

# SPANDAN

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# Agriculture in India: Performance, Challenges and Opportunities

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# **Agriculture in India: Performance, Challenges and Opportunities**

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## *Abstract*

*The current analysis contextualizes Indian agriculture by an evaluation of its performance, the roles and challenges for the smallholders, and opportunities. One observes a turn-around in recent years (2004/5-2010/1) compared to the immediate post-reforms period (1993/4-2004/5), which had witnessed stagnation in comparison to the pre-reforms period (1981/2-1993/4). The changes in recent years could be attributed to some public policy initiatives on investments, research, extension and credit and also a slew of good monsoons among others. A matter of concern is the sustainability of smallholder farming who have difficulty in livelihood sustainability despite being efficient. It is here that one should look at opportunities that reduce costs and risks and use low external input sustainable agriculture (LEISA) while not compromising on production.*

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## **1. Introduction**

In 2012, a delay in rains and the possibility of drought reiterates the risks of monsoon-dependent agriculture in India. It brings into focus the discourse on the crisis in Indian agriculture observed since the early nineties. Two symptoms of this crisis were non-serviceable debt and increasing the incidence of farmers' suicides. These symptoms point out the adverse implications on the livelihood of people dependent on agriculture - the agrarian crisis. The crisis is also associated with stagnation in the growth of production and productivity - the agricultural crisis. The latter is intertwined with the former. There seems to have been a revival in the agricultural growth in recent years, which we elaborate in section 2 in our analysis of the performance of Indian agriculture. While appreciating this recent turn-around and hoping that it should continue, one does agree that it has important policy challenges to continue with the same. What is more, despite these improvements the incidences of farmers' suicides continue to remain as a matter of concern and it is premature to visualize a positive outcome in the livelihood of those dependent on agriculture. A true measure of success should be the implications on smallholders (section 3) who constitute more than four-fifths of the cultivating household. To address these, as section 4 suggests, it is particularly important to leverage new technologies, build institutions and emphasize on low external input sustainable agriculture (LEISA) so as to help improve income and reduce risks without compromising on yield.

## **2. Performance of Indian Agriculture**

Recent discourses have pointed out relatively lower growth in agriculture in the post-1990s than prior to that (Desai et al, 2011; Dev and Pandey, 2012; Mishra, 2012; and Mishra and Reddy, 2011; among others). Some of them do point to a departure of reversal during recent years, i.e., sometime after 2004-5. Keeping this in mind the current exercise proposes to calculate growth rates by using triennium ending (TE) time series data, a standard practise to smoothen out fluctuations in agricultural production, to separate the experiences of the recent years (TE 2004/5 to TE 2010/1) with that of the immediate post-reform period (TE 1993/4 to TE 2004/5) while contrasting the experience of the latter with pre-reform period (TE 1981/2 to TE 1993/4). The choice of TE 1981/2 as a start year is a standard practice in the analysis of Indian agriculture; the years TE 1993/4 and TE 2004/5 have been chosen as one observed some changes in

broad trends around these years. Our calculations are based on a two-kinked exponential curve following Boyce (1986).<sup>1</sup>

### *2.1 Growth in Agricultural Gross Domestic Product*

The analysis of agricultural Gross Domestic Product (GDP) shows a significant decline in the growth rate of agriculture and allied sector GDP from 3.29 per cent in the pre-reform period to 2.72 in the immediate post-reform period; a matter of concern because the overall economy was going very strong during this period. Thus, the measures taken under the rubric of economic reforms during 1991/2 was not of much help to agriculture (Bhalla, 2002; Kumar, 2002; Chand, 2004). However, in recent years, the agriculture sector, specifically, crop and livestock are showing some sign of revival (Table 1). The agricultural GDP from crop and livestock improved to 3.08 per cent in TE 2004/5-2010/1 from 2.68 per cent during TE 1993/4-2004/5, but the improvement in growth rate was not statistically significant.

This growth could be attributed to different initiatives taken by the Government since late 2005, due to which, the ratio of gross fixed capital formation in agriculture to agricultural GDP improved from 13 per cent in 2004/5 to 20 per cent in 2010/1 (Ministry of Agriculture, hereafter MoA, 2012). Total investment especially, public investment has firmed up (Table 2), public expenditure on agricultural research and extension has been boosted (Table 3). However, it may be noted that public investment in agriculture mostly relates to medium and major irrigation projects where substantial resources are put without much critical scrutiny (Government of India, 2011; Vaidyanathan, 2010). There is also a lag effect of public investment on agriculture growth. Therefore, impacts from these would be felt more in the long run and would depend on the nature and composition of the investment. Besides, since the mid-2000s, private investments by individual farmers as well as by other entities who develop infrastructure from an agri-business perspective, increased significantly and this can also have positive implications.<sup>2</sup> It may also be noted that the share of private sector in total agricultural

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<sup>1</sup> Growth rates have been computed using double-kinked exponential curve,  $\ln(Y_t) = a + b_1D_1 + b_2D_2 + b_3D_3 + u_t$ ;  $Y_t$  refers to TE average data,  $t$  begins with 0 for TE 1981/2 and increases by one unit for every year such that it is 29 for TE 2010/1.  $D_1$  begins with 0 and increases by one unit for every year till TE 1993/4 and for this as also all subsequent years it is 12.  $D_2=0$  from TE 1981/2 till TE 1993/4 and then increases by one unit for every year till TE 2004/5 and for this as also all subsequent years it is 11.  $D_3=0$  from TE 1981/2 till TE 2004/05 and then increases by one unit for every year till TE 2010/1. Growth rates of the three sub-periods are  $b_1$ ,  $b_2$  and  $b_3$  respectively.

