and for providing incentives to farmers (buyers may lose control of production processes, quality assurance and regularity of supplies; farmers may not benefit from technology transfer; there is also a risk of price distortion and reduced incomes for farmers).

Multipartite model - This model can develop from the centralized or nucleus estate models. It involves various organizations such as governmental statutory bodies alongside private companies and sometimes financial institutions. Special features:

- This model may feature as joint ventures of community companies with domestic/ foreign investors for processing.

- The vertical coordination depends on the discretion of the firm. Due attention has to be paid to possible political interferences.
- This model may also feature as farm-firm arrangement complemented by agreements with 3rd party service providers (e.g. extension, training, credits, inputs and logistics).
- Separate organizations (e.g. cooperatives) may organize farmers and provide embedded services (e.g. credits, extension, marketing, sometimes also processing).
- This model may involve equity share schemes for producers.

Centralized model - In this model, the buyers' involvement may vary from minimal input provision (e.g. specific varieties) to control of most production aspects (e.g. from land preparation to harvesting). This is the most common CF model, which can be characterized as follows:

- The buyer sources products from and provides services to large numbers of small, medium or large farmers.
- The relation/ coordination between farmers and contractor is strictly vertically organized.
- The quantities (quota), qualities and delivery conditions are determined at the beginning of the season.
- The production and harvesting processes and qualities are tightly controlled, sometimes directly implemented by the buyer's staff.
- Typical products: large volumes of uniform quality usually for processing; e.g. sugar cane, tobacco, tea, coffee, cotton, tree crops, vegetables, dairy, poultry.

Nucleus estate model - In this model, the buyer sources both from own estates/ plantations and from contracted farmers. The estate system involves significant investments by the buyer into land, machines, staff and management. This CF model can be characterized as follows:

- The nucleus estate usually guarantees supplies to assure cost-efficient utilisation of installed processing capacities and to satisfy firm sales obligations respectively.
- In some cases, the nucleus estate is used for research, breeding or piloting and demonstration purposes and/ or as collection point.
- The farmers are at times called 'satellite farmers' illustrating their link to the nucleus farm. This model was in the past often used for state owned farms that re-allocated land to former workers. It is nowadays also used by the private sector as one type of CF. This model is often referred to as "outgrower model".
- Typical products: perennials

Advantages

Contract farming is looking towards the benefits both for the farm-producers (farmers) as well as to the agro-processing firms. (**for Produers/Farmers**)

- Makes small scale farming competitive - small farmers can access technology, credit, marketing channels and information while lowering transaction costs
- Assured market for their produce at their doorsteps, reducing marketing and transaction costs
- It reduces the risk of production, price and marketing costs.
- Contract farming can open up new markets which would otherwise be unavailable to small farmers.
- It also ensures higher production of better quality, financial support in cash and /or kind and technical guidance to the farmers.
- In case of agri-processing level, it ensures consistent supply of agricultural produce with quality, at right time and lesser cost.

(for Agri-based firms)

- Optimally utilize their installed capacity, infrastructure and manpower, and respond to food safety and quality concerns of the consumers.
- Make direct private investment in agricultural activities.
- The price fixation is done by the negotiation between the producers and firms.
- The farmers enter into contract production with an assured price under term and conditions.

Challenges

- Contract farming arrangements are often criticized for being biased in favor of firms or large farmers, while exploiting the poor bargaining power of small farmers.
- Problems faced by growers like undue quality cut on produce by firms, delayed deliveries at the factory, delayed payments, low price and pest attack on the contract crop which raised the cost of production.
- Contracting agreements are often verbal or informal in nature, and even written contracts often do not provide the legal protection in India that may be observed in other countries . Lack of enforceability of contractual provisions can result in breach of contracts by either party.
- Single Buyer – Multiple Sellers (Monopsony).
- Adverse gender effects - Women have less access to contract farming than men.

Policy Support

Agricultural marketing is regulated by the States' Agricultural Produce Marketing Regulation (APMR) Acts. In order to regulate and develop practice of contract farming, Government has been actively advocating to the States/ Union Territories (UTs) to reform their agri marketing laws to provide a system of registration of contract farming sponsors, recording of their agreements and proper dispute settlement mechanism for orderly promotion of contract farming

in the country. So far, 21 States (Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Maharashtra, Madhya Pradesh, Mizoram, Nagaland, Odisha, Punjab (separate Act), Rajasthan, Sikkim, Telangana, Tripura and Uttarakhand) have amended their Agricultural Produce Marketing Regulation (APMR) Acts to provide for contract farming and of them, only 13 States (Andhra Pradesh, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Maharashtra, Madhya Pradesh, Odisha, Rajasthan and Telangana) have notified the rules to implement the provision.

NABARD's Initiatives in contact farming

NABARD developed a special refinance package for contract farming arrangements (within and outside AEZs) aimed at promoting increased production of commercial crops and creation of marketing avenues for the farmers. The various initiatives undertaken by NABARD in this direction are:

- Financial Interventions
- Special Refinance package for financing farmers for contract farming in AEZs
- 100% refinance to disbursements made by CBs, SCBs, RRBs and select SCARDBs (having net NPA less than 5%)
- Term facility for repayments (3 years)
- Fixation of higher scale of finance for crops under contract farming.
- Extension of refinance scheme for financing farmers for contract farming in AEZs to contract farming outside AEZs besides coverage of medicinal and aromatic plants.
- Extension of Refinance scheme for contract farming under Automatic Refinance Facility.

Agricultural Produce Suitable for CF

The various agricultural produce are suitable for practices under contract farming like tomato pulp, organic dyes, poultry, pulpwood, mushrooms, dairy processing, edible oils, exotic vegetables, baby corn cultivation, basmati rice, medicinal plants, potato for making chips and wafers, onions, mandarin oranges, durum wheat, flowers and orchids, etc.

Minimum requirement for Contract Farming- Key points

Broadly, the project must:

- not result in farmers' overspecialisation in certain crops to the detriment of building resilience and contributing to local food security;
- promote sustainable farming practices and not promote reliance on chemicals or expensive seeds, or lead to excessive debts;
- lead to higher incomes for farmers than they would otherwise earn, and compared to alternative models
- substantially include women farmers and promote their rights;
- promote the land rights of farmers;

- apply free, prior and informed consent of those affected in terms of project design and implementation.

In relation to contractual terms, the project should:

- be negotiated transparently and fairly among the parties, providing adequate information at all times on the financial aspects of the project and the risks and likely impacts;
- consider alternative contract farming models;
- be regulated by a written contract spelling out the details and obligations of both the company and the out-growers, and which must be written in a clear and understandable way with out-growers given sufficient time to review it;
- be transparent about how the price is determined, the duration of the project and how production inputs and other services are to be supplied and used by farmers;
- build in a clause for the renegotiation of the contract at agreed intervals, and specify the sharing of production and market risks among the parties;
- track and communicate performance to affected stakeholders to build accountability at the operational level;
- prevent unfair practices in buyer-farmer relations, and not prohibit or discourage farmers from associating with other farmers to compare contractual clauses or to address concerns or problems;
- have clear mechanisms for settling disputes.

The government should:

- act as a third party, or mediator, between the parties and not be a mouthpiece for the company sponsor;
- have appropriate legislation to ensure that farmers' rights can be enforced.

Organic Farming

Farmers are adopting organic farming practices and reaping more benefits; the more organic and natural the produce, the safer and healthier it is for us and for the environment. Farming, as we know, is a traditional occupation that's been followed since time immemorial. But the organic farming concept is gaining prominence in India.

Organic farming is a system which avoids or largely excludes the use of synthetic inputs (such as fertilisers, pesticides, hormones, feed, etc.) and to the maximum extent feasible relies upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilisation and plant protection.

Though the concept is not new to us, we are seeing a rise in organic farming, as it is the need of the hour. Consumers are becoming highly conscious about their health and the foods they consume — more and more people are opting for organic food to avoid the consumption of foods that are grown using chemical preservatives.

Taking the organic route

In order to yield early and abundant produce, a lot of farmers in the rural areas have been using chemical fertilisers, pesticides and hormone applications — also due to a lack of knowledge. But this is gradually changing as more farmers taking the organic route.

This system helps producing or supporting farmers to yield fresh and unadulterated produce that is healthy for consumption. Also, with more number of people preferring to consume organic food, and with the number of organic e-commerce stores popping up in various cities, it seems like people are moving towards the right direction.

Organic methods can increase farm productivity, repair decades of environmental damage and knit small farm families into more sustainable distribution networks leading to improved food security if they organize themselves in production, certification and marketing. During last few years an increasing number of farmers have shown lack of interest in farming and the people who used to cultivate are migrating to other areas. Organic farming is one way to promote either self-sufficiency or food security. Use of massive inputs of chemical fertilizers and toxic pesticides poisons the land and water heavily. The after-effects of this are severe environmental consequences, including loss of topsoil, decrease in soil fertility, surface and ground water contamination and loss of genetic diversity.

Organic farming which is a holistic production management system that promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity is hence important. Many studies have shown that organic farming methods can produce even higher yields than conventional methods. Significant difference in soil health indicators such as nitrogen mineralization potential and microbial abundance and diversity, which were higher in the organic farms can also be seen. The increased soil health in organic farms also resulted in considerably lower insect and disease incidence. The emphasis on small-scale integrated farming systems has the potential to revitalize rural areas and their economies.

Advantages of Organic Farming

- It helps to maintain environment health by reducing the level of pollution.
- It reduces human and animal health hazards by reducing the level of residues in the product.
- It helps in keeping agricultural production at a sustainable level.
- It reduces the cost of agricultural production and also improves the soil health.
- It ensures optimum utilization of natural resources.
- It not only saves energy for animal and machine but also reduces risk of crop failure.

- It improves the soil physical properties, improves water-holding capacity and reduces soil erosion.
- It improves the soil's chemical properties such as supply and retention of soil nutrients, reduces nutrient loss into water bodies and environment and promotes favourable chemical reactions.

Nutrient Management in Organic Farming

In organic farming, it is important to constantly work to build a healthy soil that is rich in organic matter and has all the nutrients that the plants need. Several methods viz. green manuring, addition of manures and biofertilizers etc can be used to build up soil fertility. These organic sources not only add different nutrients to the soil but also help to prevent weeds and increase soil organic matter to feed soil microorganisms. Soil with high organic matter resists soil erosion, holds water better and thus requires less irrigation. Some natural minerals that are needed by the plants to grow and to improve the soil's consistency can also be added. Farmers also make compost from animal manures and mushroom compost. Before compost can be applied to the fields, it is heated and aged for at least two months, reaching and maintaining an internal temperature of 130°-140°F to kill unwanted bacteria and weed seeds. A number of organic fertilizers / amendments and bacterial and fungal biofertilizers can be used in organic farming depending upon availability and their suitability to crop. Different available organic inputs are 1. Organic manures and 2. Bacterial and fungal biofertilizers (viz. Rhizobium, Azotobacter, Azospirillum, Plant growth promoting rhizobacteria, Phosphorus-solubilizing bacteria (PSB), Mycorrhizal fungi., Blue green algae (BGA) and Azolla etc.)

Weed Management in Organic Farming

In organic farming, chemical herbicides cannot be used. So weeding can be done only manually. Different cultural practices like tillage, flooding, mulching can be used to manage the weeds. Besides, biological (pathogen) method can be used to manage the loss due to weeds. When the ground is fallow, a cover crop can be planted to suppress weeds and build soil quality. Weeds growth can also be limited by using drip irrigation whenever possible, which restricts the distribution of water to the plant line.

Insect pest Management in Organic Farming

In organic farming, the presence of pests (where and when) is anticipated in advance and accordingly the planting schedules and locations are adjusted as much as possible to avoid serious pest problems. The main strategy to combat harmful pests is to build up a population of beneficial insects, whose larvae feed off the eggs of pests. When faced with a pest outbreak that cannot be handled by beneficial insects, the use of natural or other organically approved insecticides like neem pesticides is done. The two most important criteria for allowed organic pesticides are low toxicity to people and other animals and low persistence in the environment as envisaged by the National Organic Standards.

Diseases Management in Organic Farming

Plant diseases are major constraints for reductions in crop yield and quality in organic and low input production systems. Proper fertility management to crops through balanced supply of

macro and micronutrients and adoption of crop rotation have shown to improve the resistance of crops to certain diseases. Thus one of the biggest rewards of organic farming is healthy soil that is alive with beneficial organisms. These healthy microbes, fungi and bacteria keep the harmful bacteria and fungi that cause disease in check.

Limitations and implications of Organic Farming

There are a few limitations with organic farming such as

1. Organic manure is not abundantly available and on plant nutrient basis it may be more expensive than chemical fertilizers if organic inputs are purchased.
2. Production in organic farming declines especially during first few years, so the farmer should be given premium prices for organic produce.
3. The guidelines for organic production, processing, transportation and certification etc are beyond the understanding of ordinary Indian farmer.
4. Marketing of organic produce is also not properly streamlined.

In dry lands, covering over 65% cultivated area in India; application of chemical fertilizers and pesticides is always low. So these areas are at least “relatively organic” or “organic by default” and a portion of these lands can be converted easily to an organic one to provide better yields/returns. India can greatly benefit from the export of organic foods, but needs to seriously devote attention to market intelligence regarding which product to grow, where to sell, distribution channels, competition, marketing access etc. Presently, good awareness exists among farmers, researchers and policy makers about organic production but a lot more need to be done to streamline production, certification and marketing of organic produce.

It can thus be concluded that due to the inherent features of organic farming the popularity of its products are increasing day by day expanding the opportunities for its markets which will ultimately going to benefit the farmers in enhancing their income.

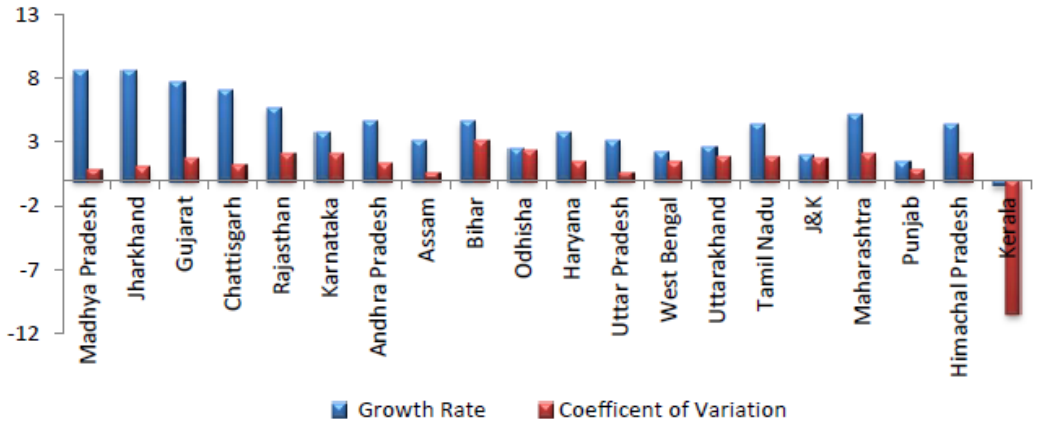
Prime Minister FasalBimaYojana(PMFBY) - its Implementation in Odisha

Introduction

Indian agriculture has little more than half (53 percent) of its area still rain fed. This makes it highly sensitive to weather conditions, causing uncertainty in agricultural output. Extreme weather conditions such as floods, droughts, heat waves, cyclones and hailstorms cause extensive crop damage. Subtle fluctuations in weather during critical phases of crop development can have a substantial impact on yields. Climate change increases agricultural risk by increasing variability in rainfall, causing water stress, enhancing susceptibility to plant diseases and pest attack and, more importantly, raising the frequency, intensity and duration of extreme weather events like droughts, floods, cyclones and storm surges. According to the fifth report of the Inter-Governmental Panel on Climate Change (IPCC), the average combined land and ocean surface temperature data has shown an increase of 0.85°C over the period 1880 to 2012. Climate change will be particularly hard on agricultural production in Africa and Asia. For wheat, rice and maize in tropical and temperate regions, climate change without adaptation is projected to negatively impact production. Therefore, it is necessary for countries to develop strategies for adaptation to climate changes.

The growth of agriculture in India has varied across states (Figure 1). Variations in the performance of agricultural growth across states and year to year fluctuations are major causes for concern for long term food security and also for welfare of farmers. The coefficient of variation indicates the volatility in agricultural growth rates across various states. A high coefficient of variation, indicating high volatility is observed in states like Kerala, Bihar, Rajasthan, Karnataka and Maharashtra.

Figure 1: Average Annual Growth Rate (%) and Coefficient of Variation of GSDP Agriculture (2005-06 to 2014-15)



Source: National Accounts Statistics, CSO

Farmers primarily face two types of risks – yield risk and price risk. An unplanned and major variation in either the yield or price of a crop in a particular agricultural cycle can translate into significant losses to the farmer.

Yield risk refers to uncertainty regarding the quantity and quality of agricultural product harvested at the end of an agricultural cycle. Erratic rainfall distribution has an adverse impact on agricultural production. On an average, crops on 12 million hectares of land are damaged annually by natural calamities and adverse seasonal conditions in the country (Planning Commission, Eleventh Five-year Plan, 2007-2012). In the last fifteen years, there have been several years when deficiency in rainfall has adversely affected agricultural production. In 2002, rainfall deficit was 19 per cent due to which there was a loss of 38 million tonnes of food grains. The 2009 drought was the third worst since 1901, when a rainfall deficit of 18 per cent was recorded and there was a production loss of about 16 million tonnes of food grains.

Price risk refers to the uncertainty about prices that farmers receive for their produce. During years of high production, prices of crops slide downwards, affecting the incomes of farmers. There have been times when higher production of crops has led to prices falling to very low levels, even below MSP levels as happened after the Kharif of 2016 and 2017 in case of several pulses and oilseeds. Furthermore, farmers have not been adequately protected by MSPs in all states. Although MSPs are announced by the government for 23 commodities, they are mainly implemented for rice and wheat and that too in a few states of the country. The price risk is becoming more pronounced as Indian agriculture opens to global trade. In 2017-18, prices of several agricultural commodities like tur, urad, soybean, groundnut etc. remained much lower than MSP causing widespread distress to farmers in several states.

Income of farmers depends on both prices and yield, which are inversely related to each other. When aggregate production of a commodity increases, market prices tend to decrease, and when yields fall, prices generally rise. This offsetting nature of price and production effects has somewhat cushioning impact on farmers' incomes.

Traditionally, successive governments have dealt with agricultural distress by relying on the practice of announcing relief packages from time to time. In 2006, a rehabilitation package of Rs 16,978.69 crore for farmers in 31 suicide-prone districts in Maharashtra, Kerala, Karnataka and Andhra Pradesh was approved. The Agricultural Debt Waiver and Debt Relief Scheme (ADWDRS) was announced in May 2008, which cost the government Rs 52,516.86 crore. Recently, six states-Tamil Nadu, Maharashtra, Uttar Pradesh, Rajasthan, Karnataka and Punjab have announced farm-debt waivers and this is expected to spread to other states as well. Besides these irregular relief packages, the government also provides assistance to states from the State and National Disaster Response Fund. The cumulative amount released by the Centre for all calamities including drought and flood from National Disaster Response Fund between 2011-12 and 2015-16 amount to Rs. 24,055 crore1. These ad hoc relief measures provided by the government, in the wake of natural calamities, are characterised by severe limitations – lack of transparency in terms of any robust scientific basis for estimating compensation, non-payment in many cases, inadequate amount of compensation under SDRF and NDRF and delayed payment to farmers. Therefore, there is urgent need to develop a robust insurance system to insulate farmers from risks faced by them.

Although agricultural insurance has been present in the country since 1972, it suffers from operational weaknesses and it has not been able to adequately protect farmers against yield and price volatility.

This paper highlights the implementation of flagship Agricultural Insurance Scheme i.e. Prime Minister FasalBimaYojana in the State of Odisha and highlights the major challenges that the State is encountering during implementation.

The first nation-wide crop insurance scheme was the Comprehensive Crop Insurance Scheme (CCIS) introduced in Kharif, 1985-. This scheme was based on an area approach and area units were identified for the purpose of assessing indemnity. This was replaced by National Agriculture Insurance Scheme (NAIS) in Rabi 1999-2000, which was further changed to the Modified National Agricultural Insurance Scheme (MNAIS) during Rabi 2010-11 (Annexure 1). Apart from these schemes, several other pilot projects such as Seed Crop Insurance (1999-00), Farm Income Insurance Scheme (Rabi 2003-04) and Weather Based Crop Insurance Scheme (Kharif 2007) were implemented from time to time. In April 2016, Pradhan MantriFasalBimaYojana (PMFBY) - an area based scheme and Restructured Weather Based Crop Insurance Scheme (RWBCIS) was introduced.

