Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 02, pp.46542-46544, February, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

STABILITY ANALYSIS OF CHICKPEA EXPORT MARKETS OF INDIA – MARKOV CHAIN APPROACH

***Siddeshwar S. Shiraganvi and Guledagudda, S. S.**

Department of Agricultural Economics, College of Agriculture, Vijayapura, University of Agricultural Sciences, Dharwad – 580005, Karnataka, India

ARTICLE INFO

Article History:
Received 15th November, 2016
Received in revised form
10th December, 2016
Accepted 29th January, 2017
Published online 28th February, 2017

Key words:

Markov chain,
Export,
Stability,
Chickpea.

ABSTRACT

Chickpea is an important pulse crop of India which plays an important role in meeting the domestic and export demands. India, despite being the world's largest producer of chickpea it imports a considerable amount to meet the domestic requirement. The present level of export is not consistent and exhibits high variations in volume and revenue earnings because of frequent ban on the export by the country. In this paper, the dynamics of changes have been measured in the export of chickpea from India to different export markets employing the Markov-chain model. The results have shown 'other countries' category as the stable destination for our Indian chickpea exports. The other traditional importing countries such as Algeria, Pakistan, UAE, Saudi Arab, Sri Lanka and Turkey indicated unstable export share to these markets. Projected export shares of Indian chickpea to major importing countries revealed that the export share of Indian chickpea is predicted to be highest (28.8%) to Pakistan.

Citation: Siddeshwar S. Shiraganvi and Guledagudda, S. S. 2017. "Stability analysis of chickpea export markets of India – Markov chain approach", *International Journal of Current Research*, 09, (02), 46542-46544.

INTRODUCTION

Agriculture being one of the major sectors associated with country's population has attracted much attention since independence. Pulses have exhibited wide year-to-year fluctuations in production. The fluctuations may induce inefficiency in production which, in turn, would curb the pace of growth in production. The different pulses grown in the country are an integral part of sustainable farming. Pulses are the important crop in India. Chickpea, the third most important food legume of the world is commonly known as chana. There is a huge domestic demand, India is a net importer of chickpea and has a share of about 25 to 28 percent in world chickpea import market. India imports chickpea mainly from Australia (70 per cent), Russia, and Tanzania (2014-15). However, there is also a significant share of India in global chickpea exports.

Data and Methodology

1. Compound growth rate analysis

Growth rates in import and export of chickpea for a period of 15 years in India were estimated by using the exponential growth model.

**Corresponding author: Siddeshwar S. Shiraganvi,*
Department of Agricultural Economics, College of Agriculture, Vijayapura, University of Agricultural Sciences, Dharwad – 580005, Karnataka, India.

$$Y_t = A\, B^t\, V_t \quad \ldots (1)$$

Where,
Y_t =Area / production / import /export or other variable under consideration in the year t
A =Intercept indicating Y in the base period (t = 0)
B =1 + g
t =time period
V_t =Random disturbance term

Equation (1) was converted into the logarithmic form as follows to make it in a linear form:

$$\ln Yt = \ln A + t * \ln B + \ln V_t$$

This is of the following form

$$Qt = a + bt + U_t \quad \ldots (2)$$

Where,
Qt=ln Y
a=ln A
b=ln B
Ut=ln V_t
The values of 'a' and 'b' were estimated by using Ordinary Least Squares estimation technique. Later, the original 'A' and

'B' parameters in equation (1) were obtained by taking antilogarithms of 'a' and 'b' values as;

A = Antilog (a)
B = Antilog (b)

Average annual compound growth rate (%) was calculated as follows:

g = (B – 1) * 100

Instability Analysis

The coefficient of variation was used as a measure to study the variability in export and import of chickpea in India. The coefficient of variation or index of instability were computed using the following formula

$$CV = \frac{\text{Standard Deviation } (\sigma)}{\text{Mean } (X)} \times 100$$

Linear trend were fitted to the original data of import and export quantity and values of chickpea, for the period of 15 years from 2000-01 to 2014-15. The trend coefficients were tested for their significance. Whenever the trend of series found significant; the variation around the trend rather than the variation around mean was used as an index of instability. The formula suggested by Cubby and Della (1978) was used to compute the degree of variation around the trend. That is coefficient of variation was multiplied by the square root of the difference between the unity and coefficient of multiple determination (r^2) was significant to obtain the instability Index.

