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# ECONOMETRIC ANALYSIS OF SOYBEAN EXPORT WITH RESPECT TO PRODUCTION AND CONSUMPTION

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**Abstract**

This paper is an attempt to study the relationship between Independent variables (soybean production & soybean consumption) and dependent variables (soybean export).Through this paper the authors' attempt to explain the behaviour of soybean production & soybean consumption with reference to soybean export. The study was done by taking five-year month-wise data of Export, Production and consumption. From October 2018 to June 2023.ADF test was applied for checking the unit rool of data with the help of EVIES Software. Regression and correlation analysis are used in this research paper and for performing analysis EVIEWS & SPSS is used. was performed with the help of EVIEWS & SPSS Software and after analysis it can be concluded that that Production and export are moving in same direction as per correlation but consumption is not much correlated with export. Both production and consumption jointly affect the export and on an individual basis, production has a significant impact on export but not on consumption. The regression line is constructed for predicting the future values of soybean export.

**Keywords**: Soybean Export, Soybean Production, Soybean Consumption, Regression, Correlation.

## INTRODUCTION

Glycine max L. Merr.**, commonly known as soybean, is a crucial species of legume extensively cultivated for its edible beans. Soybean is one of the world's most important crops, recognized for its versatility and numerous applications, making it a staple in global agriculture. It is an essential oilseed and a low-cost source of high-quality protein. This yellow bean plays an impactful role in maintaining soil fertility through effective crop rotation practices. Additionally, soybean holds a prime position in the global oilseed market, characterized by high productivity and profitability. The increasing demand for soy as a food source, vegetable oil, and animal feed continues to rise, driven by its nutritional benefits and versatility.

The largest soybean-producing nations include the United States, Brazil, China, India, and Argentina. Collectively, these countries account for a significant portion of global

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production. Approximately 85% of all soybean crops worldwide are processed into soybean oil and meal. A substantial quantity of soybean meal is processed for animal feed, while about 2% is converted into soy flour and protein isolates. In the Asian market, around 6% of the soybean beans are utilized directly as meal. Soybean serves as a key foreign exchange earner, particularly for the export of de-oil cake (DOC). The economic landscape of soybean cultivation has historically relied on DOC exports. Given that Argentina, Brazil, and the USA are major players in the international market, India's dependence on DOC exports raises concerns about the sustainability of soybean farming in the country.

To fortify the soybean sector and mitigate reliance on global markets, it is crucial to enhance domestic consumption of soybean products. Here are several strategies to achieve this:

1. **Promote Awareness**: - Increasing awareness about the nutritional benefits and versatility of soy products, such as soy milk, tofu, and soy-based snacks, can stimulate consumer interest.
2. **Diversify Soy Products**: - Innovating value-added goods, such as plant-based protein alternatives, soy-based health products, and fortified foods, can tap into the growing trend toward health-conscious eating and sustainable food sourcing.
3. **Government Support and Policies**: - Implementing supportive government policies, such as subsidies for soybean farmers and incentives for establishing local processing facilities, can help lower production costs and improve market access for domestic products.
4. **Sustainable Agricultural Practices**: - Promoting sustainable farming practices, including integrated pest management and organic cultivation methods, can enhance yield while preserving the environment, ensuring long-term viability for soybean farming.
5. **Market Research and Development**: - Conducting comprehensive market research to identify consumer preferences, trends, and areas for innovation will enable producers and marketers to align their offerings with market demands effectively.

By focusing on strategies to increase domestic consumption and diversify markets, India can strengthen its soybean economy and reduce vulnerability to international market fluctuations. Encouraging sustainable practices alongside consumer education will pave the way for a robust and resilient soybean sector, ensuring both economic stability and environmental sustainability in the long run.

This research highlights the critical need for a concerted effort to bolster domestic soybean utilization while recognizing its significant role in global agriculture. Through proactive measures and strategic planning, India can position itself as a key player in the global soybean market while fostering local agricultural growth.

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## SECTION I

## REVIEW OF LITERATURE

In the realm of agricultural research, a significant study by Sharma Purushottam, Dupare B. U., and Patel Ram Manohar (2016) revealed that among the 45 soybean varieties in the Indian seed chain, only four dominate, accounting for approximately 95% of the total soybean seed requirement and 98% of seed availability in the country. This stark concentration highlights a pressing need for innovative approaches to meet the growing demand for nutritional needs, edible oil, and genetic advancements in soybean cultivation.

