

# Growth and Performance of Agriculture Sector in India

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## Abstract

The growth of agriculture and allied sectors is critical for the Indian economy as about 49 percent of the population is directly or indirectly dependent on agriculture. During the last decade and so, the agriculture sector has undergone profound changes resulting in sharp deceleration in its growth. The study has attempted to analyse growth and performance of the agriculture sector in India since 1980-81 and tries to comprehend some of the factors responsible for the deceleration in growth. The study has shown that agriculture sector has been able to show tremendous improvement in expansion of area and production of food grain and non-food grain crops. However, there are so many underlying factors responsible for slowdown of the agricultural growth. Some of the factors identified include: increase in area under non-agriculture uses, excessive dependence on rain fed farming, increase in number of agricultural labourers, reducing size of the operation holdings, over use of agri-inputs, inequity in the distribution of agriculture credit along with sharp deceleration in public gross capital formation in agriculture etc. The study pointed in order to achieve higher growth rate, there is a need to enhance the gross capital formation in agriculture sector particularly on irrigation so that more area can be brought under assured irrigation. Bringing equity in distribution of agricultural credit coupled with judicious and need-based agricultural inputs are some of the other recommendations drawn based upon the study.

**Keywords:** Agriculture Sector, Gross Capital Formation, Operation Holdings, Agri-inputs

## Introduction

Notwithstanding the declining share of agriculture and allied sectors in gross domestic product (GDP), agriculture sector is still considered as a backbone of the rural population. The share of agriculture and allied sectors in GDP was 51.9 percent in 1950-51, which has come down to 13.9 percent in 2012-13 (Economic Survey,

Various Issues). But, the share of the agriculture and allied activities in the employment has only declined from about 73 percent in 1951 to 48.9 percent 2011-12 (NSSO, 1998; Misra & Suresh, 2014). The importance of agriculture and allied sectors can also be realised from the fact that India is presently the world's largest producer of pulses and the second largest producer of rice and wheat in the world. The country is also the second largest producer of sugar (Economic Survey, 2013-14). India is among the 15 leading exporters of agricultural products in the world and the share of agricultural exports in total exports is around 14 percent (State of Indian Agriculture, 2011-12; Pocket Book on Agricultural Statistics, 2013). Besides the contribution of agriculture in GDP, employment and exports, it is also a base for the industrial sector as it provides surplus labour as well as raw material such as cotton textile, jute, sugar etc. to the industrial sector. The food processing, village and cottage, handloom industries are also dependent upon agriculture for various inputs. Thus, the agriculture and allied sectors in the context of Indian economy play a vital role not only in providing employment to rural population, but also act as a raw material and catalyst for other sectors in the economy. However, the agriculture sector in India has undergone wide ranging changes in terms of land holding, cropping pattern, farm productivity, employment etc. during the past few decades adversely affecting the mode of production and resulting in deceleration in agricultural growth during the recent years. In this context, the study is an empirical investigation into changes in development pattern witnessed by agriculture and allied sectors in India.

## Land Use Pattern

Table 1 shows changes in land use pattern in India from 1980-81 to 2010-11. The total geographical area of the country was 328.73 million hectares, out of which

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**Table 1: Land Use Pattern from 1980-81 to 2010-11 (in Million Hectares)**

Category	1980-81	1990-91	2000-01	2010-11
Geographical area	328.73	328.73	328.73	328.73
Reporting area for land utilisation statistics	304.16	304.86	305.19	305.9
Area under non-agricultural uses	19.6	21.09	23.75	26.51
Barren and un-cultivable land	19.96	19.39	17.48	17.05
Cultivable waste land	16.74	15	13.63	12.66
Current fallows	14.83	13.7	14.78	14.27
Permanent pasture and other grazing land	11.99	11.4	10.66	10.3
Land under miscellaneous tree crops and groves not included in net area sown	3.58	3.82	3.44	3.21
Gross sown area	172.63	185.74	185.74	198.97
Net area sown	140.29	143	141.34	141.58
Cropping intensity	123.05	129.89	131.13	140.54
Gross irrigated area	49.78	63.2	76.19	89.36
Net irrigated area	38.72 (27.6)	48.02 (33.5)	55.2 (39.0)	63.6 (44.9)

Note: Figures in parentheses indicate % net irrigated area in net area sown.

Source: Agricultural Statistics at a Glance, 2013

reporting area had marginally increased from 304.16 million hectare in 1980-81 to 305.9 million hectares in 2010-11. The area under non-agricultural uses has gradually increased from 19.6 million hectares in 1980-81 to 26.51 million hectares in 2010-11. Increasing demand for industrialisation, urbanisation, housing and infrastructure is forcing conversion of agriculture land to non-agriculture uses (State of Indian Agriculture, 2012-13). On the other hand, the barren and uncultivable land has declined from 19.96 million hectares in 1980-81 to 19.39 million hectares and 17.48 million hectares in 1990-91 and 2000-01 respectively. It further declined to 17.05 million hectares in 2010-11. The cultivable waste land has also fallen from 16.74 million hectares in 1980-81 to 15.00 million hectares in 1990-91 with a further decline to 12.66 million hectares in 2010-11. The area under current fallow land has remained almost same in these decades i.e. 14.83 million hectares in 1980-81 to 14.27 million hectares in 2010-11. Land under permanent pasture and other grazing land; and land under miscellaneous tree crops and groves has also declined from 11.99 million hectares to 10.3 million hectares and 3.58 million hectares to 3.21 million hectares in 1980-81 to 2010-11 respectively.

