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An economic analysis of trade performance of groundnut export from India

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Abstract
Groundnut is one of the major oilseed crops cultivating in India with an area of 5.57 Mha and 10.2 Mt production. India is the second largest exporter of groundnut in the world with export of 3.8 Mt to around 132 countries worth of Rs. 53810 million during the year 2020-21. The secondary data on area, production, productivity, export and import value of groundnut from India and world was collected from 1995 to 2020 by using various sources like Food and Agricultural Organization (FAO), Directorate of Economics and Statistics and Ministry of Farmers and welfare, Government. of India. There is an increasing trend in growth rate of production, productivity, export and import of Groundnut during the overall period (1995-96 to 2020-21) at 0.74, 2.50, 13.85 and 18.83 percent respectively. There was a negative trend in area and production during the I period (1995-96 to 2010- 11) with -1.76 and -0.54 percent respectively and During the second period (2011-12 to 2020-21) area, production, productivity and import was having positive growth rate with 0.57,4.73,4.14, and 44.51 percent respectively and in the same sub period India had an RCA more than 1, ranged from 1.23 to 3.13 which means that India enjoyed comparative advantage in the export of groundnut during the study period, this is supported by the positive value of RSCA ranged from 0.10 to 0.52. Trade pattern indicated by transition probability matrix showed that Thailand and others losing its stability with the probability retention of 9 and 7 percent respectively. Vietnam, China (main land), Ukraine, Russian Federation, Algeria and United Arab Emirates were the unstable importers of shelled Groundnut as those countries completely lost its share to other importer countries with zero retention of its previous share. As there is instability in the credibility of importing countries and fluctuation in the comparative advantage values, steps should be taken to strengthen the export of groundnut from India.

Keywords: Economic analysis, trade performance, groundnut export

1. Introduction
International trade leads to higher output, increased consumption and higher rewards for those sectors where a country has comparative advantage. India is one of the largest agricultural product exporters in the world. During 2021-22, the country recorded US$ 49.6 billion in total agriculture exports with a 20 percent increase from US$ 41.3 billion in 2020-21. India's agriculture sector primarily exports agricultural and allied products, marine products, plantation, and textile & allied products. Agricultural and allied products exports were valued at US$ 37.3 billion, recording a growth of 17 percent over 2020-21 and 18.8 percent in 2021-22. (Anonymous a). India is one of the largest oilseed product exporters. The country exports soybeans, mustard seeds, groundnuts, sesame seeds, niger seeds, cotton seeds, castor seeds and sunflower and safflower seeds. India exported Rs. 8,310 crores (US$ 1,003.99 million) worth of Oilseeds in 2021-2022.Groundnut is one the essential oil seed fetching high returns in foreign exchange. It is exporting in different forms viz., Groundnut oil, Groundnuts, excluding shelled and Groundnuts, shelled, to the foreign market. (Anonymous b)
Groundnut is cultivating in 5.57 Mh in India and ranks first in Groundnut area under cultivation and second largest producer in the world next to china with 10.2 Mt of production with productivity of 1831 kg per hectare in 2020-21. Nearly 13 percent of world groundnut production is contributed by India during 2018. Among the major groundnut producing states in India, Gujarat is the largest producer contributing 33 percent of the total production of Groundnut followed by Rajasthan (21%), Tamil Nadu (14 %), Andhra Pradesh contributes (7%) and Telangana contributes 5 percent to total Groundnut production (Anonymous c).
India is exporting groundnut to over 132 countries throughout the world. Indonesia, Vietnam, Malaysia, Philippines are the major importers of groundnut from India.

It is the second largest exporter of groundnut in the world followed by Argentina with 16.34 percent of the world groundnut export with 0 .63 million tonnes worth of Rs 53810 million during the year 2020-21. (Anonymous d). All these figures show the prominence of groundnut sector in in boosting the Indian oilseed export in turn economy in earning the foreign exchange. Hence it is salient to study the growth trend of groundnut in terms of area, production, productivity, export and import in India along with the comparative advantage and changes in the trade direction of export of shelled groundnut from India to take the crucial measures to improve the groundnut export from India.

