Export Performance of Indian Walnut: Decomposition Analysis and Gravity Model Approach[§]

Naseem A. Qammer and S.H. Baba*

Division of Agricultural Economics & Marketing,
Sher-e-Kashmir University of Agricultural Sciences &Technology of Kashmir,
Shalimar Campus, Srinagar-190 025, Jammu and Kashmir

Abstract

Export performance of Indian walnut has been comprehensively analyzed in this study employing chronological data. The export of walnut from India has significantly increased over the years, but still constituted only 3 per cent of total world export. Between 1979 and 2012, the export of shelled walnut has significantly increased, at an annual growth rate of about 3 per cent, while walnut with shell has shown a declining trend over the years, implying widening of markets for value-added products of walnut. The export instability in quantity and value of both shelled and walnut with shell has declined over the years; however, the instability in unit price of shelled walnut has increased over the years. The decomposition analysis has revealed highest contribution of change in mean export quantity among the other components of change in the average export value of walnut. The unit value of Indian walnut export has been found lower compared to many other nations, indicating the possibility of a higher price by ensuring quality parameters as per global standards. The estimates of gravity model have revealed that per capita GDP, agricultural GDP, and consumption of importing partners, and also the Indian GDP are the significant factors determining Indian walnut export. The study has also unveiled unexploited potential of Indian walnut export to some trading partners. The study has emphasized on the improvement in quality of walnut, integration of production and value addition, export promotion and strengthening of bilateral ties with regular trade partners for enhancing export of Indian walnut.

Key words: Decomposition analysis, gravity model, Indian walnut export, price competitiveness, revealed comparative advantage

JEL Classification: Q13, Q17

Introduction

Diversification towards horticultural crops has been suggested as a viable option to stabilize and raise farm income, enhance agricultural growth and increase employment opportunities in the agricultural sector (Vyas, 1996; Joshi, 2005; Birthal *et al.*, 2007). Not surprisingly, the majority of farm households have a clear preference for horticulture sector (Joshi, 2005).

The horticulture has emerged as an indispensible part of agriculture, offering ample opportunities for sustaining large number of agro-based industries which generate substantial employment opportunities and play a vital role in providing livelihood security to the farmers.

India is the world's second largest producer of fruits after china (Anonymous, 2013); however, this transition from subsistence to commercial fruit production is linked with the development of marketing structure. Among the fruits, dry fruits have a distinct

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* Author for correspondence
  Email: drshbaba@gmail.com
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place in the cropping system. Walnut possesses a potential of earning substantial foreign exchange to the nation owing to its increasing demand across the world and corresponding area expansion under this fruit at significant rate especially in major walnut-producing states of India. The walnut is grown in the north-western Himalayan belt, expanding up to Darjeeling and Sikkim, though it is mainly found at the highlands of Kashmir and its cultivation is practised by small/ marginal farmers on marginal land. Within Kashmir, the walnuts produced at an altitude of 1500m and above are considered of superior quality, with a light-colour kernel and the characteristic thin shell.

Walnut is an important commodity of international trade. Considering its rising consistent demand, farmers are laying new walnut orchards wherever technically and economically feasible. Further learnings from market behavior tend to encourage them to adopt quick bearing and papery varieties. Now that walnut growing has received export orientation, the activities that are to confirm international standards like grading, packing of nuts as well as kernel are getting common at field and enterprise level. In view of its huge export potential, private enterprises are now penetrating into its export trade in the state. India's share in the overall walnut export has recently reached about US$ 40 million, yet its export constituted only 2.73 per cent and 0.10 per cent of world export of shelled and walnut with shell, respectively. There has been an increase of about 44 per cent in earnings from walnut export between 2008 and 2012 in Jammu & Kashmir. India presently exports walnut to around 90 countries though this number has varied across years. The linkages of walnut production with its global trade are expected to remain an important domain of agricultural research in future. With this background, this study has analysed the global trade of walnut to explore the possibilities of harnessing its untapped potential.

Data and Methodology

The study is mainly based upon the secondary data collected from official websites of Food and Agricultural Organization (FAO), World Fact book, World Bank, etc.

Analysis of Variance

The components of change in average export value and variance of export were examined by the analysis of variances (Hazell, 1982). This method has been used by Shyam *et al.* (2004) in the studies on export quantity and export unit values were first detrended using the linear relations of the form of Equation (1):

$$Z_t = a + bt + e_t \qquad \qquad …(1)$$

where,

Z_t = Dependent variable (export quantity and export unit values),

t = Time variable, and

e_t = Random variable residual (with zero mean and variance σ^2).

After detrending the data, the residuals were centered on the export quantity and export unit value resulting in the detrending time–series data of the form of Equation (2):

$$\hat{Z}_t = e_t + z \qquad \qquad …(2)$$

where,

$\hat{Z}_t$ = Detrended export quantity or unit value,

z = Mean of export quantity /unit value, and

e_t = Random variable.

