



An Economic analysis of determinants of Agricultural growth in India

M.Balageetha* Dr.V. Suthacini **

*M. Balageetha, Assistant professor, Department of Economics, Thiagarajar college, Madurai and Research scholar, School of Economics, Madurai Kamaraj university, Madurai balageethaeco@gmail.com

**Dr.V.Suthacini, Assistant Professor and Head, Department of Agricultural Economics, Madurai Kamaraj university, Madurai suthacini@gmail.com

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Abstract

The study focuses on factors determining agricultural gross domestic production India by considering secondary data from 1990 to 2023. Multiple regression analysis is applied to analyse the factors determining agricultural gross domestic product. The study considers agricultural GDP as a dependent variable and nine independent variables such as rural population, gross capital formation, gross sown area, gross irrigated area, fertilizer consumption, Agricultural Credit, Rain fall, Life expectancy of Indians and Inflation. The empirical results indicate that the rural population, fertilizer consumption, gross sown area, credit in flows, rain fall are positive and significant and also influences in agricultural GDP. However gross capital formation in agriculture, gross irrigated area, life expectancy and inflation are negative and not significant and do not influence agricultural GDP.

Keywords: Gross Domestic Product, multiple regression, correlation, rural population

I. Introduction

Agricultural sector is the largest economic sector in India. And it is the engine of economic growth and agricultural sector providing food and fodder supply, raw materials to the industrial sector and employment opportunities. The agricultural sector GDP is increasing but the percentage share to India's GDP is decreasing. The agricultural sector as a share of India's GDP has reduced from 57 percent in 1950-51 to 18.4 per cent in 2019-20 (NSO, MOPSI). The fluctuations in share of agricultural GDP due to some of the factors. There

are many factors determining to increase or decrease agricultural GDP. Some of the factors are weather conditions, available equipment, the demand and supply in the market, pest control, technological factors, infrastructural facilities, landholding and agricultural credit.

II. Objective

The main objectives of the study are

1. To identify the factors determining the agricultural growth in India
2. To study the relationship between the agricultural GDP and the factors determining the agricultural growth in India

III. Review of literature

Earlier studies made in this area have been studied regarding the factors determining agricultural GDP in various countries of the world.

Tamma Koti Reddy and Madhubanti Dutta (2018) investigated the impact of agricultural inputs on agricultural gross domestic product in India for the period 1980-81 to 2015-16. They employed simple regression analysis, agricultural GDP was taken as the dependent variable and fertilizers, net irrigated area, pesticides, electricity, rainfall and usage of HYV seeds were taken as independent variables. The study revealed that the variable like fertilizer and net irrigated area are not statistically significant but the variables like pesticides, electricity, rainfall and seeds were statistically significant which means that these variables had a significant impact on agricultural GDP during the study period.

Prasant Kumar panda and Rittu Susan



varkay(2019) examined the factors affecting agricultural output for the fifteen selected states of India for the period from 1991 to 2013. By using fixed effect model, they found that the gross sown area has positively and significantly contributed to the agricultural output of selected fifteen states. And further forest cover variable was found to be negative and significant

Sormeaux and Pemberton(2017) identified the factors that influence agriculture's percentage contribution to gross domestic product for a group of Latin America and Caribbean countries. This analysis employed the use of a random effects panel regression model for 1980-2009 for the Latin America and Caribbean countries. The findings of the study revealed that rural population, life expectancy, foreign direct investment, the rate of inflation, level of exports of all goods and services and the ratio of agricultural exports to agricultural imports significantly determined the percentage contribution of agriculture to GDP in these countries.

Temidayo Apata (2018) et.al examined public spending contributes positively to GDP growth in the agricultural sector in Malaysia compare with Nigeria GDP growth in agricultural sector. This study employed GDP as dependent variable and four independent variables namely public expenditure in agriculture, public investment, drivers of agricultural growth (research and development, credit delivery services and extension services) and indirect factors like internal and external invention. They concluded that public expenditure and GDP growth had an inverse relationship in Nigeria and direct relationship in Malaysia.

