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PRESIDENTIAL ADDRESS

Doubling Farmers' Income: Strategy and Prospects*

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I

I am highly grateful to the office bearers and members of the Indian Society of Agricultural Economics, for electing me as the President of 76th Annual Conference of the Society. I attach very high value to this recognition, though I feel my professional achievements are nowhere near to the contributions of the eminent and reputed agricultural economists who have delivered this presidential address in the past 75 years. I will remain indebted to Indian Society of Agricultural Economics for bestowing this honour on me.

I have chosen to speak on the theme of "Doubling Farmers' Income" not because this is the current concern of the government, but because of the neglect of this theme which is so relevant for the future of Indian agriculture. Farmers' income is also one of the subjects selected for discussion in this conference and we have also received a comprehensive keynote paper on this topic. I feel these papers will fill the gap in the understanding of farmers' income and also offer valuable input for achieving the goal of doubling farmers' income in the country at the earliest.

Past strategy for development of the agriculture sector in India has focused primarily on raising agricultural output and improving food security. This 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 crops 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

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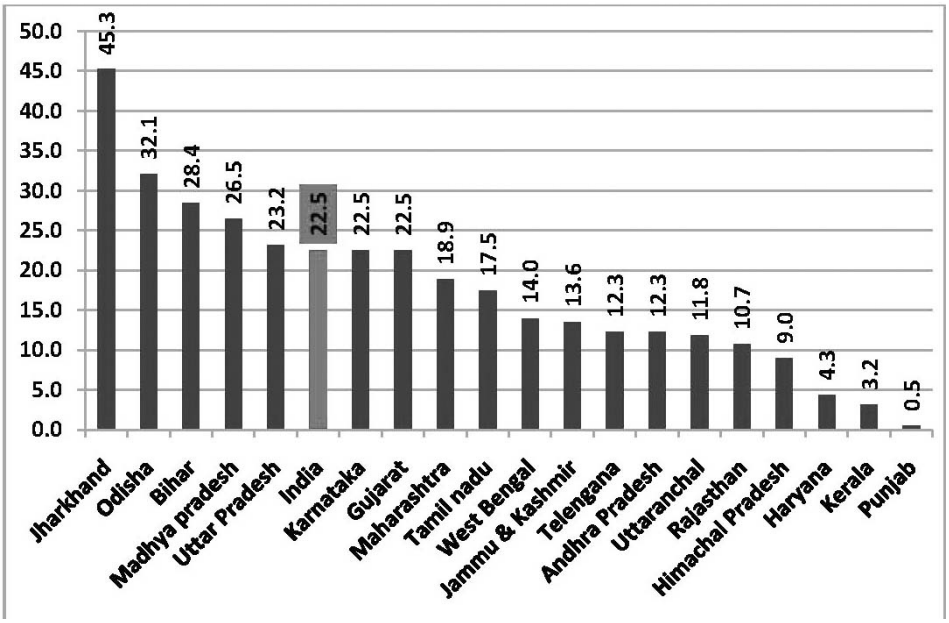
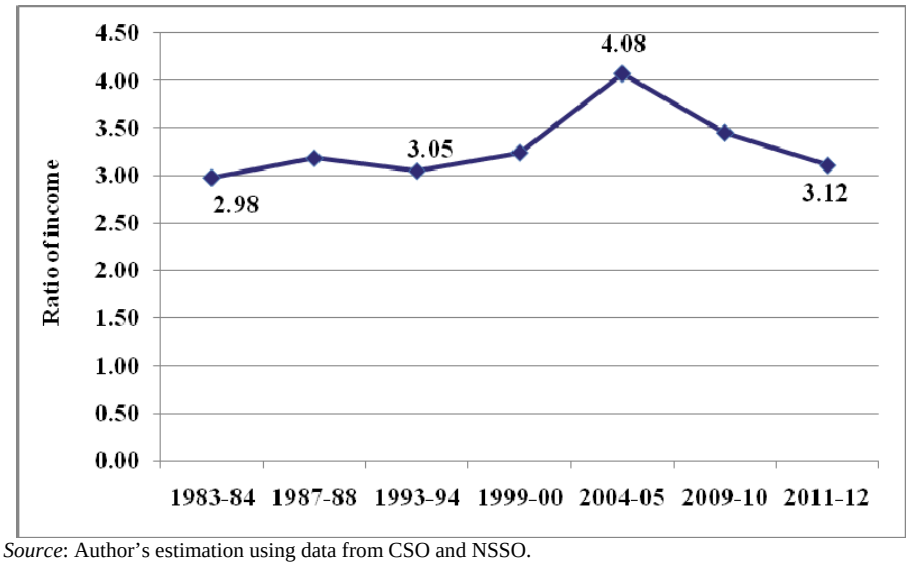
but in many cases farmers' income did not grow much with increase in output. The net result has been that farmers' income remained low, which is evident from the incidence of poverty among farm households. The NSSO data on Consumption Expenditure Survey for year 2011-12 reveals that more than one-fifth of the rural households with self-employment in agriculture as their principal occupation[1] were having income less than the poverty line. The proportion of such farm households suffering from poverty varied widely across states (Figure 1). The highest incidence was observed in Jharkhand where 45.3 per cent of farm households were under poverty. Poverty among farm households was found to be quite high in all eastern states except West Bengal.



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

Figure 1. Farm Households with Income below Poverty Line, 2011-12.

Farmers' income also remained low in relation to income of those working in the non-farm sector (Figure 2). During early 1980s, farm income per cultivator was just 34 per cent of income of a non-agricultural worker. This 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 the 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 increase during 2004-05 to 2011-12, but no improvement over the 1983-84 level. The past four years (2012-13 to 2015-16) again witnessed deterioration in relative income of farmers.



Source: Author's estimation using data from CSO and NSSO.

Figure 2. Ratio of Income Per Non Agricultural 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 constitutes 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 rate of agricultural output (Chand and Parappurathu, 2012).

In the background of these disquiet developments, the then government constituted "National Commission on Farmers (NCF)" in 2004, with reputed agricultural scientist Dr. M.S. Swaminathan as its Chairperson. The Commission submitted its final report in October 2006 which ran into five volumes covering almost all the aspects of agriculture. The Commission also submitted a draft "National Policy for Farmers" in 2007.

All five volumes of the report have the main title as "Serving the Farmers and Saving the Farmers". The report mentions at one place that the "*Success in agricultural progress should be measured by the growth of farmers' incomes and not just by production figures*".[2] The report suggests assuring income security to farmers' through minimum support price (MSP) and argued that the prices received by farmers for their produce should be at least 50 per cent more than the cost incurred.[3]

Two important suggestions of the NCF that have a direct bearing on farmers' income were (i) prices received by farmers for their produce should be at least 50 per cent more than the cost and (ii) include agricultural labour also in the definition of farmer.