The series of export quantity (Q) and unit value of export (P) was divided into two sub-periods, viz 1980-1995 and 1996-2012. The components of average export value were estimated as:

$$EV = \overline{Q}_I \Delta \overline{P} + \overline{P}_I \Delta \overline{Q} + \Delta \overline{Q} \Delta \overline{P} + \Delta Cov\,(Q, P)(\text{Method I}) \text{ or}$$

$$= \overline{Q}_{II} \Delta \overline{P} + \overline{P}_{II} \Delta \overline{Q} + (-\Delta \overline{Q} \Delta \overline{P}) + \Delta Cov\,(Q, P)(\text{Method II})$$

Although method II explained all the sources of change in average export value of walnut, however, both methods were estimated in the present study.

where,

$\overline{Q}_I$ = Average of export quantity of walnut in first period,

$\overline{Q}_{II}$ = Average of export quantity of walnut in second period.

$\overline{P}_I$ = Average of unit value of export in first period,

$\overline{P}_{II}$ = Average of unit value of export in second period,

$\Delta \overline{Q}$ = Change in export quanity $(=\overline{Q}_{II} - \overline{Q}_I)$, and

$\Delta \overline{P}$ = Change in unit value of export $(=\overline{P}_{II} - \overline{P}_I)$.

Accordingly, the components of change in average export value were estimated as shown in Table 1.

Table 1. Components of change in average export value of walnut

Source of change	Component of change		
Description	Symbol	Method I	Method II
Change in mean export unit value	$\Delta\overline{P}$	$\overline{Q}_I\Delta\overline{P}$	$\overline{Q}_{II}\Delta\overline{P}$
Change in mean export quantity	$\Delta\overline{Q}$	$\overline{P}_I\Delta\overline{Q}$	$\overline{P}_{II}\Delta\overline{Q}$
Interaction between change in mean quantity and unit mean value	$\Delta\overline{P}$, $\Delta\overline{Q}$	$\Delta\overline{Q}\Delta\overline{P}$	- $\Delta\overline{Q}\Delta\overline{P}$
Change in quantity -unit value covariance	$\Delta Cov\,(Q, P)$	$\Delta Cov\,(Q, P)$	$\Delta Cov\,(Q, P)$

The variance of export value of walnut was estimated by making use of sources of change as given in Table 8.

The Gravity Model: Specification and Functional Form

The gravity model of trade is a widely acclaimed empirical tool for modelling bilateral trade (Zhang and Christensen, 1995). The selection of the gravity in the present analysis is based on its success in other empirical studies, although criticisms regarding weak linkages to a theoretical basis are acknowledged. The gravity model in its original form as applied to international trade (Tinbergen, 1962; Poyhonen, 1963) is given by Equation (1):

$$T_{ij=}\alpha.Y_iY_j/D_{ij} \qquad \ldots(1)$$

where, T_{ij} is the value of the bilateral trade between countries 'i' and 'j'; Y_i and Y_j are the national incomes of country 'i' and 'j', respectively measured in terms of GDP; D_{ij} is the measure of bilateral distance between the capital cities of the countries 'i' and 'j' and á is the constant of proportionality.

Recently, several researchers have used augmented gravity model for modelling the bilateral trade flow between various country pairs (Anderson and Wincoop, 2001; Sevela, 2002, Jayasinghe and Sarker, 2004). The structural form of the model in the present study, to explain the volume of walnut export from India to 38 partners countries (Table 13), using panel data was laid out as follows:

$$\log (T_{ij})=\log \alpha+ \beta_1\log (D_{ij}) + \beta_2\log (Y_j)+ \beta_3\log (Y_{aj})$$
$$+ \beta_4\log (C_j) + \beta_5\log(Y_i) + \beta_5\log(C_i)+u_{ij}$$
$$\ldots(2)$$

where, T_{ij} is the value of the walnut export from India to the jth Indian trade partner, Y_j and Y_{aj} are the per capita GDP and proportion of agricultural GDP of the jth Indian trade partner, respectively. The variable D_{ij} denotes the distance between India 'i' and country 'j' and was measured as the great circle distance between the capitals of the two countries. Y_i denotes Indian GDP, and C_j and C_i denote the domestic walnut consumption of the jth partner country and exporting country India 'i'. The error-term u_{ij} represents the myriad other influences on bilateral trade and its expected value was assumed to be zero.

The present study postulates that walnut export from India would be better explained by agricultural GDP rather than GDP by itself, as in other studies. The per capita GDP of Indian trade partner has been included as an independent variable in the model since it can explain the link between a country's trade and its stage of development (Batra, 2004). It is also hypothesized that higher income leads to greater demand, greater investment and production and hence, greater external trade. The distance variable is in fact, a proxy for the transportation cost of the commodities being traded. The domestic consumption in exporting and importing countries has been used as one of the determining factor, as more consumption means more demand for a commodity. The model has been estimated using a panel data set for 38 trade partner countries by employing the Fixed Effects Model (FEM) and Random Effect Model (REM) (Gujarati, 2003). Fixed effects model is preferred over random effects model to estimate a gravity equation (Egger, 2000).

