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IMPACT OF ANIMAL EXPORTS ON ECONOMIC GROWTH: WITH SPECIAL REFERENCE TO INDIA

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ABSTRACT

Agriculture sector contributes a significant share in the national income of developing countries, despite of the growth of other sectors much more than agriculture sector like service and industry it is still be the backbone of the developing countries. Here, animal exports (Independent variable) consist of five products as per HS-2 digits coding such as live animals (01), meat and edible meat offal (02), Fish and crustaceans, molluscs and other aquatic invertebrates (03), Dairy produce; birds" eggs; natural honey; edible products of animal origin, not elsewhere specified or included (04), Animal originated products; not elsewhere specified or included (05) as per the data availability from the official site that is WITS. As agricultural exports being the important products, this study intends to show the relationship between animal exports with the Gross Value Added (GVA) of India for the time period 1988 to 2021. The data is collected from World Integrated Trade Solutions (WITS) and the official site of World Bank and it used Autoregressive Distributive Lag Model (ARDL) and Error Correction Form to check the existence of long-term and short-term relationship between the variables. The findings of the study revealed that the animal exports have a significant and positive impact on the Gross Value Added (GVA) in the long run while the results from Error Correction Form posits that there is no short-run relationship between the variables.

Keywords- Animal Export, Agricultural Exports, ARDL, Economic Growth, GVA.

INTRODUCTION

India, as a major player in global agricultural trade, has been a significant growth in its export sectors, particularly in fish and live animals. These sectors not only contribute substantially to the country's export earnings but also play a vital role in running the livelihoods of millions of people involved in farming, fishing and related industries.

The annual average growth in the per capita demand of fish and fish products was around 2.4% (MDPI) in developing countries and many less developed countries consume fish as only source of protein. The exports of fish become the lifeline for many countries that is why it is mandatory to focus on the expansion and growth of fisheries sector which in return help in the development of the country.

Currently, the livestock sector of India contributes around 27% to agriculture gross domestic income and provide employment to approximately 20 million people which make it the most significant sector of India. The worldwide demand for the livestock products is on rise, exclusively for the products like bovine meat. India has the potential to become the one of the top livestock exporting country for which there is a need to improve the techniques and exploit the market for its exports.

In current years, the fisheries sector in India has appeared as one of the reckless growing segments within the agricultural exports portfolio. As per the Marine Products Export Development Authority (MPEDA), India exported fish products worth USD 7.76 billion in the fiscal year 2022-2023, marking a significant increase from previous years. Similarly, the

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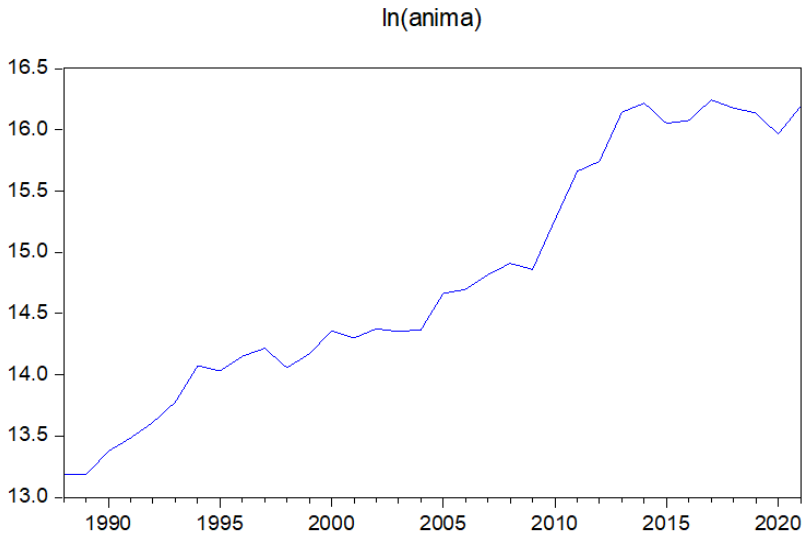
livestock sector, including dairy and meat products, has seen steady growth, with exports reaching approximately USD 4 billion in the same period, as per data from the department of Animal Husbandry and Dairying.

This paper explores the casual relationship between the animal exports with Gross Value Added in India, seeking to know the level to which growth in these sectors influences overall agricultural export performance and it gives the valuable insights to the interconnectedness of the animal exports sectors within the broader agricultural economy. Here, animal exports are the total of first five agricultural commodities as per HS-2 digit data (01-05). By analyzing historical data and employing econometric models, the study aims to identify patterns and trends that reveal the interdependencies among these sectors, thereby offering policy implications for enhancing the export potential of India's agricultural sector as a whole.