Pradhan MantriFasalBimaYojana (PMFBY) - Kharif 2016 onwards
Realizing the limitations of existing system of crop insurance that was not able to meet the needs of farmers, the Government of India announced a new crop insurance program. PMFBY scheme became operational from Kharif, 2016 with an objective to provide adequate insurance coverage and financial support to the farmers in the event of crop failure.

PMFBY shows considerable improvement in the model especially in area of premium with uniform premium of only 2% to be paid by farmers for all Kharif crops and 1.5% for all Rabi crops. In case of annual commercial and horticultural crops, the premium to be paid by farmers will be only 5%. The premium rates to be paid by farmers are very low and balance premium will be paid by the Government to provide full insured amount to the farmers against crop loss on account of natural calamities. There is no upper limit on Government subsidy. Even if balance premium is 90%, it will be borne by the Government. Earlier, there was a provision of capping the premium rate which resulted in low claims being paid to farmers. This capping was done to limit Government outgo on the premium subsidy. This capping has now been removed and farmers will get claim against full sum insured without any reduction. The use of technology of Smart phones to capture and upload data of crop cutting to reduce the delays in claim payment to farmers and Remote sensing to reduce the number of crop cutting experiments is the most considerable modification to reduce losses and make the financial viable. Without adequate use of technology in previous schemes, burden fell on state governments to conduct crop cutting experiments to estimate the actual yield and thereby calculate losses. Such experiments were often poorly done and do not give real value of the produce. Moreover, the calculation of premiums in NAIS and MNAIS were based on 3 years past records which made the premiums hefty. Delinking the premiums with past records is progress on determining actuarially fair premiums.

The insurance unit defined in the scheme is a village as against the revenue administrative unit of a block in previous schemes. A block covers a large area with sub regional weather variations, risk of exclusion in previous scheme was higher. Localised risk coverage of hail storms, land slide and inundation are included. Post-harvest coverage of cyclonic and unseasonal rains is also covered under the scheme. Provision of direct transfers to accounts will try to reduce the time taken in settling the claims in addition to reducing corruption.

Features of the new scheme

(i) Sum Insured- The sum insured is equal to the Scale of Finance (SoF) for that crop as fixed by District Level Technical Committee. Sum Insured for individual farmer is now

equal to the Scale of Finance per hectare multiplied by area of the notified crop proposed by the farmer for insurance. The scale of finance takes into account the cost of cultivation on the basis of land quality, irrigation expenses and facility as well as cost of fertilizers, seeds and labour which varies from one district to another.

(ii) Premium Rates: The premium rates payable by farmers for Food Crops and Oilseeds (FCOS) is fixed at 2 percent of the Sum Insured or Actuarial rate, whichever is less, for Kharif season and 1.5 percent for Rabi season. For commercial/horticulture crops, premium rate of 5 percent is fixed to be paid by the farmer. The difference between premium rate and rate of insurance payable by farmers will be shared by the Central government and the State government equally as premium subsidy.

(iii) Estimation of Crop Yield: The minimum number of Crop Cutting Experiments (CCEs) required at village level is 4 for major crops and 8 for other crops. Inputs from RST/satellite imagery would also be utilized in optimizing the sample size of CCEs.

(iv) Use of modern technology: The CCEs have been lacking in reliability and speed in estimation of crop yield. The use of mobile based technology with GPS stamping was recommended to improve the quality of data and make faster assessment of claims. The expense in procuring handheld devices/smart phones are to be borne equally by the Centre and the State, with a cap on total funds to be made available by the Central government. The use of technology available in the fields of remote sensing, aerial imagery, satellites etc. would reduce manpower and infrastructure. It is estimated that using a mix of modern technology can be expected to minimize the number of CCEs by about 30 percent.

(v) Role of Private players: The public sector company, Agriculture Insurance Company (AIC) of India along with other public and private insurance companies are participating in the new crop insurance scheme. The selection of Implementing Agency (IA) is made by state governments by adopting a cluster approach consisting of 15-20 'good' and 'bad districts', based on risk profile, with reference to the bid to be laid out. Selection of IA is to be made through competitive bidding upto 3 years.

(vi) Time frame for loss assessment: The cut-off date for the receipt of yield data is within one month of final harvest. Processing, approval and payment of final claims is based on the yield data and it is to be completed within three weeks from receipt of yield data.

(vii) Timely release of premium subsidy to Insurance Companies: The government (both Central and State) must release 50 percent share of premium subsidy to insurance companies, in the beginning of every crop season, based on fair estimates submitted by them, and settle balance of actual premium subsidy for season as soon as final figures are submitted by insurance company.

(viii) Publicity and awareness: Adequate publicity is to be given in all villages of the notified districts through fairs, exhibitions, SMS, short films, electronic and print media and documentaries. The crop insurance portal should be regularly uploaded with all published material information.

Comparision of PMFBY with NAIS and MNAIS.

No	Feature	NAIS [1999]	MNAIS [2010]	PM Crop Insurance Scheme
1	Premium rate	Low	High	Lower than even NAIS (Govt. to contribute 5 times that of farmer)
2	One Season – One Premium	Yes	No	Yes
3	Insurance Amount cover	Full	Capped	Full
4	On Account Payment	No	Yes	Yes
5	Localised Risk coverage	No	Hail storm, Land slide	Hail storm, Land slide, Inundation
6	Post-Harvest Losses coverage	No	Coastal areas - for cyclonic rain	All India – for cyclonic + unseasonal rain
7	Prevented Sowing coverage	No	Yes	Yes
8	Use of Technology (for quicker settlement of claims)	No	Intended	Mandatory
9	Awareness	No	No	Yes (target to double coverage to 50%)

Source: PIB

Progress so far

The scheme provides the farmers maximum financial protection against non-preventable natural risks.

Following review of erstwhile crop insurance schemes PMFBY has been formulated, with simplified provisions and reduced premium for farmers which has resulted in both increased awareness among farmers and increase in coverage of area and crops.

The farmers premium has been reduced for all food and oilseeds crops and kept at a maximum of 1.5% for Rabi, 2% for Kharif and 5% for annual horticultural/commercial crops.

Increased coverage :

In 2016-17, 30% of Gross Cropped Area (GCA) has been covered in comparison to 23% in 2015-16.

In 2016-17, a total of 5.74 crore farmers were covered, including 1.35 crore non-loanees.

Thus, there was an increase of 0.89 crore in total coverage of farmers, an enhancement of 18.23% in comparison to the previous year. Coverage of non-loanees has increased by 123.50%.

During 2016-17, 518.11 lakh ha. area was insured which is 56.56 lakh ha. more than in the previous year, an enhancement of 10.78%.

In 2016-17, coverage of non-loanee farmers is up from 5% to 22.5% of total farmers insured.

Increase in sum insured:

Due to capping of premium under erstwhile schemes, the sum insured was consequentially reduced, as a result of which the farmers were denied the expected benefits and complete compensation for their crop loss. However, under PMFBY, in order to provide maximum risk coverage to farmers, sum insured has been equated to Scale of Finance (SOF). As a result the farmers now get timely settlement of claims for entire sum insured, without any deduction and are being compensated for entire crop loss.

In 2016-17, the total area covered has been insured for a sum of Rs. 204779 crore, which is

78.14% more than that of Rs. 114951.81 crore in 2015-16.

Sum insured per ha. in Kharif 2015 was Rs. 20498 which increased to Rs. 34574 in Kharif 2016 and in Rabi 2015-16 was Rs. 8733 which increased to Rs. 39358 in Rabi 2016-17.

Increase in Risk Coverage:

Comprehensive coverage has been provided against non-preventable natural risks from pre-sowing to post-harvest losses. In addition, losses due to localised risks are estimated at the individual farm level for claim settlement.

Coverage of Losses due to Prevented Sowing : In 2016-17, in Tamil Nadu, claims worth Rs. 27.61 crore (upto 25% of sum insured) were settled due to prevented sowing on account of inclement weather.

25% advance relief due to mid-season adversity : In 2016-17, due to adverse climatic conditions such as floods, drought spell, severe drought, unseasonal rains etc., on account payments were made to the tune of Rs. 31.69 crore in Uttar Pradesh, Rs. 11 crore in Chhatisgarh, Rs. 11.19 crore in Maharashtra and Rs. 9.42 crore in Madhya Pradesh.

Coverage of localised claims : In 2016-17, due to localised calamities such as hailstorm, inundation and landslides, claims worth Rs. 0.11 crore in Andhra Pradesh, Rs. 0.09 crore in Chhatisgarh, Rs. 4.04 crore in Haryana, Rs. 1.55 crore in Maharashtra, Rs. 0.32 crore in Rajasthan and Rs. 0.80 crore in Uttar Pradesh were settled expeditiously before conduct of Crop Cutting Experiments.

Coverage of Post-Harvest Losses : In 2016-17, claims on this account worth Rs. 0.11 crore in Andhra Pradesh, Rs. 0.66 crore in Manipur and Rs. 16.51 crore in Rajasthan were settled.

Use of Improved Technology

In order to promote transparency and timeliness a Central Crop Insurance Portal has been developed which integrates farmers and other stakeholders and also provides for online registration of farmers.

All possible farmer friendly administrative initiatives and technology have been put in place to increase the coverage of non-laonee farmers including sharecroppers. For example, Common Service (CSC) has been engaged to facilitate enrolment of non-loanee farmers from Kharif 2017.

Approximately 12 lakh farmers have registered online for crop insurance during Kharif 2017.

Direct Benefit Transfer (DBT) has been initiated to facilitate transmission of claims amount directly to the farmers account.

Provision has been made for use of advanced technology such as drone, remote sensing etc.

for promoting transparency and immediate settlement of insurance claims.

PMFBY and Odisha

Consequent upon the discontinuance of National Agricultural Insurance Scheme (NAIS) & Modified National Agricultural Insurance Scheme (MNAIS) and introduction of Pradhan MantriFasalBimaYojana (PMFBY) commencing from Kharif 2016 season i.e. April 2016 by the Government of India, Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation and Farmers Welfare, the Government of Odisha have decided to accept and implement the Pradhan MantriFasalBimaYojana (PMFBY) and the operational guidelines formulated by the

Government of India and communicated by Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India to the Chief Secretary, Odisha.

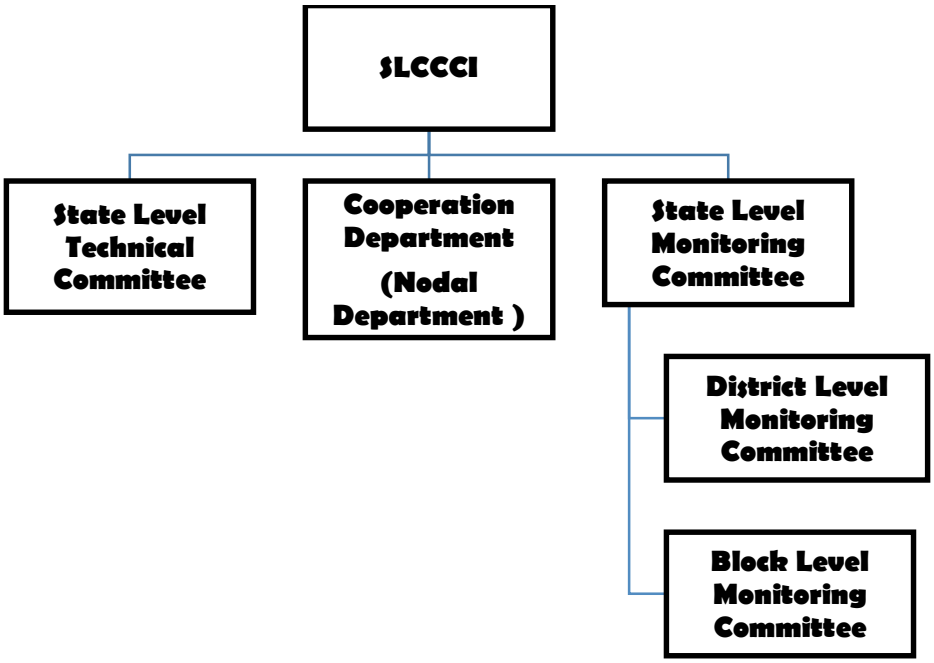
Cooperation Department shall be the Nodal Department for implementation of the PMFBY in the State.

Clusters and Implementing Agency

As per the operational guidelines of PMFBY, 30 districts of the State have been grouped into 6 clusters for smooth implementation of the scheme during Kharif 2016. Three Insurance Companies have been selected for the six clusters to implement the PMFBY during Kharif 2016 in the State.

As per the notification released by the Nodal Department for Implementation of PMFBY

Administrative structure for implementation of PMFBY



All farmers including sharecroppers and tenant farmers growing the notified crops in the notified areas are eligible for coverage. However, farmers should have insurable interest for the notified/

insured crops. The non-loanee farmers are required to submit necessary documentary evidence of land records prevailing in the State (Records of Right (ROR), Land possession Certificate (LPC) etc.) and/ or applicable contract/agreement details/ other documents notified/ permitted by concerned State Government (in case of sharecroppers/ tenant farmers).

As per provisions of the scheme, risk defined is based on the loss cost/experience of claims or on variability in the agricultural produce/yield from average of past ten years viz, ≤15%, 16-30% and ≥30% as low, medium and high risk respectively. However, premium is to be decided on the basis of bidding and L-1 bidder is chosen by the State Government. Thus high risk States are those where the frequency of high claims is higher due to one natural calamity or the other. These States include Gujarat, Karnataka, Maharashtra, Madhya Pradesh, Rajasthan etc. due to the frequent and high claims, insurance companies quoted high premium in high risk States during Kharif 2017.

Crop Season Wise, Insurance Company wise details of Premium amount collected, Share of Govtboth paid and Number of farmers benefitted

During Kharif 2016 under PMFBY						
Company	Farmers' Premium	GOI Share in Premium	State Share in Premium	Gross Premium	Total Claims	No. of Farmers benefitted
					Rs. In Lakh	
Future	4367.96	5582.82	5582.82	15533.60	6129.16	37770
HDFC	1988.80	2796.26	2796.26	7581.32	2556.43	17187
ICICI	3438.39	3582.30	3582.30	10602.99	25074.99	62919
RELIANCE	1519.64	2200.49	2200.49	5920.62	3866.30	26514
SBI	2466.76	5582.83	5582.83	13632.42	4990.85	22004
TOTAL	**13781.54**	**19744.70**	**19744.70**	**53270.94**	**42617.73**	**166394**
Kharif 2016 Grand Total (India)	**295119.49**	**667021.71**	**684352.65**	**1647606.45**	**958233.69**	**9913133**
During Rabi 2016-17 under PMFBY						
Chola	26.51	11.83	11.83	50.17	18.64	494
NATIONAL	66.06	41.04	41.06	148.15	32.13	0
NEW INDIA	122.91	23.50	23.50	169.90	52.60	0
UNITED	264.21	0.00	0.00	264.21	123.64	0
TOTAL	479.68	76.36	76.38	632.43	227.01	494
RABI 2016-17 GRAND TOTAL (INDIA)	145254.98	218144.84	219704.16	552769.21	370972.70	1693156

Kharif 2017 (PMFBY and RWBCIS Combined)- Till 1st Oct 2018 (Odisha)

Farmers Insured	Area Insured	Sum Insured	Farmers Premium	State	GOI	Gross Premium	Claim Paid	Farmers Benefitted
No.	ha	In Rs. Lakh						No.
1827839	1348990.64	721039.29	14509.23	34518.45	34518.45	83546.13	161829.09	657790
Kharif 2017 (PMFBY and RWBCIS Combined)- Till 1st Oct 2018 (India)								
34652622	34147729.43	13137364.47	305475.26	812758.31	807618.45	1925852.02	1518099.56	12146456

During the year 2018-19, nodal department has brought the notification for implementation of this flagship programme in the State. The plan for implementation is as given below:

Farmers Covered

All farmers growing the notified crops in the notified areas are eligible for coverage. However, farmers should have insurable interest for the notified/ insured crops. The non-loanee farmers are required to submit necessary documentary evidence of land records prevailing in the State (Records of Right (RoR),Land Possession Certificate (LPC) etc.) and/ or applicable contract/agreement details/ other documents notified/ permitted by State Government.

The Self Declaration Certificate shall be treated as the substitute of "Sÿ(owing Certificate" for non-loanee farmers.

i. Compulsory Component

All farmers availing Seasonal Agricultural Operations (SAO) loans from Financial Institutions (i.e. loanee farmers) for the notified crop(s) would be covered compulsorily. All non-defaulter loanee farmers shall be covered under the programme based on the Credit limit sanctioned against them.

ii. Voluntary Component

The Scheme would be optional for the non-loanee farmers. Special efforts shall be made to ensure maximum coverage of SC/ ST/ Women farmers under the scheme. Budget allocation and utilization under these segments should be in proportion of land holding of SC/ ST/ General along with Women in the State/ Cluster. Panchayat Raj Institutions (PRIs) may be involved at various stages of implementation of crop insurance schemes particularly in the identification of the crops and beneficiaries, extension and awareness creation amongst farmers, obtaining feed-back of the farmers while assessing the claim for prevented sowing, localized perils, post-harvest losses and advance payment of claims etc.

3.Clusters and Implementing Agencies: On the basis of the

recommendations of the National Remote Sensing Centre, Hyderabad, 30 districts of the State have been grouped into six clusters for implementation of PMFBY during

Kharif 2018 and Rabi 2018-19 based on risk index and crop coverage. Four Insurance Companies have been selected for the six clusters to implement PMFBY during Kharif 2018 and Rabi 2018-19 in the State as indicated below:

Clusters and Insurance Companies allotted both for Kharif-2018 and Rabi 2018-19

Chola MS GIC Ltd.	Royal Sundaram GIC	Oriental Insurance co.	Reliance GIC	Royal Sundaram GIC	Chola MS GIC Ltd.
Clusterl	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6

Mayurbhanj	Ganjam	Bargarh	Sundergarh	Bolangir	Keonhar
Nawarangpur	Kalahandi	Bhadrak	Sambalpur	Balasore	Cuttack
Kendrapara	Subarnapur	Gajapati	Koraput	Malkangiri	Khorda
Deogarh	Puri	Jajpur	Nuapara	Nayagarh	Rayagada
		Jagatsinghpur	Kandhamal	Dhenkanal	Angul
			Boudh		Jharsuguda

4. Coverage of Risks

The following stages of the crops and risks leading to crop loss shall be covered under the Scheme.

(a) Prevented Sowing

Insurance coverage to farmers shall be provided in case of wide spread incendence of eligible risks affecting crops in more than 75% of area sown in a notified unit at early stage leading to total loss of crop or the farmers are not in a position to either sow or transplant the crop.

(b)Standing Crop (Sowing to Harvesting):

Comprehensive risk insurance shall be provided to cover yield losses due to non- preventable risks, viz. Drought, Dry spells, Flood, Inundation, Pests and Diseases, Landslides, Natural Fire and Lightening, Storm, Hailstorm, Cyclone, Typhoon, Tempest, Hurricane and Tornado.

(c) Post-Harvest Losses :

Coverage shall be available only upto maximum period of two weeks (14 days) from harvesting for paddy in case of occurrence of cyclone, cyclonic rains and unseasonal rains.

(d) Localized Calamities:

Loss/ damage resulting from occurrence of identified localized risks of hailstorm, landslide, and Inundation affecting isolated farms in the notified area.

(e)On Account Payment of Claims due to Mid-Season Adversity:

Insured farmers shall be provided immediate relief in case of adverse seasonal conditions during the crop season viz. floods, prolonged dry spells, severe drought etc., wherein expected yield during the season is likely to be less than 50% of Threshold yield.

For coverage of all risks the operational guidelines of PMFBY shall be final.

The rainfall data will be obtained from three sources namely, Automatic Rain

Gauges (ARG) of Indian Meteorological Department (IMD), Manual Rain Gauges of SRC and Automatic Rain Gauges of Agriculture &Farmers Empowerment Department

General exclusions-Losses arising out of war and nuclear risks, malicious damage and other preventable risk shall be excluded.

Loss assessment procedure and submission of reports of claims for different risk scenarios shall be carried out as laid down in the Resolutions of Department of Agriculture & Farmers Empowerment made for the purpose.

Indemnity level

The indemnity level for all crops will be 70% both for Kharif 2018 and Rabi2018-19.

Sum Insured 'Coverage Limit

Sum Insured per hectare for both loanee and non-toanee farmers will be same and equal to the Scale of Finance as decided by the District Level Technical Committee, and would be pre-declared by SLCCCI and notified. No other calculation of Scale of Finance will be applicable. Sum Insured for individual farmer is equal to the Scale of Finance per hectare multiplied by area of the notified crop proposed by the farmer for insurance. 'Area under cultivation' shall always be expressed in 'hectare'. There should not be any deviation in this regard.

The total area, crops and unit of insurance, calculations are being specified in the notification and circulated amongst all the Government Departments of the state who are responsible for implementation.

As indicated by Government of India, this year to make the implementation of PMFBY more effective, has emphasizing upon bringing more and more non-loanee farmers into this insurance fold. In the process for each and every district target is fixed.

