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AN ECONOMETRIC ANALYSIS OF THE IMPACT OF AGRICULTURE SECTOR ON ECONOMIC GROWTH IN INDIA: A POST REFORM STUDY

Ms. Umang Bhutani[1], Dr. Nisha Singla[2]
(Assistant Professor in Economics)
Dev Samaj College for Women, Sector 45-B, Chandigarh, India.

ABSTRACT

Role of the agriculture sector in economic growth is a matter of debate among many economists. Despite the growth of the service sector, agriculture continues to be the backbone of the country's GDP, as a large number of rural people depend on it for their survival. This study examines the relevance of the agricultural sector to India's economic growth during 1991-2020. Quantitative methodology and time series data extracted from secondary sources are used in the study. Moreover, the Auto Regressive Distributed Lag (ARDL) model in statistical software E-views-9 is utilized to analyze the relationship between the variables in the long run. Granger causality has also been used to examine the short run relationship between the variables. The findings of the study revealed that the agriculture sector has a significant and positive impact on India's economic growth only in the short run.

Keywords:- Economics Growth, Agriculture Sector, ARDL.

INTRODUCTION

Despite of the major contribution of the service sector in the India's economic growth annually, we all know the agriculture sector is still continuing to be the backbone of the Indian economy. As per economic survey 2022-23, agricultural sector is contributing nearly 15% to the total GDP and provides employment to about 58% people. It can be fairly said that this sector constitutes the major source of livelihood to around 2/3 of the general public. It is well known fact that most of the India's rural population depend upon farming for their basic requirements. Agriculture sector also helps other sectors to grow by providing them raw materials and even helped in alleviating poverty and unemployment in the economy.

Agriculture for developing countries like India is one of the significant sectors of the economy. As per the economic data of financial year 2022-23, near about 60% of India's geographical area is covered by agriculture sector. Although, its share in India's GDP has declined dramatically but still it has the significant place in the growth and development of the economy. It is evident from the historical background that the country has evolved from a dependent nation to a more self-sufficient country in terms of food grains. Currently, we can proudly say that the agricultural sector has developed a lot with time and it has not only made us independent in food grain production but also we could successfully build the reserves of it to meet future contingencies. After the food crisis of 1960s, the policy makers compelled the government to frame a more comprehensive and integrated agricultural policies to meet the food requirements of the growing population and the result was the adoption of modern green revolution policy which was adopted in 1967 to make the country more food secure. It worked splendidly in many ways like adding additional area for the cultivation, improved irrigation techniques, water management techniques, use of better quality seeds, use of fertilizers and pesticides etc.

In the field of foreign trade, this sector also shows a great performance by exporting large amount of commodities such as cereals, pulses, fresh fruits, dairy products, marine products etc. and contributes about 2.5% to the total world's agricultural exports. Indian economy is the highest producer of rice amounting to 9671.1$ million followed by Marine products 7772.4$ million, dairy products 4141.0$ million, spices 3896$ million etc. which helped the economy in procuring more foreign currency. India's top ten agricultural export commodities are rice, marine products, buffalo meat, cotton, spices, sugar, castor oil, oil meals. The total food grain production has increased from 176.6 MT in the year 1990-91 to 305.45 MT in the year 2020-21. Promotion of agriculture exports is significant not only for earning foreign exchange but also to achieve the goal of Atmanirbhar Bharat.

In addition to this, the agriculture sector has also the potential to boost the industrial and service sector in smoothen way. Moreover, growth in agriculture sector can also help in achieving overall economic growth by releasing capital along with labour to the other sectors of the economy. From the above discussion it is evident that the agricultural sector is important for all the developed countries like India that is why, the present study has focused on its impact on the economic growth of Indian economy for the period 1991-2021.

Trends in production of some of the agricultural and allied activities

: Figure 1

Figure 1: Trends in agricultural production.

Year	**1990**	**2020**
Food crops	1763.9	3107.4
Non-food crops	1006.77	2093.63
Horticulture	96.6	326.6
Milk production	53.9	208
Fish production	3.84	14.07

Source: Handbook of statistics on Indian Economy

It is evident from the table 1 that there is manifold increase in the production of all the agricultural commodities with in a span of three decades.