According to Wooldridge (2000), random effects are possible when the cross-sectional effects are not correlated with the independent variables. Also, Nag and Nandi (2006) reported that in the gravity model context, the country effects or the intercepts will possibly have relationships with country variable such as GDP, distance, etc. In the present study, Hausmans' Specification Test was employed to choose one among the two models.

Revealed Comparative Advantage Ratios

The concept of revealed comparative advantage (RCA) was first developed by Balassa, (1964). In Balassa's frame work, RCA can be measured by the relative export share of a country in the world export of the individual commodity. In other words, the relative export share of a particular country can be quantified in the form of an index, which indicates the pattern of RCA in the trade of a particular commodity. The RCA is measured by the commodity's share in the country's export relative to its share in the world by employing formula (3):

$$RCA=(X_{Iw}/X_{Im})/ (X_{Ww}/X_{Wm}) \qquad …(3)$$

where,

X_{Iw} = Value of India's walnut export,

X_{Im} = Total India's merchandise agricultural trade,

X_{Ww} = Value of world's walnut trade,

X_{Wm} = Total world's merchandise agricultural trade,

If RCA > 1, then the country has a revealed comparative advantage in that commodity,

If RCA < 1, then the country has a revealed comparative disadvantage in that commodity, and

RCA = 1 shows comparative neutrality.

Results and Discussion

Trends in Area, Production and Productivity of Walnut in India

The walnut growing is becoming commercial at increasing pace owing to its export orientation. It could be seen from the Table 2 that area under walnut in India has steadily increased. Between 1979 and 2012, there has been an expansion of over 11.5 thousand hectares area under walnut at annual growth rate of 1.70 per cent and this growth was even more significant during period 1 (1979-1996). Presently, walnut occupies an area of 31.5 thousand hectares and produces 40 thousand tonnes (Table 2). The production of walnut also exhibited a rising trend but unlike area its growth has been faster during post-WTO era. The higher growth in production during 1996-2012 was owing to improvement in productivity level during this phase; however, its productivity has not increased at the desired pace. Except in a few regions, the walnut is

Table 2. Area, production and yield of walnuts in India: 1979-2012

Year		Area (ha)	Production (Mt)	Yield (Mt/ha)
1979		20,000	17000	0.85
1980		20,000	18000	0.90
1985		17,000	15000	0.88
1990		24,600	20000	0.81
1995		28,800	25000	0.87
2000		30,200	31000	1.03
2005		30,800	32000	1.04
2010		30,800	38000	1.23
2012		31,500	40000	1.27
1979-1995	CGR	2.64*	2.29*	-0.35
	SE	0.49	0.67	0.52
1996-2012	CGR	0.31*	2.35*	2.04*
	SE	0.04	0.29	0.30
1979-2012	CGR	1.70*	2.81*	1.11*
	SE	0.16	0.18	0.18

Note: CGR=Compound growth rate (%), SE=Standard error, * Denotes significance at 0.05 per cent or better probability level.

not grown in an organized orchard, as a result walnut trees are not cultured on scientific lines and even where these trees appear as organized orchards, have formed a dense canopy. Moreover, there is no identified variety among old-age trees and each tree is said to be a separate genotype with distinct features. All these facts are responsible for the lower productivity of walnut in India, which emphasize on its improvement coupled with area expansion in view of the rising demand of walnut in national and international markets.

India's Share in Global Walnut Trade

The walnut is traded in the global markets either with shell (nut) or shelled (kernel). India's share in world export of shelled walnut was about 2.73 per cent in 2012. The USA, Ukraine, Maxico and Chile are the major exporters of shelled walnut in the world (Table 3). On the other hand, India has a meagre share in export of walnut with shell. Further, there has been intra-year variation in Indias' share in world walnut export. India's share in export of kernels has increased in absolute terms over the years, but it has decreased in proportionate terms. India has not been a regular

Table 3. Share of different countries in global walnut export: 1980-2012

(Per cent)

Country	Walnuts, shelled				Walnuts, with shell			
	1980	1990	2000	2012	1986	1990	2000	2012
USA	-	35.22	32.07	36.38	55.84	65.92	47.49	46.48
Ukraine	-	-	-	15.67	-	-	-	6.88
Mexico	0.18	1.75	4.83	7.65	-	-	19.05	9.78
Chile	0.49	1.53	3.26	5.63	5.02	8.86	3.41	5.07
China, mainland	-	26.05	10.76	3.70	15.28	6.79	1.76	0.01
Turkey	-	1.76	0.41	2.80	0.96	0.41	0.01	0.03
India	-	10.13	9.85	2.73	7.28	1.10	0.56	0.10
Germany	30.88	0.40	0.40	1.97	2.54	2.57	1.20	0.27
France	3.10	8.91	3.75	1.66	6.22	8.07	15.81	11.26
Hungary	-	-	1.76	1.07	0.49	-	0.52	0.43
Netherlands	3.12	0.73	0.49	0.72	0.27	1.77	1.66	0.27
Others	62.637	13.19	32.54	19.76	5.92	4.21	8.58	19.36
	(64964)	(33447)	(72567)	(194598)	(80447)	(77239)	(106565)	(258626)

Note: Figures within the parentheses indicate total worlds' export in tonnes

importer of walnut in any form. India's import constituted only 0.02 per cent and 0.04 per cent of total world trade of shelled and walnut with shell, respectively.