The officials responsible have already started taking the strategic steps to make it happen.

Issues and Challenges

1) **Sustainability:** For Insurance markets to work we need- (a) Low risk; and (b) Low correlation in risk amongst those buying insurance. Since the programme is aimed at covering risks of drought and floods, both assumptions are likely to be false. This is because when bad weather hits, all regional farmers are affected (high correlation) and incidence of bad-weather is high (once in 5-7 years ie. loss probability of 14% - 20%). This said, the PMFBY states the premium rates to be 1.5- 2 per cent as the, the rest being subsidized by the government. This in a long term is bad and also encourages risk-taking especially for crops with low MSPs. This however can be mitigated by use of modern technology by farmers which they can use to lower the risks.
2) **Incompetence of Local Authorities:** The scheme has loopholes in terms of assessment of crop losses, as in many cases, district or block level agricultural department officials do not conduct such sampling on ground and complete the formalities only on paper. It also points out several instances failed to release of funds on time leading to delays in releasing insurance compensation. This defeats the very purpose of the scheme which is to provide timely financial assistance to farming community. In many cases the discrepancies in determining threshold yields and CCE's made it difficult to pay even for legitimate claims.
3) **Lack of Awareness:** Almost two-thirds of farmers of the State are not aware of the crop insurance schemes. They also pointed out the lack of decent grievance redressal system and monitoring mechanism for speedy settlements of farmer complaints; at both that the Centre and State Governments level. This has to be taken up in earnest, especially the small scale farmers as this is most vulnerable class. Currently the scheme doesn't distinguish between large and small farmer as it does raise the issue of identification.
4) **Role of the Insurance** Companies: With PMFBY the role and power of Insurance companies is significant. But the reports say that Insurance companies, in many cases, didn't investigate losses due to a localised calamity and, therefore, did not pay the claims. The actuarial premium rate charged by insurance companies under PMFBY in 2016-17 was on an average a high of 12.55%, much more than earlier schemes. This meant a higher burden on government exchequer.

These are some of the major challenges and pitfalls in implementation of the crop insurance scheme which have to be overcome. There is also a role for technology to play here. If the localized weather forecasting, drought risk, disease risk, soil analysis data which is now much easily available with technology can be made available to farmers they become pre-emptive of the risk and can plan that much better, thus reducing their losses. The data can also help settle local level calamity disputes which can sometimes get tricky. The technology can enable insurance companies to be better prepared and handle the premiums and settlements much more efficiently. In addition:

1. The biggest challenge we face is the conduct of crop cutting experiments which many states are unable to do in a short window of time
2. despite collecting large premiums, insurance companies are not putting in place any ground infrastructure (required for grievance redressal and assessing crop losses in individual plots)
3. even two years after the scheme was launched, use of technology such as mobile devices or remote sensing to estimate crop losses has been limited.
4. lack of historical data has hiked up premiums in some areas, and states are not doing enough to provide data to companies.
5. Another issue which is a challenge for us is the delay in release of subsidies (towards premium) by state governments which is delaying payment of claims to farmers,

Amongst all we ned to bring out the change in mind set amongst the farmers. They need to think about something different instead of going as their forefathers used. The tradition need to be broken and diversification in farming is desired. Always risk taking attitude can only bring growth.

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Farmers producer organization

Introduction

Agricultureis themain occupationof thevast majorityof the population ofIndia. Agricultural products of various types are produced in India and the marketing of all these products is a complex process. Farmers do not have access to market, they are selling their produce to the intermediaries operate in the market. Because of intermediaries their profit margin is reduced and their farming business becomes a non-viable one.

Two important aspects of the marketing of agricultural products are distribution process and prices. Physical distribution process transfer products from producers to consumers. Various activities are involved in doing this, such as planning, growing, harvesting, grading, packing, transport, storage, processing, distribution, advertising and sale. Agricultural marketing system plays an important role in determining the prices received by the farmers.

Improvement in status of the farmer is possible only through diversification and commercialization of their agricultural activities. This is possible only through implementation of agricultural policy reforms, introducing sustainable agricultural practices, optimizing input efficiency, bringing about institutional change, developing human resources capital and through

participation of the non-governmental sector in agriculture. There is a need to strengthen support services for small farmers by developing link between farmers and purchasers of agricultural produce. Currently such types of linkages are either not exist or very weak. It is well recognized that the commercialization of small-scale, resource-poor farmers is closely linked to higher productivity, greater specialization, and higher income (Bernard and Spielman, 2009) [1].

There is need to develop suitable marketing system so as to give proper reward or return to the efforts of the Indian farmers. Linking the farm gate with retail outlets is the surest way to reduce losses and marketing costs and thereby increase marketing efficiency. For this purpose organized corporate management is the right model. Direct marketing help farmers to reduce on transportation costs and enables them to improve price realization. It is therefore important for producers to know when, where, and what amount of produce to sell, bearing in mind the market price. For which they must have access to information on different markets and prices in different markets.

Agriculture marketing is a complex process. Because of which there is a big challenge for small farmers today and they are unable to earn good profits from their produce. Farmer

Producer organization (FPO) can help farmers for successfully dealing with a range of Challenges that small producers are facing today. Initially FPOs were organized under the co-operative structure. They were supported by Govt. but the government support has declined over the years, and new producer companies are started with regulatory framework similar to that of companies. Unique elements of cooperative businesses are retained in this. For bringing industry and agriculture closer together, the Indian Government has initiated new organizational patterns in agricultural production and marketing to integrate large firms and encouraged the groups of small and marginal farmers who are the main manufacturers of agricultural output and linked with the corporate buyers (Sawairam, 2015) [10].

We can mobilize farmers in groups and build their associations called as Farmer Producer Organization (FPOs) to plan and implement product specific cluster/ commercial crop cycles. FPO is a means to bring together the small and marginal farmers and other small producers to build their own business enterprise that will be managed by professionals. FPO can help farmers for production of various agricultural produce as well as during the process of marketing the crops. Farmer organizations offer small farmers to participate in the market more effectively and collectively, they are in a better position to reduce transaction costs of accessing inputs and outputs, obtaining the necessary market information, securing access to new technologies, and to tap into high value markets, allowing them to compete with larger farmers and agribusinesses (Stockbridge *et al.*, 2003) [12].

Objective of FPO

The primary objective of FPO is to help small farmers in the country to enhance agricultural production, productivity and profitability. Other objectives are-

- To support to select appropriate crops which are suitable for their area and which are having market demand.
- To provide access to modern technology through community-based processes for improving productivity and quality of produce.

- To facilitate to access forward linkages for new technologies for improving productivity, for value addition of the produce and market tie-ups.
- To ensure access to use of quality inputs and services for improving agricultural production.
- To help farmers to strengthen their capacity for increasing productivity through use of best agricultural practices.
- To help to link producers to market for getting fair prices for their produce.

Values

FPOs are based on the values of self-help, selfresponsibility, democracy, equality, equity and solidarity. FPO members must believe in the ethical values of honesty, openness, social responsibility and caring for others.

FPO Principles

S. No.	Principle	Details
Principle 1	Voluntary and Open Membership	FPOs are voluntary organizations, open to all persons who are able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political or religious discrimination.
Principle 2	Democratic Farmer Member Control	FPOs are democratic organizations controlled by their farmer-members who actively participate in setting their policies and making decisions. FPOs farmer-members have equal voting rights (one member, one vote).
Principle 3	Farmer-Member Economic Participation	Farmer-members contribute equitably to, and democratically control, the capital of their FPO. At least part of that capital is usually the common property of the FPO. Farmer-members usually receive limited compensation, if any, on capital subscribed as a condition of membership.
Principle 4	Autonomy and Independence	FPOs are autonomous, self-help organizations controlled by their farmer-members. If they into agreements with other organizations, including Governments, or raise capital from external sources, they do so on terms that ensure democratic control by their farmer- members and maintain their FPO's autonomy.
Principle 5	Education, Training and Information	FPO gives training to member farmers and provide them necessary market information & product information.
Principle 6	Co-operation among FPOs	FPOs serves their members most effectively and strengthens the FPO movement by working together through local, national, regional and international structures.
Principle 7	Concern for the Community	FPOs work for the sustainable development of their communities through policies approved by their members.

Source: Policy & Process Guidelines for Farmer Producer Organizations, Govt. of India, Ministry of Agriculture, Dept. of Agriculture and Cooperation.

Services Provided by Farmers' Organizations Right for providing inputs, technical services for production, processing and marketing.

Varieties of services are offered by the FPO to its members

S.N	Type of service	Details
1.	Organizational services	Organize farmers into informal groups (FIG), catalyzing collective action, building their capacities and establishing internal monitoring systems.
2.	Production services	Facilitation of (collective) production activities. Developing clusters for producing significant volume of marketable surplus. Suggestion of alternate farming systems to the groups of farmers suitable to their specific situations.
3.	Input Supply Services	The FPO provides low cost and quality inputs (fertilizers, pesticides, seeds, sprayers, pump sets, accessories, and pipelines) to member farmers.
4.	Marketing services	Direct marketing after procurement of agricultural produce. Transport and storage, processing, weighment losses, price fluctuations, market information and analysis, branding, certification. Market value-added products at maximum profits and thus generate funds.
5.	Financial services	The FPO provides loans for crops, purchase of tractors, pump sets, construction of wells, lying of pipelines etc.
6.	Procurement and Packaging Services	FPO procures produce from its member farmers and then help for standardization, grading, value addition and packaging of the produce. They help farmers for obtaining firm orders from market and government programs.
7.	Technology services	FPO guides farmers for using best practices of farming, for obtaining market information, for gaining knowledge and skills in agricultural production, knowledge of post-harvest processing for adding value to products. Support farmers to ensure appropriate usage of quality inputs.
8.	Insurance Services	Provides various insurance like Life Insurance, Crop Insurance, Electric Motors Insurance etc.
9.	Education services	Identify training and extension needs. Training members on good agricultural practices based farming system approach and low-cost and environmental friendly inputs, Business skills, Production skills.
10.	Value addition services	Adding value to the farm produces locally and thus adds to profitability of the company.
11.	Welfare services	Provides welfare services for improving health and safety of member farmers.
12.	Management of resources	Help to manage resources ex. water, pasture, fisheries, forests, soil conservation.

S.N	Type of service	Details
13.	Linking services	Coordinate supply and demand of agri produce by facilitating linkages between farmers, processors, traders, and retailers. Provides key business development services such as market information, input supplies, and transport services for enhancing profitability of the company and welfare of its members.
14.	Networking Services	Help to get access of channels of information (e.g. about product specifications, market prices) and make other business services accessible to rural producers.
15.	Obtaining grants	Help to obtain various grants from government for rural welfare.

Benefits to Farmers

A Farmer Producer organization gives a robust framework for the small producers for organizing themselves for effective linkage with markets. It gives bargaining power to the small farmers, enable cost-effective delivery of extension services, and empower the members to influence the policies that affect their livelihoods. FPO help to overcome the constraints imposed by the small size of individual farms, FPO members are able to leverage collective strength and bargaining power to access financial and non-financial inputs, services and appropriate technologies, reduce transaction costs, tap high value markets and enter into partnerships with private entities on more equitable terms. Major activities of FPO are supply of inputs such as seed, fertilizer and machinery, market linkages, training & networking and financial & technical advice.

How FPO is formed

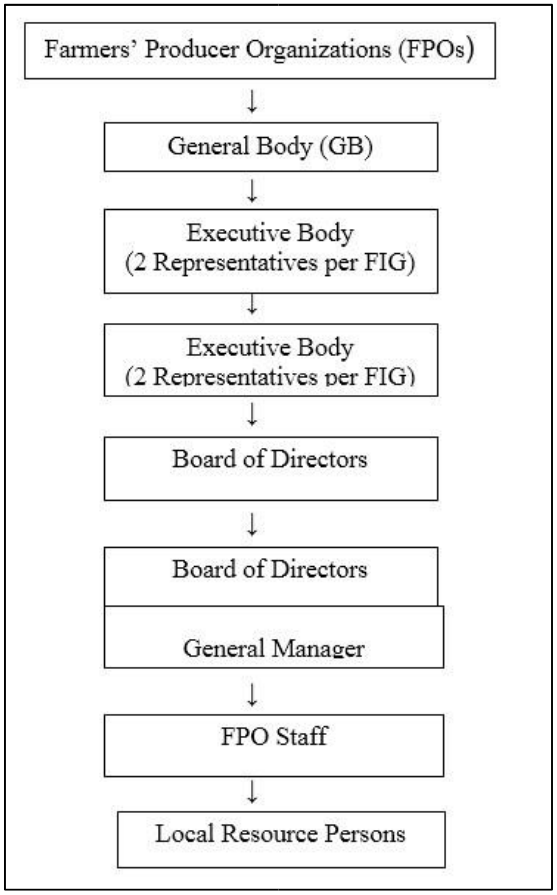
Information about FPO is informed to all families of the village and they are educated on the FPO concept. All interested farmers are made members of the FPO. Each member will have one vote in the company, irrespective of their share. Government or its nominated bodies help to fund and guide for its formation. Professional HRD organizations help for selecting professionals who will run the company. Government also assists FPO for training farmers, administration, storing farm produce and adding value to it. Need-based seed capital can be given to it to enable to borrow the required capital and working capital from financial institutions for the implementation of the project proposal after it has been appraised and accepted as viable.

Running FPO

The FPO is a farmers' organization, made and run by farmers with the support from organization ex. Promoting NGO. Hand holding support is given in the initial few years

and then it is expected that the farmers must take it forward on their own. Professionals from Producer Company guide its members for planning and budgeting macro planning for 3 years and micro planning for one year only. Professionals guide farmers for selecting the crops to be grown, area under particular crop and the price they will get on harvest. PC Professionals will be accountable to the board of directors of the PC, which will include

some farmers. farmers / members of the PC, through and budget. Each of his/her produce the time of sowing.



General body of the will have the ownership an annual business plan farmer is paid for price that was determined at

Funds required for Producer

Funds required for different in different potential of the local from Govt, various Govt schemes. E.g. Govt is acre for those become stakeholders as an intervention to programmes, creating common adding value, etc, sustainability of small

setting up Farmer Organization

setting up one FPO is cases. It depends on the area, funding available guidelines covering programmes and funding Rs 10,000 per farmers agreeing to of the local promoted deliver Govt schemes, training, facilities for storage, essential for the farm holdings.

Membership of FPO

An FPO is a farmer's enterprise. According to the law any farmer producers who have 1-4 acres of land or more than that can become a member of an FPO. Membership is given to farmers keeping their needs in mind and not necessarily based on the crop that they produce to ensure that there is round the year business for the FPO. It must have minimum 50 shareholding members at the time of registration and can be increased over a period of 3 years to a sustainable level.

Structure of FPO

Planning, Implementation and Monitoring of FPO is done by Board of directors, General Manager and FPO staff.

Source: What India can do differently in agriculture, SarthakKrishiYojana

Challenges In front of FPO

FPOs face common challenges in terms of organizing producers, increasing the capacity of staff and board members, providing effective agriculture extension services to farmers, hiring and retaining staff, raising capital including working capital, developing processes and systems for collecting, processing, value addition, marketing and understanding value chains for effective interventions.

Government Support for Promotion of FPO

The formation and development of FPOs is actively encouraged and supported by the Central and State Governments and their agencies, using financial resources from various Centrally-sponsored and State-funded schemes in the agriculture sector agencies. Government has taken several initiatives to support FPO to facilitate their emergence as successful business enterprises through apex financial institutions such as NABARD, private donor organizations, financial institutions and many other institutions. Government has given authority to SFAC to support formation of FPOs. Promotion and strengthening of FPOs has been one of the key strategies under the 12th five Year Plan of the Govt. of India to achieve inclusive agricultural growth.

Finance for FPO

FPO requires finance according to life cycle stages. The lifecycle stages are broadly categorized into three phases. In each stage need is found to be different.

A. Incubation and Early Stage

At this stage, the financial need of the FPOs revolves around the cost of mobilizing farmers, registration cost, cost of operations and management, training, exposure visits etc.

B. Emerging and Growing Stage

Once FPOs are incubated with grant support from promoting institutions, there are 3 ways to raise fund to meet their working capital and investment need. They include - Equity Financing, Credit Capital and Debt Financing.

Matured Stage (Business Expansion)

As the FPOs move towards expanding their businesses, they need finance for quality improvement in products/services. Here, finance is required for quality improvement along the value chain of the produce.

Mechanism of Doubling Farmer income through Farmer Producer Organisations (FPOs)

The concept behind Farmer Producer Organizations is the farmers, who are the producers of agricultural products, can form groups and register themselves under the Indian Companies Act. To facilitate this process, the Small Farmers' Agribusiness Consortium (SFAC) was mandated by Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India, to support the State Governments in the formation of Farmer Producer Organizations (FPOs). The aim is to enhance farmers' competitiveness and increase their advantage in emerging market opportunities. The year 2014 was observed as the "Year of Farmer Producer Organisations", and slowly but surely, the concept is catching on. The FPO's major operations include supply of seed, fertilizer and machinery, market linkages, training, networking, financial and technical advice. A variety of approaches have emerged in response to the problems faced by the small and marginal farmers. The first approach is the facilitation of collective action by small and marginal farmers. Agricultural cooperatives, formed under the Co-operative Credit Societies Act, 1904, have long been the dominant form of farmer collectives; however the experiences with cooperatives point too many limitations that prevent effective collective action.

a. Better farm income

A FPO will support the members in getting more income. By aggregating the demand for inputs, the FPO can buy in bulk, thus procuring at cheaper price compared to individual purchase. Besides, by transporting in bulk, cost of transportation is reduced. Thus reducing the overall cost of production. Similarly, the FPO may aggregate the produce of all members and market in bulk, thus, fetching better price per unit of produce.

b. Provision of market information

The FPO can also provide market information to the producers to enable them hold on to their produce till the market price become favourable. All these interventions will result in

more income to the primary producers. Many FPOs provide information to their members in a variety of forms — from workshops and conferences, to field days and focus group sessions. Printed materials like newsletters, brochures, and websites also provide valuable information.

c. Economies of scale

Large membership base also gives organizations the opportunity to benefit from collective ordering and purchasing, allowing the organisations to provide certain common items to their members at reduced cost. The cost reduction includes in ordering cost, transportation cost, economies in large scale purchase of agricultural inputs such as seed, fertilizers, pesticides, agricultural equipment, etc. on behalf of their members.

The ability to meet high food safety and quality standards was lowest in smallholder agriculture because of the scale economies. The most important reason was the inability of the smallholder dominated production systems to meet the food safety and quality requirements of the rich country markets. They stressed more on need of collective action from small holders. While there are some examples of successful collective action in both the spice and fishery export industries in India, it has been lacking in many other sectors, notably in horticulture (Deininger and Sur, 2006) [6]. Urban Poverty and Environment series report (2007) stated that to minimize the cost of inputs and ensure proper handling of output by middle men or command higher output prices, group negotiation through producers' organizations' was a valuable advantage. It also strengthened experience sharing, and offered opportunities for inter-change programmes and training.

d. Enable vertical integration

Producer-owned organisations were good examples for the vertical integration based on the horizontal coordination of farmers as initiators as they proved that by co-operation there was an opportunity to significantly improve their countervailing power and to establish ownership for farmers in the upper part of the food chain if they can secure strict quality requirements, solid financing, loyalty and trust in their organisations (Gábor and Szabó, 2009) [9].

e. Ensure market access

Market access is ensured by purchasing of members' produce and transports are equivalent to the inbound logistics activity of the manufacturing organisation. Quality control and pricing of the raw materials are also parts of the purchasing activity. Consolidation and processing covers the typical value-adding operations of the FPO. While consolidation takes care of bulking activity and storage of the produce to sell it at a favourable price later, processing is about enhancing the value of a product by changing its form and/or structure.

The benefits of farmer organization for market access were more evident in the vegetable sector, characterized by high transaction costs. There was less incentive for farmers producing an undifferentiated commodity such as maize to organize as the transaction costs associated with market access were relatively low. Although farmer organizations do not provide clear benefits in accessing undifferentiated commodity markets, they can still contribute to members' welfare by offering other services (Hellin *et al.,* 2009) [11].

f. Develop market and buyer relations

Strong and longer-term relationships with different buyers are needed to become a reliable market partner. It also require strong contractual arrangements and agreements with them. Market intelligence is important for making commercial decisions as FPO, as well as to transfer market signals to the members to influence their decisions on production and to define the conditions of supplying to the FPOs. Group of small producers through producer organizations were capable of making strategic investments to gain access to agro industrial markets where their produce was more profitable by establishing more complex contractual arrangements with potential purchasers. Javier and Cavero, (2012) [12] explore the distributional effects of lowering transaction costs to allow access to improved market opportunities for small farmers.

They found that when new marketing opportunities arise, those that have more land, are better educated and are well organized are able to deal with the complexities that the new contractual arrangements entail.