Contribution of agriculture Sector in Indian Economy : Figure 2

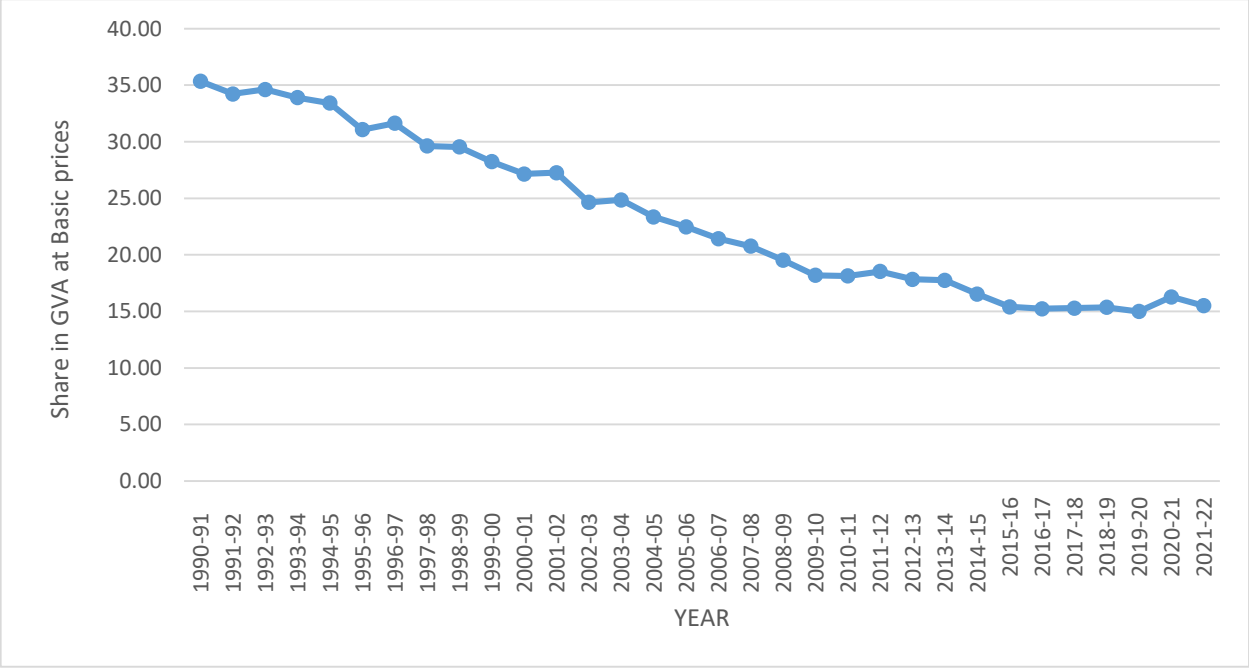

Figure 2 Source : RBI

It is evident from the above graph that the share of the agriculture sector has declined dramatically from about 35% in 1990 to nearly 15% in the year 2022. The possible reasons for the declined contribution are population pressure, unprofitable holdings, decline in the fertility of the soil, underdeveloped support services, poor irrigation infrastructure etc.

OBJECTIVE OF THE STUDY

The present study is an attempt to analyse relationship between economic growth and agriculture sector (and its allied activities) both in short run and long run in the Indian Economy for the period 1991-2022 by using ARDL Bounds Testing approach.

REVIEW OF LITERATURE

Katircioglu (2006) conducted a study on causality between agricultural and economic growth in North Cyrus**.** Granger causality test showed unidirectional causation from agriculture production and bidirectional causation between the variables exist at different lag lengths. **Safdar et.al. (2012)** explored a study on impact of agriculture volatility on economic growth in Pakistan during 1972-2011. The study found that agriculture sector is highly volatile during past decades and have confirmed the existence of negative and significant relationship between agricultural volatibility and economic growth**. Sahoo, K. & Sethi, N. (2012)** conducted a study on Investigating the Impact of Agriculture and Industrial Sector on Economic Growth of India by using Ordinary Least Square (OLS) test. The results find that both agriculture and industry have significant positive impact on both economic growth and development in India. But the result indicates that agriculture has shown more significant positive impact on economic development during the study period. **Awan & Alam, et. al. (2015)** explained a study on the impact of agriculture productivity on economic growth in Pakistan during the 1972-2012. The study found that economic growth of the country has positive trend in agricultural value added. **Odero (2017)** explained a study on analyzing the casual relationship between agricultural value addition and the economic growth in NAMIBIA in the period 1980-2015**.** The results of co-integration found a long run effect among the variables. Moreover, the Granger causality test showed a short term a unidirectional causality from the agricultural value added to economic growth. **Mohammed (2020)** explored a study on the causality between the agriculture sector and the economic growth in the Arab nations during 1980-2018. The results shows the existence of long run relationship exist between the variables. The study suggest that the agricultural sector should continue to foster better growth and development by providing inputs to other sectors of the economy. **Ogundary (2021)** conducted a study on causal relationship between the economic growth and the agricultural productivity in Sub Saharan Africa by using a panel co-integration method. The results showed that in long run and short run agricultural Total factor productivity (TFP) has a significant positive and negative effects respectively on economic growth. But, there is no significant effect is seen on economic growth on the agricultural TFP in long and short run both. The results also showed the evidence of uni-directional causality from agricultural TFP to economic growth in the short period. **Khan, & et. al. (2019)** conducted a case study on the contribution of agriculture in economic growth of West Bengal, India by using co-integration analysis. The findings of the study revealed that agriculture sector has appeared as an important contributor to drive West Bengal economic growth even after declining share in gross state domestic product over the years.