<sup>2</sup> Note that appropriate public investment will bring about private investments that supplement them and have multiplier effects whereas inappropriate ones could make private investment substitute the void that can sometimes have disastrous consequences. For instance, a decline in public investments on irrigation led to an increase in private investments on bore wells that not only had an adverse debt and cost implication on the farmer, but also led to a depletion of ground water in many areas - a tragedy of the commons.

investment is 70 to 75 per cent (MoA, 2012). There is complementarity between public and private investment. The terms of trade for agriculture based on GDP implicit price deflators seem to have improved considerably during the recent period; they increased from 100 in 2004/5 to 126 in the year 2009/10 (Dev and Pandey, 2012).

The forestry sector has shown a gradual improvement in the growth rate whereas; fishery sector has registered a gradual decline over the three periods (Table 1). Now, we take up a crop-wise analysis of growth in value of output as also in the area, production and yield.

<b>Table 1: Growth Rate of Agricultural Gross Domestic Product</b>						
Items	TE 1981/2-1993/4		TE 1993/4-2004/5		TE 2004/5-2010/1	
Agriculture and allied sectors	3.29	**	2.72	**†	2.95	**
Agriculture (crop & livestock)	3.36	**	2.68	**†	3.08	**
Forestry sector	0.06	**	1.72	**†	1.93	**†
Fishery	6.29	**	4.27	**†	3.54	**†

Note: \*\* significant at 1% level (or 99% confidence interval), † significantly different from the first period at 95% confidence interval. TE is triennium ending. Growth rates have been computed using double-kinked exponential curve. All data are in 2004/5 prices.

Source: CSO, (2012a & b)

<b>Table 2: Investment in Agriculture</b>						
Items	TE 1981/2-1993/4		TE 1993/4-2004/5		TE 2004/5-2010/1	
Investment, agriculture	2.23	**	6.43	**†	8.52	**†
Public investment, agriculture	-4.46	**	2.25	**†	12.50	**†‡

Note: \*\* significant at 1% level (or 99% confidence interval), † significantly different from the first period at 95% confidence interval, ‡ indicates significantly different from the second period at 95% confidence interval. TE is triennium ending. Growth rates have been computed using double-kinked exponential curve. All data are in 2004/5 prices.

Source: CSO, (2012a & b)

**Table 3: Growth of Real Government Expenditure on Agricultural Research, Education and Extension in India (2004/5 prices)**

Items	TE 1981/2-1992/3	TE 1993/4-2004/5	TE 2005/6-2009/10
Research and education	4.25	6.28	9.00
Extension	6.15	0.93	5.14
Total	4.68	5.14	9.75

Note: The estimates for this have been provided by Suresh Pal and Alka Singh from the Indian Agricultural Research Institute, New Delhi through a personal communication.

## 2.2 Crop-wise analysis

The performance of different segments of agriculture shows that the growth rates in the value of the output of crops and livestock declined in the immediate post-reform period (Table 4). But, the growth rates are relatively higher in more recent years. The growth rate for most of the individual crops except for fruits and vegetables is similar. They declined in the immediate post-reform period as compared to pre-reform period and are showing improvements in the recent years. During recent years, the period TE 2004/5 to 2010/1, a significantly higher growth is being observed for cotton, maize, pulses and oilseeds. Cereals also registered some improvement over its post-reform period growth rates.<sup>3</sup> The significantly higher growth of cotton coincides with the introduction of *Bacillus thuringiensis* (Bt) cotton towards the end of our second period and its spread in usage during the same period is worth noticing. However, one should be cautious in attributing reasons for this entirely to the introduction of this genetic modification because of the absence of appropriate counterfactuals that separate out the impacts on account of new hybrid varieties and the lower incidence of specific pest attacks (see Gaurav and Mishra, 2012).

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<sup>3</sup> An interesting initiative with regard to rice cultivation is the spread of an alternative cultivation practise called the system of rice intensification (SRI), which involves civil society as also some public policy initiatives (Thiyagarajan and Gujja, 2012).

Items	TE 1981/2-1993/4	TE 1993/4-2004/5	TE 2004/5-2010/1
Crops	2.74 *	2.32 *	2.68 *
Cereals	3.28 *	0.98 *†	1.90 *†
Paddy	3.77 *	0.80 *†	1.71 *†
Wheat	4.02 *	1.67 *†	1.75 *†
Maize	2.49 *	3.31 *	5.98 *†‡
Pulses	1.53 *	-0.03 †	2.48 *†‡
Oilseeds	6.07 *	0.46 †	4.79 *‡
Sugarcane	3.52 *	1.70 *	1.83 §
Cotton	4.08 *	1.02 †	13.69 *†‡
Fruits and Vegetables	2.84 *	4.79 *†	2.88 *†
Livestock	4.42 *	3.39 *	4.11 *
Milk group	4.96 *	3.73 *†	3.45 *†
Meat group	5.15 *	2.92 *†	5.50 *†
Eggs	6.25 *	3.61 *†	6.48 *†

Note: \*\* significant at 1% level (or 99% confidence interval), \* indicates significant at 5%, § indicates significant at 15%, † significantly different from the first period at 95% confidence interval, ‡ indicates significantly different from the second period at 95% confidence interval. TE is triennium ending. Growth rates have been computed using double-kinked exponential curve. All data are in 2004/5 prices.  
Source: CSO, (2012a & b).

Indian agriculture is witnessing diversification over time. Though the growth rate for value of output from fruits and vegetables have declined in recent years (Table 4), its share in total value of output has increased from 19 per cent in 1981/2 to 27 per cent in 2010/1 whereas, the share of cereals have declined from 34 per cent to 29 per cent in the same period (Central Statistical Organisation, hereafter CSO, 2012). Change in the cropping pattern is also evident. There is a decline in the area under other cereals and a decline in the growth rate of the area for rice and sugarcane. However, the area under pulses and oilseeds that had declined in the post-reform period has reversed in recent years and the improvement in the growth rate of the area is also significant (Table 5). The increase in production of other cereals is attributable to yield growth only. In the case of pulses, oilseeds, and cotton, both area and yield growth are responsible for the increase in growth rate of production in recent years. The improvements in recent years

could be attributed to various initiatives including among others the National Food Security Mission (NFSM) launched in the year 2007/8 and a favourable monsoon in almost all the years except for 2009/10 and also a price or terms of trade that favoured agriculture. It would be worthwhile to take up an analysis across states.