Share of Partner Countries in Indian Walnut Export

In order to identify the major trading partners in the Indian walnut trade, the country-wise share in Indian walnut export was analyzed. India exports shelled walnut to many countries, of which United Kingdom (15.6%) is the largest importer, followed by Egypt (13.4%), Germany (11.0%), Spain (8.3%), and Netherlands (7.9%). Besides, small quantities of shelled walnut are exported to a number of countries (Table 4). In the case of Indian export of walnut with shell, there was no main destination; only small quantities go to a number of partner countries. There has been a significant change in the share of different countries since 1980s. Some countries have increased their import from India, while others have declined import from India.

Growth and Variability of Indian Walnut Export

The Indian export of walnut (equivalent of nuts) has been performing better towards 2012. The walnut export as nut equivalent has significantly increased from about 7922 tonnes (1979) to 14976 tonnes (2012), though it has shown some swings in 2000 (Table 5). The export quality of walnut with shell (nuts) has consistently declined over the years. Although the export quantity of walnut shelled (kernel) has increased since 1979, but it has shown swings in between and declined from 6546 tonnes (2010) to 5308 tonnes (2012). The unit price of walnut both shell and with shell, has shown a favourable figure during 2012. The export of walnut during the post--WTO period was characterized by the dominance of shelled walnut compared to nuts (Table 5). The reasons for positive growth in kernels export can be the increasing price and widened markets, though the most striking feature is the emergence of demand for kernels rather than nuts. Accordingly, a number of private enterprises have ventured into the value addition of walnut around production centres to produce kernels for export.

The compound growth rates of walnut exports from India during 1979 to 2012 presented in Table 6, show that export of walnut (with shell) has decreased at an annual rate of –9.64 per cent. The declining growth was more significant during period I (-19.85%). The export value of walnut with shell has also exhibited a similar declining behaviour. The per unit price of walnut with shell has experienced a declining trend only during 1996-2011. It gives an impression that the

Table 4. Share of trading partners in Indian export of shelled and walnut with shell

(Per cent)

Partner	Walnuts, shelled					Walnuts, with shell				
	1986	1990	2000	2010	2012	1986	1990	2000	2010	2012
UK	45.3	36.8	9.7	8.4	15.6	32.8	38.7	6.8	0.2	-
Egypt	0.9	2.1	6.2	9.3	13.4	-	7.2	2.1	-	-
Germany	-	-	13.0	9.9	11.0	-	-	9.7	-	-
Spain	-	2.0	22.1	9.3	8.3	5.8	5.3	23.8	-	-
Netherlands	5.1	8.5	4.5	7.2	7.9	9.3	10.1	8.0	-	0.4
China,mainland	-	-	-	5.6	7.5	-	-	-	-	-
USA	3.3	-	2.6	1.1	5.5	3.9	-	1.9	-	-
Taiwan	0.0	-	0.8	1.1	5.1	-	-	2.1	3.1	-
France	16.3	28.1	11.5	8.1	5.0	3.7	14.3	16.4	-	-
Australia	5.9	1.5	2.1	2.1	4.7		1.3	-	-	
Denmark	3.2	3.4	2.6	2.3	2.2	2.1	8.9	13.5	-	-
Sweden	0.1	-	0.3	1.3	2.0	-	-	-	-	-
UAE	3.9	2.0	1.6	2.7	1.5	4.0	-	4.3	7.8	-
Kuwait	1.7	-	0.9	2.8	1.4	0.4	-	1.8	-	-
Algeria	-	-	-	1.0	1.2	-	-	-	-	-
Belgium	-	-	1.1	1.5	1.1	-	-	-	-	-
Greece	0.3	3.6	8.6	2.8	0.9	3.5	1.3	1.9	-	-
Norway	1.6	1.0	0.3	0.4	0.9	-	-	-	-	-
Switzerland	2.2	-	1.0	-	0.7	-	-	-	-	-
Hong Kong	0.0	-	0.1	3.1	0.7	-	-	-	22.2	-
Italy	0.5	0.5	2.0	1.7	0.6	27.0	1.5	2.7	-	-
Tunisia	-	-	-	0.8	0.5	-	-	-	-	3.1
Others	9.8	10.3	8.9	17.6	2.2	7.5	11.4	4.9	66.8	96.5
	(3296)	(3015)	(6913)	(7260)	(5187)	(570)	(754)	(513)	(451)	(228)