2. Methodology

2.1 Sources of data

The secondary data on area, production, productivity, export and import value of groundnut from India and world are collected from 1995 to 2020 (post-WTO regime) by using various sources like Food and Agricultural Organization (FAO), Directorate of Economics and Statistics and Ministry of Farmers and welfare, Government of India.

2.2 Analytical tools

2.2.1. Compound annual growth rate model

To examine the trends in area, production, productivity and export-import value of shelled Groundnut at all India level, compound annual growth rates (CAGR) was worked out using log-linear model.

$$\ln y_t = \alpha t + \beta t + u t$$

Where,

y_t=Dependent variable i.e. for which growth has been estimated
t=Time element which takes the value 1, 2 …….... n for various years.
αt=Intercept
βt=Regression coefficient
CAGR percent = [(Antilog of βt-1)] ×100 (Chaitra and Sonnad *et al.* 2019)

2.2.2. Revealed Comparative Advantage (RCA)

Balassa Index (BI) is computed to determine the RCA of selected commodity being traded over ten years (2001-2020).
Balassa Index (BI): Balassa defined the method of calculating the revealed comparative advantage. It is a ratio of traded products of the industry by a particular country to the world and total trade of that country to the world. (Vollrath, 1991, Bojnec, 2001).

$$RCA_{ij} = \frac{X_{ij}/X_{it}}{X_{wj}/X_{wt}}$$

where,
RCA_{ij} = Revealed Comparative Advantage of the i^{th} country for the j^{th} product.
X_{ij} = j^{th} commodity exports by the i^{th} country,
X_{it} = Total commodity exports of the i^{th} country,
X_{wj} = World exports of j^{th} commodity,
X_{wt} = Total commodity world exports

The calculated value of the above BI lies between 0 (zero) to infinity. If the value of the index is greater than one, then it shows that country 'i' have revealed comparative advantage in product 'j' and the value less than one indicates the country 'i' shows its comparative disadvantage capability in the product 'j'. However, RCA suffers from the problem of asymmetry as pure 'RCA is basically not comparable on both sides of unity. If the index ranged from zero to one, a country is said not to be specialized in a given sector and if the value of the index ranged from one to infinity, the country is said to be specialized. Hence the index is made symmetric by Dalum *et al.* (1988) [9], Laursen (1998) [9] and Widodo (2009) [10] and this modified RCA became Revealed Symmetric Comparative Advantage ($RSCA_{ij}$). The value of RSCA lies between -1 to +1. A modified formula is as below:

$$RSCA_{ij} = \frac{RCAij-1}{RCAij+1}$$

$RSCA_{ij}$ represent the revealed symmetric comparative advantage the country 'i' enjoy for product 'j' when the value will be above 0 (zero) and vice versa if the value will be below 0 (zero).

2.2.3. Markov chain analysis

The trade directions of shelled groundnut exports were analyzed by using the first order Markov Chain Analysis. It involves the construction of the Transitional Probability Matrix 'P' whose constituents (P_{ij}) depicts the temporal observation of switching of probability of exports from country 'i' to country 'j'. The diagonal element P_{ij} where i=j, measures the chance of a country retaining its market share or in other words, the loyalty of an importing country towards the exporter(s) (Bhavani *et al.* 2016) [11]. Annual export data for period 2011 to 2020 was used to analyze the direction of trade and changing pattern shelled groundnut exports. In this context eleven major importing countries (including all other countries grouped under 'others') were considered. The average exports to a particular country was considered to be a random variable which depended only on its past exports to that country and which was denoted algebraically by the following equation:

$$E_{jt} = \sum_{i=1}^{n} [Ei_{t-1}]P_{ij} + e_{jt}$$

where,
E_{jt} = Exports from India to the j^{th} country in the year t
Ei_{t-1} = Exports of i^{th} country during the year t-1
P_{ij} = The probability that exports shift from i^{th} country to j^{th} Country
e_{jt} = Statistically independent error term of eit-1
n = No. of importing countries