The first suggestion is not based on sound principle of economics as prices are primarily determined by forces of demand and supply. The mechanical formula to keep prices 50 per cent higher than cost is not only fraught with dangerous implications, it is also impracticable. The purpose of including agricultural labourer in the definition of farmer is not explained anywhere in the reports. Farmers are cultivators and the labour serves as an input for farm operations. Labour and farmers belong to different economic classes and promoting welfare of one is not complimentary for the other. It remains unclear how inclusion of agricultural labour in definition of farmer will serve or promote the interest of proper "farmers".

The NCF reports were expected to shift the focus of policy and development strategy from "increasing production" to "increasing farmers' welfare or income" or to "increasing production along with farmers' income". However, this kind of shift in policy was not seen following the submission of the report.

II

LACK OF ESTIMATES OF FARMERS' INCOME

It is ironic that estimates of farmers' income are not published by CSO, though time series and year-wise estimates of sectoral income for agriculture are available in *National Accounts Statistics*. However, NSSO has generated estimates and source of income of farmers based on its nation-wide surveys on *Situation Assessment of Farmers 2003* and *Situation Assessment of Agricultural Households 2013*. According to NSSO, the two surveys adopted different definitions of farmer or farmer households and therefore the estimates of income reported in the two surveys are not comparable.

The absence of such information makes it difficult to know adequacy, fluctuations and growth in farmers' income, and makes it impossible to know how various factors affect farmers' income. Some researchers have tried to fill this gap by preparing estimates of farmers' income. A notable study on this is by Chand *et al.* (2015). It provides estimates of total and per cultivator farm income for the period 1983-84 to 2011-12, and identifies sources of growth in farm income. The authors report that increase in productivity, rise in real farm prices, and shift of labour force from agriculture, are the important determinants of growth in farm income. Another important finding of this study has been that agrarian distress, as revealed by farmers' suicides, increased when growth in farm income was low and it went down when farmers' income experienced high growth rate. Thus, the level of farm income was crucial to address agrarian distress. The study observed that the income earned from agriculture was not adequate to keep as many as 53 per cent farm households out of poverty, who operated on less than 0.63 hectare of land holdings.

The low and highly fluctuating farm income is leading to a 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. Low farm income is also associated with widespread agrarian distress, which is assuming dangerous proportion in some pockets in the country. This impact is not small, as it is impacting almost half of the population of the country that is dependent on farming for livelihood. Thus, it is very clear that to have a secure future for agriculture and to improve livelihood of half of India's population, we must pay attention to the improvement of welfare of farmers and raise agricultural income. The other strong reason for paying serious attention to farmers' income is the rising disparity between income of farmers and non-farmers.

Realising the need to pay special attention to the plight of farmers the Central government changed the name of 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 (Chand, 2016a) and promote farmers' welfare. In this background, pursuit of the goal set by the Prime Minister Sh. Narendra Modi to double farmers' income by 2022-23 is central to promote farmers' welfare, reduce agrarian distress and maintain parity between income of farmers and those working in other professions.

In this address I discuss the sources of growth in farm income and explore possibilities and prospects of doubling farmers' income in India. This is preceded by a clarification on various dimensions relating to doubling of farmers' income.

III

DOUBLING FARMERS' INCOME – THE CONCEPT AND TIMEFRAME

The need to raise farmers' income got a lot of attention after the Prime Minister Narendra Modi, while addressing a farmers rally in Bareily, Uttar Pradesh, on February 28, 2015, mentioned the idea of doubling income of farmers by the year 2022. The goal has been dubbed as impossible and unrealistic by many experts (Gulati and Saini, 2016). Some commentators have produced calculations that agriculture will require annual growth of 14.86 per cent per year for five years to get farmers' income doubled and pointed out that this growth level has not been achieved even for one year in the history of Indian agriculture. It seems that critics and sceptics focused more on five years and ignored substantive aspects of the matter (Chand, 2016b). The substantive points are: one, what is the targeted year for doubling the farm income; two, what is to be doubled, is it output, value added or income earned by farmers from agricultural activities; three, whether nominal income is to be doubled or real income is to be doubled, and four, whether the targeted income includes only income derived from agricultural activities or would it also include income of farmers from other sources. Clarity on all these points is important to assess the possibility of doubling the income of the farmers as envisioned by the Prime Minister.

While talking about income of the farmers in the *Kissan* Rally, the PM stated that it is his dream to see farmers' double their income by 2022, when the country completes 75 years of its Independence. It is obvious that he was referring to double the current income of the farmers or income for the agricultural year 2015-16 by agricultural year 2022-23. It is evident that the PM referred doubling farmers' income by year 2022, which is seven years away from the base year 2015-16. And, if anything is to be doubled by the year 2022-23, it will require an annual growth rate of 10.4 per cent.

Again, it is important to point out what is sought to be doubled? Is it the income of farmers, not the output or the income of the sector or the value added or GDP of agriculture sector? If technology, input prices, wages and labour use could result in per unit cost savings then farmers' income would rise at a much higher rate than the output. Another very important source of increase in farmers' income is the relative increase in prices of farm products compared to the prices of non-agricultural commodities. Past estimates of farm income show a significant difference between growth in output and growth in farmers' income. During 2004-05 and 2011-12, agricultural output at constant prices increased by 34 per cent while real farm income per farmer increased by 63 per cent (Chand *et al*. 2015, p.142). In nominal terms, the output became 2.65 times while farmers' income tripled in the seven years period. Therefore, doubling of farmers' income should not be viewed as same as doubling of farm output.

It is obvious that if inflation in agricultural prices is high, farmers' income in nominal terms will double in a much shorter period. In the last 30 years, farmers' income at nominal prices almost doubled in five years twice, once during 1987-88 to 1992-93 and then during 2004-05 to 2009-10. Inflation in agricultural prices also leads to increase in real farm income if agricultural prices received by farmers increase at a faster rate relative to the prices paid by farmers, i.e., when terms of trade for agriculture improves. In a situation where non-agricultural prices do not rise, or, rise at a very small rate, the growth in farmers' income at real prices tends to be almost the same as in nominal prices. Anyway, the government's intention seems to be to double the income of farmers from farming in real terms.

