



ORIGINAL RESEARCH PAPER

Economics

THE PERFORMANCE OF FOODGRAIN CROPS IN INDIA OVER A PERIOD OF TIME

KEYWORD: Agriculture Performance, Green Revolution Period, Economic Reforms Period, Area Cultivated, Irrigated Area, Food-grain Crops, Production and Productivity.

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ABSTRACT

The present paper is an effort to study the trends in area cultivated, irrigated area, production and productivity of major food grain crops from the period 1952-53 to 2015-16 by collecting and analyzing the data from various sources of the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India. The analysis of the data reveals that the area under Food grain crops has been increasing from 1952-53 to 2015-16 at the rate of only 0.18 per cent per annum. The irrigated area increased during the same two points of time at the rate of 2.08 per cent per annum. Whereas the production and productivity of the food-grains increased by about 2.40 per cent and 2.20 per cent respectively for the same period. This clearly reveals that total cultivated area has been almost remained the same, whereas the area under irrigation, the production and the productivity of the food grain-crops increased over a period of time. This is mainly because of the input application like HYV seeds, fertilizers, pesticides and also by providing irrigation facilities. Therefore, the paper suggests that more area has to be brought under irrigation to meet the growing demand for food-grains in India.

INTRODUCTION:

The Indian economy has undergone structural changes over time with the anticipated decline in the share of agriculture in the GDP. Despite a fall in its share from 55.10 per cent in 1950-51 to 14.39 per cent in 2018-19, (Govt. of India Report, 2019). However, the importance of agriculture is not diminished for two major reasons. First, the country achieved self-sufficiency in food production at the macro level, but still is a food deficit country facing massive challenges of high prevalence of malnourished children and high incidence of rural poverty. Second, the dependence of the rural workforce on agriculture for employment has not declined in proportion to the sectoral contribution to GDP. This has resulted in widening the income disparity between the agricultural and non-agricultural sectors (Chand and Chauhan, 1999).

The experiences of developed countries reveals that the transfer of labour force from agriculture to non-agriculture, in particular, the manufacturing sector has taken place. This has brought enhanced productivity growth in agriculture and hence higher income (Gollin et.al., 2002). However, India's industrial sector witnessed volatile growth and its share in GDP has almost remained constant at 15 per cent for the last three decades. Further, given the fact that the current economic growth pattern is driven by the service sector, labour absorption outside agriculture will be slow until rural education improves, dramatically, in the near future. Under these circumstances, higher growth in agriculture assumes greater importance and is a matter of concern for policy makers and research scholars in recent times regarding the progress of the agriculture sector (Chand et al., 2007; Balakrishnan et al., 2008; Bhalla and Singh, 2009; Reddy and Mishra, 2009; Vaidyanathan, 2010).

The study is based on purely secondary data. The Compound Annual Growth (CAGR) rates have been worked out by using the semi-log method. Data on the value of crop output were compiled from the Central Statistical Organisation, Government of India. For the trend analysis, the time series data has been converted into Triennium averages (TE) of different variables were calculated to even out the inter-year fluctuations and then used statistical techniques for data analysis.

Growth Performance of Food Grain Crops for the Various Periods in India.

This paper presents the trends and patterns in agricultural growth at the all India level. The study relies on secondary data compiled from various published sources. The data on the area, production and yield were collected for some important food grain crops in India for the period 1952-53 to 2015-16. The study period has been divided into seven phases, viz.,

1. Pre-Green Revolution Period (1952-53 to 1959-60)
2. Early Green Revolution Period -I(1960-61 to 1969-70)
3. Early Green Revolution Period -II (1970-71 to 1979-80)
4. Mature Green Revolution Period (1980-81 to 1989-90)
5. Early Economic Reforms Period (1990-91 to 1999-2000)
6. Economic Reforms Period (2000-01 to 2009-10)
7. Mature Economic Reforms Period (2010-11 to 2015-16)

1. Agricultural Growth Performance During The Pre-green Revolution Period (1952-53 To 1959-60):

During this period, Agricultural Policies resumed superlative an import role in the Indian agricultural sector. The basic objective of the Indian agriculture sector is to achieve the self-sufficiency in food production to take care of the economic well-being of two-thirds population of the country. The trends in the Growth Rate (GR) of the food-grains between 1920 and 1945 was virtually nil as the annual GR has been only 0.03 per cent, which contrasted the population growth rate, which was much more than this. And also the non-food-grain crops the growth rate during the same period has been 1.08 per cent compared to population growth rate of 1.12 per cent. The non-food-grain crops output was tripled amounting to 3.61 per cent during the same period (John Adams, 1970).