Note: Figures within the parentheses indicate total Indian export in tonnes

Table 5. Trend in walnut export from India: 1979-2012

(Quantity in tonnes, value in '000$ and unit value in '000$/tonne)

Year	Walnuts, with shell			Walnuts, shelled			Nut equivalent		
	Export quantity	Value	Unit value	Export quantity	Value	Unit value	Export quantity	Value	Unit value
1979	7922	14374	1.8	0	0	0	7922	14374	1.8
1980	5858	12186	2.1	0	0	0	5858	12186	2.1
1985	4292	8531	2.0	0	0	0	4292	8531	2.0
1990	849	2051	2.4	3389	8805	2.6	4494	10856	2.4
1995	428	1116	2.6	6445	24273	3.8	9737	25389	2.6
2000	597	1716	2.9	7145	22765	3.2	8517	24481	2.9
2005	179	155	0.9	5077	25810	5.1	29985	25965	0.9
2010	337	361	1.1	6546	39098	6.0	36836	39459	1.1
2011	166	641	3.9	5393	43924	8.1	11541	44565	3.9
2012	252	665	2.6	5308	38871	7.3	14976	39536	2.6

Table 6. Growth rates of Indian export of walnut: 1979-2012

Period		Walnuts, with shell			Walnuts, shelled		
		Quantity	Value	Unit value	Quantity	Value	Unit value
1979-1995	CGR	-19.85*	-17.04*	3.02*	11.01*	13.89*	3.37*
	SE	3.99	4.14	0.73	1.82	2.09	1.13
	CV	0.92	0.81	0.19	0.32	0.42	0.13
1996-2012	CGR	-5.27*	-8.76*	-3.49*	1.09	8.68	7.59*
	SE	2.24	3.57	2.49	2.03	1.44	1.63
	CV	0.56	0.82	0.41	0.21	0.37	0.34
1979-2012	CGR	-9.64*	-10.34*	-0.70	2.78*	6.16*	3.37*
	SE	1.34	1.44	0.76	0.59	0.60	0.47
	CV	1.35	1.19	0.32	0.48	0.60	0.36

*Denotes significance at 0.05 per cent or better probability level

export of walnut with shell has been declining over the year which could possibly be due to the declining preference of importing countries to walnut as nut.

Between 1979 and 2012, the export of shelled walnut (kernel) significantly increased at an annual growth rate of about 3 per cent. The export of shelled walnut was increasing at 11.01 per cent annual growth in pre-WTO period, but later its growth slackened during post-WTO phase. The growth in export value of shelled walnut has been more during post-WTO phase. It was generally observed that the increased volume of export can be ascribed to the manifold increase in the walnut production consequent to the introduction of high-yielding low-gestation varieties. The structural changes in product composition, growth in the number of exporters, establishment of focal points, continuous improvement in quality standard and manifold promotional measures by APEDA and other agencies have resulted in the increased growth.

The coefficients of variation (CV) were calculated to measure the variability in quantity, value and unit price of walnut export (Table 6). The calculated coefficients of variation indicated that the export quantity and value of both shelled and with shell walnuts declined over the years. The estimates for CV were higher in pre-WTO period (1979-1995) than in post-WTO period (1996-2012). However, the instability in unit price of shelled walnut has increased over the years. The competition from other exporting countries may be an important reason for the increasing instability in unit value of walnut export. The existence of variability indicated that export of walnut can be increased by employing suitable measures like quality control, demand creation, branding, etc.

Decomposition Analysis

The decomposition analysis was carried to find the sources of growth of average export value and variance of export value of Indian walnut. The components of change in the export value of Indian walnut in terms of change in mean export quantity and mean export unit value and their variability besides the interaction effect, were set out in Table 7. The results indicate that the contribution of change in mean export quantity was the highest across all components of change, i.e. the increase in mean export quantity accounted for 81.90 per cent and 79.45 per cent of the increase in average export value in methods I and II, respectively. It was expected because the export quantity had recorded a significant higher growth rate during both the periods, whereas the export unit value recorded a negative growth rate during the post-liberalization period. The changes in the covariance between the mean export quantity and mean export unit value accounted for 19.02 per cent decrease in the mean export value in method I and 18.62 per cent decrease in method II. The changes in the co-variances could arise through the changes in the variance of export quantity and export unit value.

With regard to interaction effect, the export quantity was benefited to a small extent (0.75%) from both mean export quantity and mean export unit value.

Table 7. Decomposition analysis of components of change in average export value of Indian walnut

Source of change in export Description	Component of change		
	Symbol	Method I (%)	Method II (%)
Change in mean export unit value	$\Delta\overline{P}$	-0.42	-1.17
Change in mean export quantity	$\Delta\overline{Q}$	81.90	79.45
Interaction between change in mean quantity and mean unit value	$\Delta\overline{P} . \Delta\overline{Q}$	-0.77	0.76
Change in quantity- unit value covariance	$\Delta Cov.(Q, P)$	-19.02	-18.62

Among the various components, the contribution of change in mean export quantity of Indian walnut was the dominant source for the change in average export value, followed by the interaction between changes in the mean export quantity and mean export unit value.