IV

TREND IN FARMERS' INCOME

As mentioned before, the annual estimates of farm income at national and state level are not published by any official agency in the country. However, NSSO has conducted two national level surveys titled *Situation Assessment Survey of Farmers* in 2003 (59th Round) and *Situation Assessment Survey of Agricultural Households (SAS)* in 2013 (70th Round)for the reference years 2002-03 and 2012-13 respectively, which provide estimates of farmers' income from various sources including agriculture. The definition of "farmer" is not kept uniform in the two surveys and

therefore comparison of the two periods or change based on these estimates is not very meaningful. According to SAS for the year 2012-13, the average annual income of a farm household from farm as well as non-farm sources was Rs. 77,112. Sixty per cent of total income of an agricultural household was derived from farm activities (cultivation and farming of animals) and 40 per cent was derived from non-farm sources (wages, salary, non-farm business etc.). In absolute terms, cultivation generated annual income of Rs. 36,938 and livestock provided Rs. 9,176, per agricultural household. According to this estimate, the share of livestock activity in total farm income of agricultural household was close to 19.89 per cent. This is much lower than the CSO estimates of share of livestock in net value added in agriculture sector for the same year, which was 28.6 per cent. This indicates that farm income reported in SAS differs significantly from CSO measures of farm income, presumably due to the specific definition of farmer used in the SAS 2013.[4]

Some researchers have also prepared estimates of farm income using Cost of Cultivation data for various states and national level data on output, input and labour use. The most recent estimates of farm income are prepared by Chand *et al.* (2015) for the period 1983-84 to 2011-12. These estimates are presented in Table 1 at nominal prices as well as in real terms. Here it is important to mention that farm income in real terms is not the same as the income at constant prices. These estimates were further extended to year 2015-16 to arrive at income for the recent years. During the past 22 years, between 1993-94 and 2015-16, farmers' income in nominal terms increased 9.18 times. During the same period, CPIAL (consumer price index for agricultural labour), which measures price change in rural India, increased 4.62 times. Taking away the effect of inflation, real farm income just doubled during past 22 years. Meanwhile, the farm income per cultivators shows a slightly higher increase due to the decline in the number of cultivators after 2004-05.

TABLE 1. TREND IN FARMERS' INCOME IN INDIA, 1993-94 TO 2015-16

Year	Net value added at market prices (Rs. crore)	Wage bill at market prices (Rs. crore)	CPIAL (2004-05=100)	Total farm income of all farmers' (Rs. crore)		Cultivators (number in crores)	Farm income per cultivator (Rs.)	
				Market price	Real prices		Current price	Real prices
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1993-94	223709	45755	59	177954	303814	14.39	12365	21110
1999-00	426582	90951	90	335631	372923	13.88	24188	26875
2004-05	527289	93130	100	434160	434160	16.61	26146	26146
2011-12	1409932	252804	183	1157128	632514	14.62	79137	43258
2012-13	1558480	245750	220	1312730	596695	14.36	91416	41553
2013-14	1753691	276532	245	1477159	602922	14.10	104763	42760
2014-15	1849931	291708	261	1558223	597020	13.85	112507	43106
2015-16	1940636	306010	273	1634625	598764	13.60	120193	44027

Notes: (1) Wage bills till the year 2011-12 are taken from Chand *et al*. (2015). For subsequent years wage bills are estimated using the proportion of wage bill to net value added for the year 2012-13. (2) Farmers' income are expressed in real terms using CPIAL (2004-05=100) as deflator. (3) Number of cultivators after the year 2011-12 were projected based on rate of growth between 2004-05 and 2011-12.

The results presented in Table 1 reveal that farm income expanded at different rates in different periods depending upon the growth rate in output, increase in wage bill, and changes in prices received by farmers relative to the changes in consumer price index for agricultural labour (CPIAL). During 1993-94 to 2004-05, which marks the first decade of economic reforms and liberalisation in the country, value added in agriculture at 2004-05 prices witnessed 2.52 per cent annual growth. The implicit price index[5] for agricultural commodities in this period increased by 5.65 per cent per year while the CPIAL showed an annual increase of 4.91 per cent. Income of all farmers taken together increased by 8.45 per cent per year at nominal prices. When this income was deflated by CPIAL to arrive at real income, the growth rate turned to be 3.30 per cent. This period also witnessed an increase in the number of cultivators from 14.39 crore to 16.61 crore. This resulted in much smaller increase in per farmer income as compared to the income of all the famers. The growth rate in per farmer income turned out to be less than 2 per cent in this period.

The subsequent period till 2011-12 witnessed acceleration in total and per farmer income. Total income of all the farmers increased by 5.52 per cent per year during 2004-05 to 2011-12. In sharp contrast to the first decade of the reforms, the period 2004-05 to 2011-12 witnessed decline in the number of cultivators, which translated into much higher growth in per farmer income as compared to the growth rate in income of all farmers. The rate of growth was 7.46 per cent a year, which is a great step towards achieving goal of doubling farm income. The period 2004-05 to 2011-12 faced a very favourable combination of factors which constitute farm income. Growth rate in output was impressive, number of farmers to share farm income declined and prices received by farmers increased at a much higher rate than the increase in prices paid by rural consumers.

This tempo of growth in farm income got a big setback after 2011-12 (Table 2). Output of crop sector witnessed small decline (0.29 per cent) in the year 2012-13 at 2011-12 prices. This was followed by two consecutive below normal monsoons in years 2014-15 and 2015-16. Many parts of the country suffered from drought in these two years. Consequently, the growth rate in value added in agriculture decelerated to

TABLE 2. GROWTH RATE IN FARM INCOME IN INDIA,

(*per cent per year*)

Period	Agriculture value added at constant prices	Farm income of all farmers		Farm income per cultivator		CPIAL base 2004-05	Implicit price index for agriculture
		Market prices	Real terms	Market prices	Real terms		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1993-94 to 2004-05	2.52	8.45	3.30	7.04	1.96	4.91	5.65
2004-05 to 2011-12	4.19	15.03	5.52	17.14	7.46	9.02	9.80
2011-12 to 2015-16	1.60	9.02	-1.36	11.01	0.44	10.52	6.88
1993-94 to 2015-16	2.87	10.61	3.13	10.89	3.40	7.21	7.35

1.6 per cent during 2011-12 to 2015-16. Agricultural prices received by farmers remained depressed despite poor output. The rate of increase in implicit prices of agricultural produce was much lower (6.88 per cent) than inflation in CPIAL (10.52 per cent). Because of these factors, real income of farmers followed a decline during 2011-12 to 2015-16.

It is pertinent to mention that the latest data on number of cultivators is available only up to the year 2011-12. Therefore, while calculating per cultivator income, it is assumed that farm workers would continue their withdrawal from agriculture at the rate observed during 2004-05 to 2011-12. Interestingly, even with less number of cultivators in agriculture sector, real income per farmer showed insignificant increase during 2011-12 to 2015-16.

Presently, per cultivator income has been estimated as Rs. 1,20,193/- at current market prices.

V

SOURCES OF GROWTH IN FARMERS' INCOME

Doubling real farmers' income till 2022-23 over the base year of 2015-16, requires annual growth of 10.41 per cent in farmers' income. This implies that the on-going and previously achieved rate of growth in farm income has to be sharply accelerated. Therefore, strong measures will be needed to harness all possible sources of growth in farmers' income within as well as outside agriculture sector. The major sources of growth operating within agriculture sector are: (i) improvement in productivity, (ii) resource use efficiency or Total Factor Productivity, saving in cost of production, (iii) increase in cropping intensity, (iv) diversification towards high value crops, The sources outside agriculture include: (v) shifting cultivators from farm to non-farm occupations, and (vi) improvement in terms of trade for farmers or real prices received by farmers.