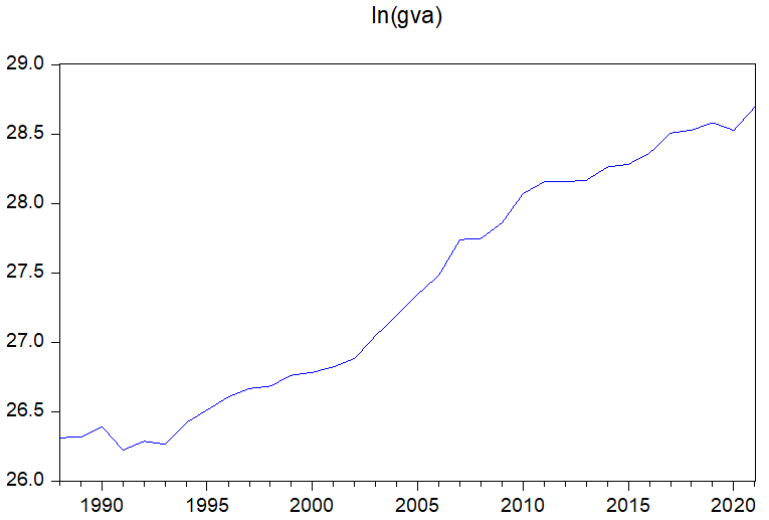
THE TREND OF ANIMAL EXPORTS

Figure-I.



Trend of GVA

Figure-II.



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REVIEW OF LITERATURE

Emam and et. al. (2021) conducted a study to analyse the relationship between the fish exports and the progress of the agricultural sector of south and southeast Asian countries for the period 2000 to 2018 which is collected from Food and Agriculture Data (FAO), World Bank (World Development Indicators). The study used ARDL model for retrieving long term relationship and granger causality for short run relationship and the results shown positive and significant relationship between the variables.

Ilyas and et. al. (2021) conducted a study to analyse the impact of livestock and fisheries on the economic growth of Pakistan for the time period 1987 to 2017 and the data is retrieved from the official site of Pakistan Economic Survey. The study employed Vector Error Correction Model (VECM) for the analysis and the results shown livestock and fisheries have a negative and insignificant effect on growth in short-run and co-integration results shown a positive relationship between the sectors of agriculture and the economic growth of Pakistan.

Muniz and et. al. (2022) explained a study on the exports and production of fisheries and aquaculture sector in Latin America to East Asia during the time period 2012 to 2019 and the data is obtained from ECLAC-CEPALSTAT, International Trade Statistics database and Un Comtrade. Generalized Methods of Moments estimator technique is used for the analysis and it shown significant and positive and non-significant relationship between output and economic growth.

Oyakhilomen and Zibah (2013) examined the relationship between the fisheries production and the economic growth rate in Nigeria during the time period 1970 to 2011 and for the purpose the time series data is obtained from the publications of Central Bank of Nigeria, Statistical Bulletin and Federal Department of Fisheries (FDF). The study employed vector autocorrelation (VAR) lag order selection and granger causality test for the analysis and the results indicate that the fisheries production does not granger cause economic growth in Nigeria.

Kumar (2010) conducted a study on the exports of livestock products from India to check its competitiveness and performance for the time period 1979 to 2008 for which the data is collected from the monthly statistics for foreign trade, Ministry of Commerce and government of India. The study used nominal protection coefficient to measure the competitiveness and the results shown that India is efficient in the export of meat products mainly the buffalo meat and except the poultry.

Research Gap

While some studies analyzed the relationship between Animal products exports with the economic growth, the results however were mixed and hence inconclusive. The studies, not only failed to find any direct relationship between the selected variables but also no consensus is seen regarding the precise direction of causation between the variables. Apart from this, there were no recent studies in the Indian context which would clarify the relationship between the selected variables.

OBJECTIVE

The study aims to examine the long-term and short-term relationship between the animal exports (ANIMAL) with the Gross value added at current price (GVA) of India for the time period 1988 to 2021.

HYPOTHESIS

H0- There is no long-term and short-term relationship between the variables.

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H1- There is a long-term and short-term relationship between the variables.

DATA SOURCES AND METHODOLOGY

Data

Annual time series data of animal exports in dollar is taken from the World Integrated Trade Solutions and database of World Bank for the time period 1988 to 2021. Here, animal exports (Independent variable) consist of five products as per HS-2 digits coding such as live animals (01), meat and edible meat offal (02), Fish and crustaceans, molluscs and other aquatic invertebrates (03), Dairy produce; birds" eggs; natural honey; edible products of animal origin, not elsewhere specified or included (04), Animal originated products; not elsewhere specified or included (05) (WITS). The data for dependent variable Gross Value Added (GVA) is retrieved from the official site of World Bank. The data has been analysed in E views-12 statistical software. Moreover, for the empirical analyses, the variables are transformed into their natural algorithm to decrease the disturbing influence of the outliers in the extracted data.