Items	Area			Production			Yield		
	TE								
	1981/2- 1993/4	1993/9- 2004/5	2004/5- 2010/1	1981/2- 1993/4	1993/9- 2004/5	2004/5- 2010/1	1981/2- 1993/4	1993/9- 2004/5	2004/5- 2010/1
Food Grains	-0.27 *	-0.27 *†	0.46 *†‡	3.05 *	1.00 *	2.18 *	3.31 *	1.27 *	1.72 *
Rice	0.65 *	0.18 §†	0.02	3.79 *	0.92 *†	1.87 *†	3.15 *	0.73 *†	1.88 *†‡
Wheat	0.76 *	0.72 *	0.95 *	4.04 *	1.67 *†	1.75 *†	3.28 *	0.95 *†	0.80 *†
Other Cereals	-2.05 *	-1.55 *	-0.28 †‡	0.52 *	0.31	3.60 *†‡	2.57 *	1.84 *	3.93 *‡
Total Pulses	-0.13	-0.45 *	1.50 *†‡	1.51 *	-0.40 §†	3.04 *‡	1.64 *	0.03 †	1.58 *‡
Oilseeds	3.16 *	-0.46 †	1.72 *‡	5.83 *	0.57 †	4.93 *‡	2.69 *	1.01 †	3.25 *‡
Cotton	1.09 *	0.61 *	3.98 *†‡	3.67 *	2.84 *	14.27 *†‡	2.59 *	2.22 *	10.24 *†‡
Sugarcane	2.17 *	1.39 *	1.31 *	4.01 *	1.15 *†	1.79 *	1.84 *	-0.26 †	0.48 *†

Note: \*\* significant at 1% level (or 99% confidence interval), \* indicates significant at 5%, § indicates significant at 15%, † significantly different from the first period at 95% confidence interval, ‡ indicates significantly different from the second period at 95% confidence interval. TE is triennium ending. Growth rates have been computed using double-kinked exponential curve.

Source: Ministry of Agriculture, 2012.

### 2.3 Analysis across States

An analysis of the agricultural Gross State Domestic Product (GSDP) shows that it has increased in 11 of the 15 major states during the TE 2004/5 to 2010/1 period as against the post-reform period of TE 1993/4 to 2004/5; the increase is significant in seven of these states (Table 6). The states like Kerala, Uttar Pradesh and West Bengal recorded decline in the agricultural GSDP, but the decline is significant in Kerala alone. Some states have recorded a gradual improvement in the agricultural GSDP over the three periods; the improvements are significant in Andhra Pradesh and Odisha. In recent years,

the highest growth rate for agricultural GSDP was recorded by Andhra Pradesh followed by that of Maharashtra and then by Madhya Pradesh.

<b>Table 6: Growth of Agricultural Gross State Domestic Product</b>			
States	TE 1981/2-1993/4	TE 1993/4-2004/5	TE 2004/5-2010/1
Andhra Pradesh	2.44 *	3.34 *	6.22 *†‡
Bihar	1.69 *	3.60 *†	3.85 *
Gujarat	1.85 *	3.80 *	4.57
Haryana	4.25 *	1.83 *†	3.84 *‡
Himachal Pradesh	0.12 *	0.10 *	0.06
Karnataka	3.99 *	0.55 †	4.71 *‡
Kerala	4.40 *	1.36 *†	-0.42 †‡
Madhya Pradesh	3.78 *	1.40 *†	5.34 *‡
Maharashtra	5.12 *	3.48 *†	5.91 *‡
Odisha	-0.26	0.63	4.99 *†‡
Punjab	4.15 *	1.84 *†	2.20 *†
Rajasthan	4.12 *	2.57 *	3.77 *
Tamil Nadu	4.53 *	0.58 *†	4.13 *‡
Uttar Pradesh	3.35 *	2.11 *†	2.01 *†
West Bengal	5.44 *	2.71 *†	1.36 *†
<p>Note: ** significant at 1% level (or 99% confidence interval), * indicates significant at 5%, § indicates significant at 15%, † significantly different from the first period at 95% confidence interval, ‡ indicates significantly different from the second period at 95% confidence interval. TE is triennium ending. Growth rates have been computed using double-kinked exponential curve. Source: CSO, (1999, 2007, 2010, 2012c)</p>			

<b>Table 7: Instability in Net Domestic Produce and Net State Domestic Produce from Agriculture Using Ray's Instability Index</b>			
States	TE 1981/2-1992/3	TE 1993/4-2004/5	TE 2005/6-2009/10
All India	6.39	6.28	3.03
Andhra Pradesh	8.93	13.19	6.03
Bihar	14.51	14.10	12.13
Gujarat	45.38	26.69	13.75
Haryana	13.09	6.03	5.76
Himachal Pradesh	13.11	9.13	14.22
Karnataka	9.36	12.58	7.84
Kerala	7.19	9.31	7.60
Madhya Pradesh	11.16	20.44	6.58
Maharashtra	18.62	9.75	14.47
Odisha	20.51	15.69	4.40
Punjab	4.61	3.97	1.16
Rajasthan	25.02	29.68	14.96
Tamil Nadu	13.21	13.46	9.34
Uttar Pradesh	3.70	4.22	1.65
West Bengal	7.43	5.06	3.98

Note: Ray Instability Index: Standard Deviation of  $\ln \{(Y_{t+1})/(Y_t)\}$  where  $Y_t$  is net domestic produce or net state domestic produce from agriculture.

Source: CSO (1999, 2007, 2010, 2012a, b & c).

