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Causal relationship between agricultural exports and economic growth: a diagnostic approach

Ankit CHHIKARA
Chaudhary Ranbir Singh University, Jind
ac.ankit.chhikara@gmail.com
Laurel PASRICHA
Kurukshetra University, Kurukshetra
laurelpasrichaphd@kuk.ac.in

Abstract. *This study attempts to investigate the causal relationship that exists between agricultural exports and economic growth for the time period starting from 1992-93 to 2018-19. Gross Domestic Product (GDP) has been used as the proxy of the economic growth. The study applied the unit root testing for checking the stationarity of the data which comes out to be integrated at level 2. The study used Johansen co-integration test to understand if there is any co-integration between the two variables of the study i.e. agricultural exports and economic growth. Vector Error Correction Model has been used to know if there is short run or long run causality between them. The results revealed that there is short run causality between the taken variables when GDP is taken as independent and agricultural exports as dependent variable but not vice-versa. Granger-Causality test shows that there is unidirectional causality running from gross domestic product to exports of agricultural products. The study would help in policy formulation in a way that gives boost to economic growth and thus the agricultural exports.*

Keywords: causality, agricultural exports, economic growth.

JEL Classification: C30, C32, F14.

1. Introduction

Agriculture is indeed one of the most crucial sectors of the Indian Economy**.** While earlier farming was done for subsistence of the families, it is now being replaced by commercial agriculture. India is a country where more than 50 per cent of population depends upon agriculture for earning their livelihood. Agricultural development is therefore, necessary for economic sustenance and building a strong base for the economy. As per 2018, Government of India statistics, around 17-18 per cent of the total Indian GDP is contributed by the agriculture sector. The common feature of under developed and developing countries is that agriculture is still the most important sector as far as generation of employment and very survival of the people is concerned.

India is not only climbing the ladder of becoming self-sufficient but also playing an important part in international trade as well. Balance of payment disequilibrium is indeed one of the most common problems faced by most of the developing nations. This disequilibrium can be improved upon by increasing exports of the country and agricultural exports contribute a good share in total exports of India. The share of agriculture exports in total exports was nearly 12 per cent in 2018-19. India is an exporter of variety of products. Top exports of India include mineral fuels, precious metals, machineries, vehicles, organic chemicals, pharmaceuticals, iron, steel, cotton, clothing, agriculture and allied products. Coffee, tea, oil cakes, tobacco, cashew kernels, spices, raw cotton, rice, fish and fish preparations, meat and meat preparations, fresh fruits and vegetables and processed fruits and vegetables are the major export items among agro-products of the country. Among the horticultural commodities, processed fruits and vegetables account for the largest share of exports followed by fresh fruits and vegetables. Among fruits, it is the mango that accounts for major share in export earnings. These are exported to more than 100 nations and regions such as Middle East, SAARC countries, the European Union, United states etc. However, the country is facing stiff competition from both existing and new entrants, the major being China, Malaysia, Philippines, Thailand, Singapore and Indonesia. The products of these nations indeed pose a great deal of threat to Indian agricultural exports.

The agricultural exports from developing countries are confined to only raw material and some beverage crops and plantation crops. The agro-exports of these developing nations find it difficult to give tough competition to the subsidized exports of developed nations. Therefore, it is imperative for these nations to identify non-traditional agricultural exports having high prospects of growth in the world market such as horticulture, fruits and vegetables, fish and meat etc. It does not mean that traditional exports need to be abandoned or given less priority. Quality production and higher productivity is the need of the hour to sustain the world market. To achieve the objective of higher growth, creating effective demand and creation of larger employment opportunities, there is a need to devise and properly implement export oriented agricultural policy.