Adding to this discourse, Malukani Bharti (2016) examined the prospects and potential market for soybean exports, identifying various global competitors. Her research underscored the necessity of formulating supportive policies for exporters and emphasized the importance of establishing partnerships with marketing agencies to enhance the global visibility of Indian soybean products. Bharti also advocated for targeted research and development programs to improve the quality of export-ready products.

In a broader context, Ian McFarlane and Ernesto A. O'Connor (2014) analyzed the dynamics of soybean trade in their paper, "Soybean Trade: Growth and Sustainability." They focused on the increasing supply of soybeans to China from both South and North America, considering future trade influences. Their findings illustrated the complexities of global soybean markets and the factors that could shape future trade flows.

Meanwhile, Sinha Neha (2013) discussed the implications of India's agricultural export policies, noting that despite a shift towards more liberal export policies, the country's agricultural exports have primarily aimed to ensure sufficient domestic supply. She argued that fostering agricultural exports could enhance foreign currency earnings and improve farmers' livelihoods, thus contributing positively to the rural economy.

Furthermore, Thomas Sunny and Sheikh Waheeda (2012) conducted a comprehensive analysis of India's agricultural exports from 1991-92 to 2009-10, utilizing the compound annual growth rate and examining the percentage share of exports in relation to GDP. Their research revealed that while there is a growing global demand for Indian agricultural commodities, the overall contribution of agriculture to national exports has diminished, despite its historical significance in the export basket.

Lastly, Masuda Tadayoshi and Goldsmith Peter (2009) explored global soybean production trends using the Box-Jenkins model. Their projections indicated that by 2030, global soybean output could reach 371.3 million metric tonnes. They noted that achieving a yield of 4.00 tonnes per hectare would require a 2.3% annual growth in average yields, while a stagnation in yield growth would necessitate the harvesting of approximately 160 million hectares to meet world demand.

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In a related study, Rosegrant et al. (2001) utilized the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) to forecast global demand and supply scenarios for 2020. Their work highlighted the complexities of agricultural trade and the challenges of addressing malnutrition, although it lacked comprehensive data at the national level regarding land use and yield-profit relationships.

These collective findings underscore the critical challenges and opportunities facing the soybean industry, particularly in India, where strategic policy-making and research initiatives are essential for sustaining growth and meeting future demand.

## SECTION II

## RESEARCH OBJECTIVES

This research is conducted with the objective to study the impact of soybean production and soybean consumption on soybean export. Along with that study focuses on how the above-mentioned variables are interconnected.

### The Study

The largest soybean producing nations are the United States, Brazil, China, India and Argentina. Major part of soybean crop is converted into oil and meal products.Some part of soybean is also converted into animal food. Around 2% of the soy meal is processed to make soy flour and protein. Approximately 6% of the bean is used directly as a meal in the Asian continent. Some soya products like soy-oil cake is the main product that is exported around the worls. Since the start of the commercial cultivation of soybean, its economy has preliminarily been dependent on the export of DOC.

### Sample

The study was done by taking five-year month-wise data of Export, Production and consumption. From October 2018 to June 2023.

### Hypothesis

$H_0$1: The residual must be normally distributed.

$H_0$2: There must be clustering volatility among the variables.

$H_0$3: There is no serial correlation among the variables.

H04: Soybean Production does not have significant impact on Soybean Export

H05: Soybean Consumption does not have significant impact on Soybean Export

H06: Soybean Production and Soybean Consuption together not affecting Soybean Export.

**$H_0$1: The residual must be normally distributed.**

In this research the probability value is more than the significance level. hence we cannot reject the Hypothesis which indicates that residulas are normally distributed.