These growth rates suggest an overall improvement in the agricultural performance with respect to agricultural GSDP during recent years (TE 2004/5 to 2010/1) when compared with the post-reform period (TE 1993/4 to 2004/5). It is, therefore, important to understand, from an equity point of view, whether instability in agricultural has increased or decreased and if states are converging towards national average or diverging from it. Table 7 shows that volatility has reduced from 6.28 per cent during the post-reform period to 3.03 per cent in recent years at the all India level for net domestic produce from agriculture. Even in the case of states, it was observed that for almost all the states, fluctuation in net state domestic produce have reduced in the recent years as against the post-reform period, except for Himachal Pradesh and Maharashtra. An analysis of  $\beta$ -convergence based on the linear regression of growth rates for net state

domestic produce from agriculture (NSDPA) per hectare on their respective initial NSDPA per hectare shows an overall convergence during the period from 1980/81 to 2009/10. Despite this positive note on reductions in volatility and an increase in convergence across states, it should be borne in mind that more than half the workforce and their dependents are still dependent on agriculture for their livelihood and a large majority of them are small and marginal farmers. It is, therefore, imperative that we take up a discussion from their perspective.

### **3. Small and Marginal farmers: Role, Challenges and Opportunities**

The objective of this section is to examine the role and challenges of small holding agriculture in achieving agricultural growth, food security and livelihoods in India. It may be noted that Indian agriculture is the home of small and marginal farmers. Therefore, the future of sustainable agriculture growth and food security in India depends on the performance of small and marginal farmers. Agricultural Census data shows that there were about 129 million agricultural holdings in India in 2005-06. Around 108 million were small and marginal farmers. Average size has declined from 2.3 hectares (ha) in 1970-71 to 1.23 ha in 2005-06. Small and marginal farmers account for more than 80 per cent of total farm households, but their share in the operated area is around 41 per cent. Thus, there are significant land inequalities in India.

The role of small farms in development and poverty reduction is well recognized (Lipton, 2006). The global experience of growth and poverty reduction shows that Gross Domestic Product (GDP) growth originating in agriculture is at least twice as effective in reducing poverty as GDP growth originating outside agriculture (World Bank, 2008). Small holdings play an important role in raising agricultural development and poverty reduction.

#### *3.1 Farm size, output and productivity*

There has been a debate in India on the relationship between farm size and productivity. The results of the Situation Assessment Survey (SAS) of Farmers, National Sample Survey 59<sup>th</sup> round, 2003 has empirically established that for the agricultural year of 2002-03 the small farms continue to produce more in value terms per hectare than the medium and large farms. The value of output per hectare was Rs.14,754 for marginal farmers Rs.13,001 for small farmers Rs.10,655 for medium farmers and Rs.8,783 for

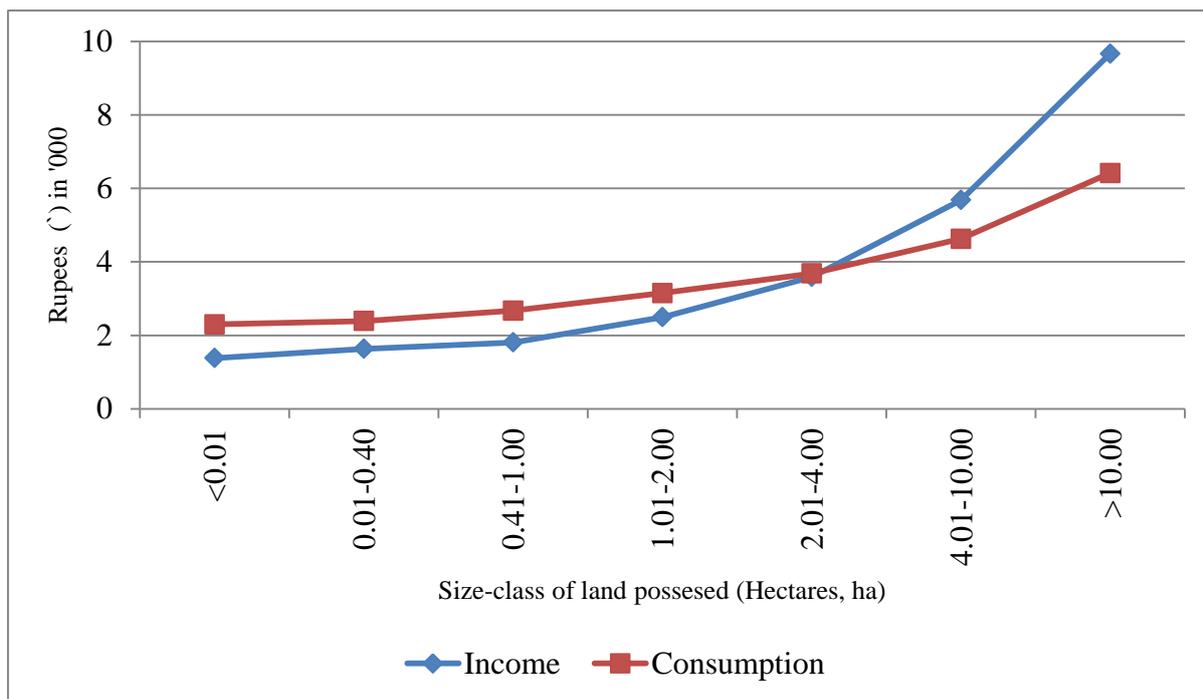
large farmers. It shows that from the efficiency point of view, small holdings are equal to or better than the large holdings.

It is true that small holdings have higher productivity than medium and large farms. But, this is not enough to compensate for the disadvantage of the small area of holdings. The cost of cultivation per hectare is also high on small and marginal farms than medium and large farms.<sup>4</sup> At the all India level, net farm income per hectare for small holdings is higher than large holdings. Across 20 major states, the results are similar to the all-India pattern in 11. But, in the remaining nine, the reverse is true – net farm income per hectare is high in large holdings than in small holdings.