India is aiming to double the income for “Anndaata” by 2022. The agriculture in India is expected to have momentum as the investments in developing infrastructure facilities such as irrigation facilities, advancement in research related to agriculture, warehousing and cold storage facilities have increased manifold. Furthermore, the growth in usage of genetically modified crops will improve the quality and amount of produce. India targets to raise the average income of a farmer from ₹96,703 (US$ 1,505.27) in 2015-16 to ₹219,724 (US$ 3,420.21) at current prices by the year 2022-23.

Changes in export policies can bring changes in the composition of exports as well as the markets to which India can export. In order to promote export of agricultural commodities it is necessary to examine the changes in the composition of exports of agricultural commodities and give a focus on commodities in which India has a comparative advantage. This article explores the causal relationship between agricultural exports and economic growth. ADF and PP unit root test is applied to identify the stationarity properties and Johansen co-integration test is used to examine relationship between the taken variables. Also, Granger causality test is applied to identify the direction of causality that exists between agricultural exports and economic growth.

The rest of the paper is organised as- Section 2 presents the review of literature; Section 3 discusses the data and empirical methodology; Section 4 discusses the empirical analysis; and Section 5 concludes the study.

2. Review of literature

Relationship between agricultural exports and economic growth is important to understand as these variables are vital for the sustenance of the economy. Guntukula (2018) examined the relation that exists between exports, imports and economic growth of India. The output of co-integration test revealed that there is long run relationship among the exports, imports and economic growth. There was bi-directional relation between exports and economic growth of India as well as between imports and economic growth of India. The bidirectional relation support export-led growth hypothesis and growth-led export hypothesis in India. Bala and Sudhakar (2017) found the significant improvement in agricultural products. Exports of products such as cereals, guar gum, spices, cotton had shown significant increment while that of fish and marine products, coffee, tea had shown decrease. Kumar (2016) examined the relationship between exports and economic growth of India. The study shows that positive and significant relation exists between exports and gross national product of India. The manufacturing exports are negatively associated with gross national product. Limbore and Khillare (2015) analysed the production and exports of wheat in India. The study showed that India is one of the largest producers of wheat but in terms of exports, wheat was not having much largest share in total agricultural exports. The study suggested of improving exports strategies so that exports of wheat can be improved upon.

Sahni (2014) analysed the trends present in the exports of India using trend series data and made a comparative study of these trends in pre and post reform period. The study found that exports of India have increased significantly after reforms but still the share of India in total exports of the world is not satisfactory. During post-reform period, agricultural products showed the Compound Annual Growth Rate of 9.7 per cent in comparison to 1.9 per cent in pre-reform period. Similarly, Compound Annual Growth Rate of minerals and ores showed a significant increase.

Nabi and Dhami (2013) showed that exports have increased in post WTO period to 9.5 per cent in comparison to -2.8 per cent during pre WTO period. Thus WTO was having positive impact on the agricultural exports of India. Export index also showed an improvement during post-WTO period and reached to 98 per cent level. Mishra (2011) analysed the relationship between exports and economic growth of India. The co-integration shows that there is long rum equilibrium relationship between the two. VECM shows that there is short run equilibrium relation between them. The study shows that the causality is running from gross domestic product to exports of India.

Thomas and Sheikh (2010) revealed that share of agricultural exports in exports decline to 10 per cent from 17.9 per cent over the period of study. All the agricultural commodities have shown an increase in growth of their exports except tea and coffee. Compound Annual Growth Rate (CAGR) of total agricultural exports was 9.2 per cent. Shinoj and Mathur (2008) recalled that exports of commodities such as oil meals, cashew nuts have maintained their competitiveness but for products such as tea, spices, marine products, India have lost it advantage to other Asian nations Since India's position was found to be eroding the study suggested of reforms in the export policies. Kundal and Sharma (2006) analysed the agricultural exports of India in new economic environment. The proportion of agricultural exports in total exports showed an increase from 18.7 per cent in 1991-92 to 20.4 per cent 1996-97 but after that it continued to decline and became 12.8 per cent in the year 2002-03. Fish and fish preparations contributed maximum in agricultural exports while the share of raw cotton is minimum. Dawson (2004) examined the relationship among the agricultural exports and economic growth and shows that investment in the agriculture exports sector had statically identical impact on the economic growth, as investment in the non-agricultural sector.