In the entire country for the Pre-Green Revolution Period i.e., 1952-53 to 1959-60 the performance in terms of cultivated area, irrigated area, production and yields are presented in the Table-1. The table clearly reveals that the Compound Annual Growth Rate (CAGR) has been 1.81, 1.41, 3.53 and 1.71 per cent respectively for all the four variables during this period. And also the coarse cereals the CAGR for all the four variables has been positive where cropped area is grown at the rate of 0.84, 2.54 per cent for the production and 1.74 per cent the yield. However, during this period for the coarse cereals under irrigated conditions it is declined at the rate of 1.02 per cent. The pulse crops have shown a promising trend as they are growing at the rate of 3.08, 1.18, 3.77 and 0.64 respectively for the cropped area, irrigated area, production and productivity.

Table-1: Performance Of Food Grain Crops During The Pre-green Revolution Period (te 1952-53 To 1959-60)

Particular	Cropped Area	Irrigated Area	Production	Yield
Food grains	1.81	1.41	3.53	1.71
Paddy	1.36	3.29	3.89	2.49
Wheat	4.36	2.06	4.60	0.24
Jowar	0.51	0.87	3.34	2.84
Bajra	1.22	0.62	2.05	0.95
Maize	2.74	-0.08	5.17	2.49
Barley	0.13	NA	-0.64	-0.79
Small Millets	-0.07	NA	-0.70	-0.65
Ragi	1.44	NA	4.51	3.04
Coarse Cereals	0.84	-1.02	2.54	1.74
Gram	4.90	-0.75	6.69	1.69
Tur	0.00	14.63	-0.79	-0.83
Total Pulses	3.08	1.18	3.77	0.64

Source: Calculations Are Based On Data Collected From Directorate Of Economics And Statistics, Ministry Of Agriculture, Government Of India.

Agricultural growth during early green revolution period (1960-61 to 1969-70):

The food availability for the fast growing population of India remained insufficient during 1960s mainly because there was no scope for the increase in farm production through area extension and therefore, agricultural production became stagnated. Further the situation was worsened, the government of United States discontinued the food export to India under the PL-480 scheme and also, the fear of food crisis started in the country. This has forced the government to implement a number of programmes for 'Intensive Agricultural Development'. Because of the change in the policy of the government the farmers were motivated to adopt a package of practices including the usage of improved technology, high yielding inputs, taking credit, high yielding seeds, fertilizers, pesticides and assured irrigation facilities (Dantwala, 1986).

The Table-2 reveals that the performance of the food grains in the Early Green Revolution period in India. The analysis of the data clearly reveal that the decadal CAGR for all the variables it is positive for the major food grain crops i.e., total food grain crops, paddy, wheat, jowar, Bajra and Maize. And most interestingly for the wheat crops it is much higher growth compared to all the other crops. The decadal CAGR reveals that they are growing at the rate of 1.43, 5.09, 3.52, 6.90 and 5.39 respectively. This highlights that the performance of food grains has been reaching the people and it is playing an important role in increasing the food production and reducing poverty in the rural areas. During this period India started achieving self-sufficiency in food production and avoided food import from other countries of the world.

Table-2: Performance Of The Food Grain Crops Durin The Early Green Revolution Period (te 1960-61 To 1969-70)

Particular	Cropped Area	Irrigated Area	Production	Yield
Food grains	0.38	2.67	1.36	0.95
Paddy	0.85	1.37	1.04	0.18
Wheat	1.43	6.90	5.09	3.52
Jowar	0.13	1.89	0.66	0.52
Bajra	1.47	4.52	3.58	2.02
Maize	2.94	8.58	4.42	1.41
Barley	-1.44	NA	-0.10	1.31
Small Millets	-0.77	NA	-2.06	-1.29
Ragi	-0.62	NA	-1.69	-1.00

Coarse Cereals	0.53	2.67	1.38	0.76
Gram	-2.95	1.90	-2.94	-0.07
Tur	0.85	0.00	-0.53	-1.38
Total Pulses	-1.24	0.81	-1.88	-0.68

Source: Calculations Are Based On Data Collected From Directorate Of Economics And Statistics, Ministry Of Agriculture, Government Of India.

3. Agricultural Performance During The Green Revolution Period-ii (1970-71 to 1979-80):

The period between 1970-71 and 1979-80 is generally indicated that as the green revolution period. The compound annual growth rate of food-grains production and yield in this period was, however, better as it is higher in comparison to the pre-green revolution period and the green revolution period. The crop-wise comparison of compound annual growth rate in area, production and yield, irrigated area and percentage of the change in the area under irrigated between pre-green revolution period or the green revolution period (1970-71 to 1979-80) would strengthen this argument.