However, the monthly income and consumption figures across different size class of land holdings show that marginal and small farmers have dis-savings (expenditure higher than income) compared to medium and large farmers. According to SAS, the monthly consumption of marginal farmers was Rs.2,482 and monthly income was Rs.1,659 (Figure 1). It shows that they have dis-savings of Rs.823. The dis-savings for small farmers were Rs.655. For large farmers, monthly income and consumption were Rs.9,667 and Rs.6,418 respectively with savings of Rs.3,249. As National Commission for Enterprises in the Unorganised Sector (NCEUS, 2008, p.12) suggests, “...consumption expenditure of marginal and small farmers exceeds their estimated income by a substantial margin and presumably the deficits have to be plugged by borrowing or other means.” NCEUS (2008) also indicates that the poverty for small holding farmers is much higher than other farmers. The need for an increase in productivity and incomes of small holdings and promotion of non-farm activities for these farmers are obvious.

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<sup>4</sup> On returns to farming, see Gaurav and Mishra (2011).



**Figure 1: Income and Consumption by Size-class, India, 2002-03**

Source: National Sample Survey Organisation (NSSO, 2005, pp.21-22).

### 3.2 Access to Inputs and Markets

There are many issues and challenges for small holding agriculture in India. They face several challenges in their access to inputs and marketing. They need a level playing field with large farms in terms of accessing land, water, inputs, credit, technology and markets. Small holdings also face new challenges on the integration of value chains, liberalization and globalization effects, market volatility and other risks and vulnerability, and adaptation of climate change among others (Thapa and Gaiha (2011).

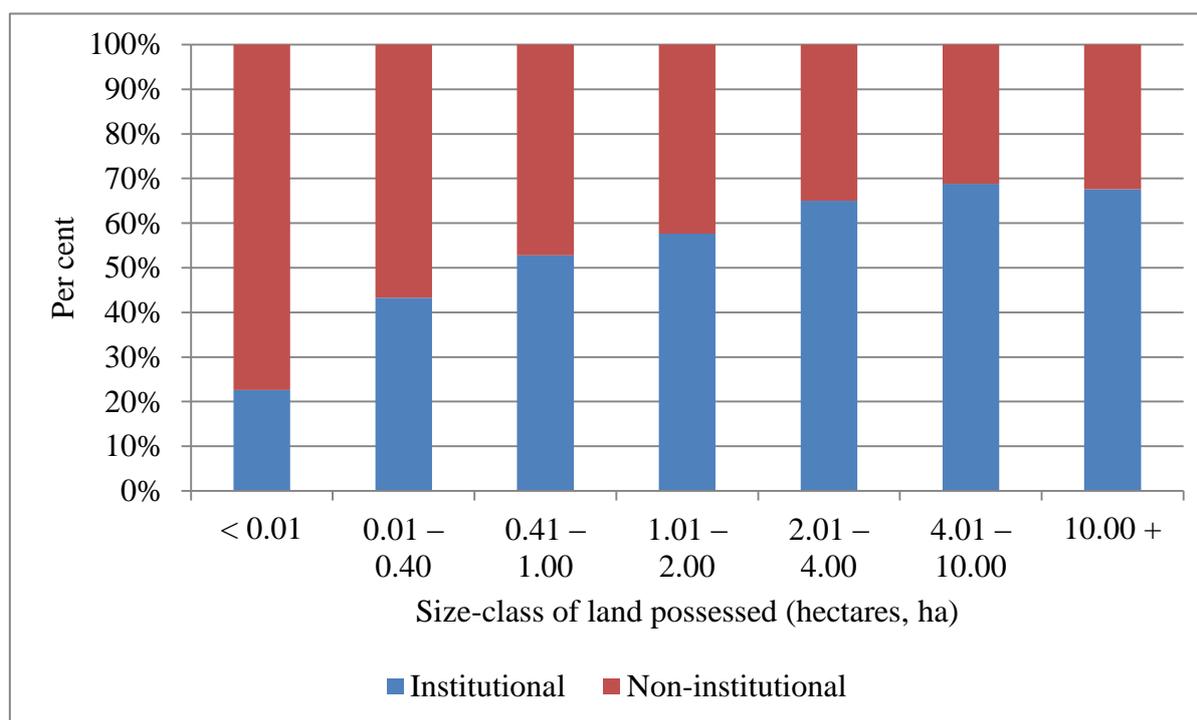
SAS of 2003 brought out many issues relating to small and marginal farmers. Based on this Survey, NCEUS (2008, p.7) mentions that “some of the general issues that confront marginal-small farmers as agriculturalists are: imperfect markets for inputs/product leading to smaller value realizations; absence of access to credit markets or imperfect credit markets leading to sub-optimal investment decisions or input applications; poor human resource base; smaller access to suitable extension services restricting suitable decisions regarding cultivation practices and technological know-how; poorer access to ‘public goods’ such as public irrigation, command area development, electricity grids; greater negative externalities from poor quality land and water management, etc.”

Increasing globalization has added to the problems faced by the small holding agriculture. The policies of huge subsidies and protection policies by developed countries have negative effects on small holding farmers in developing countries. If support is not given to small farms, globalization may become advantageous for large farms.

### *3.3 Credit and indebtedness*

Small holdings need credit for both consumption and investment purposes. As discussed in Mishra (2012), we reiterate some of the recent policy discourses. A report by a working group, Reserve Bank of India (RBI) (2006), pointed out the relevance of both credit and non-credit factors. But, some important observations are that the agriculturists continue to be bothered with the inadequate amount, untimely and other hassles while borrowing credit from formal sources; that the system fails to differentiate between wilful and non-wilful defaulters; and that there does not exist any credit guarantee to facilitate the non-wilful defaulter.

**Figure 2: Share of Loan Amount from Institutional and Non-Institutional Sources of Credit by Size-class of Land Possessed, 2002-03**



Source: Reddy and Mishra (2010)

The report by the Expert Group on Agricultural Indebtedness indicates that the farmers are increasingly dependent on informal sources of credit; share of debt of farmer households from formal sources shows a secular increase from 7.3 per cent in 1951 to 66.3 per cent in 1991 and then it declined to 61.1 per cent in 2002 (Government of India, 2007). The dependence on informal sources is higher for marginal and small farmers (Figure 2) and that too at a higher interest burden because 73 per cent of the debt by farmer households from non-institutional sources has an interest rate of more than 20 per cent, of which more than half (overall 38 per cent) have an interest rate of more than 30 per cent per annum.