Ghatak and Price (1997) analysed the exports composition and investigate the relation between export and economic growth of India. The result shows that with the help of co-integration there is long run relation between the exports and economic growth. Jeromi and Ramanathan (1993) analysed growth and instability of world pepper market and India. The study shows that Sri Lanka has the maximum growth rate of 25.59 per cent and Madagascar has the minimum growth rate of -5.14 per cent. India have growth rate of 3.65 per cent that is above world growth rate that is 1.34 per cent. Chand and Tewari (1991) studied the behavioural pattern of growth and instability of exports and imports of agricultural commodity of India. The study shows that the share of agricultural exports decreases during the year from 90.2 per cent in 1970-73 to 84.5 per cent in 1985-88. Coffee, tea and cocoa has the maximum share in the agricultural product exports and pulses remain in the bottom. The percentage of import of agricultural commodity also decreases over the period of study from 74.5 per cent in 1970-73 to 65.8 per cent in 1985-88.

3. Research methodology

This section discusses the sources that have been explored for the collection of relevant data, study period; variables used and also discuss the tools and techniques that have been applied to come up with the results of the study.

3.1. Data sources

The study completely rests on the secondary data. The data is collected from various secondary sources such as *Directorate General of Commercial Intelligence and Statistics (DGCI&S), Department of Agriculture Cooperation and Farmers Welfare, Economic survey Ministry of Finance, Reserve bank of India and* World Bank. For the analysis, annual data for the period 1992-93 to 2018-19 has been collected. The study is based on time series analysis of data of agricultural exports and GDP. GDP has been used as a proxy for economic growth.

3.2. Methods of the study

To find the relationship among the variables unit root test, co-integration test, VECM and Granger causality is used.

3.2.1. Unit root

Unit root testing is done to know about the stationarity of time series data. For a series to be called as stationary, the mean (μ) and the variance (σ^2) of the variables should be consistent or don't vary with respect to time. Augmented Dickey Fuller Test and Phillips Perron test have been used for testing the stationarity of the data.

Augmented Dickey Fuller test

Augmented Dickey Fuller test is the most commonly used test to understand the stationarity of the time series variables (Dickey and Fuller, 1979). This test is an improved version of Dickey Fuller test. The Dickey fuller test is based on the assumption that the errors are uncorrelated (Gujarati, 2007), while the ADF test assumes that the errors can be correlated by introducing the lagged value of dependent variable as an independent variable in the equation. Augmented Dickey-Fuller test specification used here is as follows:

$$\Delta x_t = \alpha_0 + \theta x_{t-1} + \sum_{i=1}^{n} \gamma_i \Delta x_{t-i} + u_t$$

Phillips-Perron test

Phillips-Perron (PP) test is the alternative of the ADF test to test the presence of unit root among variables of time series. The PP test is non-parametric test while the ADF test assumes the error as independently distributed. In the PP test, the lagged difference is not added (Gujarati, 2007).

3.2.2. Co-integration test

When the two variables are co-integrated they share a common stochastic trend over time. To test the co-integration among the variables, Johansen co-integration test is applied. This test is applied when the variables are stationary at same level of integration. It is based on two test statistics which are the trace test statistic and the maximum eigenvalue test statistic.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln\,(1 - \lambda_i)$$

And

$$\lambda_{max}(r, r+1) = -T\ ln(1 - \lambda_{r+1})$$

Where, λ_i is the i^{th} largest eigenvalue of matrix Π and T is the number of observations and λ_{r+1} is the $(1+r)^{th}$ largest squared eigenvalue.