The possibilities of doubling farmers' income in real terms from the above sources are explored in the following section.

(a) *Sources of Income Growth within Agriculture Sector*

5.1 *Increase in Agricultural Productivity*

There are two sources to increase in agricultural output, viz., area and productivity. Due to rising demand for land for non-agricultural uses and already high share of arable land in total geographical area of the country, further expansion in area under cultivation is not feasible. Rather there is a decline of about 10 lakh hectares, as agricultural land has been diverted to non-agricultural uses since the year 2004-05. Therefore, agricultural output has to be increased through improvement in productivity per unit of land.

Productivity of most of the crops in the country is low and there is considerable scope to raise it. Except wheat, productivity of other crops in the country is below world average and much lower than agriculturally advanced countries. Even, within the country there is large variation in yield across states. A large variation in yield across states is due to variation in access to irrigation but even for the states with similar irrigation coverage, productivity show significant variation (Figure 3).

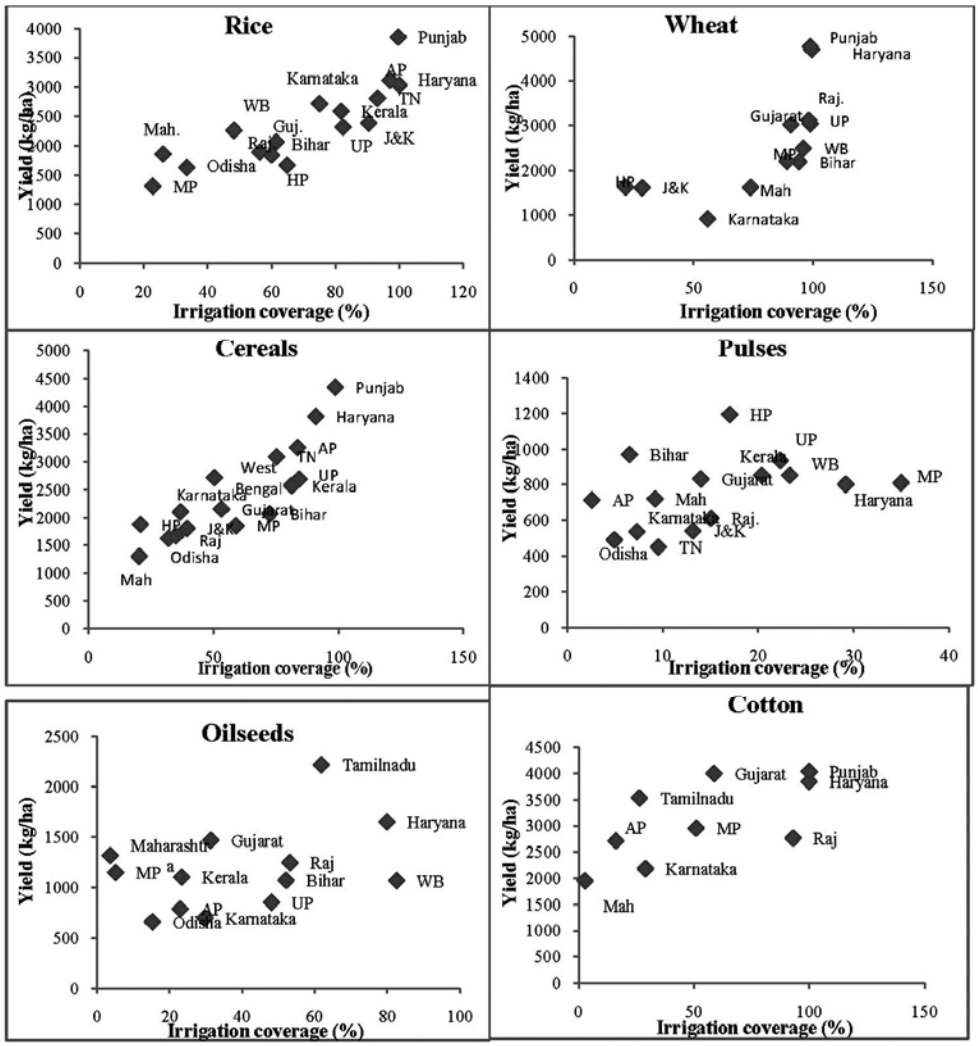


Figure 3.Yield of Selected Crops in Major Growing States, TE 2012-13.

Effect of irrigation on yield is well known. Variation in yield at same level of irrigation and lower yield in India compared to the world average are due to poor level or low adoption of improved technology. Enhancing access to irrigation and

technological advancement are the most potent instruments to raise agricultural productivity and production in the country.

Effect of irrigation on agricultural productivity was also seen from district level data[6] (Figure 4). Per hectare productivity of all crops taken together was Rs. 56,510 under largely irrigated conditions as compared to Rs. 35,352 under largely rain-fed conditions during biennium ending (BE) 2011-12.[7] This shows great scope to improve farmers' income through productivity enhancement in the country, as only 48 per cent of the gross sown area is under irrigation.

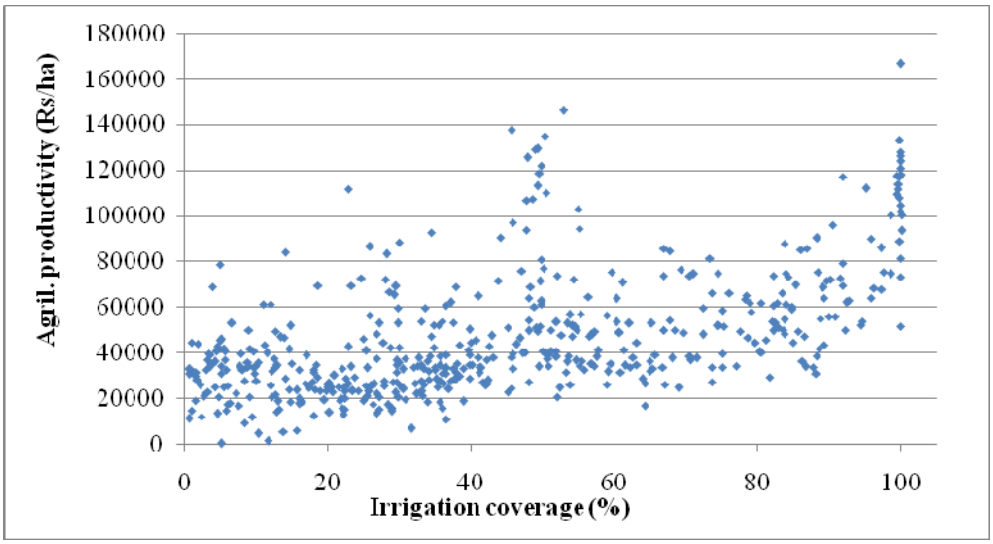


Figure 4. Aggregate Crop Productivity (Rs./Ha. Net Sown Area) Across Districts Arranged According to Irrigation Coverage, Average of 2010-11 and 2011-12.