Shetty (2009) further observes that (a) there has been a decline in the number of rural bank branches from 32,981 in 1996 to 31,967 in 2005, (b) there is a decline in the number of agricultural borrowal accounts from 277 lakh in March 1992 to 198 lakh in March 2001, and (c) there is a decline in agricultural credit as per cent of net bank credit from 18 per cent in the 1980s, which is the statutory requirement, to 11 per cent in 2004.<sup>5</sup>

<sup>5</sup> From April 2007 the statutory requirement of priority sector lending is calculated from adjusted net bank credit (ANBC) and the agricultural credit as per cent of ANBC in March 2004 is around 15 per cent (Chart 1, RBI 2012a). Using Basic Statistical Returns Chakrabarty (2012) points out that outstanding credit from scheduled commercial

The ratio of the share of credit disbursed to the share of area operated and the ratio of the share of the number of borrowal accounts to the share of the number of operational holding indicates that both have been declining for marginal holdings (those with less than one hectare), Table 9. For small holdings, both the ratios increased in the 1980s, but in the 1990s, it is only the borrowal accounts to operational holdings ratio that increased whereas the credit disbursed to area operated ratio decreased. For the others category of holdings, the credit disbursed to area operated ratio shows a slight decline in the 1980s, but all the ratios increased in the 1990s. In other words, there was a shift in favour of small holders in the 1980s, which seem to have been reversed in favour of the other (medium and large) holdings in the 1990s.

There have been some policy initiatives following this such as doubling of agricultural credit in three years during 2004-5 to 2006-7, which was achieved but this did not increase the proportion of agricultural credit as a per cent of adjusted net bank credit (ANBC) that stands at 16.1 per cent in March 2011.<sup>6</sup> There was an Agricultural Debt Waiver and Debt Relief Scheme (ADWDRS) in 2008, which helped the banks books by reducing their non-performing assets, but as a study by the National Bank for Agriculture and Rural Development indicates this did not automatically improve the access to credit of all farmers because 50 per cent of active farmers is not likely to have a Kissan Credit Card (Samantara, 2010). Some other initiatives are the introduction of no-frills account and use of business correspondents to improve access to banking services.

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banks to agricultural occupation was as follows: 16.7 per cent in 1981, 15 per cent in 1991, 9.6 per cent in 2001 and 11.3 per cent in 2011.

<sup>6</sup> RB I (2012b) indicates that the credit disbursed for agriculture and allied activities as per cent of gross bank credit has declined from 13.5 per cent in March 2010 to 12.3 per cent in March 2011 to 12.0 per cent in March 2012.

**Table 8: Ratio of the share of credit disbursed to the share of area operated and the ratio of the share of the number of borrowal accounts to the share of the number of operational holdings**

Year	Ratio of the share of credit disbursed to the share of area operated			Ratio of the share of the number of borrowal accounts to the share of the number of operational holdings		
Year	Marginal	Small	Others	Marginal	Small	Others
1981-82	2.41	1.24	0.72	0.90	1.28	1.00
1991-92	1.85	1.33	0.71	0.72	1.77	1.19
2002-03	0.98	1.22	0.93	0.56	1.85	2.21

Note: Marginal, small and others+ refer to <1 hectare, 1-2 hectares and >2 hectares for area operated and operational holdings and are superimposed on <2.5 acres, 2.5-5.0 acres and >5 acres for credit and borrowal accounts. The land-based information is based on the National Sample Survey rounds (1981-82, 1991-92 and 2003) and the credit-based information is based on the *Handbook of Statistics on the Indian Economy* published by the Reserve Bank of India.

Source: Mishra (2012) based on Government of India (2007).

A recent report on credit related issues of farmers (Government of India, 2009; also see Mehrotra, 2011) refers to regional inequalities - the eastern region share in credit disbursed is much lower than its share in gross cropped area, southern region with a history of good branch banking have a higher share of credit and the amount is spread across a large number of borrowal accounts with the average amount disbursed per borrowal account at Rs 41,331 in June 2008 being lower than eastern region (Rs.66,812), western region (Rs.113,387) and northern region (Rs.176,179) raises issues of inclusion or rather exclusion in the latter areas. The report also points to a seasonal anomaly with nearly one-fourth of the credit being disbursed during March and another 10-20 per cent being disbursed during January and February when even Rabi activities are by and large over raising questions on the timeliness and the 'purpose' behind these disbursals. All these do raise concerns on the livelihoods and opportunities for agriculture in general and that of the small and marginal farmers in particular. We take up some further discussion on technological and institutional innovations for agriculture.

## **4 Opportunities: Technological and Institutional Innovations**

There are many opportunities in the form of technological and institutional innovations which can enable marginal and small farmers to raise agricultural productivity and increase incomes through diversification and high-value agriculture. Research and extension should give importance to cost reduction without reduction in yields. Therefore, new technological innovations with approaches focusing on LEISA that does not use chemical fertilizers, pesticides or genetically modified organisms. It counters the argument of 'there is no alternative' (TINA) by affirming that there are multiple alternatives that are situation specific, but they are not mainstream practices because to promulgate them one needs the support of appropriate knowledge, resources and also appropriate leveraging with new advances in marketing opportunities and information technology.