The components of change that affected the stability of export value are shown in Table 8. The change in the mean export quantity accounted for only 1.26 per cent in the variance of value of walnut export. The change in the variance of export quantity was the important source in increasing the export value variance to the extent of 33.54 per cent. The change in the covariance between mean export quantity and mean export unit value contributed -17.83 per cent, showing the variability effect of both the mean export quantity and mean export unit value reduced the instability of export value variance to some extent thus generating a stabilizing effect among all other components of change. The effect of interaction between the change in mean export quantity and unit value variance was also important in determining the stability of the export

value and when added together, contributed 15.58 per cent of the increase in the variance of total export value.

The interaction terms arose in part from the change in mean export unit value and export quantity unit value covariance and induced a change in the behaviour of the exporters, which affected the mean or variance of the export quantity and led to the instability of export value. The value for this interaction turned out to be -26.11 per cent. There was about -2.89 per cent contribution of the residue in declining variations in export quantity. The effects of all the components of change are to be judiciously taken care of to improve the export and harness the export potential of Indian walnut.

Price Competitiveness and Revealed Comparative Advantage of Indian Walnut Export

This section examines the price competitiveness of Indian walnut in the global trade. Table 9 reveals that India exported shelled walnut at US\$ 7330/tonne and nut at US\$ 2640/tonne in 2012, which is a relatively

Table 8. Decomposition analysis of the components of change in the variance of export value of Indian walnut

Source of change	Symbols	Components of change (%)
Change in mean unit value	$\Delta\overline{P}$	-0.02
Change in mean quantity	$\Delta\overline{Q}$	1.26
Change in unit value variance	$\Delta V(P)$	2.24
Change in quantity variance	$\Delta V(Q)$	33.54
Interaction between change in mean unit value and mean quantity	$\Delta\overline{P} .\Delta\overline{Q}$	0.01
Change in quantity -value covariance	$\Delta Cov(P,Q)$	-17.83
Interaction between change in mean export quantity and unit value variance	$\Delta\overline{Q}, \Delta V(P)$	15.48
Interaction between change in mean unit value and quantity variance	$\Delta\overline{P}, \Delta V(Q)$	-0.63
Interaction between change in mean quantity and unit value and changes in quantity value covariance	$\Delta\overline{QP}\Delta Cov(PQ)$	-26.11
Change in residue	ΔR	-2.89

Table 9. Unit value of walnut realized by different exporters in the global market

('000US$/tonne)

Country	Walnut	1980	1990	2000	2010	2011	2012
Afghanistan	Shelled	-	1.62	0.53	8.10	5.49	7.32
	With shell	-	2.50	-	1.32	1.34	1.20
Australia	Shelled	-	3.00	3.80	7.47	8.64	9.21
	With shell	-	4.00	-	3.41	4.19	3.42
Chile	Shelled	-	5.19	5.92	12.27	13.44	12.84
	With shell	2.76	1.89	2.18	4.28	4.59	4.32
Hong Kong	Shelled	-	2.11	4.08	4.32	4.31	8.24
	With shell	-	1.15	1.49	2.08	2.19	1.89
China mainland	Shelled	1.90	2.10	2.70	5.10	6.60	7.60
	With shell	1.95	1.04	1.16	1.94	3.15	2.04
France	Shelled	6.74	7.53	5.39	9.37	12.61	10.49
	With shell	1.80	2.10	2.00	3.40	4.10	4.20
Germany	Shelled	4.00	6.00	6.00	8.00	10.00	11.00
	With shell	1.44	1.98	2.10	3.78	5.00	4.90
Hungary	Shelled	4.14	-	1.48	3.71	3.92	4.22
	With shell	-	-	3.06	6.64	8.44	7.30
India	Shelled	-	2.60	3.19	5.97	8.14	7.33
	With shell	2.08	2.42	3.87	1.07	3.86	2.64
Kyrgyzatan	Shelled	-	-	0.47	1.47	1.81	1.84
	With shell	-	-	0.34	0.70	0.79	0.71
Maxico	Shelled	-	4.37	4.08	3.24	10.94	10.78
	With shell	-	-	1.90	4.24	4.29	3.80
Maldova	Shelled	-	-	2.78	6.26	7.88	6.78
	With shell	-	-	0.84	1.54	2.23	1.67
Romania	Shelled	-	-	1.96	4.84	6.97	5.42
	With shell	-	-	0.68	1.21	2.02	1.56
Turkey	Shelled	1.20	3.70	4.00	7.40	9.80	11.00
	With shell	3.81	0.78	2.33	3.00	6.38	4.18
Ukraine	Shelled	-	-	-	2.62	4.08	3.60
	With shell	-	-	-	1.70	2.20	1.40
USA	Shelled	3.01	3.29	3.4	6.44	7.60	9.17
	With shell	1.52	1.80	1.82	3.09	3.71	3.91
Uzbekistan	Shelled	-	-	1.06	3.28	2.73	4.42
	With shell	-	-	0.66	1.28	1.65	1.72

low price than of other exporting nations, although this unit value of walnut was higher than of Kyrgyzstan, Romania and Ukraine. Similarly, walnuts with shell were also exported at a lower unit price compared to of other nations. The lack of uniformity in produce owing to poor grading and not confirming to global quality standards in association with other trade-related factors resulted in a lower price for Indian walnut in the global market. However, the price scenario gave us an impression that India can invest much on quality improvement as it has a margin for raising unit price for its produce.