The transitional probabilities P_{ij}, can be arranged in a (c x n) matrix, with the following properties:

$$0 \leq P_{ij} \leq 1$$
$$\sum_{i=1}^{n} P_{ij} = 1$$

The transitional probability P_{ij} indicates the possibility that trade will switch over from the market 'i' to other market 'j' with the passage of time. The probabilities P_{ij} for $i \neq j$ indicates the gain or losses in trade of each of the importing market. The probability P_{ij} for i=j (diagonal probabilities) indicates probability of retention of an importing market.

3. Results and Discussion

Table 1: Trends in Area, Production, Productivity, Export and Import of Groundnut in India

Particulars	Area (Million Hectares)	Production (Million Tonnes)	Productivity (Kg/Hectare)	Export (1000 US$)	Import 1000 US$
Period I (1995-1996 to 2010 -2011)	-1.76*	-0.54	1.23	11.63*	11.16
Period II (2011-2012 to 2020-2021)	0.57	4.73	4.14	-3.76	44.51*
Overall Period (1995-1996 to 2020-2021)	-1.71*	0.74*	2.50*	13.85*	18.83*

Source: Agriculture statistics at glance,2021.
Note: * Indicates significance at 1 percent level.

3.1 Compound annual growth rate of groundnut

The compound annual growth rates of area, production, productivity, export and import of groundnut at all India level as a whole for the period I (1995-96 to 2010- 11), period II (2011-12 to 2020-21) and overall period (1995-96 to 2020-21) were worked out and represented in Table 1.

There is an increasing trend in growth rate of production, productivity, export and import of Groundnut during the overall period at 0.74, 2.50, 13.85 and 18.83 percent respectively at one percent level of significance, but there is negative trend in the area at -1.71percent per annuum. Gayathri (2018) [12] studied trend analysis of area, production, and yield of groundnut in India also found the same result for the study period 2001 to 2016 in which the trend values of groundnut except for area, production and yield shows an increasing trend. There is increase in production of groundnut in the overall period may be due to the introduction of oilseed promotion schemes in India.

There was a negative trend in area and production during the I period with -1.76 and -0.54 percent respectively and productivity, export and import have positive grow rate at 1.23, 11.63, 11.16 percent respectively. Sameer *et al.* (2014) work is in the same line with the above result in which they showed that quantity of groundnut exports grew annually by 15.25 percent and export value by 24.28 percent for 2001 to 2011.

During the second period area, production, productivity and import was having positive growth rate with 0.57,4.73,4.14, and 44.51 percent respectively and export was having negative trend with 3.76 percent. over the years the area under groundnut is decreasing, it may be due to shifting of farmers to other high incoming yielding crops and climate aberrations effecting the yield in turn income of farmers. (Madhusudhana, 2013) [14].

Table 2: Revealed comparative advantage and revealed symmetric comparative advantage of groundnut exports from India

Year	RSC	RSCA	Groundnut export from India (1000 US$)	World Groundnut export (1000 US$)	Percent share of Indian Groundnut export in world
2011	2.12	0.36	932485	20841552	4.47
2012	1.69	0.26	888733	19764378	4.50
2013	1.23	0.10	623337	18514370	3.37
2014	1.75	0.27	657530	14790782	4.45
2015	2.43	0.42	622472	11390447	5.46
2016	3.13	0.52	700869	10867559	6.45
2017	2.14	0.36	651817	14120157	4.62
2018	1.39	0.16	447340	15202102	2.94
2019	1.97	0.33	606118	15139878	4.00
2020	2.45	0.42	739523	14032696	5.27

Source: FAO

3.2 Revealed comparative advantage and revealed symmetric comparative advantage of shelled groundnut exports from India

The Revealed Comparative Advantage and Revealed Symmetric Comparative Advantage of export of shelled groundnut is represented in Table 2. The table indicates that during 2011 to 2020, India had an RCA of more than 1, ranged from 1.23 to 3.13 which means that India enjoyed comparative advantage in the export of groundnut during the study period, this is supported by the positive value of RSCA ranged from 0.10 to 0.52. There is fluctuation in the share of Indian Groundnut export to world as major importing countries of Indian groundnut implied strict regulations in terms of quality which negatively affect the export of groundnut from India. (Anonymous e).