The gross sown area has witnessed a continuous increase from 1980-81 to 2010-11 as it increased from 172.63

million hectares in 1980-81 to 185.74 million hectares each in 1990-91 and 2000-01 with a further increase to 198.97 million hectares in 2010-11. The net area sown was 140.29 million hectares in 1980-81, which increased to 143.00 million hectares in 1990-91 though it declined to about 141 million hectares in 2000-01 and in 2010-11. The cropping intensity has increased from 123.05 per cent to 140.54 per cent in 1980-81 to 2010-11. The gross and net irrigated area has also increased over the period of time as the area has increased from 49.78 million hectare and 38.72 million hectare in 1980-81 to 140.54 million hectare and 89.36 million hectare in 2010-11 respectively. Thus, over a period of time, area under barren and uncultivable land, cultivable waste land, current fallows and permanent pasture and other grazing land has declined, while area under non-agricultural uses has increased resulting in net increase in gross sown area and net sown area. Although gross and net irrigated area has also gone up during the last thirty years, but still more than 55 percent of the area is un-irrigated.

### Cropping Pattern

Table 2 presents changes in cropping pattern in India since 1980-81. The proportion of area under food grains has declined from 44.8 percent to 43.78 percent from 1980-81

to 1990-91 with a further decline to 43.43 percent in 2000-01 and 42.2 percent in 2012-13. There was a corresponding increase in the proportion of area under non-food grain crops with the exception of jute and mesta that showed the marginal decline during the overall period. However, among food grain crops, area under coarse cereals was replaced by wheat and rice. The proportion of area under rice has increased to 16.04 percent only in 2000-01 and it remained same during the other periods under study, whereas the proportion of area under wheat has increased gradually from 7.88 percent to 8.28 percent during 1980-81 to 1990-91 respectively and from 9.77 percent to 10.41 percent during 2010-11 to 2012-13 respectively, whereas the area under coarse cereals has declined gradually from 14.78 percent in 1980-81 to 12.44 percent in 1990-91 and it further declined to 10.86 percent in 2000-01 and was only 8.65 percent in 2012-13.

Under the non-food grain crops, the proportion of area under sugarcane has nearly doubled during the study period. It was 0.94 percent in 1980-81, which gradually increased to 1.26 percent in 1990-91, 1.55 percent in 2000-01, 1.64 percent in 2010-11, and 1.78 percent in 2012-13. Similarly, the area under oilseeds has also increased from 6.23 percent in 1980-81 to 8.27 percent in 1990-91, 9.15 and 9.32 percent in 2010-11 and 2012-13 respectively. Area under cotton has also increased nearly to double in the overall period. It was 2.77 percent in 1980-81 and to 2.55 percent in 1990-91. There after, it increased to 3.06 percent in 2000-01, which further increased to 4.21 percent in 2012-13. The area under jute and mesta has declined throughout the study period. It was 0.46 percent in 1980-81, which declined to 0.35 percent in 1990-91 and 0.29 percent in 2010-11 with a further decline to 0.3

percent in 2012-13. Thus, it is evident that the movement of diversification is greater in case of non-food grains than food grains. In this context, it can be concluded that area under wheat, sugarcane, oilseeds, and cotton has increased, area under rice has almost remained same, while the area under coarse cereals, food grains, jute and mesta under has decreased.

## Area, Production, and Yield of Major Crops

Table 3 shows the area, production, and yield of major crops and their growth rates during the period 1980-81 to 2012-13. The area under rice has continuously increased from 40.15 million hectare in 1980-81 to 44.71 million hectare with a growth rate of 0.41 percent in 1980-81 to 1989-90 and 0.67 percent during 1990-91 to 1999-2000. However, the area under rice declined to 42.41 million hectare in 2012-13 with a negative growth of 0.07 percent. But, still the production has increased from 53.63 million tonnes in 1980-81 to 104.4 million tonnes in 2012-13 on account of continuous improvement in yield of rice from 1336 kg/hectare in 1980-81 to 2462 kg/hectare in 2012-13. Similarly, the area under wheat has continuously increased from 22.28 million hectare in 1980-81 to 29.65 million hectare in 2012-13 with a growth rate of 0.46 percent in 1980-81 to 1989-90 and 1.33 percent during 2000-01 to 2012-13. Thus, the production of wheat has continuously increased from 36.31 million tonnes in 1980-81 to 92.46 million tonnes in 2012-13 with a growth rate of 3.58 percent in 1980-81 to 1989-90 and declined 2.74 percent during 2000-01 to 2012-13. Yield of wheat has also shown tremendous increase from 1630

**Table 2: Cropping Pattern from 1980-81 to 2012-13 (in percentage)**

Crops	1980-81	1990-91	2000-01	2010-11	2012-13
Rice	14.2	14.62	16.04	14.4	14.89
Wheat	7.88	8.28	9.23	9.77	10.41
Coarse cereals	14.78	12.44	10.86	9.52	8.65
Pulses	7.94	8.45	7.3	8.87	8.24
Total food grains	44.8	43.78	43.43	42.57	42.2
Sugarcane	0.94	1.26	1.55	1.64	1.78
Oilseeds	6.23	8.27	8.17	9.15	9.32
Cotton	2.77	2.55	3.06	3.78	4.21
Jute and mesta	0.46	0.35	0.37	0.29	0.3

Source: Pocket Book on Agricultural Statistics, 2013

kg/hectare in 1980-81 to 3118 kg/hectare in 2012-13 with the growth rate of 3.1 percent during 1980-81 to 1989-90 and 1.39 percent in 2000-01 to 2012-13. But a close look at the Table 3 reflects that the growth in yield levels of wheat and rice has reached to plateau and there is a need for renewed research efforts to boost production with the help of raising productivity.