Farmer organisations have the potential to improve services and reduce transaction costs but effective mechanisms of downward accountability were necessary so that issues such as poor management and elite capture can be addressed, and farmers are motivated to invest in actions that have collective benefits (Mbeche and Dorward, 2014) [13].

Status of Farmer Producer Organizations (FPOs) The concept of 'Farmer Producer Organizations, (FPO)' consists of collectivization of Producers especially small and marginal farmers so as to form an effective alliance to collectively address many challenges of agriculture such as improved access to investment, technology, inputs and markets. Department of Agriculture and Cooperation under Ministry of Agriculture, Govt. of India has identified Farmer Producer Organizations registered under the special provisions of the Companies Act, 1956 as the most appropriate Institutional form around which the mobilization of farmers is to be made for building their capacity to collectively leverage their production and marketing strength. The Department of Agriculture and Cooperation (MoA) has setup 'Small Farmers Agribusiness Consortium' (SFAC) as designated Agency for organising FPOs though various schemes and projects. These projects subscribe to a broad objective of mobilizing farmers into groups called Farmer Interest Groups (FIGs), forming Farmer Producer Organizations (FPOs), strengthening farmers' capacity through training on agricultural best practices for enhancing crop productivity in sustainable manner, ensuring access to and usage of quality inputs and services, and facilitating access of the producer groups to fair and remunerative markets for marketing the crop produce as well as their value added products, where feasible.

STATE WISE PROGRESS OF FPO PROMOTION as on 31.01.2019

S.No	State	No. of Farmers			No. of FPOs		
		Mobilized	Under Mobilization	Total Targeted Farmer	Registered	Under the process of registration	Total
1	Andhra Pradesh	6792	6208	13000	7	6	13
2	Arunachal Pradesh	1850	2900	4750	2	4	6
3	Assam	7147	3353	10500	12	6	18
4	Bihar	26186	8814	35000	27	9	36
5	Chhattisgarh	29135	0	29000	26	2	28
6	Delhi	3535	0	3500	4	0	4
7	Goa	1810	0	1750	2	0	2
8	Gujarat	19166	4834	24000	20	5	25
9	Haryana	12225	525	12750	23	0	23
10	Himachal Pradesh	4887	1963	6850	5	2	7
11	Jammu & Kashmir						
	Jammu (Division)	3694	287	3981	1	0	1
	Srinagar (Division)	3120	960	4080	1	0	1
12	Jharkhand	10009	0	12000	8	2	10
13	Karnataka	121218	6282	127500	119	6	125
14	Madhya Pradesh	126934	22066	149000	143	5	148
15	Maharashtra	96622	7878	104500	99	6	105
16	Manipur	5671	1279	6950	4	4	8
17	Meghalaya	2990	760	3750	3	1	4
18	Mizoram	1700	1000	2700	1	1	2
19	Nagaland	1750	2000	3750	2	2	4
20	Odisha	39463	0	38900	41	0	41
21	Punjab	6288	0	6000	7	0	7
22	Rajasthan	49617	10883	60500	40	10	50
23	Sikkim	16279	0	15750	30	0	30
24	Tamil Nadu	10945	6055	17000	11	6	17
25	Telangana	24548	4450	28998	20	5	25
26	Tripura	2874	0	2750	4	0	4
27	Uttarakhand	6004	0	6000	7	0	7
28	Uttar Pradesh	35746	20254	56000	35	22	57
29	West Bengal	82736	7764	90500	79	10	89
Total		760941	120515	881709	783	114	897

Source: http://sfacindia.com/FPOS.aspx

It is clear from the table that, highest number of FPOs registered is in Madhya Pradesh state with 148 numbers of FPOs. Followed by Karnataka (125 FPOs),Maharashtra (10571 FPOs), and West Bengal (8962 FPOs).

Conclusions

Improvement in status of the farmer is possible only through diversification and commercialization of their agricultural activities. There is a need to strengthen support services for small farmers by developing link between farmers and purchasers of agricultural produce. Farmer Producer Organization (FPO) is a means to bring together the small and marginal farmers and other small producers in the local communities to build their own business enterprise that will be managed by professionals. FPO offers a proven pathway to successfully deal with a range of challenges that confront farmers today, especially small producers. FPO can help farmers for production of agricultural produce as well as during the process of marketing the crops. Through FPO farmers can access quality inputs at low cost, can obtain the market information on different markets and prices in different markets, secure access to new technologies, and tap into high value markets. FPO is the best way of linking producers to market for getting fair prices for their produce.

The role of the Farmer Producer Organisations (FPO) is critical in the development of inclusive and sustainable supply chains. These organisations can be effective and vital players in the supply chain due to their ability to connect smallholder farmers to markets, including the school feeding market. The key hindrances faced by the FPOs are low membership and seasonal nature of agriculture which force the FPOs to be sit idle during off-seasons. The FPOs should take up additional activities in order to ensure the regular income of their members in off-seasons. Apart from this wrong selection of model, non-availability of suitable market linkages, problems within the clusters, non-availability of APMC licence etc. are the other hurdles in their growth. It is suggested that selection of the model should be according to the local conditions and needs. The managements of such FPOs should be take initiatives to identify good market linkages where the members will bemore benefitted. The respective state government and Agricultural Produce Marketing Committee (APMC) should make changes in the current APMC Act in order to cover the FPOs also.

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Farmers producer organization

Introduction

Agricultureis themain occupationof thevast majorityof the population ofIndia. Agricultural products of various types are produced in India and the marketing of all these products is a complex process. Farmers do not have access to market, they are selling their produce to the intermediaries operate in the market. Because of intermediaries their profit margin is reduced and their farming business becomes a non-viable one.

Two important aspects of the marketing of agricultural products are distribution process and prices. Physical distribution process transfer products from producers to consumers. Various activities are involved in doing this, such as planning, growing, harvesting, grading, packing, transport, storage, processing, distribution, advertising and sale. Agricultural marketing system plays an important role in determining the prices received by the farmers.

Improvement in status of the farmer is possible only through diversification and commercialization of their agricultural activities. This is possible only through implementation of agricultural policy reforms, introducing sustainable agricultural practices, optimizing input efficiency, bringing about institutional change, developing human resources capital and through participation of the non-governmental sector in agriculture. There is a need to strengthen support services for small farmers by developing link between farmers and purchasers of agricultural produce. Currently such types of linkages are either not exist or very weak. It is well recognized that the commercialization of small-scale, resource-poor farmers is closely linked to higher productivity, greater specialization, and higher income (Bernard and Spielman, 2009) [1].

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2.	Production services	Facilitation of (collective) production activities. Developing clusters for producing significant volume of marketable surplus. Suggestion of alternate farming systems to the groups of farmers suitable to their specific situations.
3.	Input Supply Services	The FPO provides low cost and quality inputs (fertilizers, pesticides, seeds, sprayers, pump sets, accessories, and pipelines) to member farmers.
4.	Marketing services	Direct marketing after procurement of agricultural produce. Transport and storage, processing, weighment losses, price fluctuations, market information and analysis, branding, certification. Market value-added products at maximum profits and thus generate funds.
5.	Financial services	The FPO provides loans for crops, purchase of tractors, pump sets, construction of wells, lying of pipelines etc.

S.N	Type of service	Details
6.	Procurement and Packaging Services	FPO procures produce from its member farmers and then help for standardization, grading, value addition and packaging of the produce. They help farmers for obtaining firm orders from market and government programs.
7.	Technology services	FPO guides farmers for using best practices of farming, for obtaining market information, for gaining knowledge and skills in agricultural production, knowledge of post-harvest processing for adding value to products. Support farmers to ensure appropriate usage of quality inputs.
8.	Insurance Services	Provides various insurance like Life Insurance, Crop Insurance, Electric Motors Insurance etc.
9.	Education services	Identify training and extension needs. Training members on good agricultural practices based farming system approach and low-cost and environmental friendly inputs, Business skills, Production skills.
10.	Value addition services	Adding value to the farm produces locally and thus adds to profitability of the company.
11.	Welfare services	Provides welfare services for improving health and safety of member farmers.
12.	Management of resources	Help to manage resources ex. water, pasture, fisheries, forests, soil conservation.
13.	Linking services	Coordinate supply and demand of agri produce by facilitating linkages between farmers, processors, traders, and retailers. Provides key business development services such as market information, input supplies, and transport services for enhancing profitability of the company and welfare of its members.
14.	Networking Services	Help to get access of channels of information (e.g. about product specifications, market prices) and make other business services accessible to rural producers.
15.	Obtaining grants	Help to obtain various grants from government for rural welfare.

Benefits to Farmers

A Farmer Producer organization gives a robust framework for the small producers for organizing themselves for effective linkage with markets. It gives bargaining power to the small farmers, enable cost-effective delivery of extension services, and empower the members to influence the policies that affect their livelihoods. FPO help to overcome the constraints imposed by the small size of individual farms, FPO members are able to leverage collective strength and bargaining power to access financial and non-financial inputs, services and appropriate technologies, reduce transaction costs, tap high value markets and enter into partnerships with private entities on more equitable terms. Major activities of FPO are supply of inputs such as seed, fertilizer and machinery, market linkages, training & networking and financial & technical advice.

How FPO is formed

Information about FPO is informed to all families of the village and they are educated on the FPO concept. All interested farmers are made members of the FPO. Each member will have one vote in the company, irrespective of their share. Government or its nominated bodies help to fund and guide for its formation. Professional HRD organizations help for selecting professionals who will run the company. Government also assists FPO for training farmers, administration, storing farm produce and adding value to it. Need-based seed capital can be given to it to enable to borrow the required capital and working capital from financial institutions for the implementation of the project proposal after it has been appraised and accepted as viable.

Running FPO

The FPO is a farmers' organization, made and run by farmers with the support from organization ex. Promoting NGO. Hand holding support is given in the initial few years

and then it is expected that the farmers must take it forward on their own. Professionals from Producer Company guide its members for planning and budgeting macro planning for 3 years and micro planning for one year only. Professionals guide farmers for selecting the crops to be grown, area under particular crop and the price they will get on harvest. PC Professionals will be accountable to the board of directors of the PC, which will include some farmers. General body of the farmers / members will have the ownership of the PC, through an annual business plan and budget. Each farmer is paid for price of his/her produce that was determined at the time of sowing.

Funds required for setting up Farmer Producer Organization

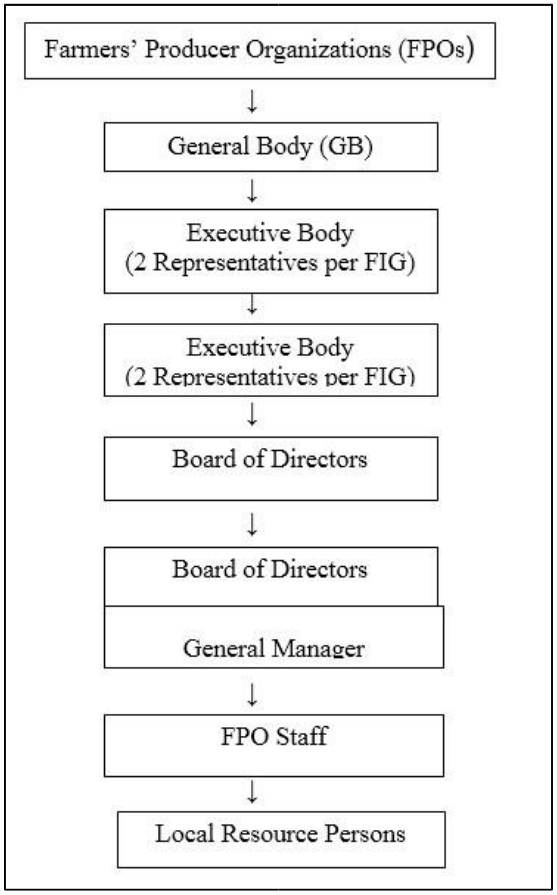
Funds required for setting up one FPO is different in different cases. It depends on the potential of the local area, funding available from Govt, guidelines covering various Govt programmes and schemes. E.g. Govt is funding Rs 10,000 per acre for those farmers agreeing to become stakeholders of the local promoted as an intervention to deliver Govt programmes, schemes, training, creating common facilities for storage, adding value, etc, essential for the sustainability of small farm holdings.

Membership of FPO

An FPO is a farmer's enterprise. According to the law any farmer producers who have 1-4 acres of land or more than that can become a member of an FPO. Membership is given to farmers keeping their needs in mind and not necessarily based on the crop that they produce to ensure that there is round the year business for the FPO. It must have minimum 50 shareholding members at the time of registration and can be increased over a period of 3 years to a sustainable level.

Structure of FPO

Planning, Implementation and Monitoring of FPO is done by Board of directors, General Manager and FPO staff.



Source: What India can do differently in agriculture, SarthakKrishiYojana

Challenges In front of FPO

FPOs face common challenges in terms of organizing producers, increasing the capacity of staff and board members, providing effective agriculture extension services to farmers, hiring and retaining staff, raising capital including working capital, developing processes and systems for

collecting, processing, value addition, marketing and understanding value chains for effective interventions.

Government Support for Promotion of FPO

The formation and development of FPOs is actively encouraged and supported by the Central and State Governments and their agencies, using financial resources from various Centrally-sponsored and State-funded schemes in the agriculture sector agencies. Government has taken several initiatives to support FPO to facilitate their emergence as successful business enterprises through apex financial institutions such as NABARD, private donor organizations, financial institutions and many other institutions. Government has given authority to SFAC to support formation of FPOs. Promotion and strengthening of FPOs has been one of the key strategies under the 12th five Year Plan of the Govt. of India to achieve inclusive agricultural growth.

Finance for FPO

FPO requires finance according to life cycle stages. The lifecycle stages are broadly categorized into three phases. In each stage need is found to be different.

A. Incubation and Early Stage

At this stage, the financial need of the FPOs revolves around the cost of mobilizing farmers, registration cost, cost of operations and management, training, exposure visits etc.

B. Emerging and Growing Stage

Once FPOs are incubated with grant support from promoting institutions, there are 3 ways to raise fund to meet their working capital and investment need. They include - Equity Financing, Credit Capital and Debt Financing.

Matured Stage (Business Expansion)

As the FPOs move towards expanding their businesses, they need finance for quality improvement in products/services. Here, finance is required for quality improvement along the value chain of the produce.

Mechanism of Doubling Farmer income through Farmer Producer Organisations (FPOs)

The concept behind Farmer Producer Organizations is the farmers, who are the producers of agricultural products, can form groups and register themselves under the Indian Companies Act. To facilitate this process, the Small Farmers' Agribusiness Consortium (SFAC) was mandated by Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India, to support the State Governments in the formation of Farmer Producer Organizations (FPOs). The aim is to enhance farmers' competitiveness and increase their advantage in emerging market opportunities. The year 2014 was observed as the "Year of Farmer Producer Organisations", and slowly but surely, the concept is catching on. The FPO's major operations include supply of seed, fertilizer and machinery, market linkages, training, networking, financial and technical advice. A variety of approaches have emerged in response to the problems faced by the small and marginal farmers. The first approach is the facilitation of collective action by small and marginal farmers. Agricultural cooperatives, formed under the Co-operative Credit

Societies Act, 1904, have long been the dominant form of farmer collectives; however the experiences with cooperatives point too many limitations that prevent effective collective action.

a. Better farm income

A FPO will support the members in getting more income. By aggregating the demand for inputs, the FPO can buy in bulk, thus procuring at cheaper price compared to individual purchase. Besides, by transporting in bulk, cost of transportation is reduced. Thus reducing the overall cost of production. Similarly, the FPO may aggregate the produce of all members and market in bulk, thus, fetching better price per unit of produce.

b. Provision of market information

The FPO can also provide market information to the producers to enable them hold on to their produce till the market price become favourable. All these interventions will result in more income to the primary producers. Many FPOs provide information to their members in a variety of forms — from workshops and conferences, to field days and focus group sessions. Printed materials like newsletters, brochures, and websites also provide valuable information.

c. Economies of scale

Large membership base also gives organizations the opportunity to benefit from collective ordering and purchasing, allowing the organisations to provide certain common items to their members at reduced cost. The cost reduction includes in ordering cost, transportation cost, economies in large scale purchase of agricultural inputs such as seed, fertilizers, pesticides, agricultural equipment, etc. on behalf of their members.

The ability to meet high food safety and quality standards was lowest in smallholder agriculture because of the scale economies. The most important reason was the inability of the smallholder dominated production systems to meet the food safety and quality requirements of the rich country markets. They stressed more on need of collective action from small holders. While there are some examples of successful collective action in both the spice and fishery export industries in India, it has been lacking in many other sectors, notably in horticulture (Deininger and Sur, 2006) [6]. Urban Poverty and Environment series report (2007) stated that to minimize the cost of inputs and ensure proper handling of output by middle men or command higher output prices, group negotiation through producers' organizations' was a valuable advantage. It also strengthened experience sharing, and offered opportunities for inter-change programmes and training.

d. Enable vertical integration

Producer-owned organisations were good examples for the vertical integration based on the horizontal coordination of farmers as initiators as they proved that by co-operation there was an opportunity to significantly improve their countervailing power and to establish ownership for farmers in the upper part of the food chain if they can secure strict quality requirements, solid financing, loyalty and trust in their organisations (Gábor and Szabó, 2009) [9].

e. Ensure market access

Market access is ensured by purchasing of members' produce and transports are equivalent to the inbound logistics activity of the manufacturing organisation. Quality control and pricing of the raw materials are also parts of the purchasing activity. Consolidation and processing covers the typical value-adding operations of the FPO. While consolidation takes care of bulking activity and storage of the produce to sell it at a favourable price later, processing is about enhancing the value of a product by changing its form and/or structure.

The benefits of farmer organization for market access were more evident in the vegetable sector, characterized by high transaction costs. There was less incentive for farmers producing an undifferentiated commodity such as maize to organize as the transaction costs associated with market access were relatively low. Although farmer organizations do not provide clear benefits in accessing undifferentiated commodity markets, they can still contribute to members' welfare by offering other services (Hellin *et al.,* 2009) [11].

f. Develop market and buyer relations

Strong and longer-term relationships with different buyers are needed to become a reliable market partner. It also require strong contractual arrangements and agreements with them. Market intelligence is important for making commercial decisions as FPO, as well as to transfer market signals to the members to influence their decisions on production and to define the conditions of supplying to the FPOs. Group of small producers through producer organizations were capable of making strategic investments to gain access to agro industrial markets where their produce was more profitable by establishing more complex contractual arrangements with potential purchasers. Javier and Cavero, (2012) [12] explore the distributional effects of lowering transaction costs to allow access to improved market opportunities for small farmers.

They found that when new marketing opportunities arise, those that have more land, are better educated and are well organized are able to deal with the complexities that the new contractual arrangements entail.

Farmer organisations have the potential to improve services and reduce transaction costs but effective mechanisms of downward accountability were necessary so that issues such as poor management and elite capture can be addressed, and farmers are motivated to invest in actions that have collective benefits (Mbeche and Dorward, 2014) [13].

Status of Farmer Producer Organizations (FPOs) The concept of 'Farmer Producer Organizations, (FPO)' consists of collectivization of Producers especially small and marginal farmers so as to form an effective alliance to collectively address many challenges of agriculture such as improved access to investment, technology, inputs and markets. Department of Agriculture and Cooperation under Ministry of Agriculture, Govt. of India has identified Farmer Producer Organizations registered under the special provisions of the Companies Act, 1956 as the most appropriate Institutional form around which the mobilization of farmers is to be made for building their capacity to collectively leverage their production and marketing strength. The Department of Agriculture and Cooperation (MoA) has setup 'Small Farmers Agribusiness Consortium' (SFAC) as designated Agency for organising FPOs though various schemes and projects. These projects subscribe to a broad objective of mobilizing farmers into groups called Farmer Interest Groups (FIGs), forming Farmer Producer Organizations (FPOs),

strengthening farmers' capacity through training on agricultural best practices for enhancing crop productivity in sustainable manner, ensuring access to and usage of quality inputs and services, and facilitating access of the producer groups to fair and remunerative markets for marketing the crop produce as well as their value added products, where feasible.