3.2.3. Vector Error Correction Model

Once the co-integration is established among the variables, then VECM can be applied to find the further inferences. If the variables are not co-integrated then the VECM is not useful to apply. In this situation Vector auto regression (VAR) gives more appropriate result. The VECM model is applied to find the long run and short run equilibrium relationship among the variables. The VECM is a restricted VAR designed to use when there exist co-integration among the variables. The co-integrated term is also known as error correction term which shows the speed of adjustment of any disequilibrium towards the long run equilibrium state. The general form of VECM is as follows:

$$\Delta x_t = \alpha_0 + \lambda_1 EC_{t-1}^1 + \sum_{i=1}^{n} \alpha_1 \Delta x_{t-i} + \sum_{i=1}^{n} \alpha_j \Delta y_{t-j} + u_t$$

$$\Delta y_t = \beta_0 + \lambda_2 EC_{t-1}^2 + \sum_{i=1}^{n} \beta_1 \Delta y_{t-i} + \sum_{i=1}^{n} \beta_j \Delta x_{t-j} + \varepsilon_t$$

Where EC_{t-1} the error correction term is lagged one period and λ is the short run coefficient of error correction term.

3.2.4. Granger Causality test

To test the causality among the variables granger (1969) test is used. This test states that a variable x_t is said to Granger-Cause y_t, if y_t can be predicted with greater accuracy by using past values of the x_t variable, all other terms remaining constant. In Granger Causality, there are bivariate regressions of the under mentioned form:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots + \alpha_n y_{t-n} + \beta_1 x_{t-1} + \cdots + \beta_n x_{t-n} + u_t$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \cdots + \alpha_n x_{t-n} + \beta_1 y_{t-1} + \cdots + \beta_n y_{t-n} + \varepsilon_t$$

4. Causal relationship between agricultural and allied products exports and economics growth

4.1. Descriptive statistics

In order to understand the basic behaviour of the data series, descriptive statistics are measured. Descriptive statistics of the variables of the study- agricultural exports and Gross Domestic Product (GDP) have been shown in Table 1. Different measures of central tendency, dispersions and distribution are calculated and are shown in table 1.

Table 1. *Descriptive statistics*

Statistics	Agricultural exports	GDP
Mean	98304.78	6052567
Median	46703	3632125
Maximum	271358	19010164
Minimum	9457	761196
Std. Dev.	93697.79	5480511
Skewness	0.7873	0.9932
Kurtosis	1.9157	2.7371
Jarque-Bera	4.1123	4.5168
Probability	0.1279	0.1045
Sum	2654229	1.63E+08
Sum Sq. Dev.	2.28E+11	7.81E+14
Observations	27	27

From table 1, it is evident that both the variables have positive mean and there is high degree of variability as shown by the value of standard deviation. The results of Jarque-Bera shows that the data series is not following normal distribution. Table 1 shows that value of both the variables are positively skewed.

4.2. Testing the stationarity of the data

When the data is stationary, it means that statistical properties of time series data do not change over time. Several statistical models and tests rely on this very concept. The use of non-stationary time series not only gives a meaningless relationship but also leads to spurious regression when the method of Ordinary Least Square is applied. Therefore, before examining the causal relationship between agricultural exports and gross domestic product, the first step is to see whether the data series are stationary or not. For examining the stationarity of the variables, unit root test is applied. Time series is said to be stationary when mean, variance, standard deviation of the series become constant over time.

4.2.1. Unit root test

The test of unit root is done in order to determine the order of integration of the time series. If the series is stationary at level then it is said to be integrated of order 0 (I(0)) or the series is stationary without any difference. If the series is non-stationary at level, then the series must be differenced once so that data becomes stationary. The series then is said to be integrated with order 1 i.e. (I(1)). If the series had to be differenced twice to make it stationary, the series is said to be integrated with order 2 i.e. (I(2)). In order to check the stationarity of the variables, Augmented Dickey-Fuller test and Phillips-Perron test have been used.

4.2.2. Unit root test for agricultural exports and GDP

The result of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test for agricultural exports and GDP is presented in table 2 and Table 3 respectively.

