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An Econometric Analysis of Agricultural Production and Growth in India Since 1966

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Abstract

Agriculture plays an important role in economic development, such as provision of food to the nation, enlarging exports, transfer of manpower to non-agricultural sectors, contribution to capital formation, and securing markets for industrialization. The present study discussed an agricultural production and productivity trend in India during from 1966-67 to 2020-21. Data on important variables like, Agricultural production, area under cultivation, and yield. The Econometric model is formulated with Lon Linear Regression Model, Chow Breakpoint Test and Unit Root Test. The major objectives of the study were to evaluate the performance of agricultural production in India, to analyse the trend of agricultural production, productivity and area under cultivation with GDP and major commercial crops in India from 1966-67 to 2010-21.

Keywords: cultural diplomacy, CRI sinhala Service, language, international media

Introduction

Agriculture plays an important role in economic development, such as provision of food to the nation, enlarging exports, transfer of manpower to non-agricultural sectors, contribution to capital formation, and securing markets for industrialization. After the institution of planning in India, the share of agriculture has persistently declined on account of the development of the secondary and tertiary sectors of the economy. From 55.3 per cent in 1950-51, the share of Agriculture and allied activities in GDP at factor cost declined to 37.9 percent in 1980-81. The share of agriculture and allied activities in GDP at factor cost was 14.6 percent in 2009-10. In 1951, 69.5 percent of the working population was engaged in agriculture. This percentage fell to 66.9 percent in 1991 and to 56.7 percent in 2001. In 2004-05, agriculture provided employment to 52.1 percent of the work force. However, with rapid increase in population the absolute number of people engaged in agriculture has become exceedingly large.

Agriculture provides raw materials to various industries of national importance. In India, for a number of years there are three agricultural commodities like cotton textile, jute and tea accounted for more than 50 percent of export earnings of the country. The share of agriculture in total exports rose to around 70 percent to 75 percent. With economic progress and consequent diversification of production base, the share of agricultural goods in total exports has consistently fallen. For instance, the share of agricultural exports

in total exports was 44.2 percent in 1960-61. This fell consistently to 30.7 percent in 1980-81 and 9.9 percent in 2009-10. The contribution of agriculture to GDP rose to 19.9 per cent in 2020-21, up from 17.8 per cent in 2019-20. It has decreased currently 15 per cent from the previous year.

Review of Literature

Shoaib et al. (2022), "Agriculture Production and Economic Growth in India Since 1991: An Econometric Analysis" the study focused on the major objective is to arrive into how agricultural production contributes to economic growth in India between 1991 and 2020. The secondary information collected from the RBI's Statistical Handbook and the Economic Survey of India from 1991 to 2020. Toole were used A Log-Linear Growth Regression Model, Unit Root Test, Johansen Co-integration Test and Augmented Dickey-Fuller tests. The log-linear regression growth model was applied, with GDP serving as the dependent variable and wheat, tobacco, rice, pulses, and sugarcane serving as explanatory variables. E-views-10 is used for the regression analysis. While the production of wheat, rice, and tobacco has a positive impact on India's GDP development, the production of pulses and sugarcane has an inverse, but not insignificant, impact. As a result, decreases in agricultural output have been paralleled by decreases in GDP growth.

Krishna and Shoaib (2022), "Agriculture Productivity and Economic Growth in India: An Ardl Model" analyzed investigate agricultural production and its influence on India's economic growth. Using secondary data from 1991 to 2020, the ARDL Model was used to estimate the long-run and short-run links between agricultural production and economic growth. Concluded the study demonstrate that inflation and GCA (-0.54 percent and -053) slowed India's GDP. coare cereal contributes greatly to GDP growth, hence its cultivation should be prioritised. As the basic diet of most Indians and a positive contributor to GDP, total foodgrain productivity and output must be improved.

Arun Prabha et al. (2021), in their study on "Trend in Area, Production and Yield of Coffee in India" analysed that coffee plantation during 2007-2020 in Tamil Nadu. It was used by secondary data. They observed that Area, Production and Yield of Arabica and Robusta coffee in India showed a positive trend. A negative trend was observed in productivity of Arabic coffee in India. Whereas in Tamil Nadu, area of Arabica and Robusta coffee showed positive trend, a negative trend was seen in production and productivity of Arabica and Robusta due to extreme weather conditions like erratic rainfall, high temperature and pest incidence prevailing in the major growing regions of Tamil Nadu.