### *4.1 Information technology*

Changes in information technology will help in a big way to improve agri-business and incomes of small farmers. Indian private companies and Non-government Organizations (NGOs) are global leaders in providing information to farmers, as a spinoff from India's meteoric rise as a world leader in Information and communications technology (ICT). E-Choupal has expanded access to the internet in rural areas. Up to 6,400 internet kiosks were set up between 2000 and 2007 by ITC Limited, one of the largest agricultural exporters. It reaches about 4 million farmers growing a range of crops - soybean, coffee, wheat, rice, pulses or shrimp - in over 40,000 villages. They get free information in their language about local and global market prices, weather forecasts, farming practices and crop insurance. It serves as a purchase centre, cutting marketing costs and allowing farmers to obtain a bigger farm price.<sup>7</sup> The M. S. Swaminathan Research Foundation established Knowledge Centres in Pondicherry in 1997. With the support of the Indian Space Research Organization, centres in each village are connected by satellite to a hub at Villianur. The women self-help groups use the centres' computers to manage their business accounts and coordinate their activities, using video links with the other villages. The declining costs of ICTs are giving small farmers much greater access to

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<sup>7</sup> A caveat is that there have been some second generation problems with e-Choupal and their success in scaling- up or reproducing the same in other regions have not been as smooth.

information. Mobile phone coverage in India is expanding and has an important function of linking the farmers to markets.

#### *4.2 Institutions for Marketing*

A number of innovative institutional models are emerging to link farmer groups to bargain together in the input and produce markets. For small and marginal farmers, marketing of their products is an important problem apart from credit and extension. In recent years, there has been some form of contract arrangements in several agricultural crops such as tomatoes, potatoes, chillies, gherkin, baby corn, rose, onions, cotton, wheat, basmati rice, groundnut, flowers, and medicinal plants. There is a silent revolution in institutions regarding non-cereal foods. New production-to-market linkages in the food supply chain are spot or open market transactions, agricultural co-operatives and contract farming (Joshi and Gulati, 2003).

There is a need to revamp some of the legal hurdles for agro-processing and APMC Act. Several state governments have already amended their APMC Acts allowing varying degrees of flexibility. However, several states are yet to notify the relevant rules that would make the amendment fully operational (Patnaik, 2011). These steps should be speedily completed to provide a boost to the promotion of direct marketing, contract farming, and setting up of markets in private and co-operative sectors.

There are different models for marketing collectively by the small and marginal farmers. These are self-help group model, co-operative model, small producer co-operatives and contract farming. *Apni Mandi* in Punjab, *Rytu Bazars* in Andhra Pradesh, dairy co-operatives are some of the successful cases in marketing. The real challenge lies in organising the small and marginal farmers for marketing and linking them to high-value agriculture. Thus, group approach is needed for getting benefits from marketing. The most important problem for the small farmers is output price fluctuations. There is a big gap between producer prices and consumer prices.

Small farmers can also benefit from the emerging super markets and value chains. In a study of food supply chains in India, Reardon and Minten (2011) indicate a rapid change in supply food chains in the past two decades. A modern sector is emerging in the wholesale sector with the growth of modern logistics firms and specialized modern wholesalers. Along with this, the tradition segment of the wholesale sector is also transforming with reductions in supply chains, declining role of village brokers as farmers sell directly to *mandis* and an expansion of cold storage that seems to be taking

up wholesale functions including providing credit. However, it is the medium and small farmers who take advantage of this dynamism with the marginal farmers being at a disadvantage because of less marketable surplus. They also point out infrastructural constraints on account of poor roads, unavailability of electricity, limited access to credit, less education and no tube wells.

In India, the expansion of modern retailing has the potential to spark investment in marketing efficiency and processing that yields benefits to both producers and consumers. In those cases where small producers have been able to integrate into the supplying chains, supermarkets have offered enhanced security and considerably higher margins than the traditional clients, such as wholesales and groceries. However, there is scope for exploitation in contract farming and super markets if rules are not properly framed or not properly implemented.

While recognizing the advantages of contract farming, Singh (2012) as also, Narayanan (2012) point out that its evaluation has to be situation specific, as contracts depend on the type of firm, the farmer, the crop being grown, and the nature of contract among others. Singh (2012), further, adds that the success of contract farming should be assessed based on its impact on reducing market risks for the small and marginal farmers, and its impact on resource base because of implications on future income and environment.<sup>8</sup> Next, we discuss a cultivation practice that could ensure some of these advantages.

#### *4.3 Non Pesticide Management*

Non-pesticide management (NPM) is one of the approaches that reduce costs and adverse implications on the environment. As the term suggests, it tries to manage pests without the use of chemical pesticides and if feasible, tries to avoid the use of fertilizers. This technology is knowledge-centric, and hence, its success as also scaling-up depends a lot on appropriate extension services. A successful intervention, as discussed in Mishra and Reddy (2011), is the Community Managed Sustainable Agriculture (CMSA) under the aegis of the Society for Elimination of Rural Poverty (SERP) in Andhra Pradesh.<sup>9</sup> A major emphasis of this was to retain soil health through natural processes that enhance microbial activity and replenish nutrients to sustain productivity. NPM has a number of non-negotiable practices that include ‘deep summer ploughing, community bonfires, seed treatment, bird perches, border crops, trap crops, yellow and white plates,

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<sup>8</sup> For a discussion on technological change giving higher net returns, which happens to be facilitated through contract farming and can add rather than reduce exposure to risks, see Mishra (2008).

<sup>9</sup> The continuing effectiveness and further scaling-up of NPM under SERP in Andhra Pradesh also needs constant interventions in terms of knowledge, human resources, physical capital, monitoring and evaluation.

intercrops, light traps, pheromone traps, delta traps in groundnut, alleys in paddy, and cutting of the tips in paddy at the time of transplantation among others’.

Under CMSA, farmer field schools comprising 15 to 20 meet every week for on-site observations that help them understand the ecological systems - the life cycle of the pest and their predators. If pest infestation is observed then there is a discussion with the resource person as also with other groups in the village to gauge the intensity of the problem and plan a course of action. Bio-pesticides would be used only as a last resort. In addition to pest management, nitrogen fixation and soil nutrient deficiencies are addressed through locally available resources. Some of the other important aspects are the setting up of community seed banks and promotion of appropriate cropping pattern and crop rotation practices. Local youth is encouraged to start micro enterprises with forward and backward linkages to facilitate input availability or marketing of produce.