On the other hand, the production of maize has also increased due to increase in both area and yield of the crop. The area under coarse cereals has continuously declined from 41.78 million hectares in 1980-81 to 24.64 million hectares in 2012-13 with a negative growth rate of 1.34 per cent 1980-81 to 1989-90, 2.09 per cent of 1990-91 to 1999-2000 and 1.12 percent in 2000-01 to 2012-13. But, the production has been able to increase from 29.02 million tonnes in 1980-81 to 40.08 million hectares in 2012-13 mainly on account of continuous improvement in yield of coarse cereals from 695 kg/hectare in 1980-81 to 1626 kg/hectare in 2012-13 at a growth rate of 1.71 percent in 1980-81 to 1989-90 and 3.89 percent in 2000-01 to 2012-13. Thus, the area under food grains has declined from 126.67 million hectares in 1980-81 to 120.16 million hectares in 2012-13 at a negative growth rate of 0.22 percent in 1980-81 to 1989-90, 0.07 percent in 1990-91 to 1999-2000 and improved growth rate of 0.26 percent in 2000-01 to 2012-13. But the production of food grains has witnessed continuous increase from 129.59 million tonnes in 1980-81 to 255.36 million tonnes in 2012-13 with a growth rate of more than 2 percent during this period on account of increase in yield of food grains increased from 1023 kg/hectare in 1980-81 to 2125 kg/hectare in 2012-13.

The area under pulses showed a fluctuating trend as it hovered between 20-24 million hectares during 1980-81 to 2012-13. As a consequence, production has also shown a fluctuating trend between 10-18 million tonnes. The yield of pulses has improved from 473 kg/hectare in 1980-81 to 786 kg/hectare in 2012-13. The area under oilseeds has increased from 17.6 million hectare in 1980-81 to 26.53 million hectare in 2012-13 though during nineties area under oilseeds was declined. The yield of oilseeds has also improved from 532 kg/hectare in 1980-81 to 1169 kg/hectare in 2012-13. The production of oilseeds increased from 9.37 million tonnes in 1980-81 to 31.01 million tonnes in 2012-13 on account of improvement in yield and increase in area under oilseeds.

The area under groundnut has shown fluctuating trend during 1980-81 to 2012-13, but overall it has decreased from 6.8 million hectare in 1980-81 to 4.77 million hectare in 2012-13 despite the increase in yield of groundnut from 736 kg/hectare in 1980-81 to 996 kg/hectare in 2012-13. Thus, decrease in area was somewhat compensated by increase in yield and thus, production of groundnut was stagnated around 5 million tonnes. The area under soyabean has continuously increased from 0.61 million hectares in 1980-81 to 10.84 million hectare and yield has also increased from 728 kg/hectare in 1980-81 to 1354 kg/hectare in 2012-13, thus resulting in huge increase in production from 0.44 million tonnes in 1980-81 to 14.68 million tonnes in 2012-13.

The area under cotton has increased from 7.82 million hectare in 1980-81 to 11.98 million hectare in 2012-13. But during the 1980s, growth in area under cotton was negative which significantly improved in 3.4 per cent in 2000-01 to 2012-13 mainly due to the introduction of Bt cotton varieties which were resistant to insect/pest attack. However, the production has increased from 7.01 million tonnes in 1980-81 to 34.0 million tonnes in 2012-13 with growth rate increased to 2.8 percent in 1980-81 to 1989-90 and 12.8 percent in 2000-01 to 2012-13. The area under jute and mesta has declined from 1.3 million hectare in 1980-81 to 0.87 million hectare in 2012-13, but still production was able to increase from 8.16 million tonnes in 1980-81 to 11.3 million tonnes in 2012-13 due to increase in yield from 1130 kg/hectare in 1980-81 to 2338 kg/hectare in 2012-13. The area under sugarcane has increased from 2.67 million hectares in 1980-81 to 5.06 million hectares in 2012-13. The yield has also improved from 57.8 tonne/ha to 67 tonne/ha during this period. Thus increase in production of sugarcane from 154.25 million tonne in 1980-81 to 338.96 million tonne in 2012-13 was accounted by both increase in area and yield.

Fig. 1 presents the overall growth rate in area, production and yield of major crops in India during 1980-81 to 2012-13. Soyabean witnessed highest increase in growth rate in production (11.40 percent) on account of increase in growth in area (9.36 percent) coupled with yield (1.84 percent) for the period of 1980-81 to 2012-13. The production performance of cotton was also much better largely due to increase in yield of cotton with the introduction of Bt cotton. The yield of cotton flourished efficiently with growth rate of 3.38 percent throughout the study period. On the other hand, the study period has also

**Table 3: Growth in Area, Production and Yield of Major Crops (Area in Million Hectares, Production-Million Tonnes and Yield-Kg/Hectare)**