Table-3 GR Of The Food Grain Crops During The In The Period 1970-71 To 1979-80

Particular	Cropped Area	Irrigated Area	Production	Yield
Food grains	0.47	2.65	2.44	1.95
Paddy	0.83	1.61	2.32	1.45
Wheat	2.65	5.59	4.74	2.04
Jowar	-1.08	2.02	4.15	5.33
Bajra	-1.61	1.00	-1.94	-0.22
Maize	0.03	0.78	0.04	0.02
Barley	-3.05	NA	-1.72	1.31
Small Millets	-0.44	NA	0.50	0.93
Ragi	0.72	NA	4.10	3.31
Coarse Cereals	-1.01	0.02	1.28	2.33
Gram	0.31	-0.08	0.62	0.26
Tur	0.46	9.34	0.54	0.03
Total Pulses	0.85	-1.35	0.48	-0.40

Source: Calculations are based on data collected from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

The Table-3 presents the performance of the food grains the period of Green Revolution in India. Interestingly in this decade or period the performance of the total food grains crops is positive. The total food grain crops area, production and yield are grown at the rate of 0.47, 2.44 and 1.95 per cent respectively. But these growth rates are very much low compared to the Pre-Green Revolution period from 1952-53 to 1959-60. And also the productivity of jowar and ragi crops are very much growing at the rate of 5.33 and 3.31 per cent respectively. However, the productivity for the bajra and total pulses are grown negatively showing that the performance is poor during the Early Green Revolution Period. This clearly reveals that the food grains productivity is better performance in this period.

4. Agricultural Growth Performance During The Matured Green Revolution Period (1980-81 To 1989-90)

The green revolution has been the cornerstone of India's agricultural success as it transformed the country from food shortage to self-sufficiency through greater adoption of technology, greater public and private investment and some institutional innovations that have increased production and earnings of productivity. The matured green revolution period following the Green Revolution saw massive structural changes (Vyas, 2004) taking place in Indian agriculture. For example, Indian agriculture has gradually acquired the character of a small farm, with 40 per cent of the land now managed by small and marginal farmers.

The Table-4 reveals that the performance of the food grains in the period of Matured Green Revolution Period in India. Interestingly in this decade the performance of the total food grain crops production and yield are positive growing at the rate of 2.73 and 2.96 per cent respectively. And major food grain crops like, paddy and wheat crops production and yield rates are positive as they are grown at the rate of 3.43, 3.13 for paddy and 4.09, 3.53 for wheat respectively during the period 1980-81 to 1989-90. However, the area cultivated for the total food grain crops is negatively grown at the rate of 0.23 per cent. And also the irrigated area is declined as the GR was only 1.41 per cent during the same period. The production of Pulse crops and its productivity grown at the rate of 1.99 per cent and 2.09 per cent respectively during the same period. It can be concluded that during this period agriculture sector has seen very low performance.

Table-4: Performance Of Food-grain Crops During The Matured Green Revolution Period (1980-81 To 1989-90)

Particular	Cropped Area	Irrigated Area	Production	Yield
Food grains	-0.23	1.41	2.73	2.96
Paddy	0.28	1.23	3.43	3.13
Wheat	0.55	2.10	4.09	3.53
Jowar	-0.69	0.87	-0.44	0.26
Bajra	-1.05	0.62	-0.35	0.49
Maize	-0.17	-0.08	1.74	1.88
Barley	-5.70	NA	-2.64	3.25
Small Millets	-4.38	NA	-3.47	0.97
Ragi	-1.45	NA	-0.98	0.47
Coarse Cereals	-1.26	-1.02	-0.24	1.04
Gram	-1.22	-0.75	0.11	1.29
Tur	2.33	14.63	3.17	0.85
Total Pulses	-0.10	1.18	1.99	2.09

Source: Calculations are based on data collected from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

5. Agricultural Growth Performance In Early Economic Reforms Period (1990-91 To 1999-2000):

The growth rate thus achieved during the 1980s could not be sustained in the 1990s or precisely between 1990-91 and 1999-2000. Growth in case of most of the crops has slowed down. During this period the cropped area started declining at the rate of 0.22 per cent, even for the total pulses the area declined at the rate of 0.47 per cent. There was a marginal increase in the growth of the paddy area, production and also the productivity. Even in case of the crop wheat also similar experience is observed. Though the area under total pulses has shown declining trend area irrigated and the production and productivity have shown little positive trend. In general we can say that the agricultural performance during this period is not up to the mark.

Table-5: Performance Of Food Grain Crops During Early Economic Reforms Period (1990-91 To 1999-2000).