From results of ADF test and PP test (See Table 2 and 3), it can be seen that agricultural exports as well as GDP are not stationary at level or first difference because the probability value (P-value) is more than 0.05 per cent. Since, the p-value at second difference is less than 5% significance level, the series is stationary at second difference and is integrated with order 2. Thus, agricultural exports and GDP are non-stationary at level and first difference and become stationary at second difference. Since both the series are stationary at second difference, granger causality test can be applied at second difference for both the data which will not provide spurious results.

Table 2. *Augmented Dickey-Fuller test*

Variable	At Level		First Difference		Second Difference	
	t-statistics	Prob.	t-statistics	Prob.	t-statistics	Prob.
Agricultural Exports	-1.3630	0.8479	-2.7428	0.2294	-4.2218	0.0144*
GDP	5.8160	1.0000	-1.4451	0.8213	-5.3440	0.0013*

Table 3. *Phillips-Perron test*

Variable	At Level		First Difference		Second Difference	
	t-statistics	Prob.	t-statistics	Prob.	t-statistics	Prob.
Agricultural Exports	-1.5666	0.7784	-2.9187	0.1737	-4.1818	0.0157*
GDP	4.2274	1.0000	-0.8348	0.9483	-9.4577	0.000*

4.3. Co-integration

Co-integration is the existence of long-run relationship between two or more variables. In order to test co-integration between agricultural exports and gross domestic product, Johansen co-integration test is applied. The results of Johansen co-integration test with trace and maximum eigenvalue is presented in table 4 and 5 respectively.

Table 4. *Unrestricted co-integration rank test (trace)*

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None	0.6199	23.4343	15.4947	0.0026*
At most 1	0.0932	2.1521	3.8415	0.1424

Table 5. *Unrestricted co-integration rank test (maximum eigenvalue)*

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.6199	21.2822	14.2646	0.0033*
At most 1	0.0932	2.1521	3.8415	0.1424

Johansen co-integration test gives trace statistics and maximum eigen statistics values in order to determine the number of co-integration equations. If the trace statistics and maximum eigen statistics values are greater than the designated critical values, then null hypothesis will be rejected and if trace statistics and maximum eigen statistics values are less than the designated critical values, then null hypothesis will be accepted or simply the probability value should be less than 0.05 per cent in order to reject the null hypothesis and if the probability value is greater than 0.05 per cent the null hypothesis will be accepted.

It is thus concluded from the result of trace statistics and maximum eigen statistics values only none null hypothesis is rejected. It means that there is only one co-integration equation.

4.4. Vector Error-Correction Model (VECM): short run and long run causality

From the result of Johansen co-integration, it is found that there does exists agricultural exports and gross domestic product. If variables are co-integrated, then there is an error-correction model wherein short term movements of variables are affected by the deviation from the equilibrium. If co-integration is found among the variables, we generally use VECM both for short as well as long run. But if there is no co-integration present among the variables, then vector auto-regression is useful. The result of vector error-correction model is show in table 6. If the value of co-integration equation is negative and significant then only there is long run causality. If the value is negative and not significant then there is no long run causality. If the value is positive then also there is no long run causality. Result are obtained after estimating the equations (equation A and equation B) using ordinary least square (OLS) method. Following are the results of vector error-correction model and is shown in table 7.

Table 6. *Vector Error Correction Model*

Cointegrating Eq:	CointEq1
Agricultural exports(-1)	1.0000
GDP(-1)	0.0029
C	-115420

Results of vector error-correction model cofficients with their t-statsitics and probability values is highlighted in the above table. Here C(1) shows the co-integration cofficient (long run) and C(2),C(3),C(4) and C(5) are short run coeffecent of agricultural exports as dependent and gross domestic product as independent variable. As the co-integration cofficient C(1) is negative and significant, it means that there is long run causality between them. The value -0.390944 indicates that speed of adjustments towards equilibrium is 39 per cent. Similarly C(7) shows the co-integration cofficient (long run) and C(8),C(9),C(10) and C(11) are short run coefficient of gross domestic product as dependent and agricultural exports as independet variable. As the co-integration cofficient C(7) is negative but is not significant so there is no long run causality between them.