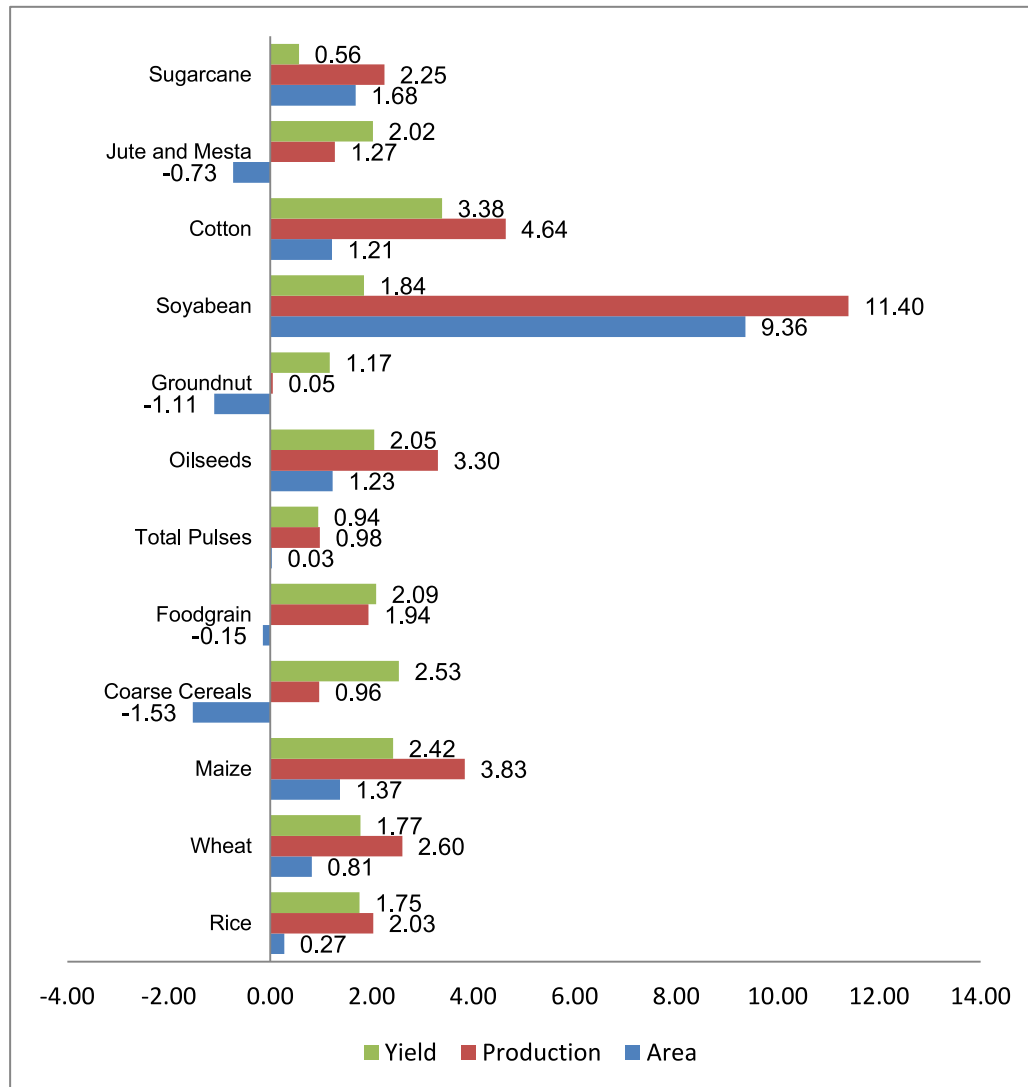
Crops	Area (A)/Production (P)/Yield (Y)	1980-81	1990-91	2000-01	2012-13	CAGR (1980-81 to 1989-90)	CAGR (1990-91 to 1999-2000)	CAGR (2000-01 to 2012-13)
Rice	A	40.15	42.69	44.71	42.41	0.41	0.67	-0.07
	P	53.63	74.29	84.98	104.4	3.58	2.02	1.9
	Y	1336	1740	1901	2462	3.19	1.34	1.97
Wheat	A	22.28	24.17	25.73	29.65	0.46	1.72	1.33
	P	36.31	55.14	69.68	92.46	3.58	3.57	2.74
	Y	1630	2281	2708	3118	3.1	1.82	1.39
Maize	A	6.01	5.9	6.61	8.71	-0.18	0.94	2.63
	P	6.96	8.96	12.04	22.23	1.91	3.29	5.71
	Y	1159	1518	1822	2552	2.1	2.26	3
Coarse Cereals	A	41.78	36.32	30.26	24.64	-1.34	-2.09	-1.12
	P	29.02	32.7	31.08	40.08	0.35	-0.01	2.74
	Y	695	900	1027	1626	1.71	2.14	3.89
Foodgrains	A	126.67	127.84	121.05	120.16	-0.22	-0.07	0.26
	P	129.59	176.39	196.81	255.36	2.73	2.09	2.44
	Y	1023	1380	1626	2125	2.97	2.17	2.18
Total Pulses	A	22.46	24.66	20.35	23.47	-0.1	-0.6	1.31
	P	10.53	14.26	11.08	18.45	1.54	0.65	3.65
	Y	473	578	544	786	1.59	1.26	2.31
Oilseeds	A	17.6	24.15	22.77	26.53	2.44	-0.07	1.58
	P	9.37	18.61	18.44	31.01	5.45	2.25	4.7
	Y	532	771	810	1169	2.95	2.09	3.07
Groundnut	A	6.8	8.31	6.56	4.77	1.64	-2.3	-1.8
	P	5.01	7.51	6.41	4.75	3.76	-1.25	-0.01
	Y	736	904	977	996	2.08	1.07	1.82
Soyabean	A	0.61	2.56	6.42	10.84	17.11	10.24	5.11
	P	0.44	2.6	5.28	14.68	18.06	13.06	8.89
	Y	728	1015	823	1354	0.62	2.57	3.59
Cotton	A	7.82	7.44	8.53	11.98	-1.26	2.71	3.4
	P	7.01	9.84	9.52	34	2.8	2.29	12.8
	Y	152	225	190	482	4.1	-0.41	9.08
Jute and Mesta	A	1.3	1.02	1.02	0.87	-2.83	0.71	-1.47
	P	8.16	9.23	10.56	11.3	0.14	1.78	0.15
	Y	1130	1634	1868	2338	3.1	1.11	1.62
Sugarcane	A	2.67	3.69	4.32	5.06	1.46	1.7	1.47
	P	154.25	241.05	295.96	338.96	2.71	2.73	2.08
	Y	57844	65395	68578	66988	1.23	1.05	0.59