DATA SOURCES AND METHODOLOGY

Annual time series data is taken from the Handbook on Indian economy by the RBI for the period 1991-2021. The data has been analysed in E views-9 statistical software. Moreover, for the empirical analyses, the variables are transformed into their natural algorithm to reduce the disturbing influence of the outliers in the extracted data. The data from the year 1991 to 2011 was available at 2004-2005 basic prices and the data from 2011-2021 was available at 2011-12 basic prices. Therefore, the data has been shifted from the old base year i.e. 2004-2005 to a new base year i.e. 2010-2011 by using statistical tool named splicing and shifting base year formula for uniformity of data.

Long-Run Analysis: ARDL Bounds testing Approach

The study has used ARDL Bounds testing technique to examine the long-run relationship between the variables for the period 1991-2021. The estimation procedure involves the succeeding steps. Firstly, for testing the presence of unit root in the variables, the Augmented-Dickey Fuller (ADF) by D.A. Dickey and W.A. Fuller (1979 and 1981). and Phillips-Perron (PP) tests have been applied. Based on the results, in the next

step, ARDL Bound testing approach is used to analyse the long-run relationship between the variables and in the last step, Granger's causality test/Block Exogeneity Wald test in a multivariate VAR framework has been applied to deduce short-run relationship and direction of causality by using Eviews software.

Economic growth is expressed as Gross Value Added at Basic Prices (GVA) and the agricultural Sector (AG) which also combines allied activities pertaining to agriculture. The regression model of the study is as follows:

$GVA = f(AG)$ (1)

Transforming the equation (1) into linear equation i. e.

$GVA_t = \alpha_o + \alpha_1 AG + \varepsilon_{1t}$ (2)

Where, α_o, is a constant, α_1 is a coefficient of GVA the agriculture sector and ε_{1t} is the error term in the model which is in the equation (2). All the variables are transformed into their natural logarithms. Therefore, the final description of the model is presented in succeeding equation:

$\ln GVA_t = \alpha_o + \alpha_1 \ln AG + \varepsilon_{1t}$ (3)

Firstly, the stationarity of the variables is checked as the ARDL method needs variables to be stationary at either I(0) or I(1) levels. Unit root tests are broadly used to check stationarity. The present study has used ADF and PP test to check the unit root at both level and at the first difference level. The null hypotheses in the ADF and PP tests are the lnGVA and lnAG have unit root i.e. the series is non-stationary. The results are exhibited in Table 1 and 2.

Table 1: Unit Root Table : ADF, PP and KPSS (Schwarz Info Criterion); lnAG

Tests	**ADF**	**PP**
Level (Intercept)	0.558113 (0.986)	1.943618 (0.9997)
Level **(Trend and Intercept)**	-3.567875 (0.0495)**	-3.708936 (0.0367)**

Note: 1. The results have been computed by using ADF test using Eviews software 9.
2. *, ** and *** represents significance at 10, 5 and 1 percent levels of significance respectively

Table 2: Unit Root Table : ADF, PP and KPSS (Schwarz Info Criterion); lnGVA

Tests	**ADF**	**PP**
Level (Intercept)	-0.300657 (0.9138)	-0.300537 (0.9138)
Level **(Trend and Intercept)**	-1.308216 (0.8657)	2.159089 (0.4945)
1st Difference (Level)	-2.033619 (0.2716)	-6.115333 (0.0000)***
1st Difference (Level and Intercept)	-5.097857 (0.04781)**	-

Note: 1. The results have been computed by using ADF test using EViews software 9.
2. *, ** and *** represents significance at 10, 5 and 1 percent levels of significance respectively.
Source: Computed

The results from the tests show that lnAG is stationary at I(0) by using both ADF and PP tests, as depicted in Table 1. The p-value is statistically significant at 0.0495% and 0.0367% by using both ADF and PP test respectively. Whereas, lnGVA is stationary at I(1) by using both the tests as shown in Table 2 i.e., at 0.04781% at both level and intercept by using ADF and at 0.0000% by using PP test. The results qualifies for the usage of ARDL model to deduce the long-run relationship between the variables. In the next step, the existence of long-run relationship will be examined by using the Bounds test approach. Following is the ARDL equation of the model, when GVA is a dependent variable:

$\Delta \ln(GVA)t = \alpha 0 + \sum_{j=1}^{n} bj\Delta \ln(GVA)_{t-1} + \sum_{j=0}^{n} cj\Delta \ln(AG)_{t-j} + \delta 1 \ln GVA_{t-1} + \delta 2 \ln AG_{t-1} + \varepsilon_{1t}$ Where δ1 and δ2 are the long-run multipliers, while the parameters bj, and cj are the short-term dynamic coefficients of the ARDL model. The null hypothesis of the no co-integration (H_{01}: δ1 = δ2= 0) is tested against the alternative hypothesis of the presence of co-integration ((H_{11}: δ1 ≠ δ2≠ 0). Table 3 displays the results of the Bounds test.