Urmi and Minati (2017), examined that "Agricultural Production and Economic Growth in India: An Econometric Analysis". They followed log Linier growth, Johansen Co- Integration Test, Long run estimates. The result has shown that difference of GDP, Cereals, Tobacco, Tea, Coffee and Sugarcane production were 99 % level of confidence. Regarding long run estimate, there is a positive relationship between GDP and Cereals as mentioned by a coefficient of 0.07. There is an inverse relationship between GDP and Coffee production as denoted by a coefficient is 0.014425 and sugarcane is -0.000771. They found that farmers need to be given training in order to use of modern techniques of cropping productivity can be enhanced through attainment of resource use efficiency. Irrigation facility need to extend is terms of volume of production.

Objectives of the Study

1. To analysis the trend of Agricultural Production, Productivity and area under cultivation of Major Commercial crops with GDP in India.
2. How Agricultural production contributes to the Economic Growth in India 1966-67 to 2020-21.
3. To fit the log linear growth regression growth model and Unit Root Test to find out the relationship between Gross Domestic Product and the selected variables of Agricultural Production in India.

Methodology

Log Linear Regression Modal

The study used a Log Liner Growth Regression Model. The dependent variable is Gross Domestic Product (GDP) and the independent variable included five major crops such as Cereals, Tobacco, Tea, Coffee and Sugarcane.

Log GDP= β_0+ β_1 Log + TOTAL OILSEEDS+ β_2 Log COFFEE + β_3 LogCOTTON+β_4 Log RAW JUTE + β_5 Log SUGCAN+$\beta_5 TEA$+β_6 TOBACCO

Where, Log GDP = is the logarithm for Gross Domestic Product, = β_0 = is a constant

β_1,β_2,β_3,β_4,β_5 and β_6 = are parameters to be estimated.

Chow Breakpoint Test

E Views reports three test statistics for the Chow breakpoint test. The F-statistic is based on the comparison of the restricted and unrestricted sum of squared residuals and in the simplest case involving a single breakpoint, is computed as:

$$F = \frac{(\bar{u}'\bar{u} - (u_1'u_1 + u_2'u_2))/k}{(u_1'u_1 + u_2'u_2)/(T - 2k)}$$

Unit Root Test

A test of stationarity (or nonstationarity) that has become widely popular over the past several years in the unite root test.

If ρ=1, that is, in the case of the unit root, Y_i= ρ Y_{t-1} + u_t –1≤ ρ ≤ 1 becomes a random walk modal without drift, which we know is a nonstationary stochastic process.

Therefore, why not simple regress Y_t on its (one period) lagged value Y_{t-1} and find out if the estimated ρ is statistically equal to 1? If it is, than Y_t in nonstationary. This is the general idea the unit root test of stationarity.

For theoretical reason, we manipulate Y_t –Y_{t-1} = ρ Y_{t-1} –Y_{t-1} + u_t as follows: Subtract Y_{t-1} from both sides of = (ρ – 1) Y_{t-1} + u_t to obtain:

Which can be alternatively written as:

$\Delta Y_t = Y_{t-1} + u_t$

Table 1.1 Result of Long Run Estimates from 1966-67 to 2020-21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.281473	0.505369	-2.535717	0.0150
Coffee	0.153997	0.105328	1.462074	0.1512
Cotton	0.356484	0.083321	4.278428	0.0001
Raw Jute	-0.138119	0.141035	-0.979323	0.3330
Sugarcane	0.007812	0.172862	0.045194	0.9642
Tea	1.776220	0.249387	7.122355	0.0000
Tobacco	-0.140638	0.107568	-1.307434	0.1982
Total Oilseeds	0.003322	0.119278	0.027850	0.9779
R-squared	0.983957	S.D. dependent var		0.361174
Adjusted R-squared	0.981283	Durbin-Watson stat		0.872057
S.E. of regression	0.049412			
Sum squared resid	0.102544			
Prob (F-statistic)	0.000000			

Source: Values Computed from Hand Book of statistics on India Economy 2020-21 by using E-Views.