Methodology

The methodology of the paper is explained below. This includes the explanation of various factors affecting the variables (dependent and independent) used for the study, data collection and model specification.

1. **Global Economic Conditions:** Global economic downturns can reduce demand for these products, affecting India's export volumes and changes in global prices of these commodities can impact export revenues.
2. **Exchange Rates:** A weaker Indian Rupee can make exports more attractive, while a stronger Rupee can make them more expensive and exchange rate fluctuations affect the profitability of exporters.
3. **Government Policies and Trade Regulations:**

1. Policies that support exports, reduce trade barriers, and provide incentives can boost the sector. Compliance with international SPS standards is crucial for market access. Favorable trade agreements with importing countries can enhance export opportunities.

4. **Infrastructure and Logistics:** Efficient transportation (cold chain infrastructure, etc.) is essential for perishable products like fish and dairy. Streamlined logistics reduce costs and ensure timely delivery. Modern port facilities and efficient customs procedures facilitate exports.
5. **Production and Quality:** Disease outbreaks can severely impact exports of live animals and animal products. Maintaining high quality and meeting international standards are essential for competitiveness. Increasing production capacity sustainably is crucial to meet export demands.
6. **Market Access and Competition:** Reducing reliance on a few markets can mitigate risks. Competition from other exporting countries can affect India's market share.
7. **Domestic Demand:** High domestic demand can sometimes limit exportable surpluses.

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8. **Environmental and Sustainability Concern:** Growing emphasis on sustainable practices in animal husbandry and fishing can influence export potential. Compliance with environmental regulations in importing countries is important.

9. Other Factors:

- **Climate Change:** Climate change can impact production and availability of animal products.
- **Technological Advancements:** Adoption of modern technologies in production, processing, and packaging can enhance competitiveness.
- **Branding and Marketing:** Effective branding and marketing strategies can increase the visibility and demand for Indian products.

RESULTS

Long-Run Analysis: ARDL Bounds testing Approach

The study employed the ARDL Bounds testing technique to analyse the long-term correlation between the variables for the period from 1988 to 2021. The estimation procedure involves the succeeding steps. For testing the presence of a unit root in the variables, the study used Augmented Dickey-Fuller test (ADF) by D.A. Dickey. Based on the results, further ARDL Bound testing approach is used to analyse the long-run relationship between the variables and in the last step, Granger's causality test in a multivariate VAR framework has been applied to deduce short-run relationship and direction of causality by using E-views software.

GVA at current price (dependant variable) is expressed as (GVA) and the independent variable is animal exports (ANIMAL). The regression model of the study is as follows:

$$GVA_t = \alpha_o + \alpha_1 \, ANIMAL + \varepsilon_{1t} \qquad - (1)$$

Where, α_o is a constant, α_1 is a coefficient of animal exports and ε_{1t} is the error term in the model which is in the equation (1). Each variable is transformed into their natural logarithms. Therefore, the final description of the model is presented in succeeding equation:

$$\ln GVA_t = \alpha_o + \alpha_1 \ln ANIMAL + \varepsilon_{1t} \qquad - (2)$$

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 to check the unit root at level and at the first difference level. The null hypotheses in the ADF test is that- lnGVA, and lnANIMAL have unit root i.e. the series is non-stationary. The results are exhibited in Table 1 and 2.

Table I: Unit Root Table: ADF, lnGVA

Tests	**ADF**
Level (Intercept)	0.9860
Level (Trend and Intercept)	0.3425
1st Difference (Level)	0.0002

Source: Computed

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Table II: Unit Root Table: ADF, lnANIMAL	
Tests	**ADF**
Level (Intercept)	0.8041
Level (Trend and Intercept)	0.6895
1st Difference (Level)	0.0001
Source: Computed	

The results from the tests show that ln, lnGVA, lnANIMAL are stationary at I(0) and I(1) by using ADF, as depicted in Table 1,2 and 3. The p-value of all the variables are statistically significant by using ADF test. The results qualify 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:

$$\Delta \ln(GVA)_t = \alpha 0 + \sum_{j=1}^{n} bj\Delta \ln(GVA)_{t-1} + \sum_{j=0}^{n} cj\Delta \ln(ANIMAL)_{t-j} + \delta 1 \ln(GVA)_{t-1} + \delta 2 \ln(ANIMAL)_{t-1} \varepsilon_{1t.}$$

Where δ1 and δ2 are the long-run multipliers in the ARDL model, while bj and cj are the short-term dynamic coefficients. The null hypothesis, H01: $\delta 1 = \delta 2 = 0$, which assumes no co-integration, is being tested against the alternative hypothesis, H11: $\delta 1 \neq \delta 2 \neq 0$, which suggests the presence of co-integration. Table- 3 presents the outcomes of the Bounds test.