$$\text{Instability Index} = \frac{\text{Standard Deviation } (\sigma)}{\text{Mean } (X)} \times 100 \times \sqrt{(1-r^2)}$$

r^2 = RSS/TSS = Goodness of fit
RSS = Regression Sum of Square
TSS= Total Sum of square

Markov chain analysis

The trade directions of Indian chickpea exports were analyzed using the first order Markov chain approach. Central to Markov chain analysis is the estimation of the transitional probability matrix P. The elements Pij of the matrix P indicates the probability that export will switch from country i to country j with the passage of time. The diagonal elements of the matrix measure the probability that the export share of a country will be retained. Hence, an examination of the diagonal elements indicates the loyalty of an importing country to a particular country's exports. Mahadevaiah *et al.* (2005)
In the context of the current application, seven major importing countries of chickpea were considered. The average exports to a particular country was considered to be a random variable which depends only on the past exports to that country, which can be denoted algebraically as

$$A_{jt} = \sum_{i=1}^{n} A_{it-1} P_{ij} + e_{jt} \dots\dots\dots\dots (1)$$

Where,
Ajt = Exports from India to j^{th} country during the year t.
Ait-1 = Exports to i^{th} country during the period t-1.
Pij = Probability that the exports will shift from i^{th} country to j^{th} country.
ejt = The error term which is statistically independent of Eit-1.
t = Number of years considered for the analysis
n = Number of importing countries
The transitional probabilities Pij which can be arranged in a (c * r) matrix, have the following properties:
$0 \leq Pij \leq 1$
For all i

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

Thus, the expected export shares of each crop during particular current period t were obtained by multiplying the export to the selected crop (seven in the present study) during the previous period (t-1) with the transition probability matrix (P). The transition probability matrix was estimated in the linear programming (LP) framework by a method referred to as minimization of Mean Absolute Deviation (MAD); The LP formulation on analysis was stated as per expression:

Min OP*+Ie

Subject to,

XP* + V= Y
GP*= 1
P* = 0

Where,
0 is the vector of zeroes.
P* is the vector in which probability Pij are arranged.
I is an apparently dimensioned vector of export
E is a vector of absolute error I U I.
Y is the vector of export to each country.
X is the block diagonal matrix of lagged values of Y
V is the vectors of errors
G is the grouping matrix to add the row elements of P arranged in P* to unity.

Using the estimated transitional probabilities, the export of chickpea to various destinations was predicted by multiplying the same with the respective shares of base year. The export shares of India chickpea to different countries were predicted for the years 2015 to 2019.

RESULTS AND DISCUSSION

Compound growth rates for import and export of chickpea were analyzed for a period of 15 years i.e. from 2000-01 to 2014-15 and have been presented in Table 1. The results revealed that both import and export exhibits significant positive growth rate i.e import quantity (5.2%), import value (12.5%), export quantity (49.1%) and export value (63.9%). The study also depicted that the instability indices which was found highest in import value (72.8%) followed by import quantity (60.1%), export value (38.8%) and export quantity (38%). Growth in value of export was found to be very high indicating good potential and higher profit for Indian chickpeas.

Table 1. Compound annual growth rates and instability indices of import and export of chickpea (2000-01 to 2014-15)

Particulars	Import		Export	
	Quantity ('000 Kgs)	Value (₹ in lakhs)	Quantity ('000 Kgs)	Value (₹ in lakhs)
Average	265434.3	69915.4	107051.5	51143.2
CAGR (%)	5.2	12.5***	49.1***	63.9***
Instability Index (%)	60.1	72.8	38.0	38.8

Note: *** indicates significance at 1 per cent level of probability
CAGR- compound annual growth rate

Table 2. Transitional probability matrix of Indian chickpea export during 2004-2014