STATE WISE PROGRESS OF FPO PROMOTION as on 31.01.2019

S.No	State	No. of Farmers			No. of FPOs		
		Mobilized	Under Mobilization	Total Targeted Farmer	Registered	Under the process of registration	Total
1	Andhra Pradesh	6792	6208	13000	7	6	13
2	Arunachal Pradesh	1850	2900	4750	2	4	6
3	Assam	7147	3353	10500	12	6	18
4	Bihar	26186	8814	35000	27	9	36
5	Chhattisgarh	29135	0	29000	26	2	28
6	Delhi	3535	0	3500	4	0	4
7	Goa	1810	0	1750	2	0	2
8	Gujarat	19166	4834	24000	20	5	25
9	Haryana	12225	525	12750	23	0	23
10	Himachal Pradesh	4887	1963	6850	5	2	7
11	Jammu & Kashmir						
	Jammu (Division)	3694	287	3981	1	0	1
	Srinagar (Division)	3120	960	4080	1	0	1
12	Jharkhand	10009	0	12000	8	2	10
13	Karnataka	121218	6282	127500	119	6	125
14	Madhya Pradesh	126934	22066	149000	143	5	148
15	Maharashtra	96622	7878	104500	99	6	105
16	Manipur	5671	1279	6950	4	4	8
17	Meghalaya	2990	760	3750	3	1	4
18	Mizoram	1700	1000	2700	1	1	2
19	Nagaland	1750	2000	3750	2	2	4
20	Odisha	39463	0	38900	41	0	41
21	Punjab	6288	0	6000	7	0	7
22	Rajasthan	49617	10883	60500	40	10	50
23	Sikkim	16279	0	15750	30	0	30
24	Tamil Nadu	10945	6055	17000	11	6	17
25	Telangana	24548	4450	28998	20	5	25
26	Tripura	2874	0	2750	4	0	4
27	Uttarakhand	6004	0	6000	7	0	7
28	Uttar Pradesh	35746	20254	56000	35	22	57
29	West Bengal	82736	7764	90500	79	10	89
Total		760941	120515	881709	783	114	897

Source: http://sfacindia.com/FPOS.aspx

It is clear from the table that, highest number of FPOs registered is in Madhya Pradesh state with 148 numbers of FPOs. Followed by Karnataka (125 FPOs),Maharashtra (10571 FPOs), and West Bengal (8962 FPOs).

Conclusions

Improvement in status of the farmer is possible only through diversification and commercialization of their agricultural activities. There is a need to strengthen support services for small farmers by developing link between farmers and purchasers of agricultural produce. Farmer Producer Organization (FPO) is a means to bring together the small and marginal farmers and other small producers in the local communities to build their own business enterprise that will be managed by professionals. FPO offers a proven pathway to successfully deal with a range of challenges that confront farmers today, especially small producers. FPO can help farmers for production of agricultural produce as well as during the process of marketing the crops. Through FPO farmers can access quality inputs at low cost, can obtain the market information on different markets and prices in different markets, secure access to new technologies, and tap into high value markets. FPO is the best way of linking producers to market for getting fair prices for their produce.

The role of the Farmer Producer Organisations (FPO) is critical in the development of inclusive and sustainable supply chains. These organisations can be effective and vital players in the supply chain due to their ability to connect smallholder farmers to markets, including the school feeding market. The key hindrances faced by the FPOs are low membership and seasonal nature of agriculture which force the FPOs to be sit idle during off-seasons. The FPOs should take up additional activities in order to ensure the regular income of their members in off-seasons. Apart from this wrong selection of model, non-availability of suitable market linkages, problems within the clusters, non-availability of APMC licence etc. are the other hurdles in their growth. It is suggested that selection of the model should be according to the local conditions and needs. The managements of such FPOs should be take initiatives to identify good market linkages where the members will bemore benefitted. The respective state government and Agricultural Produce Marketing Committee (APMC) should make changes in the current APMC Act in order to cover the FPOs also.

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Plight of Farmers -Need for Skills Development

Introduction

The human skull carrying farmers from the state of Tamil Nadu have been agitating at JantarMantar, New Delhi for over a month now.

The demands of the farmers include waiver of nationalized bank loans, constitution of Cauvery Management Board and drought relief of Rs 40,000 crore to tide over their immediate distressful situation arising out of third consecutive drought in the region.

Two days ago, people from different walks of life from the State, including farmers, students and general public, launched a blood signature campaign to express solidarity with the farmers.

The dismal state in which the Indian farmers find themselves today may be attributed to the shift of focus of the successive governments from the agriculture sector, since the green revolution of 1960s, to the higher revenue generating and thus more lucrative service and industrial sectors.

Hence, progressively there was a decline in capital formation in the agro sector, the policy makers resorted to inadequate expenditure on irrigation and extension services in rural areas, and a dearth of cheap institutional credit, resulted in a slowdown of agricultural growth and heightened livelihood insecurity for a substantial proportion of those dependent on agriculture.

Distressful Plight of Indian Farmers

It may be noted that 65% of the total workforce in India belongs to the agriculture sector, which contributes about 15% to thecountry's $2 trillion economy.

The most important reason for the distressful plight of the Indian farmers is that 80% of them are small and marginal farmers, who are dependent for their survival on less than five acres of land. Nearly, 50% of rural households and 36% of the total households in India belong to this category.

India with its diverse land mass is also subjected to diverse furies of nature. It is estimated that 70% of the country's arable land is prone to drought, 12% to floods, and 8% to cyclones.

The employment of outdated agriculture practices on limited land holdings, which inhibits experimentation for progressive and revolutionary farming, has resulted in agriculture productivity levels to become stagnant over the previous few decades.

NITI Aayog recently highlighted that the agricultural sector in India is 28 years behind its time.

Furthermore, the workforce employed in the farming sector, constitutes of uneducated, unskilled labour, who have not empowered themselves with any other alternative skill set. Hence, they have very restricted options to earn their livelihood.

The world today is discussing its transition from the Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs), which aim to end poverty and hunger and promote sustainable development. In the prevalent milieu, the small farmers hold the key to success of the said global goals.

Historical Perspective

Farmers in India have been at the receiving end from times immemorial. Historical records relating to frustration, revolts and high mortality rates among farmers in India, particularly cash crop farmers, date back to the 18th and the19th century.

The Izaredari System was introduced by Warren Hasting, the then Governor of East India Company in 1773. Wherein, Izaredars were appointed by the East India Company to collect revenue from the peasants and farmers.

The revenue collectors (Thekedars) who were further deputed by the Izaredars adopted extremely harsh methods to execute their task.

Later, in 1799, Lord Cornwallis introduced **the Permanent Settlement System**, in which the Zamidars were made the permanent owners and landlords, who could keep 11% of the total produce for themselves and pay the balance 89% to the Company.

The actual cultivators were reduced to tenants and were deprived of all rights over the land that they physically tilled.

Permanent settlement fixed the revenue for 10 years. Irrespective of the vagaries of weather or any calamities, the peasants had to pay up the Landlords, who treated them worst then slaves.

Naxalism is actually an outcome of the harassment faced by the peasants at the hands of their landlords. Their extreme state of deprivation compelled them to take up arms against the landlords.

The Deccan Riots of 1875-1877 were an outcome of high land taxes of 1870s, which were payable in cash, regardless of the effects of frequent famines on farm output or productivity, combined with colonial protection of usury, money lenders and landowner rights.

In the present times, especially in India, the policy of liberalisation and removal of trade barriers between countries have created the farm crisis, for the following reasons:

- A shift from 'food first to trade first' and 'farmer first to corporate first' has discouraged farmers and restricted growth of Agriculture sector.
- The cost of agricultural production has increased immensely because of high reliance on chemicals, heavy dependence on mechanised farming and the deregulation of the input sector, like, sale of seeds, pesticides, fertilizers and now even diesel.
- Deregulation of markets and lack of effective price regulation of the farm produce, has led to a mockery of poor farmers, who are given ridiculously low prices for their farm commodities.
- The present agriculture policies, at least on the paper, suggest alternatives to boost the agro-sector, e.g. establishment of agro-processing industry and promotion of agri-businesses by way of providing subsidies. However, these subsidies are being enjoyed by already prosperous individuals in the field, like those who own cold storages, transport

and allied ancillary services. These subsides do not reach the small/ marginal farmers who actually need them.

Major Reasons for Farmer Suicides

According to the National Crime Records Bureau, as many as 5,650 cases of farmers' suicide are recorded in India annually. Out of the said figure, more than half are recorded from Maharashtra alone.

The states of Madhya Pradesh, Telangana, Chattisgarh and Karnataka also record large number of farmer suicides. In India, farmer suicides account for 11.2% of the overall suicides committed.

Let us look at the major reasons that push the farmers to take this extreme step:

Non-availability of institutionalised credit facilities and high rates of interests: It is highly cumbersome for a farmer to get institutionalised loan because of the elaborate paperwork requirements and guarantees required to be furnished.

Heavy debts on farmers: Since, the small/ marginal farmers are unable to obtain institutionalised loans, they resort to taking loan from the unorganised sector through moneylenders to meet their domestic and agro related express requirements.

The rates of interest charged by the moneylenders are anything in the range of 24 to 60 percent per annum; depending upon how urgent or inescapable is the need of the farmer.

Invariably, the farmers are unable to pay up such high interest rate and are often seen harassed by the goons of the moneylender. In such extreme cases the farmer is left with no other option but 'cancel his captivity'.

Inadequacies in implementation of safety nets: Successive governments have been incapable of effectively implementing social welfare schemes appropriately.

Government schemes to safeguard the bare necessities of the underprivileged such as running of fair price shops (FPS), various forms of food for work schemes and correct regulation of public distribution system has been grossly inadequate in the country.

Delayed and ridiculously meagre compensation for the crops damage caused due to natural calamities is never enough for the farmers to pay their debts and also have adequate capital for sowing of the next crop.

Minimum Support Price (MSP) does not support the increased inflation: The farmers, who sell their farm produce to the private buyers (middle men) designated by the Food Corporation of India (FCI) are routinely duped, harassed and paid inadequate compensation.

Many times the private buyers hold the farmers to ransom by threatening them that they will not pick up their perishable items, which are "supposedly" not meeting the quality tests being conducted at times by corrupt officials of FCI.

So, this 'coterie of thugs' is able to undervalue the farmer's produce, mostly even below the official Minimum Support Price announced by the government.

The middle-man in turn sells the produce at the government procurement centres and pick up undeserving profits, which should have rightfully gone to the farmers.

Disproportionate increase in the cost of agriculture inputs: The relative increase in the cost of agriculture inputs like seeds, fertilizers, pesticides, diesel, etc is not commensurate with the annual increase of minimum support price announced by the government.
The reducing scale of crop productivity and diminishing land holdings, coupled with high input costs has progressively declined the profit margins of the farmer. Consequently, their basic sustenance has become a major challenge.

Unpredictable weather conditions: The weather conditions have become extremely erratic and unpredictable owing to climate change.
The cumulative crop losses force the farmers to take loan from multiple unethical sources. This vicious cycle leads them into an abyss of unmanageable debt.

They are then haunted by the moneylenders, their own growing domestic demands and the need for more money to sow next crop.

Reduced land holdings: A successive property division, leading to very small land holdings, has made agriculture unviable as a profession. The small landowners still continue to cultivate low-value conventional crops, which makes their farming unsustainable.
Inappropriate land use and cropping pattern: Large scale cultivation of conventional subsistence crops, like wheat and rice has resulted in creating a surplus, which affects its price negatively.
Since the input cost of conventional crops is high, the yield per acre is more or less stagnant; the profit margin has over the period declined. Besides, this cropping pattern erodes fertility of soil, reduces resistance to diseases and extensive rice cultivation has very adversely affected the underground water table.

Similarly, the input cost of cash crops, like tea and coffee is extremely high as compared to the value of India commodities in the world market, which has made its cultivation unviable. A number of tea gardens in the NE have shutdown or are at the verge of shutting down, rendering a huge selectively skilled workforce jobless.

Remedial Measures
Re-examining the National Policy for Farmers (NPF): The government has recently set up an expert committee to scrutinise the functioning of the NPF (which was established 08 years now), so as to identify and address the specific reasons for farmer's suicides.
Re-examining the basis of working out MSP: At present the Minimum Support Price (MSP) is decided every year by the 'Commission on Agricultural Costs and Prices'.
Recently, government has announced that it would re-examine the basis of working out the MSP, so that it allows risk free farming and cuts losses.

Disaster relief: A total of Rs 61,291 crore has been earmarked for 2015-20 to provide relief to the States which may be hit by various natural and manmade disasters.
Introduction of National Agricultural Insurance Schemes: On 13 January 2016, the Cabinet had approved the 'Prime Minister Crop Insurance Scheme'.
This insurance scheme for farmers provides insurance coverage and financial support to farmers in the event of failure of any of the notified crops as a result of natural calamities, pests and diseases and protects them against crop failures owing to successive droughts.

The farmers are required to pay premiums of as little as 1.5 percent of the value of their crops, allowing them to reclaim their full value in case of natural damage.

However, this scheme has not found much favour with the farmers.

Biodiversity, through crop rotation must be the basis of production to reduce vulnerability to climate and markets.
Encourage farmers to adopt low cost organic farming based on cost-effective technology with most suitable crop patterns and indigenous pest management practices.
Integrated Pest Management (IPM): Farmers need to be sensitised regarding this effort that can be organised at the regional agriculture university level so that the crop of neighbouring farmers, not using pesticides, does not get damaged.
Government/ NGOs with a vision of eco-friendly sustainable development should guide the farmers to make the efficient use of water, electricity, pesticide and other inputs.
Government could provide community implements and machinery at panchayat / block level so that small and marginal farmers can also use mechanised techniques of farming at lesser cost to improve productivity.
Institutionalized Credit System e.g. Jan DhanYojana and MUDRA banks must be simplified and farmers be made aware of their rights and governments' initiatives in this regard.
Moneylenders charging the farmer's exorbitant rate of interest must be identified and punished for running such a racket.
The role of commission agents, traders and intermediaries should be minimized to facilitate the farmers to fetch maximum price of their produce. Governments' initiative pertaining to e-Mandi must be effectively implemented on ground.
Strongest punitive action should be taken against suppliers of spurious seeds and manufactures of spurious pesticides.
Gram Panchayats should evolve a mechanism to identify the indebted and suicide prone farmers and help them to overcome the crisis.
Personal Accident Insurance Scheme covers Kisan Credit Card Holders, to provide relief in an eventuality of an accident.
To sustain the family of the deceased, all the financial help should be provided as 'Fixed Deposit' in the bank, with quarterly payment of interest.
Recent Government Initiatives
The agriculture ministry in consultation with the NitiAayog has identified a set of nine marketing reforms to ensure remunerative prices to farmers for their produce by reducing the role of middlemen.

These measures are likely to be in place by July 2017 and are considered to be one of the key steps of the government to live up to its promise of doubling farmers' income by 2022.

The noteworthy reform measures that have been identified include:

- Integration of market to e-NAM (National Agriculture Market) within the shortest possible time so that the farmers have multiple options to sell their produce at competitive prices without the involvement of any middleman. The proposed NAM framework envisages integration of 585 major regulated mandis across the country for real-time electronic auctioning of the commodities along with integrated assaying, weighing, storage and payment systems.
- In order to encourage agro-forestry, which has a huge potential for supplementing the income from agriculture, farmers will be exempted from felling of trees grown on their private land.

- Relaxing of transit regulations will help movement of timber from one part of the country to the other and reduce dependence on imported timber to meet the huge demand for wood in the country.
- Government is working towards creating a unified market platform where any licensed trader can buy the farmers produce online. The licence will be required to be obtained by the trader from the Director of Agricultural marketing. The advantages of the unified trading licence will be that the trader will be able to purchase the notified commodities in all the notified markets of the state with a single license. The same will save time, bring about quality control through a transparent regulatory mechanism.
- Furthermore, there will be a single-point levy of market fee, so as to simplify the procedures and make trade of commodities less cumbersome.
- The National Agricultural Policy 2000 envisages an active participation of the private sector in agriculture. The same can give a real fillip to the agro-sector by conducting research and introducing improved technologies, provision credit through cooperatives and self-help groups, create infrastructure (for seeds, fertilizers & pesticides), transportation and processing services, warehousing and cold storage facilities to prevent rotting of food grains, help with all other extension services, carry out contract farming, direct marketing and setting up of private markets to allow accelerated technology transfer, capital inflow and create an assured market for crop production.

Conclusion

It is very unfortunate that the nation as a whole has failed to appropriately strengthen the hands that feed us. The farmers live in a state of unprecedented deprivation and most deaths are due to lack of adequate medical facilities or starvation or physical and mental agony.

The government must not adopt a myopic approach to address this very serious challenge by simply doling out relief packages for farmers and waiving off bank loans to tide over immediate problems.

The government needs to look at the holistic picture and adopt policies that are in the long term interest of farmers, e.g. interlinking of rivers for irrigation and mitigating flood disasters, skill development of the workforce, better regulated marketing system and employment of technology and private players to qualitatively boost the output and make the Indian agriculture sector globally competitive.

Marketing, Agri-logistics and Agri-value System

India's agriculture has travelled a long way from a period of subsistence farming to that of surplus output, calling for a paradigm shift in the earlier stance taken with the agricultural marketing system. It emerges that agriculture markets, established in 1960 to oversee and manage a situation of deficit production, are now inefficient in handling the large marketable surplus efficiently. For example, India now harvests 40 times as much tomato, 14 times more potato, 8 times more wheat, thrice as much in poultry and meat, 13 times more fish, 8 times more milk and almost 40 times more eggs, compared with that in 1960s.

The agriculture marketing system is expected to help the agricultural sector to adjust to this changed scenario, an environment where marketing of large surpluses is required. The rethink is with the reasoning, to move marketing away from overseeing the flow of produce (from farm-to-consumer), towards a function that underlines the flow of market linked information (from fork-to-farm), to guide and mentor the market and logistics networks to efficiently handle surpluses that are generated. Agricultural marketing entities have earlier focused on informing market price (transaction status) and not much on providing market intelligence (forecasted demand & price).

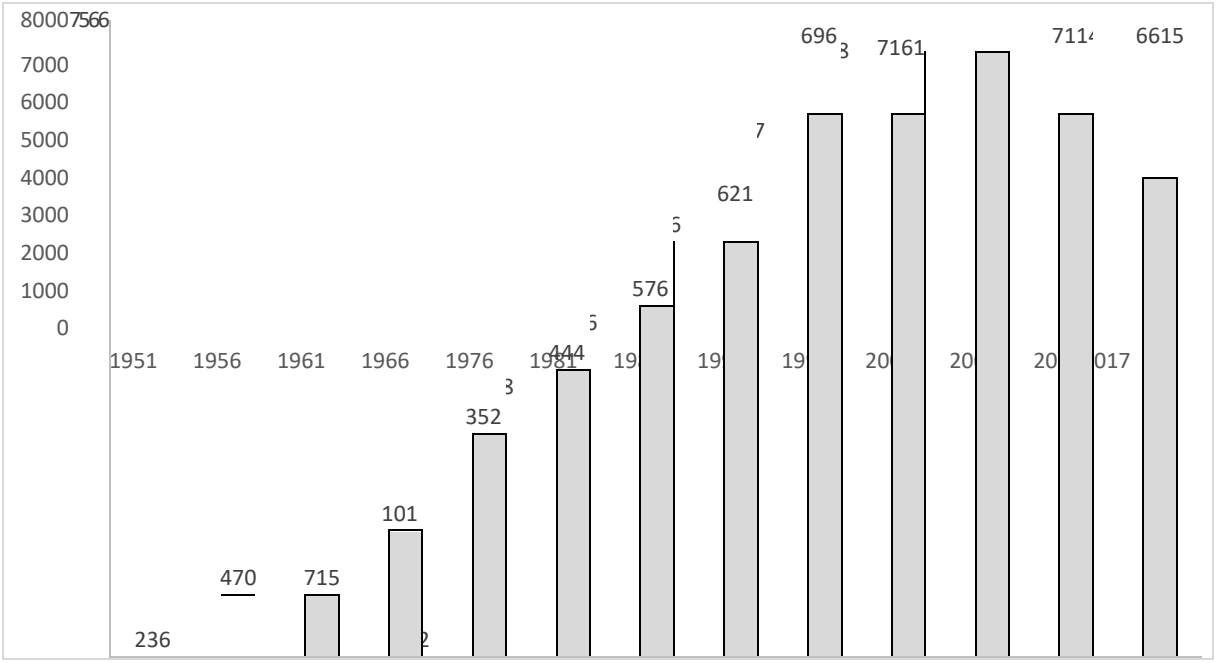
Marketing system requires to provide both intelligence and information, to allow producers to adjust to the changes taking place in the external market environment. Therefore, as a function, it is intended to direct the flow of goods to crystallise demand, for productive effectiveness & efficiency of agriculture as a business. The marketing system also needs to promote alternate concepts, e.g. provisioning of alternative market channels, participation of private sector, using e-platforms for market expansion and enabling a stable and farmer friendly market environment. Without effective marketing, all efforts and resources and the production is left undervalued and the outcome does not lead to the desired growth.

The Agricultural Marketing System incorporates government policies and strategies, for enabling efficiencies in the supply chain activities for agricultural produce. Marketing is a vital role as a link mechanism, between producers with consumers. Farming needs to be approached as a market-led business enterprise there is the need to develop a marketing system that is more appropriate to the need of the hour. The marketing system, needs next level reforms to give impetus to modernise the markets, expand upon the market network and to promote more market linked activities at village level.