Equation A: D(agricultural exports) = C(1)*(agricultural exports(-1) + 0.00286951257259 *GDP(-1) - 115419.956071) + C(2)*D(agricultural exports(-1)) + C(3)*D(agricultural exports(-2))+ C(4)*D(GDP(-1)) + C(5)*D(GDP(-2)) + C(6)

Equation B: D(GDP) = C(7)*(agricultural exports(1)+0.00286951257259* GDP(-1) - 115419.956071)+C(8)*D(agricultural exports(-1)) + C(9)*D(agricultural exports (-2))+C(10)*D(GDP(-1))+C(11)*B20D(GDP(-2))+C(12)

Table 7. *VECM using ordinary least square*

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.3909	0.1224	-3.1929	0.0029*
C(2)	0.4257	0.1626	2.6178	0.0129*
C(3)	-0.0110	0.1721	-0.0637	0.9496
C(4)	0.0823	0.0204	4.0382	0.0003*
C(5)	-0.0012	0.0311	-0.0398	0.9685
C(6)	-48216.3	15933.08	-3.0262	0.0046*
C(7)	-0.8798	1.3877	-0.6340	0.5301
C(8)	-2.2616	1.8429	-1.2272	0.2277
C(9)	-0.5975	1.9506	-0.3063	0.7611
C(10)	0.8866	0.2310	3.8386	0.0005*
C(11)	0.4126	0.3520	1.1724	0.2487
C(12)	-73253.08	180583	-0.4056	0.6874

To check the short run causality the wald test is applied. The wald test will show whether gross domestic product has any short run impact on the agricultural exports or agricultural exports has short run impact on gross domestic product. The result of wald test is shown in table 8 and table 9.

Table 8. *Wald test equation A*

Test Statistic	Value	df	Probability
Chi-square	23.9408	2	0.0000*

Table 9. *Wald test equation B*

Test Statistic	Value	df	Probability
Chi-square	3.0989	2	0.2124

Table 8 shows that the null hypothesis C(4)=C(5)=0 is rejected as the p-value is less than 0.05. It means that there is short run causality when gross domestic product is independent variable and agricultural exports is dependent variable. The values of C(4) and C(5) are not equal to 0 and are significant. Table 9 shows that the null hypothesis C(8)=C(9)=0 is accepted. That means that there is no short run causality when gross domestic product is dependent and agricultural exports is independent variable.

4.5. Diagnostic Test of the Model

The diagnostic tests was applied for the equation A and equation B. The result of diagnostic test of equation A is given in table 10.

Table 10. *Serial correlation LM test (equation A)*

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.96487	Prob. F(2,16)	0.4021

The table 10 shows that the residuals of equation A don’t have the problem of autocorrelation. The figure 1 shows that the residuals are normally distributed and figure 2 shows that the stability test also fits the equation.