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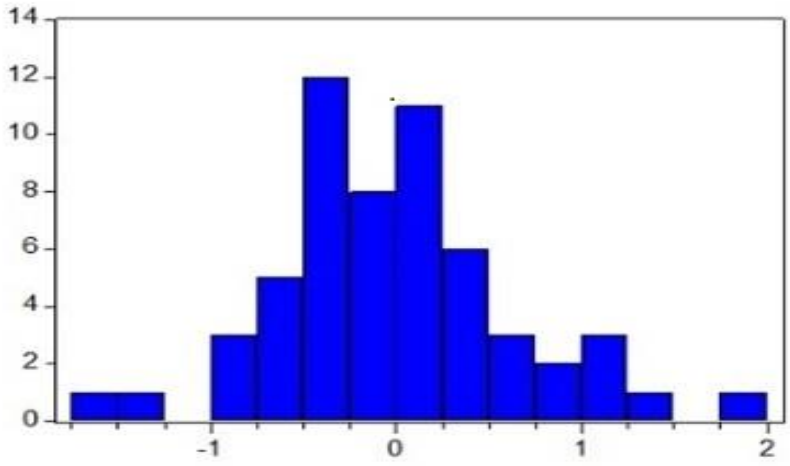
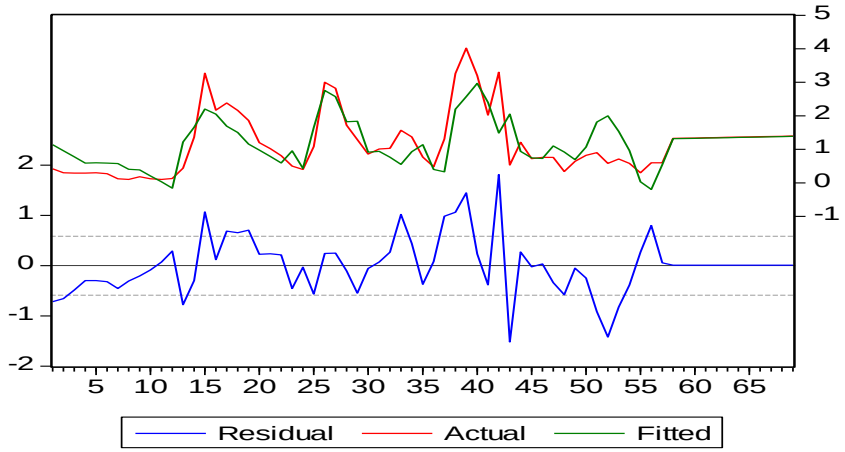



**$H_o$2: There must be clustering volatility among the variables.**

By observing the below graph it can be concluded that there is clustering volatility among the variables.

**Graph of Residual (e = EXPORT - C (1) + C (2)*CONSUMPTION + C (3)*PRODUCTION)**




Graph of residuals can be represented by the equation (**Graph of Residual (e = EXPORT - C (1) + C (2)*CONSUMPTION + C (3)*PRODUCTION),** which indicates that shows that there is high volatility between the month 40 and 50.

**$H_o$3: There is no serial correlation among the variables.**

Table indicateds that almost all probability values are less than the significant level which results in the rejection of hypothesis. The interpretation would be that there is variables are serially correlated.

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| Data: 1 57 | | | | | | |
|---|---|---|---|---|---|---|
| Total: 57 | | | | | | |
| Auto_correlation | Partial_Correlation | | AC | PAC | Q-Statistics | Probability |
| . \|** \| | . \|** \| | 01 | 0.241 | 0.241 | 3.5019 | 0.031 |
| . \|** \| | . \|*. \| | 02 | 0.225 | 0.177 | 6.5900 | 0.037 |
| . \|*. \| | . \|*. \| | 03 | 0.160 | 0.080 | 8.1879 | 0.042 |
| . \| . \| | . \| . \| | 04 | 0.052 | -0.037 | 8.3576 | 0.019 |
| . \|*. \| | . \|*. \| | 05 | 0.132 | 0.094 | 9.4789 | 0.021 |
| . \| . \| | . \| . \| | 06 | 0.043 | -0.013 | 9.6032 | 0.042 |
| . \| . \| | . \| . \| | 07 | 0.020 | -0.026 | 9.6301 | 0.011 |
| .*\| . \| | .*\| . \| | 08 | -0.078 | -0.116 | 10.049 | 0.012 |
| .*\| . \| | . \| . \| | 09 | -0.082 | -0.051 | 10.517 | 0.010 |
| **\| . \| | **\| . \| | 10 | -0.229 | -0.204 | 14.257 | 0.012 |
| .*\| . \| | . \| . \| | 11 | -0.090 | 0.030 | 14.844 | 0.020 |
| .*\| . \| | . \| . \| | 12 | -0.100 | -0.009 | 15.584 | 0.011 |
| **\| . \| | **\| . \| | 13 | -0.289 | -0.231 | 21.956 | 0.046 |
| **\| . \| | **\| . \| | 14 | -0.290 | -0.213 | 28.527 | 0.012 |
| .*\| . \| | . \|*. \| | 15 | -0.147 | 0.085 | 30.251 | 0.011 |
| . \| . \| | . \|*. \| | 16 | -0.033 | 0.142 | 30.338 | 0.016 |
| .*\| . \| | . \| . \| | 17 | -0.060 | -0.033 | 30.637 | 0.022 |
| . \|*. \| | . \|*. \| | 18 | 0.079 | 0.109 | 31.171 | 0.028 |
| . \| . \| | . \|*. \| | 19 | 0.039 | 0.081 | 31.308 | 0.037 |
| . \|*. \| | . \|*. \| | 20 | 0.101 | 0.068 | 32.233 | 0.041 |
| . \|*. \| | . \| . \| | 21 | 0.096 | 0.010 | 33.096 | 0.045 |
| . \|*. \| | . \|*. \| | 22 | 0.158 | 0.105 | 35.488 | 0.034 |
| . \|*. \| | .*\| . \| | 23 | 0.090 | -0.148 | 36.292 | 0.039 |
| . \| . \| | **\| . \| | 24 | 0.017 | -0.191 | 36.323 | 0.031 |