Aggregate productivity of crop sector increased at the rate of 3.1 per cent per year during 2000-01 to 2013-14. Assuming same increase in input as in productivity, i.e., no change in resource use efficiency, will involve the same increase in net income. If this rate of increase in productivity is maintained, it will result in 16.7 per cent increase in total farm income in seven years or 25 per cent increase in ten years from the crop sector, which comprises 70 per cent of income from agriculture.

Livestock constitutes 30 per cent of the total income from crop cultivation and animal husbandry. This sector has experienced growth rate of 4.5 per cent during 2000-01 to 2013-14. Maintaining the same growth in livestock sector in the coming years will raise total farm income by 10.8 per cent in seven years and 16.6 per cent in ten years period.

The contribution of increase in productivity/production of crop and livestock taken together adds up to 27.5 per cent increase in farm income in seven years.

5.2 *Improvement in Total Factor Productivity*

The improvement in total factor productivity (TFP) is an important source of output growth which directly contributes to cost saving and thus increase in income. TFP is the portion of output not explained by the amount of inputs used in the production. TFP account for effects in total output growth relative to the growth in total inputs used in production. TFP growth represents effect of technological change, skill, infrastructure, etc, which are not counted in the set of production inputs. It also includes increase in efficiency with which inputs are utilised in the production. According to Fuglie and Rada (2015), agriculture sector in India has witnessed 2.62 per cent growth in total factor productivity during 2004 to 2012. Another study on TFP at National Institute of Agricultural Economics and Policy Research, New Delhi, which is much more comprehensive in terms of considering inputs used in agriculture, also came out with similar findings (Jain and Chand, 2016). The implication of 2.62 per cent annual growth in TFP is that farmers' income will also increase at same rate. If TFP grows at the same rate after 2015-16 then it will lead to 26.3 per cent increase in farmers' income by the year 2022-23.

5.3. *Diversification towards High Value Crops*

Diversification towards high value crops (HVCs) offers a great scope to improve farmers' income. The staple crops (cereals, pulses, oilseeds) occupy 77 per cent of the total or gross cropped area (GSA) but contribute only 41 per cent of total output of the crop sector. Interestingly, almost same value of output was contributed by HVCs (fruits, vegetables, fibre, condiments and spices and sugarcane), which just occupy 19 per cent of gross cropped area during 2013-14 (Table 3). Average productivity of HVCs after adjusting for cropping intensity variations was estimated as Rs. 1,42,777 per hectare as compared to Rs. 41,169 per hectare for the staple crops. With this differential in productivity, shifting one hectare area from staple crops to commercial HVC has the potential to increase gross returns upto Rs 1,01,608 per hectare.

Between 2004-05 and 2013-14, area under HVCs in the country increased by 9.16 million hectare (Mha), at an annual growth rate of 3.31 per cent. Due to the large difference in area under HVC and staples, a 1 per cent increase in area under the former is equal to 0.25 per cent decrease in area under staples. Thus, a 1 per cent increase in area under HVC results in 0.319 per cent increase in output of crop sector, after netting out the decline in output due to area shift from staples to HVC. Based on these calculations it is estimated that if past trend in diversification continues in future, it has the potential to raise output of crop sector by close to 1 per cent each year. This can translate into 5 per cent increase in farmers' income by 2022-23.

TABLE 3. PER HA VALUE OF OUTPUT OF MAJOR CROPS/GROUPS IN YEAR 2013-14

S.N. (1)	Crop (2)	Value (Rs. crore) (3)	Area (Mha) (4)	Productivity (Rs./ha) (5)	Adjusted productivity* (Rs./ha) (6)	Share (per cent) In total output (7)	Share (per cent) In total area (8)
1.	Pulses	62135	23.23	26748	26748	4.14	11.95
2.	Oilseeds	116181	98.28	44707	44707	7.74	14.68
3.	Cereals	439383	28.53	40722	40722	29.26	50.56
(A)	Staple crops	617699	150.04	41169	41169	41.14	77.18
4.	Fibre crops	95993	12.54	76549	76549	6.39	6.45
5.	Sugarcane	76295	5.01	152285	109558	5.08	2.58
6.	Condiments and spices	54163	3.24	167376	120415	3.61	1.66
7.	Fruits	155547	7.19	216458	155725	10.36	3.70
8.	Vegetables	234219	9.57	244820	244820	15.60	4.92
(B)	High value crops	616217	37.54	164154	142777	41.04	19.31
(C)	All crops	1501464	194.4	77236	61503	100	100

Data source: Authors' estimates using CSO and DES data.

*Productivity for annual crops like sugarcane, fruits and condiments and spices has been adjusted with present cropping intensity of 139 per cent.

There is scope to raise farmers' income by diversifying towards other allied enterprises like forestry rather than surviving primarily on crop cultivation. India meets 40 per cent of its non-fuel timber requirement from the import of wood and wood products. India imports wood and wood products worth more than Rs. 33 thousand crore, whereas, thousands of hectare of private land remain barren. Various legal restrictions on felling of trees and setting up of timber industry and transit permit for marketing of timber are the major deterrents to raise trees on private lands.

5.4 *Increase in Crop Intensity*

India has two main crop growing seasons namely *kharif* and *rabi*, which make it possible to cultivate two crops a year on the same piece of land. With availability of irrigation and new technologies it has become possible to raise short duration crops after the main *kharif* and after the main *rabi* season.[8] Land use statistics show that the second crop is taken only on 38.9 per cent of net sown area. This implies that more than 60 per cent agricultural land in the country remains unused for half of the productive period. In most of the States, second crop is taken on less than one fourth of net sown area. Lack of access to water to meet crop requirement is said to be the main reason for low crop intensity. However, surprisingly, crop intensity on irrigated area, estimated as ratio of gross irrigated area to net irrigated area, is found to be 140, which is not much different than crop intensity under rainfed situation. The reason for this could be that irrigation is not available throughout the year.

It looks ironical that despite so much pressure on the land, it is not used intensively. Taking the second crop on the same piece of land is a significant source to address land constraint in the country and to raise income per unit of land. After 2000-01, the crop intensity in the country has increased by 0.7 percentage point per

year. Large scope exists to raise crop intensity in most of the states. The emphasis on "*Har Khet Ko Pani*" and other components under "*Pradhan Mantri Krishi Sinchai Yojana"* holds promise to quickly expand irrigation, which will have very favourable effect on increasing crop intensity. Increase in crop intensity at the same rate as observed in the recent past has the potential to raise farmers' income by 3.4 per cent in 7 years and 4.9 per cent in ten years. This can turn out to be much higher as the possibilities for taking second crop are bright.