	Algeria	Pakistan	Saudi Arab	Sri Lanka	Turkey	UAE	Others
Algeria	0.486	0.000	0.017	0.000	0.061	0.000	0.436
Pakistan	0.079	0.299	0.011	0.161	0.357	0.074	0.019
Saudi Arab	0.000	0.279	0.000	0.233	0.000	0.488	0.000
Sri Lanka	0.688	0.070	0.119	0.000	0.072	0.051	0.000
Turkey	0.000	1.000	0.000	0.000	0.000	0.000	0.000
UAE	0.000	0.888	0.000	0.000	0.000	0.112	0.000
Others	0.000	0.000	0.137	0.120	0.000	0.071	0.673

Table 3. Projected export shares of Indian chickpea to major importing countries (Percentages)

Year	Algeria	Pakistan	Saudi Arab	Sri Lanka	Turkey	UAE	Others
2015	16.4	29.0	5.1	7.9	9.6	7.4	24.6
2016	15.7	26.9	4.9	8.8	11.9	7.6	24.2
2017	15.8	28.7	4.9	8.4	11.2	7.4	23.7
2018	15.7	28.3	4.8	8.6	11.8	7.5	23.4
2019	15.8	28.8	4.8	8.5	11.7	7.4	23.1

The results are in line with the findings of Kadli Vinayaka (2013). India has increased its export of chickpea from mere 2570 thousand tonnes in 2000-01 to 190226 thousand tonnes during 2014-15 with growth rate of 49.1 per cent per annum but still India is importing considerable amount of chickpea from international market to meet the domestic requirement. The transitional probability matrix is presented in Table 2 give a broad indication of the change in direction of trade of chickpea during the period 2004 to 2014. The major importing countries of chickpea from India were Algeria, Pakistan, Sri Lanka, Turkey, Saudi Arab, UAE and all other countries have been grouped under other countries. The row elements in the transitional probability matrix provide the information on the extent of loss in trade, on account of competing countries. The columns element indicates the probability of gains in volume of trade from other competing countries and the diagonal element indicates probability of retention of the previous year's trade volume by the respective country. It is evident from the Table 2. Interestingly, the minor importers of chickpea, the 'others' category had remained the most stable and loyal markets for Indian chickpea as reflected by the probability of retention of 67.3 per cent. The most unstable markets among the importing countries were Saudi Arab, Sri Lanka and Turkey with the zero retention. Algeria, Pakistan and UAE retained 48.6 per cent, 29.9 per cent and 11.2 per cent of total export from India respectively. These results are consistent with the findings of Varghese (2011). The export shares of Indian chickpea were predicted for the year 2015 to 2019 using transitional probability. It can be seen from Table 3 that the export share of Indian chickpea is predicted to be highest (28.8%) to Pakistan. The export shares to Sri Lanka and Turkey are expected to rise and India's share to Algeria, Pakistan, Saudi Arab and other countries is expected to fall but with respect to UAE it remains the same by 2019.

Conclusions and Policy Implications

The compound growth rate analysis revealed that there was a significant growth was observed both in case of export quantity as well as export value of chickpea from India. The Markov chain analysis of chickpea export from India has indicated minor importers of chickpea as the most stable market and Saudi Arab, Sri Lanka and Turkey as the most unstable markets among importing countries. The transitional probability matrix has indicated that India is likely to lose most of its export share in the traditional markets such as Algeria, Pakistan and Saudi Arab. The estimation has indicated comparative rise in export shares in Sri Lanka and Turkey. Though others (minor importers) have remained loyal markets to Indian chickpea, India should not have high dependency on such countries so as to avoid trade risks in the long run. Therefore, appropriate export promotional strategies have to be envisaged to diversity the geographical concentration of chickpea export and minimize markets risks.

REFERENCES

Anonymous, 2016, Pulses year book 2015.

Vinayaka Kadli, 2013. Economics of production, trade competitiveness and varietal trait preferences in chickpea. *M. Sc. (Agri.) Thesis*, *Univ. Agric. Sci., Dharwad*, Karnataka (India).

Mahadevaiah, G. S., Ravi, P. C and Chengappa, P. G. 2005. Stability analysis of raw cotton export markets of India – Markov chain approach. *Agric. Econ. Res. Rev*., 18(2) : 253-259.

Nisha Varghese., 2011. Changing directions of groundnut trade in India: The WTO effect. Paper presented In: *Int. Conf. App, Econ. – ICOAE*, New Delhi, p.731-736.

****