

# Resource Use Scenario in Indian Agriculture - An Analytical Approach

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## ABSTRACT

In India, the area under forest and fallow land has increased to the tune of 0.28 percent and 0.66 percent during the period of 1970-71 to 2014-15, while area not available for cultivation and other uncultivated land excluding fallow land decreased by 0.10 percent and 0.77 percent respectively during the same period. The net area sown almost remains the same, whereas the area sown more than once and gross cropped area increased at compound growth rate of 2.00 percent and 0.42 percent, respectively. The net irrigated area and gross irrigated area has increased by 1.83 percent and 2.15 percent, respectively during the same period. A remarkable growth in productivity of paddy, wheat, coarse cereals and oilseeds was witnessed. The annual compound growth rate in use of nitrogenous, phosphatic and potassic fertilizers was 4.90 percent, 5.13 percent and 6.10 percent, respectively. The significant growth rate in the flow of farm credit registered for both production and investment credit by institutional credit agencies. The liberalization policy had a positive affect in the flow of agricultural credit.

**Keywords:** Cropping pattern, cropping intensity, compound growth Rate

In India, about 70 percent people are living in rural areas and are still dependent on agriculture, about 43 percent India's geographical area is used for agricultural activities. Of the total reported area (284.33 million hectare in 1950-51), forest area, area not available for cultivation, other uncultivated land excluding fallow land and fallow land accounted for 14.20%, 16.70%, 17.40% and 10.0 percent respectively. The net sown area was about 42 percent of the total reported area during 1950-51. In our country there are many reasons to focus on agriculture and allied sector as it will continue to play a significant role in providing employment and sustainable livelihood for growing population. However, Indian agriculture is facing with an array of problem such as water scarcity; reduction in cultivable land per capita due to

rapid population growth and other natural calamity such as flood, drought, and the timing and amount of rainfall are not adequate to meet the moisture requirement of the crops.

Keeping the importance of agriculture and allied sector in the country, the government has introduced several programmes such as National Extension Service in 1953, Intensive Agricultural Development Programme in 1959, Intensive Agricultural Area Programme in 1964-65, HYVs programme in 1966-67, DDP in 1977-78, DPAP in 1975-74, ToT in 1985

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and million well project 1988-89 and many other programmes in recent year for rational use of available resources in agriculture. Therefore it is necessary to have detailed information on land use, cropping intensity and changes taking place. Growth rate of resources like irrigated area, use of chemical fertilizer, flow of farm credit, and growth rate of production and productivity of major cereal crops, pulse crops, oilseed crops, over a period of 45 years from 1970-71 to 2014-15 provides information about changes taking place in agriculture in the country. The present study is an attempt in this direction. The base year i.e. 1970-71 has been taken in this study because many agriculture development programmes were initiated during green revolution period for augmenting the agricultural economy in the country.

## MATERIALS AND METHODS

The basic data on land use pattern, irrigation, chemical fertilizer, Agricultural credit, production and productivity of major cereal crops, pulses and oil seed crops have been collected from various issues of Economic Survey, Data Book on agriculture etc for the period from 1970-71 to 2014-15. The compound growth rate (CGR) of land use pattern, irrigation utilization, chemical fertilizers (N:P:K) uses, Agricultural credit supply from institutional financing agencies, production productivity and area under irrigation of major cereal crops, pulses and oil seed crops have been estimated using the following type of Exponential Model as adopted by earlier economists.

$$P_t = P_0 (1 + r/100)^t$$

Where,

$P_t$  = Land use, irrigated area, chemical fertilizer use, agricultural credit, production and productivity of crops in the  $t^{\text{th}}$  time period

$P_0$  = Land use, irrigated area, chemical fertilizer use, agricultural credit, production and productivity of crops in the base year

$r$  = Compound growth rate (CGR)

$t$  = time period

The secondary data (1970-71 to 2014-15) have been divided into two periods i.e. Period I and Period II.

**Period I:** Indicates from 1970-71 to 2000-01.

**Period II:** Indicates from 2001-02 to 2014-15 while in case of chemical fertilizer and farm credit disbursement 2017-18 years data included.

**Overall:** Indicates from 1970-71 to 2014-15 except data of chemical fertilizer and farm credit.

The growth rate over ten years was also estimated for every resource.