(b) *Sources of Income Growth Outside Agriculture Sector*

5.5 *Improving Terms of Trade for Farmers*

Income earned by farmers from agriculture depends on current prices, not constant prices (fixed base year prices). However, current prices may rise purely because of inflation. Therefore, true measure of level and change in income is the one adjusted for pure inflation. The inflation adjusted level of income, termed as real income of farmers, refer to the income deflated by appropriate deflator. Various deflators have been used to arrive at real income of farmers or agriculture sector. Some of these are index of prices paid by farmers, index of input prices and index of wholesale prices of non-agricultural commodities etc. No index is perfect and each one has its own specificities. We have used CPIAL (Consumer price index for agricultural labour) as a deflator to change nominal farm income to real farm income. CPIAL captures inflation in the goods and services in rural areas and it is closer than any other index to the inflation faced by farm households.

When prices received by farmers for agricultural produce rise faster than CPIAL, it adds to the real income, even without an increase in the volume of output. As can be seen from Table 2, during 2011-12 to 2015-16, farmers' income received serious blow on two counts. One, growth in value added in agriculture at constant prices was very low. Two, increase in CPIAL was 50 per cent higher than the increase in farm gate prices of agricultural produce. Several measures have been initiated by Government of India to reverse this situation. An important measure targeted at better price realisation by the farmers is e-NAM. The Centre is also persuading states to undertake various market reforms. Among other things, these reforms aim to reduce middle men, modernise value chain, attract modern private investments in agri market and, therefore, ensure a better deal for the farmers.

No study is available on what could be the impact of various market reforms and market modernisation on prices received by farmers at national level. However, some evidence of the effect of online marketing by farmers using Unified Market Platform created by ReMS (a joint venture between government of Karnataka and NCDEX Spot Exchange Limited) in Karnataka shows big benefit to the farmers. The ReMS initiative is similar to the eNAM initiative of government of India. The UMP in Karnataka was created in 2014 and it stated its operation from agricultural year 2014-

15. The effect of UMP on prices received by farmers is attempted in Table 4 by comparing increase in prices between year 2013-14, which is the year preceding the functioning of UMP, and 2015-16, which is the first year after creation of UMP in Karnataka. The increase in prices received by farmers in various mandis in Karnataka is deflated by WPI of the concerned commodity to arrive at increase in real terms.

TABLE 4. EFFECT OF ONLINE TRADING AND UMP SYSTEM ON PRICES RECEIVED BY FARMERS IN MANDIS IN KARNATAKA

	Prices received by farmers (Rs./quintal)		Increase in 2015-16 over 2013-14 (per cent)	
Commodity	2013-14	2015-16	Nominal	Real@
(1)	(2)	(3)	(4)	(5)
Tur	3939	7672	95	16
Green gram	5308	7318	38	1
Black gram	3817	7976	109	12
Bajra	1261	1419	13	11
Copra	5189	9325	80	43
Turmeric	5937	7931	34	13
Jowar	1492	1774	19	6
Maize	1257	1356	8	6
Groundnut	3398	4346	28	14
Bengal gram	3057	4541	49	15
Weighted increase			39	13

Source: Personal communication with MD &CEO of ReMS.

@ Real price computed after deflating with WPI of the commodity.

Weights were taken as share of commodity in total value of all the 10 commodities at national level, year 2013-14.

After introduction of online trading and UMP modal prices in Karnataka, mandis witnessed much higher increase than the increase in wholesale prices of the same commodity in the country. The increase in real terms varies from 1 per cent to 43 per cent. The average increase for the 10 commodities for which data is available was 38 per cent in nominal terms and 13 per cent in real terms.

As eNAM and other market reforms focus on crop sector, their benefit will accrue only to crop sector. Accordingly, a 13 per cent raise in prices translate to 9.1 per cent increase in farmers' income.

The Karnataka experience shows that small reform in the system of marketing can make a big difference to the prices received by farmers. It is also important to point out that all provisions of Unified Market Platform are not yet fully operational in Karnataka. Two changes, namely, online trading and opening market to traders outside the mandi, have made a significant difference. Full implementation of market reforms and unified national agricultural market has much larger scope to raise prices received by farmers and thus their income.

5.6 *Shifting Cultivators to Non-Farm and Subsidiary Activities*

In rural areas, agriculture sector engages 64 per cent of the total workforce and contributes 39 per cent of total rural net domestic product (Table 5). This shows over-

dependence of workforce on agriculture with significant underemployment. This also reveals large difference in per worker productivity between agriculture and non-agriculture sectors. The estimated worker productivity in agriculture sector was only Rs. 62,235 as compared to worker productivity of Rs.1,71,587 in non-farm sectors during 2011-12 (Table 5). Thus, non-farm sectors provide 2.76 times more productive employment than agriculture sector in rural areas.

TABLE 5. WORKER PRODUCTIVITY IN FARM AND NON-FARM SECTORS IN RURAL AREAS DURING 2011-12

	Net domestic product		Workforce based on usual status		Worker productivity
Sector	Rs. crore	Share (per cent) in total	Million	Share (per cent) in total	(Rs./worker)
(1)	(2)	(3)	(4)	(5)	(6)
Farm	13,40,532	39	215	64	62,235
Non-farm	20,76,198	61	121	36	1,71,587
Total	34,16,730	-	336	-	1,01,567

Data source: Estimates based on CSO and NSSO data.

Income of farmers can be improved substantially by shifting workforce away from agriculture. In fact, some farmers have started moving away from the agriculture sector and many are looking for suitable opportunities to leave farming.[9] According to NSSO, workforce in agriculture sector in rural areas declined by about 34 million between 2004-05 and 2011-12, showing an annual decline at the rate of 2.04 per cent. If the same trend continues, then workforce share in agriculture will fall to 55 per cent of total rural workforce by 2022-23. The decline in workforce in agriculture is on account of both the decline in the number of agricultural labour as well as decline in the number of cultivators. The number of cultivators fell from 16.61 crore to 14.62 crore between 2004-05 and 2011-12, which marks an annual decline of 1.807 per cent.

Notwithstanding the decline in workforce in agriculture, employment diversification is slow due to following reasons: (a) requirement of skill and certain education level, particularly in manufacturing sectors; (b) the concentration of industrial units at a distance from rural habitation; (c) the limited capacity of the non-farm sector to ensure productive employment to incoming workers (Chand and Srivastava, 2014). The government's recent initiative on skill development can play a big role in improving skills of farming community, which can fetch them better employment opportunities in non-farm sectors.

If the number of cultivators keeps declining at the same rate as experienced during 2004-05 to 2011-12, it will reduce their number by 13.4 per cent between 2015-16 and 2022-23. This implies that the available farm income will be distributed among 13.4 per cent less farmers.

VI

STRATEGIES FOR IMPROVING FARMERS' INCOME

The above discussion delved into the sources of increase in farmers' income by drawing mainly from the past experience and trends. The sources of growth in output and income can be put in four categories (i) development initiatives including infrastructure, (ii) technology, (iii) policies and (iv) institutional mechanisms.