Figure 1. *Normality test (equation A)*

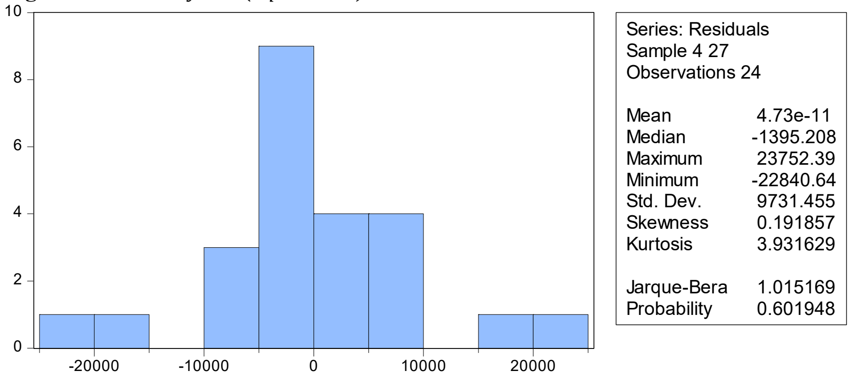
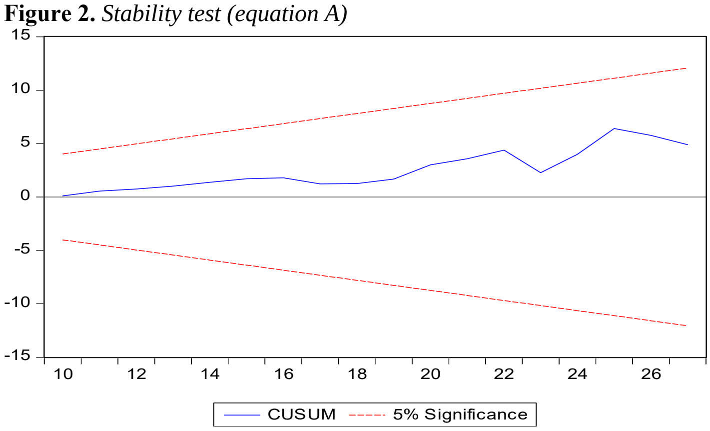


Figure 2. *Stability test (equation A)*



4.6. Granger causality test

A common problem is to determine whether changes in one variable cause or leads to changes in another variable. The granger causality test will show whether the change in gross domestic product is caused by changes in agricultural exports or vice versa. The result of granger causality is shown in table 11.

Table 11. *Granger causality test*

Null Hypothesis:	F-Statistic	Prob.
GDP does not Granger Cause AGRICULTURAL EXPORTS	18.6676	0.00003*
AGRICULTURAL EXPORTS does not Granger Cause GDP	1.0085	0.3826

The result shows that there is unidirectional causality running from gross domestic product to exports of agricultural products.

5. Conclusion

The study aimed to understand the causal relationship that exists between agricultural exports and economic growth of India. The study made use of secondary data available on various governments' platforms. Various statistical techniques have been used to achieve the objectives of the study. The results revealed that the relation between economic growth and exports of agricultural and allied commodities is unidirectional. Economic growth leads to exports of agricultural and allied commodities. Therefore, there is Growth-led exports hypothesis. On the basis of the calculations made, it was found that the share and growth rate of exports of agricultural and allied commodities are declining over the year. Thus, there is a need to make exports policy giving special attention to agricultural sector. Agricultural sector is still the widest sector geographically and provides employment to half of the population. Therefore, agricultural sector must be given special attention.

References

Abolagba, E.O., Onyekwere, N.C., Agbonkpolor, B.N. and Umar, H.Y., 2010. Determinants of agricultural exports. *Journal of Human Ecology*, *29*(3), pp. 181-184.

Bala, Dr. M. Lakshmi and Sudhakar, K., 2017. An Overview of Export Performance of Agricultural Products in India. IOSR *Journal of Business and Management*. 19. pp. 01-05. 10.9790/487X-1902010105.

Chand, R. and Tewari, S.C., 1991. Growth and instability of Indian exports and imports of agricultural commodities. *Indian Journal of Agricultural Economics*, *46*(902-2018-2828), pp. 159-165.

Dawson, P.J. (2005). Agricultural exports and economic growth in less developed countries. *Agricultural Economics*, *33*(2), pp. 145-152.

Ekanayake, E.M., 1999. Exports and economic growth in Asian developing countries: Cointegration and error-correction models. *Journal of Economic Development*, *24*(2), pp. 43-56.

Ghatak, S. and Price, S.W., 1997. Export composition and economic growth: Cointegration and causality evidence for India. *Weltwirtschaftliches Archiv*, (H. 3), pp. 538-553.