## RESULTS AND DISCUSSION

### Land use pattern

The land use pattern during 1970-71 to 1980-81, 1980-81 to 1990-91, 1990-91 to 2000-01, 2000-01 to 2010-11 and 2010-11 to 2014-15 including area under forest, area not available for cultivation, other uncultivated land, fallow land, net area sown, area sown more than once, gross cropped area, net irrigated area and gross irrigated area is presented in Table 1. The total land available for cultivation (net area sown plus current and other fallows) constituted 52.70 percent and 54.29 percent of the total reported area in 1970-71 & 1980-81. The availability of arable land per capita declined from 0.28 hectare in 1970-71 to 0.20 hectare in 1990-91 and further declined to 0.17 hectare in 2000-01 and reached to a level of 0.14 hectare in 2014-15. It is expected that the per capita arable land is below the level of one tenth of a hectare by the end of 2030 AD with the rate of population growth (Singh and Singh, 1999). The area not available for cultivation in total reported area constituted 14.67% in 1970-71, which was declined in 2000-01 to 13.54 per cent and marginally increased to 14.24 % in 2014-15. The other uncultivable land excluding fallow land in total reported area was 11.55 per cent in 1970-71, with its share declined continuously throughout the periods (from 1980-81 to 2014-15) i.e. 10.0% in 1990-91, 9.12% in 2000-01 and 8.24% in 2014-15, respectively. It is a good sign that the land under other fallow showed a declining trend during the study period, indicating extension of fallow land for cultivation.

The area under forests accounted for 21.8 percent in 1970-71, which was below the norms set under the National forest policy (1952) for the country. The share of forest area increased to 22.0 percent in 1990-91, which further grew to about 23 per cent in period 2000-01 and 2010-11 and trend is maintained in 2014-

**Table 1:** Land use pattern during 1970-71 to 2014-15 in India (Area in Million hectare)

Particular	1970-71	1980-81	1990-91	2000-01	2010-11	2014-15
Reported area	304.00	304.00	305.00	304.00	307.00	308.00
Forest area	63.83	67.46	67.81	69.84	70.03	71.79
Area available for cultivation	44.61	39.55	40.48	41.23	43.58	43.85
Other uncultivated area excluding fallow land	35.13	32.31	30.22	27.74	26.65	25.63
Fallow land	19.33	24.55	23.37	25.04	24.60	26.18
Net area sown	140.86	140.30	143.0	141.34	141.56	140.13
Area sown more than once	24.93	34.63	42.74	44.00	56.00	58.23
Gross cropped area	165.79	174.93	185.74	185.34	197.56	198.30
Net irrigated area	31.10	38.72	48.02	55.20	63.66	68.98
Cropping intensity (per cent)	117.70	123.05	129.90	131.13	139.58	141.55

**Source:** Various issues of Economics Survey Government of India New Delhi.

**Table 2:** Growth rate in land use pattern (Per cent)

Crops	1970-71 to 1980-81	1980-81 to 1990-91	1990-91 to 2000-01	2000-01 to 2010-11	2010-11 to 2014-15	1970-71 to 2014-15	1970-71 to 2000-01	2000-01 to 2014-15
Forest area	0.55	0.05	0.23	0.03	0.85	0.28	0.30	0.20
Area not available for cultivation	(-)1.2	0.20	0.18	3.76	0.40	(-)0.01	(-)0.30	0.44
Other uncultivated area excluding fallow land	(-)0.9	(-)0.80	(-)0.90	1.80	0.82	(-)0.70	(-)0.80	(-)0.60
Fallow land	2.40	(-)0.60	(-)0.90	(-)0.20	3.19	0.66	0.77	0.32
Net area sown	0.10	0.18	(-)0.20	0.01	(-)0.10	0.01	0.01	(-)0.10
Area sown more than once	3.34	2.12	0.28	2.43	1.95	2.01	1.90	2.02
Gross cropped area	0.54	0.60	-0.10	0.63	0.53	0.42	0.37	0.48
Net irrigated area	2.21	2.17	1.88	4.38	0.67	1.83	1.93	1.60
Gross Irrigated Area	2.68	2.41	1.85	1.55	2.51	2.15	2.32	1.70
Cropping intensity (per cent)	0.44	0.54	0.09	0.06	0.17	0.43	0.36	0.50