Table 1.1 shows the result of long run estimates in which GDP at factor cost is set as the dependent variable and rest of the variables are defined as the explanatory variables. Both R^2 and adjusted R^2 show quite significant outcomes at 98 per cent and 98 per cent respectively. The adjusted R^2 of 0.981283 implies that about 98 per cent of the variations in GDP are explained by the explanatory variable (Tea,

Coffee, Tobacco, Cotton, Sugarcane, Raw Jute and Total Oilseeds). That the every one per cent increase Tea production, GDP increases by 1.776220 percent on an average. This is because tea is a high value plantation crop which is produced in different states spreading over North East of the country. It is found that the contribution of tea is significant at 1 per cent level of significant.

The results also show that there is a positive relationship between GDP and Total oilseeds as denoted by a coefficient of 0.003322. However, it is statistically insignificant in explaining variations in GDP. It is also found that tobacco is having a positive contribution towards GDP but that contribution is not statistically significant.

There is an inverse relationship between GDP and coffee production as denoted by a coefficient is 0.153997. This is due to fluctuation production accounted by unfavorable weather causing delayed blossom and backing shower and high temperature in major coffee producing areas of Kerala and Karnataka. Even though these areas have irrigation facilities for a good harvest of coffee there is an absence of subsequent natural showers has reduced the coffee production in recent years. It is a curse of climate change.

In the case of sugarcane, there is an inverse relationship with GDP as denote by a coefficient is 0.007812 which indicates that for every unit increase in production of sugarcane result in a decrease in the GDP but not significant because of labour intensity and done by large. This may be attributed to reduction of area under sugarcane and absence of an organized base of information coupled with presence large farmers which discourages the sugarcane production. Insufficient irrigation is another cause.

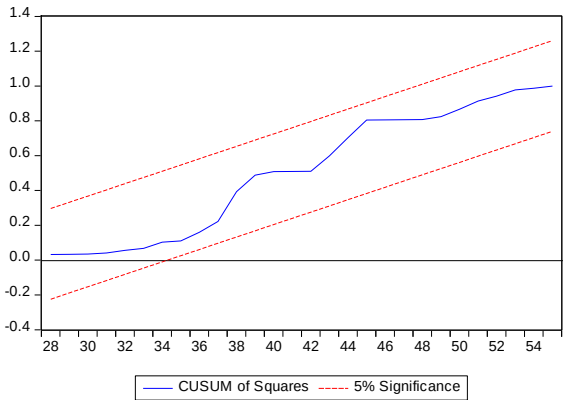

Table 1.2 Result of Structure Breaks in GDP and Commercial Crops in India since Green Revolution

Variable	Pre Reform (1966-67 to 1990-91)			Post Reform (1991-92 to 2020-21)		
F-statistic	4.721575	Prob. F(2,46)	0.0136	12.92075	Prob. F(2,46)	0.0000
Log likelihood ratio	9.335838	Prob. Chi-Square(2)	0.0094	22.29104	Prob. Chi-Square(2)	0.0000
Wald Statistic	9.443149	Prob. Chi-Square(2)	0.0089	25.84149	Prob. Chi-Square(2)	0.0000

Source: Values Computed from Hand Book of statistics on India Economy 2020-21 by using E-Views

Testing of Hypothesis

H: Null Hypothesis is rejected alternative hypothesis is accepted

H_1: Alternative hypothesis rejected null hypothesis is accepted

Interpretation: The null hypothesis is rejected, indicating a significant structural break in the regression model in 1976.

Table 1.3 Unite Root Result - Pre Reform

At Level								
With Constant	Variables	GDP	Coffee	Cotton	Raw Jute	Sugarcane	Tea	Total Oil Seeds
	t-Statistic	3.6699	-1.5836	0.1916	-2.5774	-0.3312	-1.7872	-0.4531
	Prob.	1.0000	0.4838	0.9696	0.1040	0.9128	0.3828	0.8918
With Constant & Trend	t-Statistic	-0.3296	-5.8380	-1.8504	-5.1459	-4.8797	-3.0386	-5.1837
	Prob.	0.9877	0.0001***	0.6658	0.0005***	0.0012***	0.1318	0.0005***
Without Constant & Trend	t-Statistic	6.7618	1.1035	1.6436	0.1257	3.6183	1.7877	2.0553
	Prob.	1.0000	0.9280	0.9742	0.7181	0.9999	0.9810	0.9897
At First Difference								
		d(GDP)	d(Coffee)	d(Cotton)	d(Raw Jute)	d(Sugarcane)	d(Tea)	(Total Oil Seeds)
With Constant	t-Statistic	-1.9538	-16.9299	-7.9211	-18.8046	-10.2634	-7.5753	-12.8189
	Prob.	0.3059	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
With Constant & Trend	t-Statistic	-1.5178	-18.5109	-8.0689	-19.9248	-10.1654	-7.6443	-13.3772
	Prob.	0.8107	0.0000***	0.0000***	0.0001***	0.0000***	0.0000***	0.0000***
Without Constant & Trend	t-Statistic	-1.8500	-14.4991	-7.5388	-16.2838	-6.4810	-6.6451	-11.5462
	Prob.	0.0617*	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant								
*MacKinnon (1996) one-sided p-values.								