Table-III: F- Bounds test				
Significance	10%	5%	2.5%	1%
I(0)	3.02	3.62	4.18	4.94
I(1)	3.51	4.16	4.79	5.58
F-Statistic	4.217			
Source: Computed				

According to the criterion, we can't reject the null hypothesis if the value of f-statistic is lower than the I(0) bound. Suppose the f-value is greater than the I(0) bound, in that case, we reject the null hypothesis and accept the alternative hypothesis that there is long-run co-integration relationship between the variables. If the f-statistic falls between the bounds, the test is inconclusive. The ARDL Bounds test findings indicate that the f-statistic value, 4.217 which is greater than the I(1) Bound value of 4.16 at a significance level of 5%. This strongly supports that there is a long-term relationship between the variables at 5 and 10% level of significance. The subsequent phase will involve error correction model for testing the stability between the variables.

SHORT RUN RELATIONSHIP

Error Correction Model

Since all variables are first difference stationary and co-integrated, to test the short run relationship between the variables, Error Correction Model (ECM) is used. The short-term impact of Animal exports is examined on agricultural exports. The following results were obtained (Table iv).

The short run dynamics are captured by the coefficients of the differenced independent variables. For this purpose, the formulated null hypothesis posits that the coefficient of D(animal) = 0 implying no short run impact on LNAGEX. While the alternate hypothesis

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posits that the coefficient of D(LNANIMAL) ≠ 0, implying the existence of a short run relationship.

Table iv: ARDL Error Correction Model (ECM) (Short run Dynamics)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LN_ANIMAl)	0.182331	0.087133	2.092565	0.0453
Source: Computed				

The computed results indicate that the current value of the coefficient is 0.182331 with a p-value of 0.0453 > 0.01, which is not significant. This means that we fail to reject the null hypothesis, hence there is no immediate short run impact.

However, the lagged values have p values < 0.01 indicating it to be highly significant. This means we can reject the null hypothesis of no short run impact of the independent variable. This implies that lagged effects of Agricultural exports significantly impact animal exports (negatively) in the short run (Presence of lagged short-run effects).

LONG RUN ADJUSTMENT AND MODEL DIAGNOSTICS

Error Correction Term (ECT) along with the ARDL bounds testing approach is used to evaluate the long run dynamics of the model.

For the long run co-integration, the null hypothesis states that there is no co-integration between the variables, while the alternate hypothesis states that there exists a long-run relationship (co-integration) between the variables. If the F-statistic exceeds the upper bound of the critical value, null hypothesis stands rejected.

Table v: ARDL Error Correction Model (ECM) (Long run Adjustment and Model diagnostics)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
CointEq(-1)*	-0.018124	0.004928	-3.677510	0.0010
R-squared	0.111345			
Adjusted R-squared	0.082678			
Durbin-Watson stat	1.726533			
F-statistic	4.217187			
Source: Computed				

The F-statistic as computed is 4.217187, while the critical values at 5% stood at I(0) = 3.62, I(1) = 4.16. Since, F-statistic > I(1), we reject the null hypothesis. This implies that the existence of a long-run relationship is confirmed by the ECM Model.

The error correction term also plays a pivotal role in deciding the existence of co-integration between the variables. If the coefficient of error correct term is equal to zero, this implies no adjustment towards the long-run equilibrium. While a coefficient of error correction term less than zero indicates adjustment towards the long-run equilibrium. If the ECT is negative and significant, null hypothesis stands rejected.

Here, CointEq(-1) = -0.018124, p value = 0.0010, which is negative and significant. So we reject the null hypothesis. This implies there is a long-run adjustment between the variables.

This further implies that long run deviations are corrected over time with the adjustment of 1.81% disequilibrium within one period, supporting the existence of long-term adjustment dynamics between the variables.

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Residual Testing

Residual testing of the model has been done, and the results are presented in tables vi and vii. Since the p-value in both cases is above the 5 % level of significance i.e., at 0.2230 and 0.3244 respectively for serial correlation and heteroscedasticity. Thus, we conclude that the model is fitted well and is also free from both problems.