**Source:** IBD.

15. The forest development programmes initiated by the government could bring the desired result in enhancing the forest area in the country. During the period under study, net area sown increased by 1.54 per cent in 1990-91 as compared to 1970-71. The gross cropped area has shown an increasing trend throughout the study period except during 2000-01. The gross irrigated area has shown increasing trend which is mainly due to intensification of irrigation facility in the country. The cropping intensity was expected to increase as irrigation facility increased which was about 118 per cent in 1970-71, increased to 130 per cent in 1990-91 and further to 140 per cent and 142 per cent respectively in 2010-11 and 2014-15.

### Compound growth rate in land use

The overall area under forest increases with compound annual growth rate of 0.28 per cent during 1970-71 to 2014-15 (Table 2). Similarly, area not available for cultivation declined with compound annual growth rate of -0.30 per cent per year during 1970-71 to 2000-01. The overall area not available for cultivation reduced with compound annual growth rate of -0.10 per cent per year. The cause was mainly due to shift of land for purposes other than agriculture. The uncultivated land other than fallow has also declined in the country during 1970-71 to 2014-15 with compound annual growth rate of -0.70 per cent per year. The declining growth

rate was high (0.80 per cent per year) during 1970-71 to 2000-01 as compared to 0.60 per cent per year during 2000-01 to 2014-15. The current fallow land has also achieved high growth rate of 0.77 per cent and 0.35 per cent during period of 1970-71 to 2000-01 and 2000-01 to 2014-15 with overall annual CGR of 0.66 per cent during 1970-71 to 2014-15. The net sown area more than once has been accelerated at a rate of 2.00 per cent per annum during 1970-71 to 2014-15 with 2.02 per cent per year of growth during 2000-01 to 2014-15 and 1.90 per cent per annum during 1970-71 to 2000-01. The gross cropped area increased at the rate of 0.42 per cent per year, while incremental rate was higher during 2000-01 to 2014-15. High significant rate was achieved during period of the study showing 1.83 per cent per annum during 1970-71 to 2014-15.

### Compound growth rate of production and productivity

The annual CGR in production and productivity is given in Table 3. Paddy crop recorded a growth rate of 1.48 per cent and 1.60 per cent in production and productivity during 1970-71 to 2014-15, respectively. The rate of growth was high (2.31 per cent and 1.72 per cent) in period I in comparison to period II (1.51 per cent and 1.65 per cent), respectively.

In case of wheat, the overall growth rate in production and productivity was 2.93 per cent and 1.75 per cent. The high growth rate in the same was further recorded in period I in comparison to period II. The growth rate in coarse crop was found to be 0.68 per cent and 2.10 per cent in production and productivity in all over period. It was also recorded that rate of growth in production and productivity was much more in period II than that of period I.

The production and productivity of pulses accelerated at the rate of 0.80 per cent and 0.77 per cent, respectively in overall period. This crop recorded a higher growth rate (3.18 per cent and 2.26 per cent) in production and productivity during period II against the period I. This is probably due to mission mode programmes launched by the government. Similarly the growth of oil seed crops was obtained as 2.77 per cent and 1.22 per cent, respectively in overall period. It was also recorded that the growth rate in production and productivity was high (2.67 per cent and 1.78 per cent) during period II in respect to period I (2.20 per cent and 1.12 per cent). The reason for high growth in period II was mainly due to introduction of oil seed mission programme.

The growth rate of in production and productivity of paddy, wheat, coarse cereals, pulses and oilseeds during 1970-71, 1980-81, 1990-91, 2000-01, 2010-11