## SECTION III

## RESULT AND FINDINGS

| Summarised View | | | | |
|---|---|---|---|---|
| Mode valuel | R Value | $R^2$ | Modified $R^2$ | Standard Error |
| 1 | .765[a] | .586 | .570 | .64782 |
| a. Predictors: (Constant), Consume, Production | | | | |

## TAB. ONE

| ANALYSIS OF VARAINCE | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum_of_Squares | Degree of Freedom | Mean_Square | F value | Significance |
| 1 | Regressi. | 32.021 | 2 | 16.010 | 38.150 | .000[b] |
| | Resid. | 22.663 | 54 | .420 | | |
| | Tot. | 54.684 | 56 | | | |
| a. Dependent Variable: Export | | | | | | |
| b. Predictors: (Constant), Consume, Production | | | | | | |

## TAB. TWO

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| Coefficients | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized_Coefficients | | Standardized_Coefficients | T_ Value | Significance |
| | | B | Std._Error | Beta | | |
| 1 | (Constant) | -1.157 | .581 | | -1.991 | .052 |
| | Production | .462 | .069 | .783 | 6.687 | .000 |
| | Consume | -.041 | .181 | -.027 | -.229 | .819 |
| a. Dependent Variable: Export | | | | | | |

**TAB. THREE**

**Ho4:** There is no significant impact of Soybean Production on Soybean Export

The hypothesis is not accepted. The result of this hypothesis represents that soybean production is having significant impact on Soybean Exports.

**Ho5**: There is no significant impact of Soybean Consumption on Soybean Export

The hypothesis is accepted. The result of this hypothesis represents that Soybean Consumption is not having significant impact on Soybean exports.

**Ho6**: Soybean Production and Soybean Consuption together not affecting Soybean Export.

The hypothesis is accepted. Thus Soybean Production and Soybean Con: sumption do have a joint significant impact on exports.

**Regression Line**

**Export = -1.15 + .462*Production + (-.04)*Consumption**

By using this regression line the futuristic value of export may be calculated for a different set of values of production and consumption.

**Correlation Table**

| | | Export | Production | Consumption |
|---|---|---|---|---|
| Export | Pearson_Corr. | 1 | .765** | .492** |
| | Significance(Two-tailed) | | .0 | .0 |
| | n | 57 | 57 | 57 |
| Production | Pearson_Corr. | .765** | 1 | .663** |
| | Significance(Two-tailed) | .0 | | .0 |
| | n | 57 | 57 | 57 |
| Consume | Pearson_Corr. | .492** | .663** | 1 |
| | Significance(Two-tailed) | .0 | .0 | |
| | n | 57 | 57 | 57 |
| **. Significance level at 0.01 level | | | | |

**TAB: FOUR**

Table 4 is a correlation table that shows variables are interconnected. There is a strong correlation between Export and Production with a value of .765 which indicates a impact ful relation between export and production. There is a moderate correlation between exports & consumption with a value of .492 which indicates a comparatively weak

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correlation between export and consumption. There is a strong correlation between consumption and Production with a value of .663 which indicates a positive correlation between consumption and production.

## SECTION IV

## CONCLUSION

The present study covers the analysis of soybean exports concerning the production and consumption of soybeans. It is observed that production and export are highly correlated but consumption is not much correlated with export. Thus Soybean Production does have a significant impact on Soybean exports. Thus Soybean Consumption does not have a significant impact on Soybean exports. Thus Soybean Production and Soybean Consumption do have a joint significant impact on exports. Both production and consumption jointly affect the export and on an individual basis, production has a significant impact on export but consumption does not. The regression line is constructed for predicting the future values of soybean exports. Lethesh & Reddy (2023) and Narsimhulu & Satyanarayana (2016) concluded that the future of commodities, now a days, depends upon future commodity market.

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