Source: Agricultural Statistics at a Glance, 2013

witnessed remarkable change in the favour of production of maize as its growth rate was 3.83 percent mainly due

to increase in growth in yield (2.42 percent) and area (1.37 percent) during the entire period. Similarly, the

**Fig. 1: Overall Compound Annual Growth Rate of Area, Production, and Yield of major Crops in India (1980-81 to 2012-13)**



Source: Agricultural Statistics at a Glance, 2013

increase in production of oilseeds was also attributed by increase in growth in yield and area. At the same time the growth in area of jute and mesta, groundnut, foodgrains, and coarse cereals was negative which means that area under these crops has declined, but still these crops have shown increase in production largely due to the growth in yield of these crops during the entire study period. The production of oilseeds and soya bean was largely fuelled by the favourable market conditions for refined oil and protein rich soya food which induced the farmers to allocate higher area under these crops. The production of oilseeds is largely attributed to 'Technology Mission on Oilseeds' launched in 1986 to increase the production

of oilseeds in order to reduce its imports and achieve self-sufficiency in edible oils (Kannan & Sundaram, 2011).

### Structure of Agricultural Workforce

Table 4 presents the changing structure of agricultural workforce in terms of labour absorption as cultivators and agricultural labourers. The total population of India has gradually increased from 683.3 million in 1981 to 846.4 million in 1991, 1028.7 million in 2001, and 1210.6 million in 2011. Although, average annual exponential growth rate of population has declined from 2.22 percent in 1981 to 2.16 percent in 1991, 1.97 percent in 2001, and

**Table 4: Population and Agricultural Work Force (in millions)**

Year	Total population	Average Annual Exponential Growth Rate (%)	Rural Population	Cultivators	Agricultural Labourers	Total work force in agriculture
1981	683.3	2.22	525.6 (76.9)	92.5 (62.5)	55.5 (37.5)	148 [21.7]
1991	846.4	2.16	630.6 (74.5)	110.7 (59.7)	74.6 (40.3)	185.3 [21.9]
2001	1028.7	1.97	742.6 (72.2)	127.3 (54.4)	106.8 (45.6)	234.1 [22.8]
2011	1210.6	1.64	833.5 (68.8)	118.7 (45.1)	144.3 (54.9)	263 [21.7]

Note: Figures in () are % age share of rural population in total population.

Figures in [] are % age of total work force in agriculture to total population.

Source: Agricultural Statistics at a Glance, 2013

1.64 percent in 2011. The rural population continuously has also increased from 525.6 million in 1981 to 833.5 million in 2011. But, percentage of rural population has declined from 76.9 percent in 1981 to 68.8 percent in 2011. Number of cultivators has increased from 92.5 million in 1981 to 118.7 million in 2011. The proportion of cultivators in total work force has marginally declined from 62.5 percent in 1981 to 59.7 percent in 1991 and 54.4 percent in 2001 which further declined to 45.1 percent in 2011. The agricultural labourers and their proportion in total work force has increased from 55.5 million (37.5 percent) to 144.3 million (54.9 percent) in 2011. The total work force in agriculture has sharply increased from 148 million in 1981 to 263 million in 2011, but its proportion in total population was nearly constant during the entire period. This indicates that agricultural workforce shifted from cultivators to agricultural labours.

### Distribution of Operational Holdings by Size Class

Table 5 presents the distribution of operational holdings by different size-classes. The table shows that the share of only marginal holdings went up (56.39 percent in 1980-81 to 67.10 percent in 2010-11), whereas the share of small, semi-medium, medium, and large holdings showed the tendency of decline. There was marginal decline in the share of small holdings (18.08 percent in 1980-81 to 17.91 percent in 2010-11), and the semi-medium holdings (14.01 percent in 1980-81 to 10.04 percent in 2010-11) while the share of the medium holdings declined from 9.08 percent in 1980-81 to 4.25 percent in 2010-11, whereas the