**Table 3:** Production and productivity growth rate of crops (Per cent)

Crops	1970-71 To 1980-81	1980-81 to 1990-91	1990-91 to 2000-01	2000-01 to 2010-11	2010-11 to 2014-15	1970-71 to 2014-15	1970-71 to 2000-01	2000-01 to 2014-15
<b>Paddy</b>								
Production	2.29	3.31	1.94	1.24	2.21	1.48	2.31	1.51
Productivity	1.66	2.67	0.88	1.64	1.63	1.60	1.74	1.65
<b>Wheat</b>								
Production	4.29	4.26	2.36	2.27	0.41	2.93	3.64	1.75
Productivity	2.23	3.41	1.72	0.98	-0.89	1.75	2.45	0.42
<b>Coarse cereals</b>								
Production	-0.60	1.20	-0.60	3.40	-1.00	0.68	0.06	2.14
Productivity	0.40	2.61	1.31	4.00	3.07	2.10	1.46	3.79
<b>Pulses</b>								
Production	-1.20	3.00	-2.50	5.10	-1.50	0.80	-0.30	3.18
Productivity	-1.20	2.02	-0.20	2.41	1.84	0.77	0.12	2.26
<b>Oil seed</b>								
Production	-0.30	7.01	-0.20	5.81	-4.80	2.77	2.20	2.67
Productivity	-0.86	3.77	0.49	3.92	-3.40	1.22	1.12	1.78

Source: IBD



and 2014-15 is presented in Table 3. The growth rate in production and productivity was higher in period of 1980-81 to 1990-91 (3.31 per cent and 2.67 per cent) followed by 1970-71 to 1980-81 (2.28 per cent and 1.66 per cent), respectively. The production growth rate varies from 1.24 per cent to 3.31 per cent. In case of productivity it varies from 0.88 per cent to 2.67 per cent in the study period. Similarly, the growth rate of wheat productivity was found to be highest (3.41 per cent) followed by 2.28 per cent in period of 1970-71 to 1980-81 and negative rate (-0.89 per cent) in 2010-11 to 2014-15. Increase production growth rate was higher (4.26 per cent) in period 1980-81 to 1990-91 and lowest (0.41 per cent) period 2010-11 to 2014-15. There was a big gap from 0.40 to 4.29 per cent. Productivity in coarse cereals was recorded to be maximum (4.0) percent during period 2000-01 to 2010-11 and minimum 0.40 per cent in period 1970-71 to 1980-81. Production growth in this crops was maximum (3.40 per cent) in 2000-01 to 2010-11 and negative (-0.60 per cent) in period 1970-71 to 1980-81.

In case of pulse crops productivity growth rate was highest (2.41 per cent) during 2000-01 to 2010-11 followed by 2.02 per cent in period 1980-81 to 1990-91. The highest productivity growth rate brought to higher growth in production (5.10 per cent) in this

period also. In most of the period negative growth rate was observed in production and productivity in the study periods. In oil seed crops the growth rate in productivity was highest (3.92 per cent) in period 2000-01 to 2010-11. The positive and negative was recorded in study period. Similarly highest (7.01 per cent) was found in period 1980-81 to 1990-91 followed by 5.81 per cent in period 2000-01 to 2010-11 respectively, while negative growth rate was found in same period of study. It clears from the data that production and productivity in case of paddy and wheat are more stable than pulse and oil seed crops in production and productivity. It is further observed that coarse cereal is also found to be better in term of stability in production and productivity in comparison to pulse and oil seed crops.

### Irrigated area

The rate of growth under rice crop was highest (1.78 per cent) per annum under period I as comparison to period II (0.51 per cent). In case of wheat crop, overall growth rate in irrigated area increased at a rate of 2.56 per cent per annum (Table 4). Like rice, the expansion rate under irrigated area of wheat crop was again high (2.96 per cent) in period I with respect to period II (1.67 per cent). The irrigation

**Table 4:** Crop wise growth rate in irrigated area (Per cent)

Crops	1970-71 to 1980-81	1980-81 to 1990-91	1990-91 to 2000-01	2000-01 to 2010-11	2010-11 to 2014-15	1970-71 to 2014-15	1970-71 to 2000-01	2000-01 to 2014-15
Paddy	1.33	1.77	2.50	0.29	1.42	1.41	1.78	0.61
Wheat	5.58	1.40	2.03	1.11	3.57	2.56	2.96	1.67
Coarse cereals	6.74	-1.60	1.20	0.98	2.07	1.82	2.05	1.30
Pulses	0.90	2.51	2.76	1.40	0.57	1.75	1.77	1.70
Oil seed	8.77	8.10	1.89	1.72	1.74	4.54	5.83	1.71
Total gross irrigated area	3.71	2.41	2.23	1.21	2.06	2.36	2.27	1.47

Source: IBD.