Table 3: F- Bounds test		
Significance	I(0) Bound	I(1) Bound
10%	4.04	4.78
5%	4.94	5.73
2.5%	5.77	6.68
1%	6.84	7.84
F-Statistic	3.305617	
Source: Computed		

The criterion says that if the f-value is below than I(0) bound, then we cannot reject the null hypothesis of non-existence of co-integration relationship and if the f-value is greater than the I(1) bound, we can reject null hypothesis and accept alternate hypothesis of existence of long-run co-integration relationship between the variables and if the f-statistic falls between the bounds, the test is inconclusive. The results of ARDL Bounds test found that the value of f-statistic is lower than I(0) Bound i.e. 3.305617< 4.04 even at 10 percent level thus, it strongly advocates there is non-existence of long-run relationship between the variables. In the next step short-run causality will be analysed by using VAR Granger Causality/Block Exogeneity Wald Tests.

Short-Run Analysis: VAR Granger Causality/Block Exogeneity Wald Tests

The null hypothesis represents there is non-existence of short-run causality relationship between the variables against the existence of the same as an alternate hypothesis for the period 1991-2021. As per econometric guidelines, null hypothesis is rejected, if the p-value is less than 5% level. Before applying the model, lag-length of the model has been checked and the results are presented in the table 4 which clearly concludes that the optimum lag-structure is 1-2 as majority of the tests are in favor of lag-length 2.

Table: 4 lag-length structure						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	31.18122	NA	0.000490	-1.945415	-1.852002	-1.915531
1	131.1852	180.0071	815e-07	-8.345677	-8.065438*	-8.256026
2	137.2933	10.18017*	7.12e-07*	-8.486217*	-8.019151	-8.336799*
Source- computed						

In the next step, the VAR Granger Causality Test by C. Granger (1969 and 1980) has been applied to analyse the short-run causality between the variables. The results depicted in Table 5 clearly show a uni-directional causality running from lnAG to lnGVA in the short-period at a 5% level of significance, i.e., 0.0408% < 5% level of significance. Whereas other way causality was not found as the p-value is statistically insignificant i.e., 0.6883% > 5% level of significance.

Table 5: VAR Granger Causality/Block Exogeneity Wald Tests			
Dependent variable: D(LNGVA)			
Excluded	Chi-sq	Df	Prob.
D(LNAG)	6.397558	2	0.0408
All	6.397558	2	0.0408
Dependent variable: D(LNAG)			
D(LNGVA)	0.746981	2	0.6883
All	0.746981	2	0.6883

Residual Testing

Residual testing of the model has been done, and the results are presented in tables 6 and 7. Since the p-value in both cases is above the 5 % level of significance i.e., at 0.2125% and 0.5464% respectively for serial correlation and heteroscedasticity. Thus, we conclude that the model is fitted well and is also free from both problems.

Table 6: VAR Residual Serial Correlation LM Tests		
Lags	LM-Stat	Prob
1	6.395803	0.1715
2	5.825698	0.2125
Source- computed		

Table 7: VAR Residual Heteroskedasticity Tests		
Chi-sq	Df	Prob.
22.55085	24	0.5464
Source- computed		

CONCLUSIONS AND RECOMMENDATIONS

With the view of the importance of agriculture in the life of Indians, it is very important that the crop production should increase and also starts contributing mainly to the GDP of the country. It is clear from the study that agriculture sector contributing a significant part towards the GDP growth. The current study did not find any long run relationship between the variables i.e. lnGVA and lnAG by using ARDL Bounds testing approach but a unidirectional short run causality is found to be running from lnAG to lnGVA by using VAR Granger Causality Tests. There is no doubt that this sector has no long-run impact on the economic growth of Indian economy but half of the population is dependent upon agriculture and its allied activities for their livelihood. It provides both wage goods as well as raw materials without which is important for the human survival.

I. It is suggested to increase the share of agriculture sector in India's GDP and farmers need to be given training to use the modern techniques of cropping so that the productivity can be boosted and their work should also be regularly monitored.
II. Adequate credit and insurance facilities should be provided to inspire the farmers for improving the farming activities.
III. Storage and marketing facilities should also be provided to prevent the distress of sale as it has a hindrance in agricultural production.
IV. Farmers should be motivated to produce the high quality products which can help in appealing a good price in the market.

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