share of large holdings declined significantly from 2.44 percent in 1980-81 to 0.70 percent in 2010-11. The share of marginal, small and semi-medium farmers in operated area has increased, whereas the share of medium and large farmers has declined. The share of marginal farmers in operated area rose near to double from 12.05 percent in 1980-81 to 22.50 percent in 2010-11. The share of small farmers in operated area has increased significantly from 14.14 percent in 1980-81 to 22.08 in 2010-11, while that of semi-medium farmers have increased marginally from 21.15 percent in 1980-81 to 23.63 percent in 2010-11. The share of medium farmers in operated area has declined gradually from 29.64 percent in 1980-81 to 21.20 percent in 2010-11, whereas the share of large farmers has reduced from 23.02 percent in 1980-81 to 10.59 percent in 2010-11. The average size of operational holding of marginal, small, semi-medium, and large farmers remained almost same with minor variations, whereas the average size of operational holding of medium farmers has declined from 6.02 acres in 1980-81 to 5.76 acres in 2010-11. Hence, during the overall period, the share of marginal farmers rose in holdings as well as in operated area, while average size of operational holding remained same. The share of small and semi-medium farmers has declined in holdings but increased gradually in operated area resulting in same size of operational holding. The share of medium farmers has declined in holdings as well as in operated and thus, average size of operational holdings has also declined. The share of large farmers has declined sharply in holdings as well as operated area and the average size of operational holding has also declined marginally from 17.41 hectares in 1980-81 to 17.38 hectares in 2010-11.

## Source-wise Irrigated Area

Table 6 shows that source-wise irrigated area and ratio of net irrigated area to net area sown from 1980-81 to 2010-11. During 1980-81, maximum proportion of area was irrigated by wells (45.70 percent) followed by canals (39.49 percent), tanks (8.22 percent), and other source accounted for only 6.59 percent. During 1990-91, the proportion of the area irrigated by wells increased to 51.42 percent, while that by canals and tanks area decreased to 36.34 percent and 6.13 percent respectively. This trend continued over the next two decades and the area irrigated by wells increased to 61.41 percent, while canal and tanks irrigated area has decreased to 26.40 percent and 3.15 percent respectively in 2010-11. It was also evident from the fact that during 1980-81 to 2010-11, the growth rate in expansion of area under canals and tanks was negative at 0.10 percent and 1.99 percent respectively, while growth rate in well irrigated area was 2.83 percent. Further, ratio of net irrigated area to net area sown has increased from 27.60 percent in 1980-81 to 33.58 percent in 1990-91,

and thereafter to 38.97 percent in 2000-01, which further increased 44.92 percent in 2010-11. Thus, although net sown area under irrigation has increased over the years, but still more 55 percent of the area is unirrigated.

## Consumption of Fertilisers and Pesticides

Table 7 shows the consumption of chemicals fertilisers in terms of nutrients and pesticides in terms of technical grade material. It reveals that the consumption of fertilisers in terms of N, P and K has continuously increased at a rapid rate. Consumption of nitrogen has continuously increased from 3678.1 thous and tonnes in 1980-81 to 17300.3 thousand tonnes in 2011-12 though it slightly declined to 16820.9 thous and tonnes in 2012-13. The growth rate of consumption of N was highest in the 1980s (7.64 percent), but thereafter it declined to 4.68 percent in 1990s and further to 4.61 percent in 2000s. Similarly, starting from 1980-81, the consumption of both P and K has continued to increase regularly up to 2010-11 (1213.6 thousand

**Table 5: Distribution of Operational Holding by Size Class**

Category of Holdings	1980-81	1990-91	2000-01	2010-11
<b>Share in holding (in %)</b>				
Marginal	56.39	59.44	62.88	67.1
Small	18.08	18.84	18.92	17.91
Semi-Medium	14.01	13.06	11.69	10.04
Medium	9.08	7.11	5.48	4.25
Large	2.44	1.55	1.03	0.7
<b>Share in operated area (in %)</b>				
Marginal	12.05	15.04	18.7	22.5
Small	14.14	17.42	20.16	22.08
Semi-Medium	21.15	23.19	23.96	23.63
Medium	29.64	27.04	23.97	21.2
Large	23.02	17.32	13.22	10.59
<b>Average size (in hectares)</b>				
Marginal	0.39	0.39	0.4	0.39
Small	1.44	1.43	1.42	1.42
Semi-Medium	2.78	2.76	2.72	2.71
Medium	6.02	5.9	5.81	5.76
Large	17.41	17.33	17.12	17.38
All Sizes	1.84	1.55	1.33	1.15

Note: Marginal-0 to 1 hectare; Small-1 to 2 hectare; Semi-medium-2 to 4 hectare; Medium-4 to 10 hectare; and Large-10 and above hectare.

Source: Agricultural Census, 2010-11

**Table 6: Source-wise Irrigated Area (%) and Ratio of Net Irrigated Area to Net Area Sown (%)**

Year	Canal	Tanks	Wells	Other sources	Ratio of net irrigated area to net area sown (%)
1980-81	39.49	8.22	45.70	6.59	27.60
1990-91	36.34	6.13	51.42	6.11	33.58
2000-01	28.98	4.45	61.36	5.23	38.97
2010-11	24.63	3.15	61.41	10.80	44.92
CAGR (1980-81 to 2010-11)	-0.10	-1.99	2.83	3.65	1.71

Source: \*\*www.indiastat.com, Agricultural Statistics at a Glance, 2013

tonnes and 623.9 thousand tonnes respectively in 1980-81 to 8049.7 and 3514.3 thousand tonnes respectively in 2010-11) and after that consumption has also declined to 7914.3 thousand tonnes and 2575.4 thousand tonnes respectively in 2011-12 and 6653.4 thousand tonnes and 2061.8 thousand tonnes respectively in 2012-13. On the other hand, growth rate of P was also highest (10.15 percent) in 1980s, which declined to 4.33 percent in 1990s and increased to 6.18 percent in 2000s. During the 1980s and 2000s, the growth rate of K slightly decreased from 6.29 to 5.92. Thus, total consumption of fertilisers

has witnessed an increase from 5515.6 thousand tonne in 1980-81 to 28122.2 thousand tonne in 2010-11. Thereafter, it decreased to 25536 thousand tonne in 2012-13. Thus, growth rate in consumption of fertilisers was 8.08 percent in 1980s which declined to 4.4 percent in 1990s, while again rose to 5.19 percent during 2000-01 to 2012-13. Notwithstanding with rising trend of consumption of fertilisers in general, the consumption of fertilisers was highly distortive as these were currently being used in the ratio of 8.2: 3.2: 1 against a recommended dose of 4:2:1. The consumption of pesticides has increased from