**Table 5:** Growth rate in consumption of chemical fertilizer (Per cent)

Fertilizer	1970-71 to 1980-81	1980-81 to 1990-91	1990-91 to 2000-01	2000-01 to 2010-11	2010-11 to 2017-18	1970-71 to 2017-18	1970-71 to 2000-01	2000-01 to 2017-18
Nitrogenous	9.01	7.28	3.16	3.60	0.28	4.90	6.48	2.22
Phosphatic	7.98	9.44	2.73	6.40	-2.34	5.13	6.67	2.50
Potassic	9.71	7.07	1.67	7.74	-3.50	4.95	6.10	3.02
Total	8.90	7.47	2.90	4.67	-0.84	4.97	6.50	2.37

Source: IBD.

**Table 6:** Growth rate in flow of agricultural credit (Per cent)

Type of credit	1970-71 to 1980-81	1980-81 to 1990-91	1990-91 to 2000-01	2000-01 to 2010-11	2010-11 to 2017-18	1970-71 to 2000-01	2000-01 to 2017-18	1970-71 to 2017-18
Crop loan (Short term credit)	12.05	9.34	15.56	31.14	13.09	12.58	23.37	16.32
Investment credit (Medium and long term credit)	17.78	10.76	24.78	13.33	18.29	14.60	20.13	16.51
Total credit	14.98	9.71	20.44	22.71	14.73	13.34	22.10	16.38

Source: IBD.

facility in coarse cereal crops increased at a rate of 1.82 per cent in overall period. It was further recorded that expansion rate of irrigation was high in period I (2.05 per cent) than period II as marked by 1.30 per cent per annum in the study period. The overall irrigated area under pulse crops increased at annual rate 1.75 percent. Like other crops area under irrigation improved better rate in period I than that of period II. The overall area under irrigation in oil seed crops increased at a rate of 4.54 per cent annually. The analysis further revealed that rate of growth was much more high (5.83 per cent) in period I as compared to period II in the country.

The area under irrigation increased at the rate of 2.76 per cent in pulse crops in period 1990-91 to 2000-01. The growth rate was minimum (0.90 per cent) during 1970-71 to 1980-81. The irrigated area in oilseed crops increased at a rate of 8.77 per cent per annum during 1970-71 to 1980-81 which was highest rate among all crops. During the early stage of green revolution, the rate of area under irrigation increased significantly in crops like wheat, coarse cereal and oilseed crops.

### Consumption of N:P:K

The overall growth rate of N:P:K was 4.90 per cent, 5.13 per cent and 4.95 per cent. The combined growth rate was 4.97 during the same period. During 2010-11 to 2017-18, significantly negative growth in use of phosphate and potash were recorded showing 2.34 per cent and 3.50 per cent per annum, respectively. In case of nitrogenous fertilizer annual growth rate was about 0.28 per cent in the study period.

### Growth in flow of agricultural credit

There was no much difference in annual growth rate of production and investment credit during

1970-71 to 2017-18 (Table 6). The growth rate of production and investment credit was much high in period II (23.37 per cent and 20.19 per cent) as compared to period I (12.58 per cent and 14.60 per cent), respectively. After liberalization in 1990-91, the growth rate of agricultural credit was high in the country due to several modifications in process of credit disbursement, priority of agricultural developmental programme etc.

### CONCLUSION

There are no remarkable changes in the overall land use pattern in the country during 1970-71 to 2017-18. The area sown more than once has increased during the study period along with net irrigated area. The positive growth rate was observed in production and productivity of cereals, pulses and oilseed crops. However, the rate of growth in area under pulses and oilseeds was high in period II (2000-01 to 2014-15). The higher growth rate of productivity of pulses and oilseed crops in period II was accompanied by high rate of increase in irrigated area. The growth rate of consumption of chemical fertilizer is declining. There has been a remarkable change in the flow of agricultural farm credit from formal financing institution as production and investment credit. It is suggested that there is an urgent need to make policy to bring uncultivated land into cultivation because net cultivated area is declining or almost remain constant in the country.

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