Gill, S.S. and Ghuman, R.S., 1982. India's agricultural exports: performance and some policy issues. *Indian journal of agricultural economics*, *37*(902-2018-1872), pp. 294-300.

Goldar, B., Pratap, D. and Parida, Y., 2012. Impact of Tariff Reduction according to Doha Modalities on India's Trade of Agricultural Products. *Economic and Political Weekly*, pp. 57-64.

Goyal, S.K., Pandey, R.N. and Singh, J.P., 2000. India's Agricultural Exports: Growth and Instability. *Foreign trade review*, *35*(1), pp. 32-46.

Guntukula, R., 2018. Exports, imports and economic growth in India: evidence from cointegration and causality analysis. *Theoretical and Applied Economics*, *2*(615), pp. 221-230.

Jeromi, P.D. and Ramanathan, A., 1993. World pepper market and India: An analysis of growth and instability. *Indian Journal of Agricultural Economics*, *48*(902-2018-3207), pp. 88-97.

Karnool, N.N., Vijayakumar, H.S., Raghavendra, L.B., Yogisha, G.M., Naik, A.D. and Kerur, N.M., 2007. Pre-and Post-WTO changes in oilseed economy of Karnataka: A case of groundnut. *Agricultural Economics Research Review*, *20*(347-2016-16837), pp. 529-540.

Kaundal, R.K. and Sharma, M., 2006. Agricultural Exports of India in the New Economic Environment. *Foreign Trade Review*, *41*(2), pp. 3-34.

Kumar, N.R. and Rai, M., 2007. Performance, competitiveness and determinants of tomato export from India. *Agricultural Economics Research Review*, *20*(347-2016-16825), pp. 551-562.

Kumar, N.R., Singh, B.P., Khurana, S.M. and Pandey, N.K., 2005. Impact of WTO on potato export from India. *Agricultural Economics Research Review*, *18*(347-2016-16689), pp. 291-304.

Kumar, T., 2016. An Empirical Investigation of Relationship between Export and Economic Growth in India. *International Journal of Scientific & Engineering Research.* 7(11), pp. 1279-1284

Limbore, N.V. and Khillare, S.K., 2015. An analytical study of Indian agriculture crop production and export with reference to wheat. *Rev of Res*, *4*(6), pp. 1-8.

Mishra, P.K., 2011. The dynamics of relationship between exports and economic growth in India. *International Journal of Economic Sciences and Applied Research*, *4*(2), pp. 53-70.

Nabi, T. and Dhami, J.K., 2013. Analysis of India's Agriculture Export Performance in Pre and Post WTO Regime. *International Journal of Enhanced Research in Management & Computer Application.* 2(4), pp. 1-5.

Pal, S., 1992. Agricultural exports of India: issues of growth and instability. *Indian Journal of Agricultural Economics*, *47*(902-2018-3157), pp. 185-194.

Sahni, P., 2014. Trends in India's exports: a comparative study of pre and post reform period. *IOSR Journal of Economics and Finance (IOSR-JEF)*, *3*(2), pp. 8-18.

Shinoj, P. and Mathur, V.C., 2008. Comparative advantage of India in agricultural exports vis-à-vis Asia: a post-reforms analysis. *Agricultural Economics Research Review*, *21*(347-2016-16823), pp. 60-66.

Singh, K., Kumar, P., Singh1, B.B. and Singh, S., 2013. Direction of Tea Export and Its Destination and Performance. *The Journal of Rural and Agricultural Research,* 13(2), pp. 25-29.

Suresh, A. and Mathur, V.C., 2016. Export of agricultural commodities from India: Performance and prospects. *Indian Journal of Agricultural Sciences*, *86*(7), pp. 876-83.

Thomas, S. and Sheikh, W., 2010. Growth and Composition of Indian Agricultural Exports during Reform Era. *Abhinav Journal of Research in Commerce & Management.* 1(6), pp. 92-104.