The Market Architecture

The marketing of farmers' produce has traditionally been channeled through a network of agricultural markets, predominated by APMC regulated markets. The current market system comprises about 2,284 APMCs which operate 2339 principal markets. These principal markets have extended their footprint through sub-market yards, which total 4,276. The sub-market yards are expected to operate as a part of the principal market yard under the associated APMC.

Figure 1 Regulated Market yards in India since independence



Data includes APMC markets plus their sub-market yards *Source: DMI*

In essence, there are only 2339 principal markets which operate out of 6,615 locations (principal market yards plus their sub-market yards). These 2339 principal markets are further categorised as primary, secondary or terminal markets, depending on their location and the volume being handled.

With a few states having deregulated their markets, the total number of regulated yards has reduced of late. Market yards have been mostly developed by the government and the majority of the markets have godowns or warehouses, though very few have cold stores. The markets were originally conceived as nearby trading platforms, for cotton originally, and then for other hardy crop types. Scientific assaying, packaging and preconditioning of produce, is not readily possible at these centres. The situation is more acute in case of perishable produce, other than foodgrains, which are also traded at these markets. Milk is one of the produce types not handled at such markets.

Each principal market, has a designated area under its coverage. Regulations required, that perforce, the notified produce of the region be transacted only in these regulated yards. Therefore, a farmer is, by regulations, unable to freely transact an exchange with a buyer from outside the APMC control area. This has tended to enforce a monopolistic mechanism for agricultural produce trade. Furthermore, the farmers have no facilitating system to bypass the local market and connect with larger or better paying market as they have no organised facility or assembly centre that can aggregate and transport their produce to transact at other market centres.

Even direct connection with APMC markets, which are principally wholesale markets, is difficult for many farmers. The small & marginal farmers, with uneconomical sized marketable lots, find it difficult to aggregate their produce and move to these APMCs to participate in the auction system for suitable price discovery. They therefore use local agents and traders, who relieve the

small farmer of their produce at locally determined prices, to function as aggregators and transport to transact at the APMCs. This intermediation has naturally been depriving the farmer-producers from aiming for optimal or market-linked price realisation. The current market architecture does not provide farmers with a choice of markets but imposes constraints to their selling options.

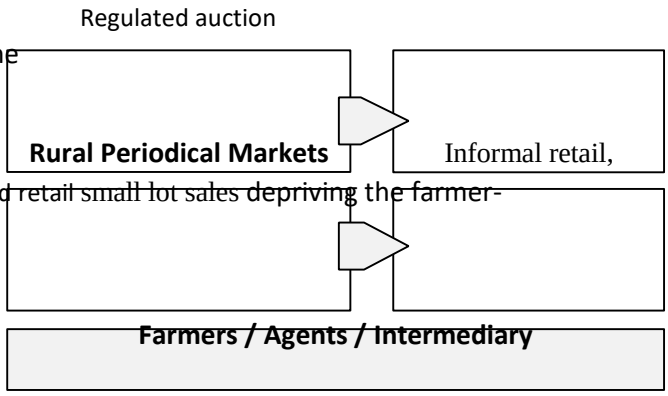


Figure 2: Existing market structure – which enforces an intermediary exchange at every stage

The market system was designed at a time when production levels and marketable surplus in the hands of farmers was comparatively less, and with the purpose to facilitate platforms where farmers and buyers could conveniently transact a trade in a transparent competitive manner. The quantum of produce was also suited to the demand in the vicinity of such markets. However, with the general growth in production levels over the years since, the markets now receive agricultural produce, far in surplus of the markets own capacity to absorb the output, which results in sub-optimal price discovery at the current markets.

Therefore, the markets no longer are platforms that provide optimal monetisation of the farmers' produce, but promote an intermediary trade, which through a series of players, connects the produce with other demand centres. There is the need to restructure the role of markets, currently limited as exchange centres, and expand it to include services that connect the farmers with other market points. Markets need to be structured so as to integrate the follow of produce from villages with domestic and global level markets.

Rural Periodic Markets

The country also has a large number of rural periodical markets (RPMs) located at village level. These are small *haats* / shandies that operate at intervals of a week or two, and attract sellers and consumers from the hinterland. An assortment of daily needs including farm produce (grains, fruits & vegetables are traded) at these places. These RPMs, numbering about 22,932 (as on 31.03.2017) are owned & managed by different agencies, namely, individuals, panchayats, municipalities, including State Agricultural Marketing Boards (SAMBs) / Agricultural Produce Market Committee (APMCs).

In parallel, many states adopted farmer-consumer markets with varied success. These go by the names of *Rythu Bazaar* (A.P. and Telangana), *Raitar Santhe* (Karnataka), *Apni Mandi* (Haryana &

Punjab), *Shetkari Bazaar* (Maharashtra), *Uzhavar Saathaigal* (Tamil Nadu) and *Krishak Bazaar* (Odisha). About 488 such market platforms are reported, and provide mostly for transactions of produce like fruits, vegetables and flowers which are perishable in nature. The quantum of produce sold in these markets is limited to the consumer footfall or local demand.

These RPMs function under traditionally existing informal procedures and provide the small farmers the opportunity to directly retail their produce to local consumers. In addition, aggregators and agents also frequent these *haats* to informally serve the marketing interests of small farmers. However, the opportunity to connect with larger markets that offer better value is not available to the small farmers. These RPMs, therefore serve as a stop gap measure, for farmers to tap into local retail buyers for quick monetisation of their produce.

The key bottleneck is a lack of facilities for the small farmers to consolidate their produce into viable quantities and link with other markets. This absence of facilities to pool and move the produce, also tends to deter the farmers from any collaborative farming, as their direct marketing opportunity is limited to the demand from local consumers. There is the need to enable aggregation and logistics hubs at village level, besides providing a retailing platform.

Density of Markets

The availability and access to markets by all farmers in general, and small and marginal farmers in particular, is an important factor in designing the market architecture. Frequently, the market density targets, are in relation to the recommendations made by the National Commission on Agriculture (1976). That Commission had recommended that a market be made available within range of 5 km of farms, a distance that is negotiable by walk or cart within an hour. This assessment was subsequently reiterated by the National Commission on Farmers (2004).

On the basis of this recommendation, the optimal market coverage is interpreted to target a catchment area of 80 sq. km (5 km radius) for each agricultural market. However, the original recommendation was made at a time when road connectivity was minimal and farmers would bring their produce on head or on camel or bullock carts. The primary guiding factor for market density is the time taken to communicate the produce to undertake a transaction and the physical distance involved is actually related to the mode of transport. The current rapid development in rural roads and availability of motorised transport, has changed the dynamics and the prior assessments on market density need to be revisited. Therefore, the market density requirements need to be revisited.

New approach to Market Architecture

The farmers no longer cater to just the local demand as their produce is channelled to populations remote from production areas. Whereas earlier, a marketing system was considered effective if it provided for market yards and transactions within immediate range of farms, the yardstick today needs to include, the interconnectivity between markets and the value dispersion between farms and consumers.

The small and marginal farmers, as a majority, are restricted in their ability to move their surpluses into markets of choice. The existing market architecture does not promote such facilitation and rural market yards are merely points to assemble and transact, deficient in offering any systemic linkage with the unified national market. Therefore, the architecture is lacking a value linked system approach, and is limited to price mechanism that is locally derived, delinking the farmer from the wider demand.

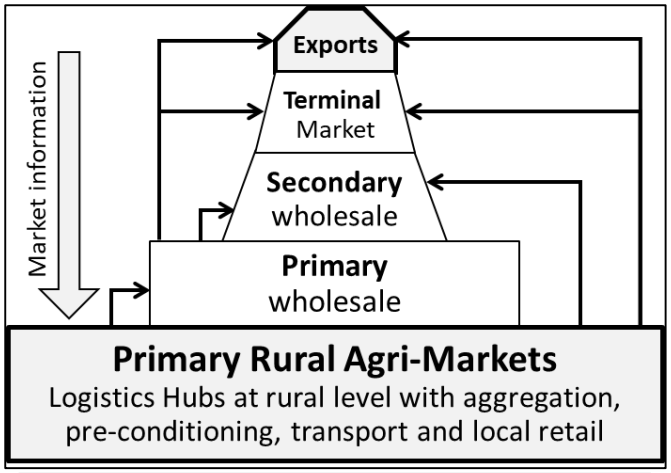


Figure 3: Aggregation at rural level is the foundation of a market structure that establishes directed flow of trade.

Both, restrictive regulatory practices and absence of a market structure that can manage the widely dispersed small lots of produce in an organised way, have deprived the farmer from his/her optimal share in the consumers' rupee. Future design and development of market architecture may require to factor in the fact that production can be in excess of a local market's capacity to absorb the supply, the transport options available and the need to facilitate farmers' transactions at national markets which offer optimal price for the value produced.

There is opportunity to upgrade the sub-market yards numbering 4276, into full-fledged wholesale markets, as well to upgrade the rural periodic markets numbering more than 22,000 into functional aggregation cum marketing hubs. As aggregation points, these can operate as facilitating centres that provide the farmers a service to link them with trade at remote locations, providing a logistics interface. The new system should aim to interconnect the farmers with multiple marketing opportunities, through the wholesale and retail market networks, domestic and international.

Effectiveness and Efficiency of Markets

A network of markets is not a sufficient condition unless the markets operate in an efficient manner as intended. Markets are operational hubs where the consolidated movement of goods from producers to consumers is initiated. The main objective of these operations is to fulfil the physical delivery of goods as per the individual transactions. Where such operations are done at the lowest possible cost, consistent with the provision of the services desired, then a market can be termed as efficient.

In the current situation, the marketing operations cannot be called effective or efficient as there remains a high price dispersion between markets within a region, and the price dispersion between farms and terminal markets is far greater than the nominal costs of operations. In the current system, the efficiency and effectiveness of the market system is negatively impacted as the system has evolved into a logistics system that is serves a blind push into markets. The current system does

not facilitate any targeted access by farmers/producers into markets of choice, and the blind push into markets promotes multiple handling of the goods, resulting in various inefficiencies.

It may be worthwhile to consider establishing functional logistics hubs at rural level, which will facilitate the aggregation and onwards supply of agricultural produce, as a service to farmers. The produce could move under ownership of the farmers, who can then undertake a transaction at prices that are determined at the remote destination market. The example of organised dairy marketing is an example of note. The price at each pooling point is not determined at the local collection centre, but is assigned by the supply and demand dynamics at the final receiving facility.

These hubs can also be points of direct marketing at rural level, therefore serving a dual purpose of exchange and facilitation, as primary rural agri-markets. There is opportunity to upgrade the infrastructure at existing periodic markets to develop them into these fully functional primary rural agri-markets, capable of handling multiple agricultural produce.

The farmers no longer cater to just the local demand as their produce is channelled to populations remote from production areas. Whereas earlier, a marketing system was considered effective if it provided for market yards and transactions within immediate range of farms, the yardstick today needs to include, the interconnectivity between markets and the value dispersion between farms and consumers. Accordingly, there is need to modernise agricultural markets, including rural periodic markets, with the capability to service a national level pan-India market. Such deliberations would include, aggregation, assaying, pre-conditioning, packaging, storage and transportation facilities, scaled to suit each production region.

The effectiveness of an agricultural marketing system will vary depending on the situation of the target regions, consumer, product and technologies in hand. Besides, global factors can come into play for certain commodities, where forecasting and preempting factors outside of the local region is also expected to contribute to marketing effectiveness. An effective marketing system is not deterred by operational inefficiencies in the flow of produce, but counters those inefficiencies by the effective dissemination of market intelligence (demand) and information (price), and by easing the rules and regulations to promote more relevant and responsive supply chains.

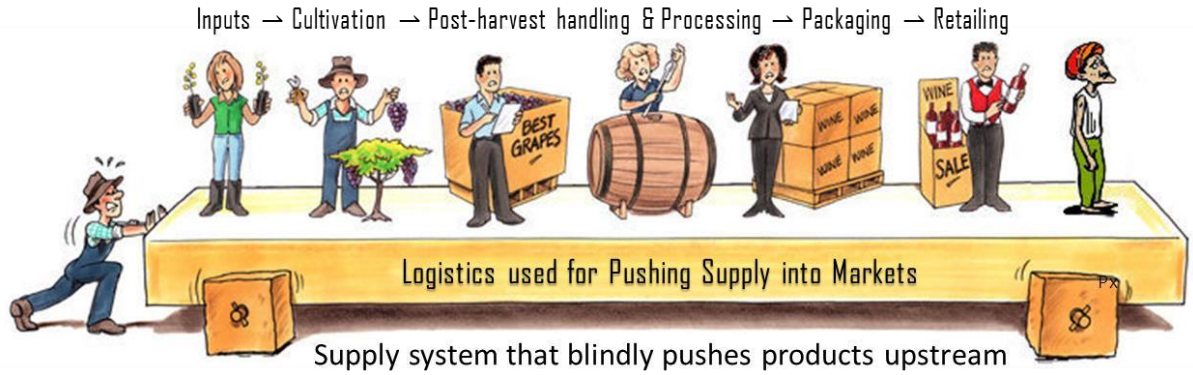
One key feature for making markets and the marketing system efficient, is to have a system that supports a pull mode from demand centres. A backwards ‘pull’ from ‘fork-tofarm’ is needed, so as to generate a directed flow of goods from farm-to-fork, to make the markets efficient. A system of consolidated market intelligence which provides advance information is needed. The information should allow farmers a choice, to monetise their produce at optimal prices at a location and time of their preference.

Market Intelligence

Markets are most effective and efficient when they operate under direction in the form of demand and supply forecasts. A revamped market structure will require to transform its operations such that they generate traffic that is guided by relevant market information.

A study of historic price signals does provide certain trend analysis, but that is not sufficient to mitigate market risks or to streamline the supply chain. There may be the need to move from giving price information to market intelligence. In the current status, market information is mainly limited to price information, where the current day's transaction price at select centres is provided. Each day's price is a signal of that day's status of the demand supply dynamics. This price signal is expected to help in decisions to select the markets to send the supply. However, since the price data is after sales (expost) information, it may not remain the same in following time period. In fact, the information results in an ex-post facto (after the event) response, and any resulting supply itself effects the demand-supply dynamics at the target market, and aggravates the price fluctuations.

Instead of current price, forecasted or advance information is more relevant to guide the entire range of agricultural activities, from production to post-production. Such advance information about future demand and price provides the stakeholders' a better set of data markers to take optimal decisions. Depending on level of advance information, the decisions can also include pre-season crop selection, crop planning, besides post-harvest market selection and post production logistics.



Supply system that blindly pushes products upstream

Traditional Supply Push – not market linked

Products are directed by pull from Customers

Modern Supply Chain - market linked

At a basic level, market intelligence can involve providing advance information, such as forecasted price, including quantitative demand and supply forecasts. Market intelligence can include dynamic information on supply situation, availability of logistics, advance market arrivals, etc. Market intelligence is a core function of marketing and is required as a useful 'Decision Support System'. In the current marketing system, there is no such comprehensive and consolidated market intelligence as a service to farmers. Such a system will be worth considering as an ease-of-doing-agribusiness initiative by the government.

Market intelligence will also serve as a guide to assess the agricultural outlook & situation analysis for food and nutritional security of the country. This conference group is to deliberate on what and how market intelligence can be implemented. The decision support system could also consolidate other information to support marketing decisions such as near real-time crop specific status on sown area, expected yield, etc. The government of India has an elaborate system of estimation of crop sown area, yield and production of different crops, but quality and timeliness of the data poses a big challenge in precise and error free forecasting and projections. Multiple organisations are involved in compilation, monitoring and release of prices/price indices, but currently no department is involved in forecasting prices/demand officially at the national level. To support this the

Directorate of Marketing & Inspection (DMI) could be restructured as to focus on Marketing & Intelligence.

Assessing, evaluating and monitoring demand and supply at global level will also be beneficial. Made in India agricultural produce and products will need to find destinations abroad, to support continued growth in production. In current situation, the intelligence about international markets is generated at captive level by some large trading houses. A macro level status, of international markets, is not available as public knowledge and this may need to be developed and refined over the long run. A matrix that indicates international supply and inventory status and market specific demand will be worth considering to support export opportunities where possible.

Price Volatility

Price volatility and price dispersion are evidenced in the existing marketing system. The variation or dispersion in price between different markets, in the same time period, is far more than the difference in cost of delivery of goods. A similar dispersion is observed in price for commodities at farm-gate within the same region. Such variation can be attributed to mark-ups by multiple players in the supply chain and due to lack of transparency in the price discovery mechanism. The market regulations which do not allow for new players to enter markets, also contribute to a less competitive environment in the market system. This also adds to a situation where the price discovery at markets is not linked only to demand and supply but also subject to monopoly of market actors.

A minor variation in the supply situation, for a given demand, is seen to result in a much larger upwards volatility in the price to consumers. In this period, the cost of delivery may not have changed. These are seen as opportunity events for agricultural markets. However, the large

opportunistic increase in price at retail end, does not reflect in an equal or proportionate increase in price at farm-gate. This is most commonly observed in case of perishable produce, especially those in high demand such as onions and tomato.

In case of crops such as cereals, pulses, oilseeds, etc., which can be stored for longer

durations, the situation is somewhat similar. Though these commodities remain in demand all through the year, there is a temporary glut at time of harvest. The farmers can be subject to price volatility during the harvesting season - the produce is valued, either at the notified MSP or the buyers determine a price for that period. In many cases the buyers' determined price is observed to be less than the notified MSP rate.

The warehousing network is important, intended to build a buffer of crops that can be stored, for subsequent supply to meet demand all through the year. However, many farmers, especially small and marginal, do not have holding capacity, they rely on the situational market valuation, or MSP rates (where applicable) for their earnings. A mechanism of valuating the annual demand and determining the annual weighted price for specific crops is not readily available. Such a system may be developed as part of market intelligence system, to inform and assist the farmers to evaluate their crop planning, production and selling decisions.

Price volatility also reflects on current market rules &regulations that do not encourage new players in the marketing system. This situation is slowly changing, but the change can be hastened. By promoting more players in the marketing system, the competitive environment is enhanced which results in improved efficiency and innovation. Business rivalry between the actors promotes market linked and logical changes in product, place and prices. The type of output, the range of transactions and the price volatility will get rationalised with a larger number of actors in the marketing system. As such, the model Agricultural Produce and Livestock Marketing, (Promotion and Facilitation) Act, 2017, needs to be wholeheartedly adopted to benefit famers and consumers alike.

The model APLM Act 2017, redefines the market area as currently specified under the APMC Act, to remove entry barriers and permit new players in agricultural marketing. It also allows warehousing to be licensed as markets. The Act is more for facilitation than regulation and provisions are made for private markets to have a level playing field, with focussed intent for 'ease of doing business.'

The proposed liberalisation in the marketing system will not only support competition and inter-market connectivity, but will also promote establishing of organised and integrated agricultural supply chains. The dairy sector has the most comprehensive supply chain system, as an integrated value-system, and price volatility (at farmer's end or consumer's end) is minimal in this sector.

Organised supply chains, that apportion a fair share of the final value realised to each stakeholder in the integrated value system, is missing in the larger agricultural marketing system. Price volatility due to demand and supply gaps are opportunity calls in the system and are balanced by market dynamics. When the demand increases, supply tends to increase in proportion and the volatility is dampened and vice versa. However, for the supply chain to respond accordingly, the availability of suitable agricultural postproduction logistics infrastructure is critical. Ideas and inputs to minimise or counter price volatility, are part of the deliberations for this conference group.

Warehousing and Value Addition

An efficient marketing system alone, is not sufficient to secure the desired benefits to farmers. To make an efficient system effective, in terms of its utility, particularly for small and marginal farmers, the sufficiency condition can be met by providing a mechanism that provides the farmers the opportunity to monetise their produce at a time of their choice. Warehousing provides this opportunity and is an important tool which allows time utility to enable the farmers to avoid an immediate sale in the surplus environment that occurs at each harvest period for certain commodities.

The National Institute of Agricultural Economics and Policy Research (NIAP - ICAR) had assessed that foodgrain demand will reach 281 million tonnes by 2020-21 (179 for direct household consumption and 102 in indirect demand like fodder, seed, industrial use, etc.). On the understanding, that about 70 per cent of this production will be stored, many have projected that this will mean the need for approx. 196 million tonnes of warehousing by 2021. However, when making such projections, it is important assess other aspects that improve inventory turn-ratios and free up warehousing space. The annual spread of production in kharif and rabi also needs to be kept in mind when planning new warehousing capacity.

The country has established widespread godowns and storage for foodgrains, including cereals and pulses. The Warehousing Development & Regulatory Authority (WDRA) estimated (in its 2015-16 Annual Report) the total available storage capacity at 126.96 million tonnes.