**Table 7: Consumption of Fertilisers and Pesticides (thousand tonnes)**

Year	N	P	K	Total consumption of fertilisers	Consumption of pesticides(technical grade material)
1980-81	3678.1 (5.9)	1213.6 (1.9)	623.9 (1.0)	5515.6	45.00**
1990-91	7997.2 (6.0)	3221.0 (2.4)	1328.0 (1.0)	12546.2	75.00**
2000-01	10920.2 (7.0)	4214.6 (2.7)	1567.5 (1.0)	16702.3	43.58**
2010-11	16558.2 (4.7)	8049.7 (2.3)	3514.3 (1.0)	28122.2	55.54*
2011-12	17300.3 (6.7)	7914.3 (3.1)	2575.4 (1.0)	27790.0	52.98*
2012-13	16820.9 (8.2)	6653.4 (3.2)	2061.8 (1.0)	25536.0	56.09*
<b>CAGR</b>					
1980-81 to 1989-90	7.64	10.15	6.29	8.08	5.40
1990-91 to 1999-2000	4.68	4.33	2.80	4.41	-5.28
2000-01 to 2012-13	4.61	6.18	5.92	5.19	1.66

Note: N-Nitrogen; P-Phosphorus; K-Potassium

Figures in () indicate fertiliser use ratio

Source: Agricultural Statistics at a Glance (2007, 2013), \*\*Reserve Bank of India, 2013- 14, \*www.indiastat.com

45 thousand tonne in 1980-81 to 56.09 thousand tonne in 2012-13 though the growth rate in consumption of pesticides have shown the fluctuations during the overall period as its growth rate was 5.40 percent in 1980-81 to 1989-90 which turned -5.3 percent during 1990-91 to 1999-2000 and it was 1.66 percent in 2000-01 to 2012-13.

## Gross Capital Formation (GCF) in Agriculture

Capital formation in agriculture is undertaken by both government (public sector) and the private sector. Almost all of the public investment is in the nature of a public good, i.e. it is non-excludable and for that reason unlikely to be undertaken by the private sector (Balakrishnan, Golait & Kumar, 2008). The private investment includes investment by a variety of economic agents, ranging from subsistence or smallholder farmers, rural wage-earners, livestock herders, small-scale traders and micro entrepreneurs; to medium-sized, local private operators such as input suppliers, microfinance institutions, transporters, agro processors, commodity brokers and traders etc. (IFAD, 2007). GCF in agriculture and allied activities is considered as one of the instruments in order

to sustain high population pressure on agriculture (State of Indian Agriculture, 2012-13). Table 8 shows the GCF in agriculture and allied sectors by public as well as private sectors. The GCF in agriculture and allied sectors has increased from Rs. 35,348 crore in 1980-81 to Rs. 1,46,578 crore in 2011-12. But, GCF in agriculture and allied sectors as a proportion of GDP from agriculture and allied activities was around 11-12 percent during 1980-81, 1990-91 and 2000-01, which increased to 19.44 percent in 2011-12.

A close scrutiny at the table also points that public investment in agriculture has continuously declined from Rs. 13,200 crore in 1980-81 to Rs. 8,085 crore in 2000-01. Even the share of public investment in total investment in agriculture and allied activities has witnessed a decline from 37.35 percent in 1980-81 to 13.02 percent in 2000-01. However, after that public investment started to increase as it reached Rs. 21,500 crore during 2010-11, and Rs. 22,095 crore during 2011-12. Subsequently, its share in total investment also rises to 16.38 percent and 15.07 percent during 2010-11 and 2011-12 respectively. The CAGR of gross capital formation shows that public sector investment showed a negative growth of 3.89

**Table 8: Gross Capital Formation and its Relative Growth with Gross Domestic Product from Agriculture and Allied Activities (at 2004-05 prices)**

Year	GDP from agriculture and allied sectors (Rs. crore)	GCF in agriculture and allied sectors (in Rs. crore)		
		Public	Private	Total
1980-81	285015	13200.88 (37.35)	22147.5 (62.65)	35348.38 [12.40]
1990-91	397971	9025.995 (19.83)	36499.28 (80.17)	45525.28 [11.44]
2000-01	522755	8085 (13.02)	54024 (86.98)	62109 [11.88]
2010-11	717814	21500 (16.38)	109723 (83.62)	131223 [18.28]
2011-12	753832	22095 (15.07)	124483 (84.93)	146578 [19.44]
<b>CAGR</b>				
1980-81 to 1989-90	2.97	-3.89	2.62	0.54
1990-91 to 1999-00	3.34	-0.30	3.00	2.46
2000-01 to 2011-12	3.31	10.81	7.53	8.00
1980-81 to 2011-12	3.02	1.96	5.62	4.73

Note: Figures in () indicate %age share in total GCF; Figures in [] indicate %age share of GCF in agriculture and allied sectors in GDP from agriculture and allied sectors.