6.1 *Development Initiatives*

Some recent development initiatives of the Central government aiming to raise output and reduce cost include *Pradhan Mantri Krishi Sinchai Yojana*; Soil health card, and *Prampragat Krishi Vikas Yojana*. Another major initiative that provides insurance against crop and income loss is *Pradhan Mantri Fasal Bima Yojana*. Beside coverage of risk, it will encourage investment in farming. Interlinking of rivers is another strong initiative with high potential to raise output and farm incomes. These programmes need to be implemented in a time bound manner to get the desired effect on farmers' income. Further, public investments in and for agriculture have remained low as only 2.76 per cent of GDP agriculture and allied sectors at current prices is spent for infrastructure development (refer to year 2012-13). This must be raised to 4 per cent as recommended by the high powered committees (Government of India, 2007).

6.2 *Technology and Innovations*

Sustainable growth in productivity and farmer income requires a paradigm shift from input intensive technologies, which have dominated Indian agriculture since the onset of green revolution. Emphasis is also laid on transformative rather than incremental gain from agricultural research and innovation. Breakthroughs in basic and other modern sciences offer voluminous opportunities for developing transformative technologies for agriculture. However, this has not been happening for a variety of reasons. Further, the challenges in agriculture are becoming more formidable. Addressing these challenges require a vibrant, responsive, and globally competitive research systems equipped with state of the art knowledge and scientific manpower of high calibre equipped with adequate resources. Public sector institutions comprising state agricultural universities and a large network of ICAR institutes dominate India's agricultural research system. While public sector research institutes have important strengths, they also face serious challenges in meeting future needs of Indian agriculture. Resources have been thinly spread on proliferating agricultural universities and institutions around the country with the leading research institutes, simultaneously facing a severe resource crunch. Lab-to-land connect has been weakening. Problem oriented research is not showing desired results. While

public sector research shows symptom of decline, there are serious apprehensions about the role of private sector, particularly relating to pricing, protection and safety of their technologies. Moreover, with the intellectual property rights regimes progressively tightening around the world, the scope for spill over benefits from lateral inflow of technology from developed countries is declining. There is greater and more urgent need than ever before to strengthen the system of agricultural research and development.

Public policy on agricultural R&D is facing a serious dilemma. Scientific community by and large favours the development and use of transgenic and genetically modified crops to address future agri-food demand and other challenges. However, there is strong public sensitivity towards the alleged health and environment safety aspects of these technologies in India and in most of the other countries, which cannot be ignored. It looks like this controversy is not going to settle soon. Therefore other alternatives and options need to be explored.

Evidence is growing about scope of agronomic technologies like precision farming to raise production and income of farmers substantially Maheswari *et al*. (2008); Mandal and Maity (2013) and Velkar (2008). Similarly, modern machinery such as laser land levellers, precision seeders and planters, and practices like SRI (system of rice intensification), direct seeded rice, zero tillage, raised bed plantation, ridge plantation, allow technically highly efficient farming. However, these technologies are developed by the public sector and their marketability is very poor. They require strong extension for the adoption by farmers. The emphasis should be on informing farmers of the opportunities these technologies offer, improving access to credit and creating an enabling policy environment for their adoption.

6.3 *Policies*

Policies affect farmers' income in a large number of ways. Particular attention need to be paid to various types of reforms needed in agriculture sector. India embraced new economic policy and economy wide reforms in 1991. These reforms involved liberalisation, deregulation and removal of excessive control and restrictions on private sector, which created very favourable macro environment for the private sector participation in economic activities. In response to these changes, the union government brought a series of reforms in the agriculture sector in quick succession beginning year 2002. These included (a) Removal of (Licensing Requirements, Stock Limits and Movement Restrictions) on Specified Foodstuffs Order, 2002 and 2003. As per this order, wheat, paddy/rice, coarse grains, sugar, edible oilseeds and edible oils, pulses, gur, wheat products and hydrogenated vegetable oil or vanaspathi were removed from the list of Essential Commodities Act (1955) and they didnot require a permit or license for their trade, storage and movement. (b) Milk and Milk product Order of 2002 modified MMPO of 1992 and removed restrictions on setting up of new capacity in milk processing and to do away with the concept of milkshed. (c)

removal of prohibition on futures trading in any commodity, in year 2003. This was followed by the move to bring reforms in agricultural marketing. The Union government prepared The Model APMC Act called the State Agricultural Produce Marketing (Development & Regulation) act, 2003, and shared it with all the states for implementation.

Majority of the states reported that they have adopted key area of reforms as suggested in the Model Act. However, the policy environment for agriculture sector did not see much change as the reforms in agriculture sector remained patchy, sporadic and partial. Most of the provisions of the APMC Act have been followed in a very diluted form (Chand, 2016c). The net result has been that persistent effort for nearly one and half decade to reform markets have remained more or less unsuccessful.

Besides marketing, serious restrictions remain on land leasing and harvest and transit of forestry plantation on private land, which deprives the farmers from raising their income.

The neglect of required reforms in agriculture sector has created wide disparity between agriculture sector and non-agriculture sectors. Till 1990-91, the growth rates in the two sectors moved in tandem and show very close correlation. As the reforms progressed the growth trajectory diverged. Growth rate in the non-agricultural sector, estimated from average annual rate of change in five years, accelerated from below 6.0 per cent towards more than 8.0 per cent for most of the period. However, agricultural sector moved on cyclical path around long term trend of 2.8 per cent (Figure 5).

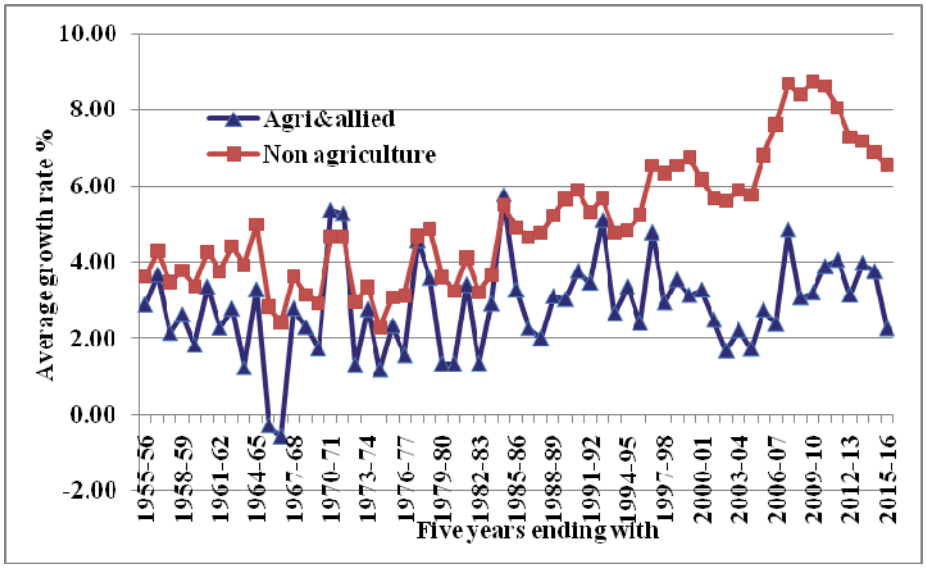


Figure 5. Average Annual Rate of Change in Five Years Period in GDP Agriculture and Non- Agriculture Sectors, 1955-56 to 2015-16.