Table 1: Status of available storage capacity in warehouses

SN	Organisation / sector	Storage Size (in million tonnes)
1	Food Corporation of India (FCI)	35.92
2	Central Warehousing Corporation (CWC)	11.72
3	State Warehousing Corporations (SWCs) and State agencies	45.28
4	Cooperative Sector	15.07
5	Private Sector	18.97
	Total	**126.96**

2015-16 Annual Report of the Warehousing Development and Regulatory Authority

In addition, the Integrated Scheme for Agricultural Marketing (ISAM), sanctioned 65.9 million tonnes of new capacity since 2001, of which about 58 million tonnes is the new capacity created as of 31 March 2017. An estimated 7 million tonnes in new capacity remains under construction. Including the capacity sanctioned by ISAM, it can be concluded that the total available warehousing capacity is about 185 million tons (in 2017) against an assessed need of 196 million tons in 2021.

It is observed that ISAM sanctions capacity to cooperatives and private sector and some level of duplication in data is likely. However, even if the entire capacity under private sector has been duplicated, the available storage capacity was still 165 million tonnes in March 2017. Warehouses created without financial support of government may not have been accounted for and such capacity would be in addition. Agro-processing industry may have also created some capacity for captive storage which may also not have been captured.

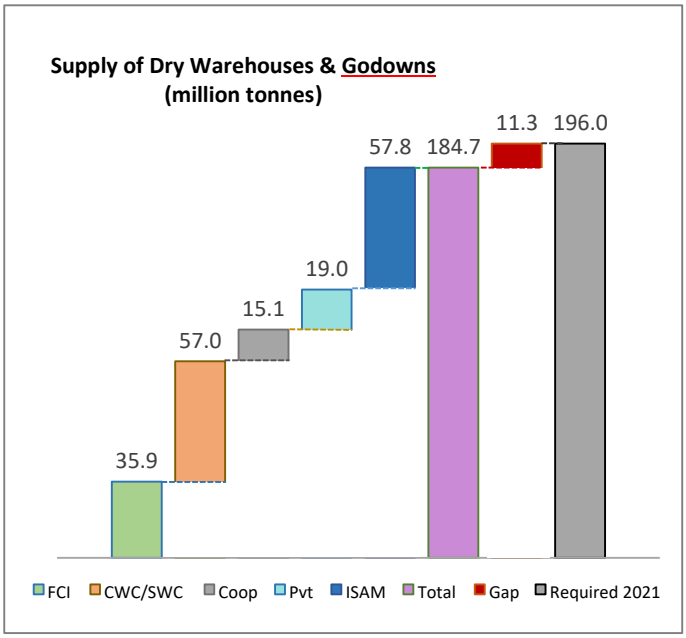


Figure 4: Availability of godowns & warehouses

The inputs from private sector inform of underutilised storage capacity in the country. WDRA has also confirmed that many States have excess warehousing capacity, and that the data on warehousing under private sector (18.97 mill tons) is not verified and actual capacity could be more. Indicators seem to suggest that the storage availability may be higher than assessed and the projected gap in storage may be far less than estimated.

An assessment of the current required warehousing capacity for foodgrains, oilseeds and milled sugar was done by the Directorate of Marketing and Inspection, by applying marketed surplus ratio (MSR) to 2015-16 production.

Table 2: Marketed surplus, distribution, warehousing assessment

Commodity	Marketed surplus (2014-15)	Ratio of surplus for warehousing	Storage required (million tonnes)
Foodgrains	193.41	50%	96.7
Oil seeds	23.41	55%	12.9
Sugar milled	22.54	60%	13.5
Total capacity needed for dry warehousing			**123.1**

Source: DMI assessments

The MSR is applied keeping in mind the distribution and seasonal spread of production of the major commodities. This assessment indicates that the current need for warehousing capacity could be less than 130 million tonnes.

As per available data about capacity utilisation of storage available in public sector (under FCI, CWC and SWC, including both owned and hired) in the South, East, North East West and North regions is 58, 60, 63, 75 and 90 per cent respectively, with average of about 86 per cent. This clearly substantiates the fact that the north zone has better utilisation compared to States covered under

south zone. The higher capacity utilisation in northern region is also attributed to the use by the central agencies to store stocks procured by them in that region. These inputs tally with those by the private sector which also inform of idle warehousing capacity.

There are some fundamental factors responsible for low use of warehouses by the farmers. The majority of farmers are marginal and small and may not consider storing the produce in a warehouse, or may be find other alternatives easier to manage. There is also a distribution asymmetry in the warehouses and these may not have always been constructed to suit the agricultural patterns or the shift in cropping patterns that can be expected in the future.

Access to safe warehousing, empowers farmers in two basic ways. The warehoused inventory not only allows the farmer a choice of time to sell their produce, it also opens the option to avail of pledge finance to meet their immediate financial needs. The inventory can be used as collateral, and farmer can benefit from the low interest credit, as facilitated by the government. The availability and access to agricultural warehousing is therefore important for the welfare of farmers.

Post-harvest / Pledge loan system

The mechanism of pledge finance to the farmers is to enable them to avail credit, when the prices are low and to sell their produce, when the prices are favourable. The aim of pledge loan scheme is to protect the interests of the farmers against distress sale of agricultural produce by providing short term loan against the pledge of the produce at zero/low interest rates. The idea is to provide access to both easy credit and safe and scientific storage.

Implemented by some state governments, the pledge loan was extended by the financing banks against warehouse receipts issued by the State and Central Warehousing Corporations. Subsequently, Agricultural Marketing Departments/Boards of various States also commenced providing post-harvest pledge loan, through their APMCs. There was however problems faced by financing banks, in assessing the quality of the stored agricultural produce and security of the inventory.

This gave rise to the emergence of Collateral Management Service providers, which are being promoted by a consortium of banks and other related organisations. These Collateral Management Service Providers assay the quality of the produce, maintain and manage the produce, issue warehousing receipts and offer collateral security of the produce stored to the banks on behalf of the farmers who own the produce. They in turn charge their margin for the services provided. The banks are able to extend pledge finance to the farmers against the warehouse receipts issued.

The data on pledge loans by banks and non-banking (APMC/Collateral managers) sector makes it evident that the reach of the facility is very insignificant. The number of farmers availing pledge loan is minimal and some reasons for low credit flow under post-harvest loan are:

i.Poor awareness level of the facility among farmers ii.Physical availability of warehouses accessible to farmers iii.Small lots in hands of small farmers, having minimal facility for aggregation iv.Complicated procedure for getting the pledge loan
v.Lack of confidence among bankers about the management at the warehouses vi.Lack of harmonised tradable standards for use of warehousing, post-harvest pledge loan and on e-NAM

The low capacity utilisation of warehouses by farmers, is also attributed to the lack of knowledge about the mechanism of warehousing receipts and associated pledge loans for the farmers. These aspects may require special focus by extension services.

Additionally, the facility of interest subvention on post-harvest loan is not available to all farmers. There is provision for concessional post-harvest loan to small and marginal farmers against negotiable warehouse receipts (NWRs). The loan on the value of agricultural produce kept under pledge terms in storage, is eligible for the interest subvention of 2 per cent (same as for crop loans) for upto a period of 6 months. However, this is offered only to small and marginal farmers holding Kisan Credit Card (KCC). Those farmers who have not availed crop loans through banking system, are not eligible for the concessional interest on the post-harvest loan.

There is an obvious need to make farmers more aware of the pre-requisites and to extend more favourable terms for the pledge loans. As the collateral is the produce itself, suitable scientific storage of the produce is a pre-condition for the advance of the loan by regulated markets / banks. Facility to assay the quality and quantity is also important.

There is no pledge finance scheme being implemented by any agency in the States of Bihar, Jharkhand, Himachal Pradesh, Uttar Pradesh, West Bengal, Orissa, Assam, Arunachal Pradesh, Manipur, Mizoram, Meghalaya, Nagaland, Sikkim, Tripura, and Delhi.

Modernising warehousing

The availability of warehousing is however not necessarily an indication of their accessibility and of their quality. The warehousing s capacity includes storage of type ‘Cover and Plinth’ (CAP), besides covered warehouses and/or silos. CAP storage is more liable to incur losses and upgradation is indicated. Similarly, the regular warehouses require upgradation and registration with WDRA so that the crop inventory is secure under storage. Capacity created may not be suited for proper scientific storage which is necessary for the farmers to entrust their yield into the care of a third party.

Modernisation of warehouses for the purpose of safe-keeping farmer produce, will mean, not only the upgradation of infrastructure, but also regular monitoring and assessment of the warehousing operations and practices followed. Modernising the warehousing, therefore infers to all aspects that safe guard the value of crops stored, so that the value can be leveraged by a farmer, as owner of the inventory.

When preparing the District Storage Plan, the status of existing infrastructure may be examined. Further, emphasis should be bringing adherence to the standards of WDRA, so that the storage

godowns can be certified as warehouses. This necessitates, restructuring of the existing godowns to meet the desired WDRA standards and ensuring, that new constructions are in strict conformity with the standard.

On-farm post-harvest value addition

The farmers market their produce to various types of primary buyers. Broadly, the buyer is categorised by their own use of the agricultural produce,

i)for own consumption (individual consumer, or an agro-processing industry), or ii)for trading (a wholesaler, or a commodity trader).

Each category of buyer has a specific preference and follow up activity. For example, the processing industry would prefer receiving the raw material of standardised specification, which can be immediately used as feedstock in their processing line. The consumer would prefer receiving produce that is clean and safe to use for immediate consumption. The trader would opt for uniform lots, package in a storable format. Such activities require an appropriate combination of assaying, grading, cleaning, packaging, consolidation and first mile transport. Each of these is an economic activity that adds value to final monetisation of the produce. Such activities are essentially carried out to pre-condition the produce for the market, and they can be expedited in the hands of farming communities, or with farmer groups. The infrastructure tools required for such preliminary market linked functions are minimal and can be established at village level or facilitated at existing rural market locations.

Lack of such facilitation means that the farmer, especially the small and marginal farmer, does not sell to the primary buyer, and instead is forced to monetise their production through a local agent or buyer's agent. When such activities are provided as a service to the farmer, these are termed as value added services (VAS). However, such VAS service centres are not provided for use of farmers in the existing marketing system.

Other forms of farm level value addition involves taking up micro and small scale secondary sector activities. These are processes that physically transform the produce into a value-added product. These are activities such as making jams, pickles, and others that can be undertaken with less capital intensive means. In these cases, the agricultural produce itself is converted into a new manufactured product, before it is monetised. Such activities are not uncommon, and is seen in case of cotton ginning, drying and crushing of chilli, jiggery making, silk reeling throwing and weaving, honey extraction, by-products such as dyes and prints, etc. Small scale naturopathy or ayurvedic units use agricultural resources and employment and these are another example of secondary agriculture. Such units are also intrinsically linked to agri-tourism.

Such secondary activities, when of micro-small cottage industry scale, utilising local resources in manpower and material, can be termed as secondary agriculture. Supporting secondary agriculture at farm level is important to achieve income growth and resource use efficiency from the farm output. Secondary agricultural activities support the farming community to maximise the value they can capture from every grain, drop and ounce of their production.

Emphasis is required on creation of multi-purpose low cost rural based agro-processing complexes/parks within a given time frame. For this, the Farmers Self Help Groups (SHG)/Cooperatives/Farmer Producer Companies be established with provisions of needed credit and policy incentives. Some action points are:

- Establishing processing and value addition units at strategic places in the rural areas/production areas for pulses, millets, fruits, vegetables, dairy, fisheries and poultry in public private-partnership (PPP) mode.
- Establishing food quality testing and phyto-sanitary laboratories.
- Helping farmers in marketing of their processed products (forward linkages).
- Skill development, particularly farmwomen in primary and secondary processing.
- Training in grading and packaging of horticultural crops should be a priority.

Secondary agriculture is viewed as small scale and involving labour intensive techniques, it will promote additional income opportunities at rural level. The marketing of the production from secondary agriculture will require special consideration. The output may be directly consumable items, or used as input for other downstream secondary/tertiary stage processing activities by large scale industry.

Industrial processing

The agro-based industries is probably the oldest industrial development having arisen alongside agriculture. The earliest examples would be wool and leather based manufacturing, fibres into textiles, pigment extracts, medicinal extracts, grain to flour milling, beverages, etc. The agro-processing industry is comprehensive and already the bulk of agricultural output is processed into consumable goods. For example, all fibre, wool and leather is converted into wearable items, wheat is converted into flour and cereals made consumable, oilseeds are extracted and tea, coffee, tobacco, rubber, etc. is processed by industry.

However, the country has a large wet market for fresh produce and even in case of milk, a bulk of the output is consumed in fresh raw form. In case of meats (poultry, fish, mutton, etc.), also, fresh wet markets prevail, rather than for processed products. In case of fruits & vegetables, in particular, there is minimal conversion into other formats of food products. As the consumer's preferences may shift from fresh fruits & vegetables to their processed items, the Ministry of Food Processing Industries supports setting up of processing units under the Kisan Sampada Yojna. The various agro-industries are promoted through various ministries such as textiles, chemicals & fertilizers, food processing, micro-small and medium enterprises, Ayush, etc.

The output from agro-based industries can broadly be categorised into non-food and food products, some of which are listed below.

Non-food processing industry, inter alia includes,

Dyes & colour additives – pigments, intermediates, reactives, etc.

Fibres – clothes and non-clothing materials, silk, paper, wool, leather, jute, bamboo, etc.

Medicinal – hormones, enzymes, drugs, active ingredients, vitamins, sutures, etc.

Bio mixtures – fertilizers, phytostimulants, biocides, vermicomposting, etc.

Bio based fuel and oils – ethanol, butanol, lubricating oils, waxes, etc.

Flowers – dried floral items, floral extracts, etc.

Fodder and animal feed – pet food, cattle feed, etc.

Tobacco and products – cigarettes, leaves, betelnut, scents, etc.

Industrial chemicals – adhesives, acids, paints, detergents, cosmetics, softeners, etc.

Industrial goods – rubber, laminates, composites, bone charcoal, building material, etc.

Food processing industry, inter alia includes,

Beverages – tea, coffee, juices, wine, alcoholic, carbonated, etc.

Food grains, Bakery & Confections – flour, breads, biscuits, sweets, pastries, etc.

Edible Oils – cooking oil, fats, refined, raw, etc.

Milk & Dairy – butter, ghee, ice cream, cheese, powder, etc.

Meats - preserved, canned, dried, frozen, nuggets, etc.

Preserves & dehydrated fruits and vegetables - pickles, jams, chutney, frozen, etc. Spices & Condiments – powders, mixtures, flavours, vinegar, sauces, etc.

These industries provide a market opportunity for the farmers, assuring demand for most of the output. These secondary sector activities take on highest importance, in case of agricultural produce that cannot directly be used by consumers, such as cotton, rubber, oils, bio-fuels, etc. The growth of the agro-processing industries is linked to availability of the raw material which is the feedstock for their manufacturing processes, and hence any uncertainty of farm output or supply of desired quality is a deterrence. Similarly, farmers that vertically integrate their output with the industry, are also dependent on their growth with that of the industry. Global level competitiveness and product innovation have become key success criteria for this economic sector.

Attracting Private Investment in Marketing Infrastructure

Private investment in infrastructure for agricultural markets and post-harvest management of produce, has been observed mainly for creation of warehousing and cold storage. In case of dairy sector, collection centres for pooling the milk has also seen investment, but mostly in the hands of cooperatives. Similar collection centres for other produce types has not attracted sufficient investment from private sector except from certain cooperatives.

The need to modernise agricultural markets and to transform rural periodic markets into regular aggregation and marketing hubs, provides opportunity to attract private sector investment in these areas. However, investment with associated activities by the private sector is dependent on surety of having a level playing field. As such the marketing regulations require amending to attract private sector investments. The Model APLM At 2017, provides for such a level playing field and if adopted by states, will result in greater private sector interest.

Liberalising the marketing system will also generate innovative business models by private sector, to streamline the domestic and international trade in made in India produce. A proposal made by the Committee on Doubling Farmers' Income, to invite private sector in MSP procurement activities is worth mentioning. The proposal allows interested players to be exempt of stock limits and trade restrictions, provided purchase is at MSP rates. Such involvement can be expected to lead to investment in modern warehousing and market infrastructure that targets export trade.

The need for rural level aggregation and logistics hubs has been expressed repeatedly in the past. Such investments, require to be promoted. For this purpose, models similar to custom hiring centres can be considered. Such hubs can be for captive supply chains by private sector. The states could attract investment by pre-designating land parcels at village level for such facilities. Partnerships between private sector and farmer groups can also be promoted by easing some restrictions on private sector shareholding in FPOs.

The fact that India is the largest consumption market for most of the agricultural output is an attraction. However, regulatory and other constraints deter private sector from playing a bigger role in agricultural markets. Permitting unencumbered access to the panIndia demand as a unified agricultural market is key to attracting the private sector.

To bring appropriate focus and to attract private investment, there is need to create a Division of Investments and Enterprise in the Ministry of Agriculture. The Division of RKVY may be upgraded to handle this role.

National Agriculture Market and e-NAM

All classical marketing studies will advocate market integration across space and over time. However, in India the agricultural markets were divided and fragmented into a number of APMCs, which restrict the movement of commodities beyond their notified geographical area. This put the farmers at a disadvantage, disallowing them access to demand in other parts of the country. Understanding this, the government has paved the way to integrate the country as one market. A Central Sector Scheme has been introduced for promotion of a National Agricultural Market (NAM) to bring about a needed transformation in the agricultural marketing environment. A unified market can be best realised through a pan-India electronic platform which can facilitate the participation of buyers and sellers from all over the country. Therefore, the e-NAM network was inaugurated on 14-April-2016 and by March of 2018, a total of 585 markets will be integrated on the e-NAM platform.

In many states, farm harvest prices prevail at sub-optimal values and e-NAM will help check such market imperfections. Better price realisation for farmers will serve as an important incentive for raising productivity and production and in turn lead to higher growth of output.

The reforms proposed in the Model APLM Act 2017 also support integration and facilitation of cross regional markets and will support such transformation in domestic agricultural trade. The fortuitous roll out of GST with effect from 1-July-2017 has given a fillip to achieving a single one-tax and one-market system. A unified national market also mitigates unwarranted price variations across regions and is an important factor in damping unnecessary price fluctuations. States are recommended to adopt or adapt the Model APLM Act, 2017, to initiate necessary changes in agriculture marketing and to encourage a single national agriculture market.

The Centre and the States should work concertedly to achieve a truly unified national agricultural market (NAM) within a period of three years (ie. 2019-20). This can be achieved by increasing the coverage of markets under e-NAM to a cumulative of 1000, and promoting alternate online platforms in the public sector by the states, as well in the private sector, besides joint venture platforms. In order to facilitate this Government of India's e-NAM platform may serve as a common platform with inter-operable

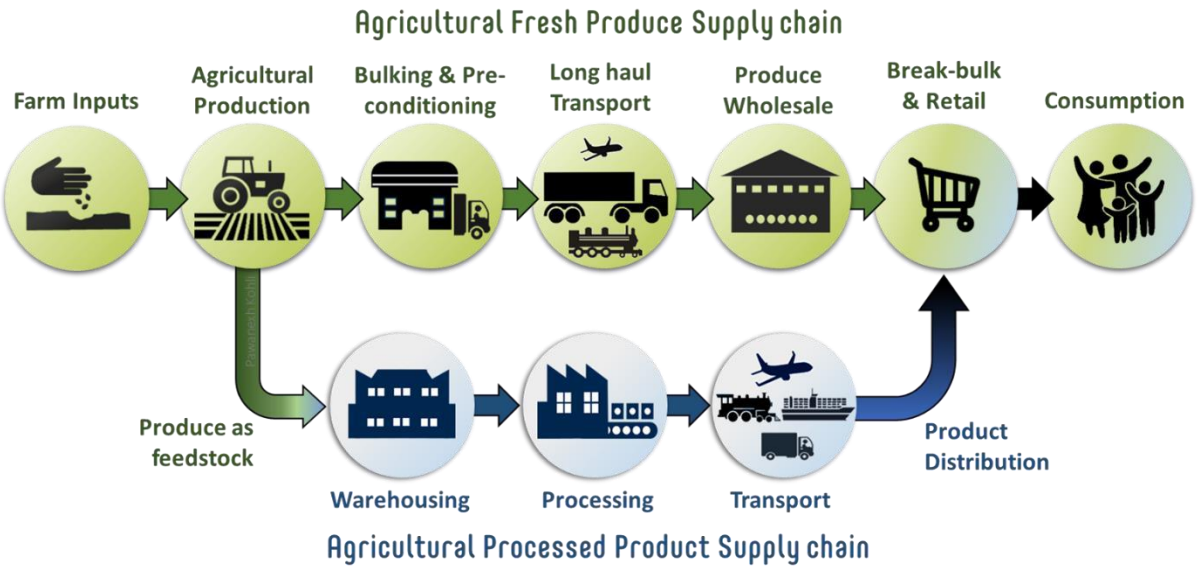
architecture, so that all other platforms can be integrated centrally, and with one-another.