Source: www.indiastat.com; Planning Commission of India, 2012-13; Agricultural Statistics at a Glance, 2003 and 2013.

**Table 9: Share of Institutional and Non-Institutional Credit in Agriculture (%)**

Year	1981	1991	2002	2010
Institutional Agencies	61.2	64.0	57.1	68.8
Non-Institutional Agencies	38.8	36.0	42.9	29.7

Source: RBI, 2013; Devaraja, 2011

**Table 10: Per Hectare Flow of Credit and Share of Each Category in Agricultural Credit disbursed by Scheduled Commercial Banks (%)**

Year	Per hectare flow of credit (Rs.)	Share of each class in total amount of credit		
		Marginal farmers (Up to 2.5 Acres)	Small farmers (Above 2.5 acres to 5 Acres)	Large farmers (Above 5 Acres)
1980-81	199	24.9	16.6	58.5
1990-91	549	30.2	24.3	45.5
2000-01	2855	25.8	25.1	49.2
2010-11	17240	24.4	30.4	45.2

Source: RBI, 2012-13; Agricultural Statistics at Glance, 2013

percent and 0.30 percent during the decades of 1980s and 1990s respectively and after that it showed the sharp growth of 10.81 percent in 2000s.

On the other hand, the private investment in agriculture has continuously increased from Rs. 22,147 crore in 1980-81 to Rs. 54,024 crore in 2000-01 and rapidly increased to Rs. 1,09,723 crore in 2010-11 and Rs. 1,24,483 crore in 2011-12 resulting in share of private investment in agriculture and allied activities to rise from 62.65 percent in 1980-81 to 84.93 percent in 2011-12. The growth rate in GCF in private sector has also shown a positive growth of 2.62 percent and 3.00 percent during the decades of 1980s and 1990s respectively and after that it showed the sharp growth of 7.53 percent in 2000s. During the post-reform period, public investment has declined and private investment has increased in absolute as well as in percentage terms. This has led to a perceptible slowdown in agricultural growth, particularly towards the later part of nineties and early years of 2000s (Chand & Parappurathu, 2011). Thus, it can be concluded that the share of GCF in agriculture and allied activities under public sector has declined, whereas share of private sector has increased. While a higher share of private sector investment in agriculture is a welcome feature, public sector investment is critical as it is generally found to accelerate private investment.

## Agricultural Credit

Table 9 shows share of institutional and non-institutional rural credit in Indian agriculture. The share of institutional credit which was 61.2 percent in 1981, increased to 68.8 percent in 2010 with marginal variations resulting in decline in share of non-institutional credit from 38.8 percent in 1981 to 29.7 percent in 2010. Table 10 shows that flow of credit per hectare has also increased to Rs. 17240 per hectare in 2010-11, a more than 80 times high as compared to 1980-81, which points that there is continuous increase in per hectare disbursement of agricultural credit. Even the disbursement of agricultural credit by scheduled commercial banks (SCBs) reveals that share of marginal farmers in agricultural credit was around 24 percent, while share of small farmers has almost doubled from 16.6 percent in 1980-81 to 30.4 percent in 2010-11 and that of large farmers has declined from 58.5 percent in 1980-81 to 45.2 percent in 2010-11. But, small and marginal farmers constitute about 82 percent of the holdings in India. Thus, about 55 percent of the agricultural credit was accessed by small and marginal farmers, while it was large farmers who despite being only 18 per cent in total holdings availed more than 45 percent of the agricultural credit.

## Conclusions and Policy Suggestions

The study reveals that food grain and non-food grain production in India has been able to expand tremendously on account of both expansion of area and increase in yield coupled with the increased use of agricultural inputs. However, during the recent decades, expansion of area and yield have reached to a saturation level which was ultimately manifested in the form of lower agricultural growth rate. Land use pattern has shown rapid rise in area under non-agricultural uses. Therefore, rapid rise in area under non-agriculture use needs to be checked as supply of land is perfectly inelastic as only available land can be put under farming and more land cannot be created irrespective of the price. In order to spur production, attempts should be made to increase gross capital formation in agriculture particularly in public sector as both public and private sector investments are complementary to each other. Such investments should be focussed on bringing more area under assured irrigation through the development of canals and tanks. Since growth in output is more affected by the improvement in yield and technology than expansion in area, a sustained increase in public investment is vital to increase the growth of agriculture sector (Sawant & Achuthan, 1995).

The number as well as percentage share of agricultural labourers in total work force has outpaced the cultivators, which points that the marginal and small farmers have left farming and are being pushed to agricultural labour category. The average size of the operational holding in India has also reduced from 1.84 hectares in 1980-81 to 1.15 hectares in 2010-11. The input use in agriculture shows that fertilisers are over used at a ratio of 8.2: 3.2: 1 against a recommended dose of 4:2:1, while the pesticide consumption shows a variation in the trend. Thus, the rational use of agri-inputs is critical for the farming as it affects the cost components of the various crops. The agricultural credit is another input which affects the use of other agri-inputs for the farming. The share of various institutional credit agencies in total credit has increased over the period of time. However, still about 30 percent of the credit is supplied by informal credit agencies. Besides, there is highly unequal distribution of credit as share of small and marginal holdings in total holdings is 85 per cent, but their share in credit disbursed by Scheduled Commercial Banks (SCBs) is only 55 percent. The emphasis should also be placed on increasing the

outreach of the formal financial institutions to the small and marginal farmers.

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