The correlation between annual rate of change in the two sectors in a ten years period remained more than 0.9 till 1994-95 after which it gradually declined to below 0.5 (non-significant at 5 per cent level) in the recent decade.

It emerges from this comparison that in the absence of market reforms, the agricultural growth remained low and the sector could not keep pace with the growth in the non-agriculture sector. Opening up agriculture and removal of various restrictions on marketing, land lease and raising of forest species on farm land will enable farmers to receive higher prices for their produce and enhance economic activities both of which are part of farmers' income.

6.4 *Institutions*

Indian agriculture is dominated by marginal and small farmers, who suffer serious disadvantage in terms of scale. Small farm size discourages many farmers to go for diversification of fruits and vegetables mainly because of the price risk and uneconomic lot for marketing. Small sized farmers are also disadvantaged in terms of bargaining power in various transactions in the input and output market. These handicaps can be overcome by organising farmers under some institutional mechanism like the farm producers organisations (Singh, 2008). SFAC has compiled case studies of successful examples of collective action by farmers working through organised institutions. It provides convincing evidence of benefits to farmers from integration with the value chain (SFAC, 2013). There are several other success stories of increase in production and better returns from market through collective action through some type of group action or organisation (Gupta, 2015). Some such organisations have shown very impressive benefits to small farmers, women, tribal farmers, even in remote and disadvantaged areas.[10] Till June 2016, SFAC has promoted 510 FPOs with membership of 5.71 lakh farmers in 28 states of the country. Some state governments and NABARD are also promoting FPOs. However, the number and network of FPOs is very small and it needs to be expanded to enable farmers to reduce transaction costs, access technology, raise bargaining power and integrate with value chains.

VII

PROSPECTS OF DOUBLING FARMERS' INCOME

Various sources of growth in farmers' income and their potential to contribute to future growth in farm income and achieving the goal of doubling farmer income have been discussed in Section 4. A summary of these estimates is presented in Table 6. The combined effect of the seven potential sources of growth comes to 75.1 per cent in 7 years and 107.5 per cent in 10 years. If the factors underlying growth in farmers' income rise at the same rate as experienced between 2001 and 2014, farmers' income will rise by 66 per cent by 2022-23 and it will almost double in ten years, i.e., by

2025-26. This does not include the effect of increase in real prices received by farmers, which is a very strong factor affecting their income.

TABLE 6. PROSPECTS OF GROWTH IN FARM INCOME FROM VARIOUS SOURCES

S.No. (1)	Source (2)	Scope (3)	Contribution 7 years (4)	Contribution 10 years (5)	Remarks (6)
1.	Crop productivity 70 per cent seg	3.1	16.7	25.0	Same as in 2001-13. For crop sector (70 per cent) ag.
2.	Livestock value added 30 per cent seg	4.5	10.8	16.6	Same as in 2004 to 2014
3.	Improvement in resource use efficiency	2.26	16.7	25.0	Same as in 2005 to 12
4.	Crop Intensity (70 per cent segment)	1 percentage point	3.4	4.9	same as during 2001-12
5.	Crop diversification (70 per cent seg)	Area increase by 3.13 per cent, elasticity 0.319	5.0	7.3	
6.	Better price realisation: crops only	13 per cent	9.1	9.1	Implemented in 7 or 10 years
7.	Shift to non -farm occupation	1.81 per cent	13.4	19.6	Same as in 2005 to 12
Total	Total		75.1	107.5	

During 2004-5 to 2011-12, farm gate prices in real terms increased by 0.78 per cent per year and thus resulted in an increase in the real farm income of the same order. However, it had put lot of inflationary pressure on the economy. Here we are contemplating implementation of market reforms, which has a large scope of cutting middlemen and their margin and thus raising price realisation by farmers. It emerged from the Karnataka experience that application of simple modern technology to auction of farm produce using electronic platform and simple market reforms can raise price realisation by the farmers in a short span by 13.4 per cent. When this factor is added to the other sources of growth in farmers' income, the increase works out to be 75.1 per cent in 7 years and 107.5 per cent in 10 years. It is concluded that if growth in factors affecting farmers' income is maintained at the level witnessed during ten years or so before 2014, then farmers' income show the prospects to double in 10 years. If this goal is to be achieved by 2022-23, then it will require additional contribution of higher price realisation by farmers through various market reforms like e-NAM and implementation of various provisions of Model APMC Act.

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 to own and achieve the goal of doubling farmers' income. If concerted and well-coordinated efforts are made by Centre and all the States, the country can achieve the goal of doubling farmers' income within 7 to 10 years period.

NOTES

1. Such households fit into the definition of farmers.

2. National Commission on Farmers (2006), Government of India, *Serving Farmers and Saving Farming*, Fifth and Final Report, Towards Faster and More Inclusive Growth of Farmers Welfare**,** Ministry of Agriculture, Para 1.8.6, p.29.

3. These suggestions are in the body text of the report. Strangely, the report does not have a separate section on recommendations at one place.

4. SAS 2013 defines an agricultural household as a household receiving some value of produce more than Rs. 3000 from agricultural activities and having at least one member self employed in agriculture either in the principal status or in subsidiary status during last 365 days.

5. Derived by taking ratio of value of agricultural output at current prices to value of agricultural output at constant (2004-05 base) prices.

6. The data set pertains to 487 districts of India (covering 94 per cent of net sown area).

7. Districts were classified into irrigated and rain-fed by using 35 per cent irrigation coverage as cutoff. Agricultural productivity (Rs./ha) was computed by taking sum of output (Rs.) of selected agricultural commodities (rice, wheat, sorghum, pearl millets, maize, finger millets, barley, gram, pigeon pea, black gram, green gram, horse gram, moth, lentil, groundnut, sesamum, rapeseed and mustard, soybean, linseed, castor, safflower, Niger, Sugarcane, potato and onion multiplied by state level implicit prices of respective agricultural commodities, divided by net sown area.

8. Some crops like sugarcane, apple, mango etc. are perennial and they occupy land throughout the year. Their share in net cultivated area remains small.

9. According to the *Situation Assessment Survey 2002-03 of NSSO*, 40 per cent farmers showed preference to quit farming if there was choice. Similarly, micro level studies provide strong evidence of youth not interested to work in agriculture (Himanshu *et al*., 2016).

10. Two such success stories are Ram Rahim Pragati Producer Company Ltd. (RPCL), in Bagli, Dewas, Madhya Pradesh and Producers Companies promoted under Rural Livelihoods Promotion Society's (BRLPS) http://www.business-standard.com Jeevika Project, in Bihar.

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