The revealed comparative advantage (RCA) of Indian walnut export indicates the measure by which the share of walnut in the total Indian exports relative

Table 10. Revealed comparative advantage (RCA) of Indian walnut export: 1980-2012

Year	Walnut (nut equivalent)	Shelled walnut	Walnut with shell
1980	16.49	0	20.84
1985	11.78	0	17.40
1990	8.33	15.49	0.28
1995	11.52	0.20	1.11
2000	8.23	13.95	1.28
2005.	3.13	4.68	0.05
2010	1.54	2.50	0.40
2011	1.17	1.90	0.04
2012	1.00	1.54	0.05

to its share in the world. The results of revealed comparative advantage of Indian walnut export showed that India has maximum RCA in its export during 1980s, but later its comparative advantage has shown a steady decline over the years (Table 10). In 2012, India gained comparative neutrality in walnut export. The RCA of walnut with shell has declined significantly and reached the level of comparative disadvantage as against shelled walnut in which India has real RCA which need to be harnessed.

Estimates of Gravity Model

The gravity model was estimated using a balance panel data set of 38 country pairs for 9 years from 2003 -2011. The estimates of Hausman's specification test revealed that Random effect model gives a best fit for the model. The coefficients obtained from the estimated model along with their standard errors and corresponding level of significance are presented in Table 11. The explanatory variables included in the model explained 40.55 per cent of the total variation in export value of Indian walnut. Of the explanatory variables specified in the model, per capita GDP, agricultural GDP, and consumption of importing partners of India, and Indian GDP were the significant factors determining Indian walnut export. This is consistent with the basic theory on which the gravity model is based. A higher per capita GDP means more availability of resources to be invested on the purchase of food commodities. The coefficient for the distance variable turned out to be insignificant to Indian walnut export. This result coupled with the significant positive contribution of walnut consumption in partner countries indicated that the demand for a commodity has much to do with imports than distance between the nations.

India's Export Potential

The estimates of the model were subsequently used to derive India's trade potential in walnut with its regular trading partners for the years 2003 and 2011. The analysis brings out unexploited export potential of Indian walnut with respect to few trading partners. The countries like Argentina, Japan, Latvia, Uruguay, Norway, Singapore, and Switzerland were identified as high potential partners for Indian export of walnut (Table 12). India can enhance its export to these nations by taking effective measures. The statistics of this potential in the year 2003 and 2011 indicated that in most of the cases India has up-scaled its export to few

Table 11. Estimates of gravity model of Indian walnut export

Explanatory variables	Coefficient	Standard error	z	P>|z|
D	0.2115658	0.4401113	0.48	0.631
Y_j	0.312997*	0.1702189	1.84	0.046
Y_{aj}	0.0243988*	0.0133233	1.83	0.047
C_j	0.3204737*	0.0749764	4.27	0.00
Y_i	1.270879*	0.2140602	5.94	0.00
C_i	-0.2559619	0.197876	-1.29	0.196
Intercept	-0.7218402	1.638934	-0.44	0.660
rho	0.5945			
R^2	0.4055			
Wald's chi square	91.25			
Probability chi square	0.00			

Table 12. India's export potential in walnut with its global partners

Partner	2003	2011	Partner	2003	2011	Partner	2003	2011
Algeria	0.83	0.81	Germany	0.76	0.81	Portugal	1.07	0.97
Argentina	1.04	1.05	Greece	0.81	0.86	Russia	1.04	0.91
Australia	0.90	0.89	Hong Kong	0.74	0.85	Saudi Arabia	0.87	0.96
Austria	0.94	0.99	Italy	1.13	0.91	Singapore	1.23	1.22
Bahrain	0.79	0.93	Japan	1.46	2.22	Spain	0.69	0.80
Belgium	0.92	0.92	Jordan	0.79	0.78	Sweden	0.96	0.86
China	0.61	0.68	Kuwait	0.83	0.85	Switzerland	0.90	1.05
China,mainland	1.07	0.90	Latvia	0.98	1.00	Tunisia	0.67	0.72
China,Taiwan	0.76	0.92	Lithuania	0.87	0.91	UAE	0.81	0.80
Cyprus	0.88	0.89	Nepal	1.06	0.97	UK	0.76	0.78
Denmark	0.73	0.83	Netherland	0.76	0.73	Uruguay	1.01	1.11
Egypt	0.68	0.67	New Zealand	0.83	0.89	USA	0.90	0.84
France	0.86	0.80	Norway	1.02	1.07			

of these destinations. Although our estimates revealed that India has gone beyond its export potential in few countries, still it can continue its trade with these countries as long as it yields a good foreign exchange.