Source: Values Computed from Hand Book of statistics on India Economy 2020-21 by using E-Views.

The above result examined that the first level with constant and trend of Coffee, Raw Jute, Sugarcane and Total oilseeds productions become stationary at 99 per cent level of confidence (it one percent level)

Table 1.4 Unit Root Result - Post Reform

At Level								
		GDP	Coffee	Cotton	Raw Jute	Sugarcane	Tea	Total
With Constant	t-Statistic	-2.8718	-1.7740	-0.0143	-2.9060	0.1455	-1.6898	-0.1391
	Prob.	0.0556*	0.3890	0.9528	0.0514*	0.9662	0.4305	0.9392
With Constant & Trend	t-Statistic	-3.6205	-2.5897	-1.9099	-5.1789	-6.5574	-3.2147	-5.1008
	Prob.	0.0377**	0.2865	0.6354	0.0005***	0.0000***	0.0926*	0.0006***
Without Constant & Trend	t-Statistic	-2.2305	1.5507	1.3197	-0.0073	2.7483	1.7577	1.7726
	Prob.	0.0261**	0.9688	0.9511	0.6757	0.9982	0.9798	0.9804

		At First Difference						
		d(GDP)	d(Coffee)	d(Cotton)	d(Raw Jute)	d(Sugarcane)	d(Tea)	(Total Oil Seeds)
With Constant	t-Statistic	-1.7328	-16.5486	-3.1399	-11.5882	-10.0002	-7.5540	-11.7637
	Prob.	0.4092	0.0000***	0.0299**	0.0000***	0.0000***	0.0000***	0.0000***
With Constant & Trend	t-Statistic	-2.8321	-16.6574	-3.2218	-6.3683	-9.9527	-7.6056	-11.7112
	Prob.	0.1933	0.0000***	0.0919*	0.0000***	0.0000***	0.0000***	0.0000***
Without Constant & Trend	t-Statistic	-1.6666	-15.4502	-2.8111	-11.6845	-8.9307	-6.6265	-11.2486
	Prob.	0.0900*	0.0000***	0.0058***	0.0000***	0.0000***	0.0000***	0.0000***
Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant								
*MacKinnon (1996) one-sided p-values.								

Source: Values Computed from Hand Book of statistics on India Economy 2020-21 by using E-Views.

The above result shows that the first level of constant and trend of Coffee, Raw Jute, Sugarcane and Total Oilseeds productions becomes stationary at 99 per cent level of confidence (i.e., one per cent level). The p values of GDP and commercial are less than the level of significance so the null hypothesis is rejected: "The time series does not have a unit root and is stationary."

Conclusion

The GDP range was 30 to 35 percent from agriculture. The current status is about 17 per cent in the agriculture, despite of a larger number of provisions, subsidies and facilitating function were made by the Ministry of Agriculture. In terms of classification of crops and products the market trend had been the same thing which is the proportionate range of demand and supply and exported input premises. The specified situation were aroused on Famine (1987, 1992, and 2011) shows that negative growth from both side. The economic growth of agriculture commodities and farmers prospects on their cultivation practices and processing activities where institutionalized after 1993 as per the norms of increased multiplication and acceleration of the regulated market in India. The study concluded that seasonal wise production and productivity of food crops were increased. The problem of unfair price of principle crops, inadequate facilities of irrigation, storage and marketing facilities to the farmers to decline the production and productivity of major crops were declined. So the study suggested that providing free seeds, proper crop insurance, irrigation facilities, know- how to supply, price support, proper monitoring by agriculture, control of migration, which in turn will certainly increase both production and productivity in India.

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