Table VI: Breusch-Godfrey Serial Correlation LM Tests

Adjusted R-square	R-square	Prob
-0.232874	3.4712	0.2230

Source- computed

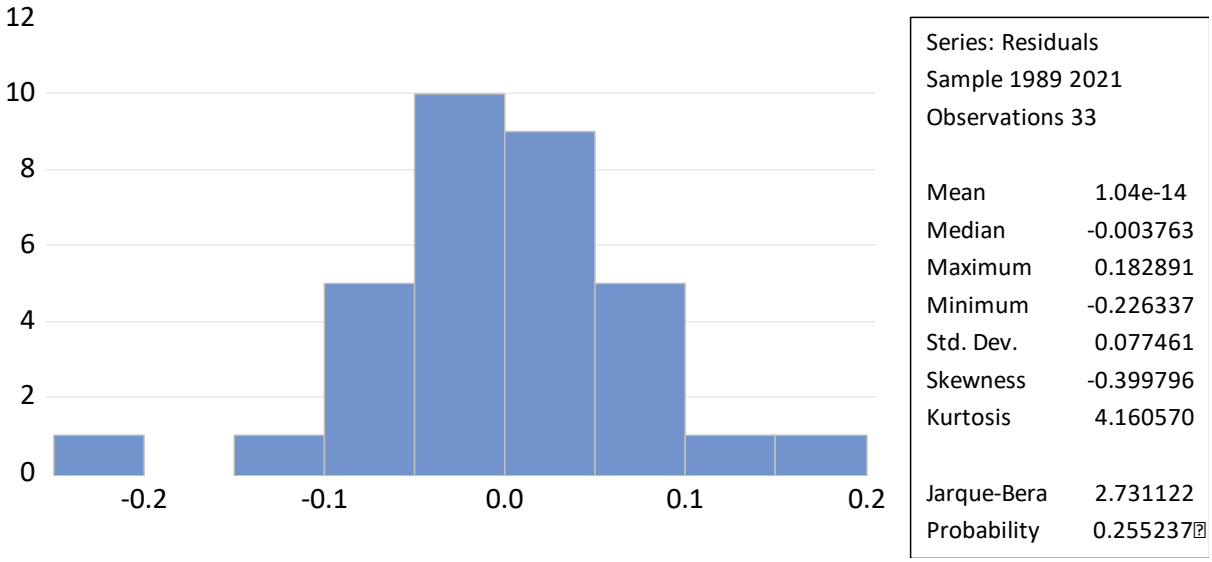
Table VII: Breusch-Godfrey Heteroskedasticity Tests

F-statistic	Prob.
1.2080	0.3244

Source- computed

Normality Test

Figure-III



Source- Computed

Figure 1, above depicts the results of the normality test conducted on the dataset. The null hypothesis posits that the data is normally distributed, while the alternative hypothesis suggests otherwise. With a p-value exceeding the 5% significance level (p = 0.255237), we fail to reject the null hypothesis. Thus, based on this analysis, we conclude that the data is normally distributed.

CONCLUSION

Exports of agricultural commodities is the most common economic activity of India due to many reasons like surplus production etc. More than 50 percent of population still depends on agriculture sector for their survival, that is why it is the legislative duty to focus more on it. Hence, the study analysed one of the major exported items of the agriculture sector and intends to fetch the attention towards it. Trading of animal products is one of the imperative

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traded agricultural products. In this paper, an attempt is made to empirically identify the relationship between the animal exports and the agricultural exports of India during the time period 1988 to 2021. With the utilization of long run bound form test and Error Correction form test, the findings suggest a significant and positive impact of animal exports on the agricultural exports in long-run but there is only lagged impact in short-run, meaning there is no short-run relationship between the variables.

POLICY IMPLICATIONS

1. Implement programs focused on breed improvement, disease prevention, and sustainable farming practices for live animals intended for export or breeding programs.
2. Invest in modern abattoirs and processing facilities that meet international hygiene and safety standards to increase the value and marketability of meat and offal exports.
3. Promote sustainable fishing practices and aquaculture development to ensure a consistent supply of high-quality fish and crustaceans for both domestic consumption and export markets.
4. Implement policies to enhance milk and egg quality, increase production efficiency, and invest in processing technologies for dairy products and egg-based goods that meet international standards.
5. Encourage research and development to create value-added products from other animal-originated materials (e.g., hides, gelatin) to diversify the export basket and increase revenue.
6. Implement and enforce rigorous SPS measures across all stages of production, processing, and export for all animal commodities to ensure food safety and meet importing country requirements.
7. Develop and strengthen cold chain infrastructure for the efficient storage and transportation of perishable animal products (meat, fish, dairy, eggs) to maintain quality and extend shelf life for export.

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