Abebe et.al analysed the factors influencing the agricultural output in Ethiopia. From the result, agricultural land has a positive significant effect on agricultural output. External debt and annual growth in service and industrial output affects the agricultural GDP negatively and significantly

Duru et.al (2018) examined comparatively the "impact of agricultural output on economic growth in Nigeria and Ghana. The study showed, the coefficients of the variables in Nigeria as follows; agricultural output AGO (-1.97), industrial output IDO (2.21) and service output SVO (-1.81)

which implies that the contribution of agriculture to GDP is insignificant in accelerating economic growth as compared to other sectors. However, industrial sector perform better in Nigeria than Ghana while in Ghana the coefficients are AGO(2.52), IDO(0.42) and SVO(1.44), which implies that in terms of contribution to GDP, agriculture contributed to Ghana GDP than other sectors followed by service sector.

IV. Data and methodology

The study is based on secondary data collected over a duration of 30 years from 1990 to 2023. The data is collected from various sources such as RBI database, NABARD, MOSPI and various volumes of handbook of statistics.

Tools of analysis:

For this analysis secondary data is used to analyse the factors determining the agricultural GDP in India. For this multiple regression is used. The model is

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \mu$$

Y = contribution of agricultural sector to GDP

X₁ = Rural population

X₂ = Gross capital formation in agriculture

X₃ = Fertilizer consumption

X₄ = Gross sown area

X₅ = Gross irrigated area

X₆ = Agricultural Credit

X₇ = Rainfall

X₈ = Life expectancy

X₉ = Inflation

If the result value is nearer to one means the correlation between variables is strong. If the result value is nearer to zero means that the correlation between variables is weak.



V. Analysis and interpretation

Table No.1 Descriptive statistics

VARIABLES	Minimum	Maximum	Mean	Standard deviation	skewness	kurtosis
AGDP	795575	2227533	1280416.06	377566.694	.904	.261
Rural population	661520801	898024053	803230848.17	74751389.969	-.435	-1.104
Gross capital formation in agriculture	59276	312518	168964.13	85666.481	.198	-1.535
Fertilizer consumption	122	299	204.53	58.443	.057	-1.532
Gross Sown Area	1739	2013	1918.37	64.028	-.489	.575
Gross Irrigated Area	632	1003	832.07	113.084	-.016	-1.150
Credit inflows	10188	1367970	359805.10	450030.967	1.191	-.029
Rainfall	695.70	994.40	869.4900	74.14476	-.504	.030
Life expectancy	58.15	69.73	64.4230	3.60274	-.134	-1.221
Inflation	3.330	14.000	7.27367	3.209523	.571	-.941

Source: Results are based author's calculation using SPSS

Table 1 reports descriptive statistics and the result shows that the mean value of agricultural GDP over the 30 years period is 1280416. The average annual growth of the rural population and gross capital formation in agriculture are 80323084 and 168964.13 with the standard deviation of 74751389, 85666.481 respectively. The mean value of gross sown area and gross irrigated area are

1918.37 lakh hectares, 832.07 lakh hectares with the standard deviation 64.028, 113.084 respectively. The average level of rainfall is 869mm with the standard deviation of 74. The mean value of the national inflation over the 30 years period is 7.2 percent with the standard deviation of 3.21 per cent

Table No.2
Correlation among factors determining agricultural GDP in India

VARIABLE	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9
Y	1.00									
X1	0.89	1.00								
X2	0.93	0.93	1.00							
X3	0.90	0.95	0.96	1.00						
X4	0.83	0.77	0.80	0.81	1.00					
X5	0.94	0.96	0.94	0.95	0.88	1.00				
X6	0.95	0.79	0.87	0.81	0.79	0.87	1.00			
X7	0.04	-0.08	-0.05	-0.02	-0.04	-0.06	0.53	1.00		
X8	0.93	0.99	0.95	0.96	0.80	0.98	0.85	-0.55	1.00	
X9	-0.34	-0.37	-0.21	-0.17	-0.17	-0.35	0.29	0.27	-0.36	1.00

Source: Results are based author's calculation using SPSS



Correlation result:

If the obtained values are over 0, the relationships are positive and stronger, and if they are closer to one, it means that the two variables are very strongly related to each other. Therefore, the correlations are positive and negative:

1. Between Y and X1-X9 variable

*There is negative correlation between Agricultural GDP and inflation (-0.34)

*There is high and positive correlation between Rural population (0.89), gross capital formation in agriculture, Fertilizer consumption, Gross sown area, Gross irrigated area, credit in flows in agriculture and life expectancy

2. Between independent variables X1-X9

*There is weak positive correlation between inflation with credit inflows (0.29)

*There is strong and high positive correlation between remaining variables. The obtained values of these variables are more than 0.05

*There is negative relationship between Rainfall with rural population, (-0.08), gross capital formation in agriculture (-0.05), fertilizer consumption (-0.02), gross sown area (-0.04), gross irrigated area (0.06) and negative relationship

between life expectancy with rainfall

*Except credit flows and rainfall, inflation have negative relationship between remaining variables.

Results of regression analysis

The value of R^2 was 0.978 per cent which indicates that fit was good and 97 percent of total changes in dependent variable (agricultural GDP) were explained by nine explanatory variable such as rural

population, gross capital formation in agriculture, fertilizer consumption, gross sown area, gross irrigated area, Agricultural Credit, Rainfall, Life expectancy and Inflation. In this study, investigated that the factors determining the agricultural GDP in India. The following table represents the result of regression the relationship between agricultural GDP (Y) and rural population (X_1), gross capital formation in agriculture (X_2), fertilizer consumption (X_3), gross sown area (X_4), gross irrigated area (X_5), Agricultural Credit (X_6), Rainfall (X_7), Life expectancy (X_8) and Inflation (X_9).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \mu$$

Table No 3 Results of Regression analysis

Explanatory variables	Coefficients	t-statistics	Significance	Standard Error
Constant (β_0)	8910990.099	1.570	0.132	5677492.870
Rural population (x_1)	0.013	1.791	0.088	0.07
AGCF (X_2)	-0.007	-0.010	0.992	0.772
Fertilizer consumption (X_3)	2423.349	1.845	0.080	1313.729
GSA (X_4)	416.215	0.692	0.497	601.236
GIA (X_5)	-254.148	-0.241	0.812	1054.772
Agricultural Credit (X_6)	0.940	3.416	0.003	0.275
Rainfall (X_7)	218.886	1.135	0.270	192.883
Life expectancy (X_8)	-299994.041	-1.711	0.102	175283.720
Inflation (X_9)	-6499.476	-1.012	0.324	6421.862
F stat				



R-square	0.978			
Adjusted R Square	0.969			

Source: Results are based author's calculation using SPSS

In the above table shows the result of multiple regression, value of R and R^2 are 0.978 and 0.969 which shows that there is close association between dependent variable and independent variable. The coefficient of $X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8$ and X_9 were statistically significant at one per cent probability level. The coefficient value of rural population indicates that at one percent increase in rural population, the agricultural GDP will increase by 0.013 per cent. Whereas the coefficient value of gross capital formation in agriculture showed that one percent increase in it will lead to the agricultural GDP to decrease by 0.007. Increase in fertilizer consumption leads to an increase of agricultural GDP by 2423.349. Moreover, the coefficient value of gross sown area (X_4) indicates that one percent increase in that leads to increase 416.215 percent in agricultural GDP.

The rural population, fertilizer consumption, gross sown area, credit inflows, rainfall are positive and significant and have influence in agricultural GDP. However gross capital formation in agriculture, gross irrigated area, life expectancy and inflation were negative and do not significant influence in agricultural GDP

VI. Conclusion

The agricultural policy formulated and implemented by the central government should focus much more on agriculture and its subsectors (crops, forestry, fisheries) as the major contributors to the GDP in general and agricultural GDP in particular. Government of India should make some intervention in the agricultural sector by introducing innovative agricultural technologies at low cost that could improve the subsectors share in the overall agricultural GDP. It is very important to encourage the gross capital formation in agriculture to enhance the contribution of the agricultural sector in India. Agriculture has potentials to increase the GDP of India.

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