Particular	Cropped Area	Irrigated Area	Production	Yield
Food grains	-0.22	2.18	1.88	2.11
Paddy	0.52	2.59	1.80	1.27
Wheat	1.55	2.40	3.50	1.92
Jowar	-3.68	-0.73	-3.37	0.37
Bajra	-1.52	-0.33	0.78	2.34
Maize	0.82	1.14	2.62	1.83
Barley	-2.74	NA	-0.38	2.39
Small Millets	-6.10	NA	-6.66	-0.51
Ragi	-3.38	NA	-1.10	2.30
Coarse Cereals	-2.31	-0.37	-0.40	2.01
Gram	1.63	3.23	3.44	1.80
Tur	-0.67	-0.77	-0.52	0.08
Total Pules	-0.47	2.03	0.49	0.99

Source: Calculations are based on data collected from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

6. Agricultural Growth Performance During Economic Reforms Period (2000-01 To 2009-10):

The growth rate thus achieved during the 1980s could not be sustained in the 1990s or precisely between 1990-91 and 1999-2000. Performance of the most of the agricultural crops it is slowed down. The crop by crop harvest report would show that there was a marginal increase in the growth of the paddy area, but the decrease in productivity had reduced the growth in paddy production. Wheat and legumes have experienced the similar growth scenario as paddy. The cumulative impact has been that the country has experienced a decrease in the growth rate of the area, production and productivity of cereals during this period.

Table-6: Performance Of Food Grain Crops During The Economic Reforms Period (2000-01 To 2009-10)

Particular	Cropped Area	Irrigated Area	Production	Yield
Food grains	0.16	1.32	1.50	1.34
Paddy	-0.15	0.77	1.33	1.49
Wheat	0.72	1.25	1.11	0.38
Jowar	-2.97	-1.63	-0.75	2.32
Bajra	0.01	3.40	3.47	3.56
Maize	3.01	4.70	5.46	2.37
Barley	-1.86	NA	-0.91	0.90
Small Millets	-4.71	NA	-2.87	1.95
Ragi	-2.97	NA	-2.31	0.70
Coarse Cereals	-0.57	2.16	2.67	3.28
Gram	2.96	5.04	3.70	0.77
Tur	0.41	0.00	1.16	0.70
Total Pulses	1.05	3.91	1.82	0.82

Source: Calculations are based on data collected from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

7. Agricultural Growth Performance During The Matured Economic Reforms Period (2010-11 To 2015-16):

This period witnessed the growth rate in the irrigated area of food grains with production and productivity showing significant positive growth rate. As for as Paddy and maize crops are concerned both the production and productivity showed positive growth rate. Positively significant growth rate was observed in case of the coarse cereals and total pulses during this period (Table-7).

Table-7: Performance Of Food Grain Crops During The Matured Economic Reforms Period (te 2010-11 To 2015-16)

Particular	Cropped Area	Irrigated Area	Production	Yield
Food grains	-0.01	2.00	2.09	2.11
Paddy	0.33	0.82	2.43	2.10
Wheat	1.63	2.37	1.98	0.37
Jowar	-4.83	-3.30	-6.21	-1.48
Bajra	-4.68	-3.84	0.29	5.27
Maize	1.65	3.96	4.43	2.76
Barley	-0.09	NA	1.89	1.73
Small Millets	-5.94	NA	-0.89	4.89
Ragi	-1.50	NA	-1.39	0.72
Coarse Cereals	-2.44	1.11	1.42	3.96
Gram	1.16	5.47	1.66	0.44
Tur	0.33	0.00	2.88	2.42
Total Pulses	0.08	5.55	2.37	2.30

Source: Calculations are based on data collected from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

The same table-7 reveals that the performance of food grain crops in the period of Matured Economic Reforms Period starting from 2010-11 to 2015-16. Interestingly the major food grain crop like Bajra productivity is very much as the growth rate is 5.27 per cent. The total food grain crops production and productivity are grown at the rate of 2.09 and 2.11 per cent respectively. Even the irrigated area is grown at the rate of 2.00 per cent during the same period. Small millets crop productivity is growing positively at the rate of 4.89 per cent. However, the total pulse crops all the variables are growing positively at the rate of 0.08, 2.37, 2.30, and 5.55 per cent respectively.