Table 3: Transition probability matrix of Shelled Groundnut from 2011 to 2020

	Indonesia	Viet Nam	Malaysia	Philippines	Thailand	China, mainland	Ukraine	Russian Federation	Algeria	United Arab Emirates	Others
Indonesia	0.2726	0.4945	0.0000	0.0684	0.0020	0.0000	0.0321	0.0262	0.0042	0.0000	0.1001
Viet Nam	0.6346	0.0000	0.1244	0.1424	0.0000	0.0000	0.0337	0.0000	0.0000	0.0034	0.0616
Malaysia	0.2742	0.0000	0.4990	0.0732	0.0879	0.0000	0.0000	0.0000	0.0582	0.0075	0.0000
Philippines	0.0000	0.0000	0.1792	0.3923	0.1757	0.1812	0.0000	0.0000	0.0617	0.0100	0.0000
Thailand	0.1414	0.0000	0.0000	0.0000	0.0941	0.0682	0.0000	0.0000	0.0000	0.0000	0.6963
China, mainland	0.0000	0.8575	0.0000	0.0000	0.1425	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ukraine	0.0000	0.0000	0.1829	0.0000	0.0000	0.2061	0.0000	0.0000	0.0000	0.6110	0.0000
Russian Federation	0.0000	0.0000	0.0000	0.0000	0.7414	0.0000	0.0000	0.0000	0.0000	0.0000	0.2586
Algeria	0.0000	0.0000	0.0329	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9671
United Arab Emirates	0.0000	0.0000	0.0000	0.0000	0.0000	0.2367	0.0000	0.7633	0.0000	0.0000	0.0000
others	0.9116	0.0000	0.0000	0.0000	0.0000	0.0000	0.0166	0.0000	0.0000	0.0000	0.0719

Source: FAO

3.3 Transition probability matrix of shelled groundnut from 2011 to 2020

The pattern of trade direction towards major imports of shelled groundnut from India has been estimated by using Markov chain analysis. Indonesia, Vietnam, Malaysia, Philippines, Thailand, China mainland, Ukraine, Russian Federation, Algeria, United Arab Emirates are the major shelled Groundnut importers from India and the other importer countries grouped under 'others' were considered for the study. The transitional probability matrices were obtained by analysing the annual export data in terms of values from the period of 2011 to 2020 is represented in the table 3.

It is evident that Malaysia followed by Philippines and Indonesia, slowly losing the stability with 49, 39 and 27 percent of retention of its previous share with small amount of transitions to other importing countries. Thailand and others losing its stability with the probability retention of 9 and 7 percent respectively. Vietnam, China (main land), Ukraine, Russian Federation, Algeria and United Arab Emirates were the unstable importers of shelled Groundnut as those countries completely lost its share to other importer countries with zero retention of its previous share. Jhade and Abhishek. (2021) [15] in their study Structural Change Analysis of Groundnut Export Markets of India also found the same results in which Indonesia and Thailand countries are having low retention probabilities in export share and Vietnam, Ukraine, and United Arab Emirates are the most unstable markets among importing countries.

4. Conclusion

Groundnut is one of the chief oilseed crop after food crops in earning the foreign exchange as it stands second highest in production and export to the world. Results clearly revealed that there is slow decrease in area, production due other competing crops. There is huge fluctuation in comparative advantage and share of shelled groundnut export in world because of quality and sanitary features not meeting importing country demands. Hence measures should be taken to increase the production of groundnut along with export demanding qualities to meet the domestic demand and to fetch the highest returns in the international market.

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