Agri-logistics including Integrated Cold-chain

The national agricultural market is not merely and electronic transaction platform. The exchange has to be fulfilled with physical transfer of the produce from seller to buyer. The role of agri-logistics is key to a successful NAM.

Agri-logistics is the backbone of the agricultural supply chain and the market intelligence is the brains behind the supply chain. With the recent impetus on development of basic support infrastructure, such as rural road networks, highways, electrification, the need and scope of appropriate logistics infrastructure has increased.

Besides warehouses, silos and cold storages, agri-logistics also includes village level aggregation hubs to create viable transportable loads in the first instance. The requirement of modernizing existing premises at primary and periodic markets to function as the source point for initiating traffic in agricultural produce is discussed earlier in this background note, under market architecture.



For efficient logistics connectivity, to network and integrate with demand within the country and abroad, the need to promote multi-modal transport is necessary.

The logistics network is expected to cater to both the fresh produce supply chain and the processed product supply chain. In the first, the value as created by the farmer is directly communicated to buyers and end consumers. In the latter, the agro-processing industry taps into the fresh produce supply for their raw material needs, and releases the farmer from the chain to create new value for onwards connectivity with demand.

Both systems, are largely driven by private sector players, and the agri-business environment needs to be liberalised to promote development in this area. The involved logistics has synergistic functions, including in the specialised cold-chain.

Currently, agri-logistics is not provided any dedicated focus, being only a subject of concern under individual domains of separate agencies of the government. However, agri-logistics is now seen as a vital factor for the successful integration of rural India with the unified national market. Agri-logistics is also critical to safely connect and trade with international markets. It may be worthwhile to bring dedicated focus on agri-logistics by creating a Division on Agricultural Marketing & Agri-logistics.

Post-harvest losses and management

Post-harvest losses and its management is directly linked to the operations of agrilogistics. The physical loss that occurs in transit between farms to consumer, is attributable to poor post-harvest handling and logistics. The physical discard which happens in the hand of consumers is a waste that requires consumer education and awareness.

The loss varies by type of produce. It can be minimal in case of long established sectors such as fibre crops, leather, wool, tea, coffee, sugarcane, oilseeds, etc. These are either hardy crops or have well

established links with the consumer. The consumer is the associated agro-industry who converts the raw material into textiles, leather goods, sugar, edible or industrial oils, etc. The transit period for the produce, between production and consumer may also be short for some of these raw materials.

On the other hand, the loss in case of some food crops can be higher for various reasons. For example, the food loss in case of most foodgrains or spices should be low, but can arise due to situations of unplanned production, where supply is more than demand and results in excess inventory which then extends to non-viable holding periods. However, and obviously, the food loss in case of perishable produce, mainly fruits, vegetables and meats is the highest. In case of milk, though highly perishable, an efficient logistics chain has kept the losses at minimum, whereas its waste in hands of consumer could be high.

Food Loss: post-harvest, in-transit, pre-consumer **|** **Food waste:** consumer-end, post-monetisation, post-retail

Modernising the post-harvest logistics system and its management can drastically reduce the post-harvest loss, which means more value is available to get monetised to the benefit of the farmers. Food loss is mainly a factor of the time taken to connect with intended consumers. When the consumer is local to point of production, the loss is usually minimal. This was the case when sustenance farming was the norm, and when supply was sufficient to meet demand from the local consumers.

If all the tomato produced can be absorbed by consumers local to the production area, then there would be no cause for loss. However, production has now increased to levels where the supply needs to be connected with demand at distant locations. The time taken to reach demand is also aggravated by seasonal supply, viz constant demand. Therefore, annual harvest of potato or apple is managed to ensure supply all through the year. In case of meats, though the harvest can be timed, the losses in transit can be high if the consumer is just a few hours away.

In all cases, agri-logistics including transportation plays an important role. Agri-logistics itself is a cause of food loss, as it involves handling under custody. Poor logistics handling practices, therefore, also result in damage to the produce and discards. Supply that is uninformed, without market intelligence, also results in non-saleable quantities, which eventually perishes and adds to the physical loss. Any quantity that cannot be readily monetised, invariably perishes as a loss. Demand expansion, is affected by deficiencies in the logistics connectivity developed so far, leaving the supply chain for perishable produce extremely short.The inadequacy of technology aided farm-to-market logistics, contributes to high food losses especially in case of perishable foods.

Food loss is mitigated in two ways, i) by connecting the produce with consumer, thereby bringing it to gainful use, and ii) by providing care and safe handling during the saleable life-cycle of the produce. Certain types of crops, can be diverted to other users, such as the food processor. However, the output from processing units, especially with expiry dates, must also have demand from market and would also need to be connected to consumers to avoid post-production loss.

Excelling at cultivation, to add to yields, is bound to result in wasted resources if the output is not finding access to markets. In fact, non-marketed surpluses end up adding to the net cost of food and feed inflationary pressures. Waste and rejected produce, needs to be recovered and monetised through food and non-food processing. Processing units can be supported by guiding in-range farmers to produce the necessary processing variety crops for use as dedicated raw material for making other finished products.

Reducing the loss of primary agricultural produce, results in more quantity that can be monetised and this adds to the total value that gets shared with the primary producer, the farmer. Various studies are done for assessing food loss, and though they may present differing per cent of loss, the need to mitigate losses in the market cycle of supply is evident. Since farmers are tending to shift into high value production such as horticulture, livestock and fisheries, the concerns on food loss and market connectivity take on greater importance. The integration of rail, road and water modes of transportation is going to play an important role in the future.

Food loss is minimised with modern agri-logistics that is multi-modal to minimise handling damage, is suited to handle the type of produce, and can efficiently connect the produce with markets around the globe, including domestic.

Role of FPOs and Contract Farming

It is well known that of the more than 137 million operational farm holdings, the largest size group is the small holders. They account for more than 85 per cent of the land holding, predominantly populated by land sizes of an average of 0.65 ha. The fragmentation of farms is a key concern in the economic viability of farms. From the perspective of produce marketing, the farmers are unable to individually produce sufficient quantities to connect efficiently with markets. This results in the need for aggregation of production into viable marketable and transportable lots, which is taken up by intermediary agents and opportunistic traders. This opportunity should rightfully accrue to the farmers, provided they collaborate as a farmer producer organisation. Working as an FPO, opens other opportunities too for famers, such as in case of inputs, credit, mechanisation, etc. in their production cycle.

The concept of FPO formation is not merely for mobilising of individual farmers into a transactional group, but to create a functional pool of land and resources that collaborates in their production and post-production activities. Collaboration in planning and producing common set of produce, results in a consolidated output of a scale that brings improved viability, and leads to a transformation of the supply chain. FPOs are currently not formed on the basis of availability of adjoining farm holdings or on prior basis of preferred crop types. In the future, development efforts can be undertaken to support collective or collaborative cultivation of specific crop types for targeted markets.

Since initiation in 2012, the country has organised as few as 1080 FPOs. After having accepted the importance of FPOs in India, it would not be appropriate to remain at the starting line, as is the case today. Village producer organisations (VPOs) can also be developed as a joint venture of FPOs, or JV of a private company and FPO, or with public private participation, such that an entire village region

is developed for a predetermined set of agricultural produce, as well as with post-production activities. For example, a region having strength in producing fibre crops can be developed as a VPO to include small handloom, weavers or handicraft units.

Similarly, a village that has appropriate agro-climatic environment for mangoes can also intercrop tomato and other vegetables and take up post-production management such as aggregation, packaging, branding and dispatch to markets. An example in grapes around Nasik, where entire regions around villages are cooperating to expand productivity and in post-production is already evident. A VPO would essentially be a cluster of farms in a village region that will function as a collective for predetermined outputs. Such a mechanism of natural clustering of activities can be expected to find greater buy-in and alignment with activities of the local population.

Collaboration of farmers to collectively cultivate and harvest a common set of produce, is not sufficient. There is subsequent need to advance efforts to connect the produce with markets farther afield. Without suitable market connectivity, the output from such collaborative farming will be directed to near-farm markets only, which will lead to a localised glut, and associated price repercussions. Therefore, the production from collaborative farming will need to be linked to multiple demand centres to maximise on the market opportunities and economies of scale achieved.

Most importantly, once meaningful scale is achieved for the transactions on both inputs and supply side, such collaboration can shift the control of the value system into the hands of the FPOs. In effect, farms can generate benefits emanating from the farmers coming together to run their operations of input and output management collectively, thereby harvesting the economy of higher scales, without diluting the status of their land ownership.

Considering the critical need to economise on the cost of production, as also realise efficient post-production transactions, the scaling up of farmer producer organisations (more particularly companies) and village producer organisations (VPOs) across the country should happen quick and fast. In the view of this, a minimum of 7,000 number of FPOs & VPOs should be targeted by 2022-23 and double that target number in the six years thereafter.

Besides FPOs, contract farming is another option to address many traditional ills, such as lack of market connectivity, long chain of market intermediaries, ignorance about the buyer demands, etc. Contracts from bulk consumers can serve to offer regular and consolidated demand to farmers and an assured exchange against predetermined quality and quantity. Contract farming allows farmers to vertically integrate with specific and organised market channels.

Contract farming refers to a pre-season agreement between the farmers and a sponsoring company, that promises the former a price at which the latter will purchase the produce post-the harvest. Such an agreement offers the farmers to transfer the future (postproduction) price risk to the sponsor. Contract farming, which in a way is a futures trade, helps the farmers to focus on their production for optimal yields, without the anxiety of post-harvest price situation. Since the contract farming agreement is generally with a group of farmers, whose land may be contiguous or in clusters dispersed within a confined geography, the farmer-members will also come to enjoy certain

other advantages related to infrastructure and transaction facilities, which may not be financially feasible to own individually.

A draft Model Contract Farming Act has been released by the Department of Agriculture & Farmers' Welfare. The model Act all encompassing, across all sub-sectors including field crops, horticultural crops, dairy & livestock, poultry, fishery etc. The draft Act is designed to protect the farmers' interests including land rights and provisions for a win:win situation for both parties in eventuality of untoward market situations.

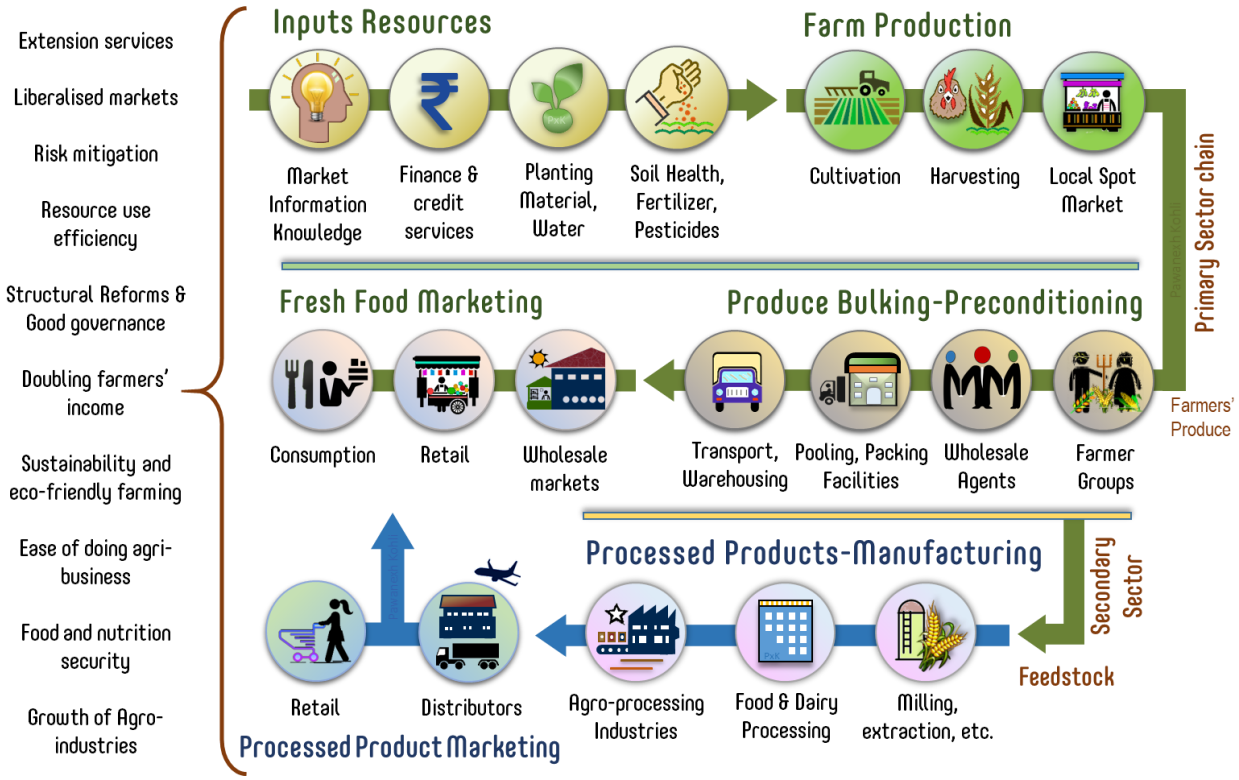
Combined with FPOs and VPOs that are designed to promote the collaborative and natural pooling of cultivable land, and contract farming that intrinsically supports farmer groups, the bane of Indian agriculture, i.e. land fragmentation, can be converted into an advantage. The various states should accordingly consider aggressive promotion of farmers groups and contract farming to bring about the desired growth outcomes in income and productivity.

National Platform for Agri-value systems in the country

Agricultural projects have inherently moved from a phase of intensive cultivation and production, towards one that requires greater integration with market demand. The farm income based approach to practicing agricultural marketing demands a 'fork-to-farm' route in preference to the commonly advocated 'farm-to-fork' option. If the purpose is to transfer optimal monetary returns on his produce, the farmer would then need to grow what can sell, and reach out to the end-use point without loss of quantity and comprise on quality. Hence, there is need to transit from production led agriculture to market-led agriculture.

The overall agricultural value system is the overarching supply chain that involves inputs, production and the output marketing. Multiple actors are involved, each attempting to add to their individual competitive advantage by optimising their own activity. A value system approach requires coordinating the range of interrelated activities by multiple stakeholders. Each stakeholder operates an independent value chain in the larger supply chain. The integration of enterprise level value chains, for a common outcome to meet final market demand, makes an effective and efficient agri-value system.

To approach agriculture as a market-led business enterprise, it is important that the starting point is market linkage, in the form of market intelligence. Thereafter, the remaining activities get guided by the forecasted demand and price, so as that all the actors in the system, can integrate their functions into a large agri-value system. The value captured within this system, gets apportioned to the various actors in the supply chain. The integration of such multifarious activities, requires facilitating all stakeholders for achieving a shared outcome. Developing the anchor stakeholders of crop specific or region specific supply chains will require an institutional mechanism.



Agricultural Sector – Integrated Supply Chain (value system)

Agricultural marketing, especially for food crops, is becoming increasingly crossgeographical and needs to address the demand and supply at the unified market level. To support a transformation of the food system in India, in partnership with private sector enterprises, a national level platform will bring about concerted gains to farmers, in tandem with other recent initiatives that allow for the one-nation market to flourish.

A National Agricultural Value System (NAVS) platform is recommended, to facilitate and guide the development of modern supply chains that will be cross regional in nature and promote demand based trade in agricultural produce.

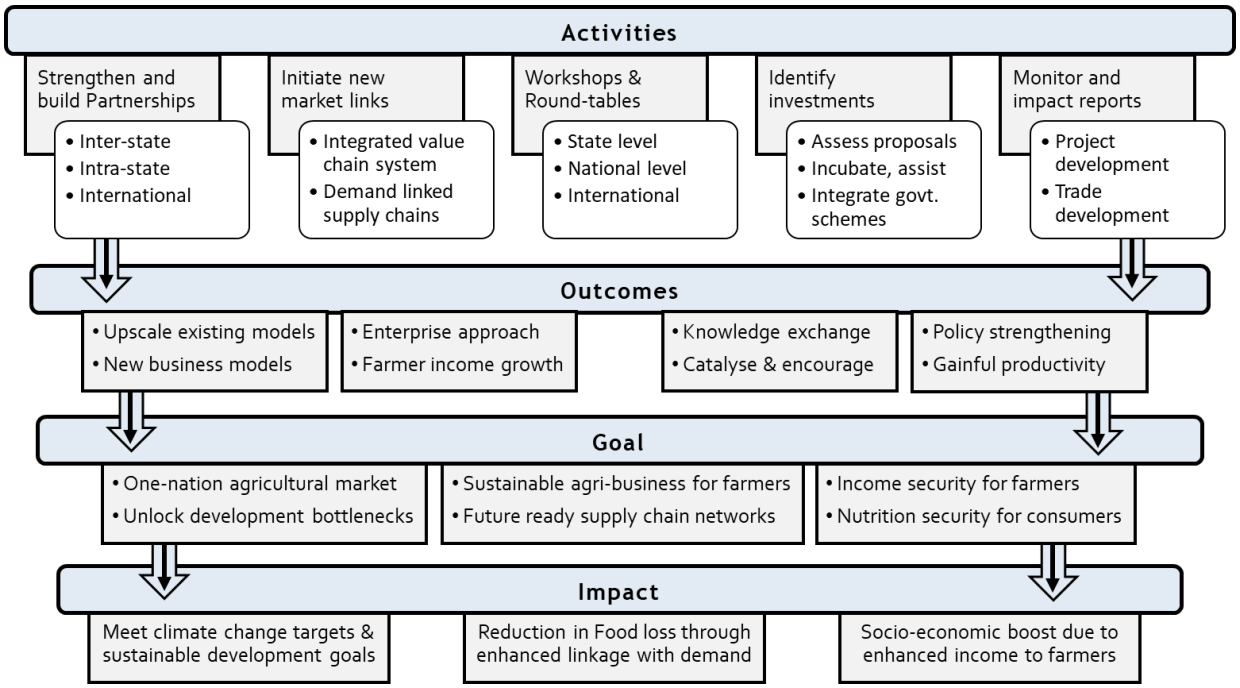
The framework of the proposed platform will be in partnership with think-tanks, industry, academia, donor agencies and government. The agenda will be to promote commercial projects that will function as a market linked system or an integrated supply chain of agricultural produce. The outcome focus will be to enhance the value captured by farmers to lead to doubling of their income.

The agri-value system platform will have a short term approach to dovetail ongoing schemes to support projects that improve the throughput of produce from farms to secondary markets, skipping intermediary markets. For the long term, the proposed platform will also serve to optimise the value chain activities of farming units, by providing value added inputs such as market linked crop planning, resource management, partnership with other supply chain actors, coordinate extension activities and assist in improving access to local market channels.

A value system contains a permutation of organically linked value chains, integrated into a supply chain. The value system platform would be one that helps to on-board and integrate the sub-

systems of multi-stakeholders from government, non-government and private sectors as working partners to meet the desired objective. The primary objective would be to strengthen market linkages of farmers, alongside the development of market yards / alternate markets, cold chains and food processing units.

Agri-Value System Platform as an enabler of Agricultural Supply chains



The scope of such a Platform will be to support both the National and State governments to catalyse investments and collaborations on projects that have multiple value chain partners, to unlock bottlenecks in implementation and scaling of such projects, and providing the enabling policy support to strengthen the agricultural marketing environment. The platform would function under the model of public private partnership, distanced however from day-to-day functioning of the government. The PPP mode of function has potential to bring the much needed synergy in knowledge, experience and finances for triggering greater competitiveness in agribusiness.

The proposed National Agri-Value System (NAVS) platform is envisaged to have a systems approach and target integration among enterprise level value chains to bring about the following benefits:

a. Move away from disjointed sectoral schemes & programs in agriculture to well designed, commodity based integrated value chains that connect all the farmers, big or small, to their consumers - wholesalers, retailers, processors & exporters.

b. Prepare an ecosystem of value chain systems that integrate market demand with production, post-production & finance in a seamless manner, to ensure that the planned reforms in agricultural marketing, land leasing, contract farming and farmer producer organisations, have a base in commercial enterprises.

c. Promote greater private investment through adoption of Public Private Partnership framework across the system wide value chain for linking farmers to the market in an efficient & effective manner.

d. For each value chain, strengthen existing extension & agricultural advisory services by promoting relevant best practices like soil management, raised bed planting, ridge and furrow method of sowing, sub-surface irrigation, precision farming, post-harvest handling, commercial negotiations, market linkages, as well as credit and insurance facilitation.

e. Diversify the portfolio of integrated value chain systems from crops to animal husbandry, dairy, fisheries, horticulture, pisciculture, sericulture, aqua culture, mushroom cultivation to enhance the farmers' income.

f. Develop strong institutions of farmers to get them integrated into the larger supply chains through promotion of FPOs/ VPOs / cooperatives / SHG / JLG / Trusts / NGOs and get them federated along regional or commodity based market linked enterprises.

This note draws heavily upon the Report of the Committee on Doubling Farmers' Income, especially Volumes III (Agri-logistics) and IV (Agricultural Marketing).