In the entire country for about seven decades starting from 1952-53 to 2015-16 the performance in terms of cultivated area, irrigated area, production and productivity are presented in the Table-8. The table clearly reveals that the calculated trienniums (moving averages) the Compound Annual Growth Rates are worked out. The analysis reveals that the food grain crops are growing at the rate of 0.20, 2.08, 2.40 and 2.20 per cent respectively for all the four variables mentioned. And also the total pulses cultivated area, production and yield are growing at the rate of 0.10, 0.70 and 0.70 per cent respectively. However, the same variables viz., cultivated area, production and yield small millets have shown the negative growth rate. Interestingly in India the famous major food grain crop viz., wheat, for this crop the cultivated area, irrigated area, production and yield are growing positive at the rate of 1.70, 3.74, 4.40 and 2.70 per cent respectively, during the period from 1980-81 to 2015-16.

Table-8: Overall Cagr Of The Food Grains During 1952-53 To 2015-16

Particular	Cropped Area	Irrigated Area	Production	Yield
Food grains	0.20	2.08	2.40	2.20
Paddy	0.59	1.57	2.50	1.90
Wheat	1.70	3.74	4.40	2.70
Jowar	-1.60	0.27	-0.30	1.30
Bajra	-0.50	1.58	1.70	2.20
Maize	1.20	2.45	3.20	2.00
Barley	-3.30	NA	-1.30	2.00
Small Millets	-3.40	NA	-2.90	0.50
Ragi	-1.10	NA	0.30	1.50
Coarse Cereals	-1.00	0.16	1.00	2.00
Gram	-0.30	1.41	0.50	0.80
Tur	0.90	6.76	0.90	0.00
Total Pulses	0.10	1.19	0.70	0.70

Table-9 reveals that the Compound Annual Growth rate with Analysis of Variance (ANOVA) for the food grains productivity in India. The table clearly indicates that the adjusted R Square is 0.988 and F value is 4981.219 which are significant, because the table value is less than 1 per cent (0.05 per cent). The coefficient value in the table indicates that the Unstandardized Coefficients for B value is 1.022, this value multiplied with hundred, then the result is 102.20. Further the same value is divided by hundred, the value is 2.20. Therefore, the result would be that the food grain productivity is grown to the extent of 2.20 per cent and therefore it is significant. Since the probability value is less than 1 per cent level (0.05). It can be said that the total food grains productivity in India has been growing at the rate of 2.20 per cent. The same thing has been presented in the Figure-1.

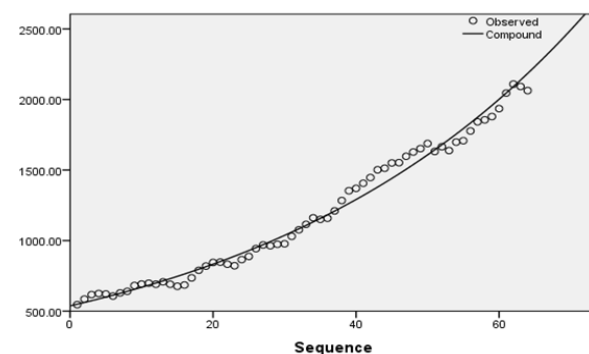
Table-9: Statistical Analysis Of Food Grain Crops Productivity In India

Model Summary				
Particulars	R	R Square	Adjusted R Square	Std. Error of the Estimate
Total Foodgrains	.994	.988	.988	.046

ANOVA					
Particulars	Sum of Squares	df	Mean Square	F	Sig.
Total Foodgrains	10.491	1	10.491	4981.219	.000

Coefficients Value					
Particulars	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Total Foodgrains	1.022	.000	2.702	3220.290	.000

Figure-1: The Performance Of Food Grain Crops Productivity During The Period 1952-53 To 2015-16



CONCLUSION:

In conclusion it can be said that in India there is a positive and significant growth rates for production and productivity of all major food grain crops, but the production of jowar, barley and total small millets are negatively growing. It is found that area under paddy, wheat, maize, tur and total pulses is increased marginally. The incremental increase in the cropped area (even for these crops the GR is very meagre now) for the crops like paddy, wheat and maize are primarily come from reduction in the area from coarse cereals i.e. jowar and bajra. It is also found that production of all the food grain crops except jowar, barley and small millets have shown satisfactory performance in their production during the same period (1952-53 to 2015-16). Notably wheat and maize have shown the increase in area, yield and production during the study period which can be due to its increasing demand for industrial usage.

The analysis clearly indicates that any crop is either replacing the other crop or is grown in the newly cultivated area therefore, the area remained more or less the same but the overall yield of the crop is increasing. Hence the growth of the area under food grains is non-significant so it is better to focus on increasing production through productivity by encouraging high yielding varieties of seeds, adequate supply of inputs and the transfer of technology and advisory services to the farmers who are engaged in the cultivation of food grains is the solution to take care of the growing demand for the food grain crops in the country.

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