An attempt was also made to find out how much percentage of total import, trading partners imported from India by computing ratio as (Import from India/ Total Import * 100). Table 13 reveals that import from India constituted only 0.95 per cent to 32.00 per cent of their total import of walnut, which implies that a huge untrapped potential is available for walnut export (Table 12). The countries like Russia, Norway, Singapore, China, mainland and Japan imported from India even less than one per cent of their total walnut import and rest was imported from other nations.

The statistics depicted in Table 13 give us an idea about the approximate demand of importing nations, and India can take appropriate measures to encash these demands.

Table 13. Walnut import from India as per cent of total walnut import by Indian export partners

Partner country	Ratio (%)	Partner country	Ratio (%)	Partner country	Ratio (%)
Algeria	32.00	Egypt	50.87	Norway	0.84
Argentina	3.78	France	6.34	Portugal	1.81
Australia	3.75	Germany	2.87	Russia	0.96
Austria	1.24	Greece	6.08	Saudi Arabia	7.31
Bahrain	26.29	Italy	0.78	Singapore	0.85
Belgium	2.92	Japan	0.01	Spain	3.70
China	2.15	Jordan	10.04	Sweden	6.69
China, Hong Kong SAR	1.90	Latvia	3.32	Switzerland	1.08
China, mainland	0.95	Lithuania	5.24	United Arab Emirates	3.58
China, Taiwan Province	9.64	Nepal	48.48	United Kingdom	8.27
Cyprus	4.49	Netherlands	8.77	Uruguay	15.00
Denmark	10.07	New Zealand	10.97	USA	10.97

Note: Ratio= (Import from India/Total Import)* 100

Conclusions and Policy Implications

This study has examined the growth, instability, and determinants of Indian walnut export using time series data. There has been a significant expansion in area under walnut at an annual growth rate of 1.70 per cent and this coupled with growth in yield levels has led to the increase in its production. It has been found that, India's export constituted only 2.73 per cent of the global export of shelled walnut in 2012, while it has a meagre share in export of walnut with shell. It was observed that the largest importer of Indian shelled walnut, is United Kingdom followed by Egypt, Germany, Spain, and Netherlands. The Indian walnut export as nut equivalent has significantly increased between 1979 and 2012, though it has shown some swings in 2000. The export of shelled walnut (kernel) has significantly increased between 1979 and 2012, at an annual growth rate of about 3 per cent.

On the other hand, walnut with shell has shown deceleration over the years, implying widening of markets for kernels and its rising demand compared to walnut with shell. The variations in the export quantity and value of both shelled and walnut with shell declined over the years, however the instability in unit price of shelled walnut has increased over the years. The decomposition analysis has indicated that the contribution of change in mean export quantity was the highest among the other components of change in average export value of walnut. Similarly, different components have different contribution in explaining the change in the variance of walnut export value. It has been observed that India places its walnut in global trade at a lower price compared to many other nations, thereby emphasizing on the quality improvement. Further, the estimates of gravity model has revealed that per capita GDP, agricultural GDP and consumption of Indian trade partners, and Indian GDP are the significant factors determining Indian walnut export. The analysis has also highlighted the unexploited potential of Indian walnut export vis-à-vis few trading partners. The study has put forth following policy suggestions:

- Considering the consistent increasing demand for walnut, there is a need to increase walnut production by laying new orchards over marginal/wastelands. In addition, concerted efforts to increase the efficiency and productivity in walnut would generate enough surplus for export.

- R&D efforts should to be streamlined toward varietal development of this fruit in the long-run. Replacement of wild/uneconomical varieties with genotypes developed/sharpened by Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir (SKUAST-K) and Central Institute of Temperate Horticulture (CITH) would help in productivity/quality improvement of the produce.

- Since the estimates of coefficient of variance have been found declining over the years, the export promotion coupled with export stabilization should be accorded high priority. The pro-motion of value-added product of walnut (kernels), and the integration of production, processing and export would add further to the export earnings of the country. Research in these areas has great potential to meet this challenge.

- To give a boost to walnut export, various sanitary and phytosanitary measures should be taken up vigorously. The emphasis upon quality improvement would also help to get better prices for walnut produce in the global markets.

- There is a need to foster bilateral relations with regular Indian trade partners by negotiating on issues that may hinder trade so as to get mutually benefited. At the same to it is important to create demand of our walnut through export promotion and better value addition.

- There is a need of capacity building, provision of technical knowhow and export consultation to the private players involved in walnut trade so that they may assess the demand of importing countries and get to learn about them and support them with adequate credit and investment subsidies.

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