There are other similar experiments. For instance, Revitalizing Rainfed Agriculture Network (RRA-N) comprising of a number of civil society groups working in the field. An aspect of their intervention is that they are refined as per local conditions with a focus on natural resource management integrated other measures to help adapt to rainfed conditions as also the increasing vagaries of monsoon.<sup>10</sup> This is particularly important because more than three-fifths of the geographical and more than two-thirds of the gross cropped area are in rainfed regions (Planning Commission, 2011a). These calls for an alternative policy discourse on agricultural intervention, which has been indicated in the approach paper to the 12<sup>th</sup> five-year plan (Planning Commission, 2011b; also see Mishra et al, 2013). It suggests initiatives in the form of comprehensive pilots spread across different agro-ecological conditions that focus on integrating interventions on water, soil, seed, livestock, fisheries, credit and institutions among others. This would require knowledge interventions from each perspective. RRA-N has already started some pilots on their own from Kharif 2012 and the Planning Commission is likely to supplement these initiatives. It will also help identify the specificities as also similarities to help scale-up such interventions in future.

#### *4.4 Federation of SHGs*

Beginning with 400 acres in 2004-05, the programme under NPM in Andhra Pradesh covered 18.15 lakh acres in 2009-10 and they are likely to have been further scaled up after that. This has to be understood under the institutional arrangement of the federation

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<sup>10</sup> For an analysis showing changes in monsoon with greater intensity of rainfall in shorter wet spells and longer dry spells, see Singh and Ranade (2010).

of women self-help groups (SHGs) that SERP had built to improve the livelihood of poorer households. Interactions with SHGs and their federations made SERP evaluate the livelihood problems associated with agriculture and the need to reduce costs in cultivation led to NPM. The success in Andhra Pradesh has now been extended to the national level under the National Rural Livelihoods Mission (NRLM) through a programme called the Mahila Kissan Sashaktikaran Pariyojana (MKSP).<sup>11</sup> The agricultural intervention under also tried to involve Non-Governmental Organizations (NGOs) like PRADAN (Professional Assistance for Development Action) who as part of their livelihood facilitation have been independently forming a federation of women SHGs in poorer districts of the country for nearly two decades now.<sup>12</sup>

The institutional imperative articulated in the federation of SHGs and other successful experiments such as the Grameen Bank of Bangladesh and the Peoples Participation Programme of the Food and Agriculture Organization (FAO) in Sri Lanka, Thailand and Zambia (see Rouse, 1996), give some lessons. These, as indicated in Mishra and Reddy (2011), point to restricting the number of members to 20-25 per farmer group (or about 15 per SHG) and drawing members from homogenous groups to avoid conflicts. The focus should be on local problems identified by the group and the involvement of outside promoters limited to enabling or facilitating processes so that the members take over as soon as possible. Training and capacity building for four-to-five years including hand holding at initial stages should be part of the long-term process of building sustainable small-marginal federated farmer groups. A sound organizational structure should be built from below with female membership and participation being insisted upon from the group level itself. Building institutions also requires developing democratic processes that are sensitive to inequities at every level. Once these are put in place and capacities of individuals and their institutions augmented, then groups and their federated institutions become self-sustaining and over time they could slowly graduate to address other requirements of the community.

## **5 Concluding Remarks**

The current analysis tries to contextualize our understanding of Indian agriculture by an evaluation of its performance, the roles and challenges for the smallholders, and some

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<sup>11</sup> The scaling-up of the programme under MKSP has been slow and one has to gauge its effectiveness across states in due course of time.

<sup>12</sup> For an evaluation of PRADAN's interventions, see Mishra and Sengupta (2013).

opportunities. Its performance appraisal delineates the recent years (2004/5-2010/1) from the immediate post-reforms period (1993/4-2004/5) and the pre-reforms period (1981/2-1993/4). Our growth estimates using a double-kinked exponential curve reiterates a turn-around in agriculture in recent years. This is also because of some changes in public investment in agriculture as also increased public expenditure in agricultural education, research and extension, initiatives to improve the availability of credit from formal sources, and a slew of normal monsoons in almost all but for one of the recent years. However, public investment in agriculture has a lag effect and it mostly relates to medium and major irrigation projects where substantial resources are put without much critical scrutiny (Government of India, 2011; Vaidyanathan, 2010). The turn-around is particularly evident for maize, pulses, oilseeds and cotton in terms of their growth in value of output, as also in production and yield. There have also been significant yield increments in rice in recent years. Analysis of agricultural GSDP across major states also shows significantly higher growth in recent years for most of them; there also seems to be a decline in volatility and convergence across states.

A matter of concern is the implications on smallholders, particularly so when SAS, a nationally representative survey on 2002/3 agricultural year points to income being less than expenditure for farmer households with less than four hectares, i.e. 95 per cent of the operational holdings. What is worrying is that this difficulty in livelihood sustainability remained in spite of the fact that per hectare returns were higher for them - there continues to be an inverse relationship between size-class and returns. Nevertheless, the smallholder farmer has had to bear a greater risk burden because of higher per unit cost, limited access to credit despite new initiatives, and a lower bargaining power in the input and produce markets among others. These problems get aggravated in bad years like the current one in 2012 when monsoon plays a truant and that too when nearly two-thirds of Indian agriculture is rainfed.

To address some of these concerns, some opportunities identified are effective use of information technology, whether to know about monsoon patterns or be informed about new knowledge on agricultural production and management or on the prevailing prices in different markets. The alternatives of RRA-N and NPM through CMSA under SERP are people-centred initiatives through the involvement of small and marginal farmers through self-help groups and field schools among others. Institutions that organize

farmers that are aggregated at different levels - groups of 20 to 25 farmers and then federating them at village, sub-district and district level to articulate their interests and improve their bargaining power at various levels. On the knowledge front, it is equally important that technologies that reduce costs, and hence, risks, while not compromising on production or yield and make use of locally available resources, are encouraged.

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