

Estimation of Demand and Supply Functions and Destination of Export of Basmati Rice from India

Shailza, Latika Sharma and S.S. Burark

Department of Agricultural Economics and Management, Maharana Pratap University of Agriculture and Technology, Udaipur-313 001 (Rajasthan), India

Abstract

India possesses an immense wealth of Basmati and non-Basmati aromatic rice varieties exhibiting a wide variability in their grain quality and cooking characteristics. India is a major producer of basmati rice and accounts for almost 70% of the world production and nearly two-third of the country's produce is exported. In the present study, estimation of demand and supply function of export of basmati rice along with destination wise pattern of export has been done on the basis of secondary data for the period of 2001-2011. Demand and supply functions were estimated by the simultaneous equation model: two stage least square method. Saudi Arabia and Italy were the leading importers of basmati rice from India during the last one decade. Export supply of Indian basmati rice was mainly on the basis of long term contracts with the importing countries.

Keywords: Basmati, secondary data, Saudi Arabia

India is the world's largest rice grower and its rice export estimated at a record 11 million tonnes in marketing year 2012-13 that ended in September 2013 on bumper production and strong overseas demand, according to a US Department of Agriculture (USDA) report. India emerged as the world's largest rice exporter in 2012 ahead of its Asian counterpart Thailand. The Basmati rice has traditionally been grown in the north and north-western part of the Indian sub-continent for centuries. Basmati rice captures higher returns as it is priced three times higher (US\$ 800-1200 per metric ton) over non-basmati rice (US \$ 200-400 per metric tons) in the international as well as in the domestic markets.

Basmati rice is also the major contributor in total foodgrain exports of India. Exports of basmati rice fluctuated between nearly 30-40 per cent of total foodgrain exports from India during the last few decades. The second most important contributor was non-basmati rice which accounted for nearly 18% of food grain exports. During 1970-71, percentage share of rice in total agricultural exports was 1.03% having 32.8 thousand tones as quantity and ₹ 5.03 crore as value (Economic Survey 1983-84). Later on during 1990-91, percentage share of basmati rice to the total agricultural exports became 7.31 per cent having 527.47 thousand tones and

₹ 439.95 crore quantity and value, respectively (Agricultural Statistics At a Glance 2002). During the triennium 1993 to 1996, basmati rice exports declined drastically from 72.16 per cent to 35.4% of total food grain exports. For basmati rice of India, Saudi Arabia is the biggest market. During 2011-12, share of basmati rice in total agriculture exports from India was 9.3 per cent and that of non-basmati rice was 5.4 per cent. Out of the total farm export in 2011-12 the share of basmati rice was 18.7 per cent and that of non-basmati rice was 10.5 per cent. In 2010, the share of basmati rice was 27.2 per cent while exports of non-basmati rice was banned. The ban was lifted on Oct. 2011 after a long period of restriction.

India has a monopolistic position in basmati rice market and the quality of Indian basmati is superior in aroma and taste to all other competing exporters of basmati. Thus basmati rice has good prospects of consolidating its position in world market and it is very important to study the factors affecting the demand and supply of basmati rice exports from India. The study was conducted with the following major objectives:

1. To study the destination-wise pattern of export of basmati rice from India.

2. To estimate demand and supply function for the basmati rice export from India.

METHODOLOGY

As it has been stated earlier that India is one of the leading producers of basmati rice and plays an important role in its exports. This commodity is exported to different countries depending on its demand and supply. Thus arises the need to analyze which were the main importing countries of basmati rice, what was their share in India's exports, how their share is changing overtime and which countries may be the prospective buyers of these commodities in future. This was done by tabular analysis. The top ten importer countries of basmati rice were identified and their share was analyzed and presented through pie diagram. The study period selected for the analysis was from 2001 to 2011.

Export demand and supply functions for the selected agricultural commodities namely basmati rice was done separately with the help of econometric models using simultaneous equation method and elasticities for demand and supply were calculated to support appropriate policy decisions. Variables affecting Export Demand of a commodity were Price of Export, World Export price level and World Income Level. Variables affecting Export Supply of a commodity were Prices of Exports, Supply Shock Variable, Demand Pressure Variable and Time Trend

Econometric Model

Specification of the model with lag adjustment behaviour was as follows:

Exports of basmati rice ($i=1$)

$$\text{(Demand)} \quad Y_{1t} = Ka_{01} + Ka_{11}Y_{31t} + Ka_{21}X_{11t} + Ka_{31}X_{2t} + (1-K)X_{61t-1} + e_{11}$$

$$\text{(Supply)} \quad Y_{21t} = Qb_{01} + Qb_{11}Y_{31t} + Qb_{21}X_{31t} + Qb_{31}X_{4t} + Qb_{41}X_{51} + (1-Q)X_{71t-1} + e_{21}$$

$$\text{(Export Market Equilibrium)} \quad Y_{11t} = Y_{21t}$$

Where, Y_{1t} = Demand for basmati rice exports in thousand \$

Y_{3t} = Export price variable in thousand \$/t

X_{1t} = World export price in thousand \$/t

X_{2t} = World real income in constant 2000 US \$

X_{6t-1} = Lagged dependent variable in thousand US \$

Y_{2t} = Supply of Indian basmati rice exports in t^{th} year in thousand US dollars

Y_{3t} = Export price of basmati rice in t^{th} year in U. S. dollar per thousand metric tonnes

X_{3t} = Supply shock in the i^{th} commodity during t^{th} year in thousand metric tonnes specified as dummy (one for positive fluctuation, zero for negative fluctuation)

X_{4t} = Demand pressure in t^{th} year at constant price

X_{71t-1} = Quantity of exports of basmati rice supplied in $(t-1)^{\text{th}}$ period in thousand U. S. dollars

e_1 & e_2 = Stochastic error terms

For the detection of presence of autocorrelation in the model, the Durbin Watson d-statistic was used.

RESULTS AND DISCUSSION

Exports have played an increasingly important role in India's economic growth in the last two decades and created absolute gains for the trading partners involved and it served as the backbone of our modern commercial world as producers in various nations try to earn profit from an expanded market, rather than limited to selling within their own boundaries. This study analyzes the destination wise pattern of exports and then estimation of demand and supply functions.

Pattern of destination of basmati rice export from India

During the study period (2001-11) the major consumer countries of Indian basmati rice were Saudi Arabia, United Arab Emirates, Iran, Kuwait, United States of America, Yemen, Belgium, Canada and Netherland. India's basmati rice exports stood at a record 31,78,174 tons in 2011 against 6,66,713 tons in 2001. Destination wise pattern of export of basmati rice can be concluded from Table1 which shows that Saudi Arabia constantly remained as top most importer of basmati rice upto 2009 and during 2010 and 2011 it slipped down to second position. It imported 4,06,096 metric tons of basmati rice from India during 2001 which increased to 7,21,245 metric tons in 2011. Kuwait, the second most important country importing Basmati rice from India during 2001 imported 65257.26 metric tons of basmati rice from India. Its basmati rice import have increased to 1,99,868 metric tons in 2011. United Kingdom, United States of America, United Arab Emirates and Yemen were also important importing countries of basmati rice

Table 1: Ranking of top ten importing countries of Basmati Rice from India (2001-11)

(metric tons)

Year Importer	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Saudi Arabia	1 st (40609 6.7)	1 st (36681 4.2)	1 st (436415. 5)	1 st (690665. 23)	1 st (643651. 51)	1 st (499584. 76)	1 st (543530. 24)	1 st (524401. 67)	1 st (640404. 41)	2 nd (622704. 96)	2 nd (721245. 48)
Kuwait	2 nd (65257. 26)	3 rd (63119. 98)	3 rd (48862. 93)	3 rd (95722. 76)	2 nd (91335.3 8)	2 nd (109067. 36)	3 rd (113066. 57)	4 th (111547. 25)	4 th (139473. 57)	4 th (197590. 4)	4 th (199869. 77)
United Kingdom	3 rd (63514. 44)	2 nd (72543. 62)	2 nd (85848. 31)	2 nd (95825. 05)	3 rd (84715.3 7)	4 th (71411. 67)	4 th (71377.5 6)	5 th (62563. 1)	6 th (36966.4 3)	5 th (77384. 45)	6 th (141666. 21)
U.S.A.	4 th (26854. 9)	4 th (30720. 58)	5 th (26757. 38)	6 th (26923. 78)	6 th (33285. 4)	6 th (34501. 92)	6 th (35738.6 8)	6 th (39625. 13)	7 th (25922. 13)	7 th (47489.73)	8 th (91816. 94)
U.A.E.	5 th (15286. 11)	5 th (27435. 49)	4 th (40256. 89)	4 th (61882. 22)	4 th (62100.4 5)	3 rd (34501. 92)	2 nd (193102. 03)	2 nd (456146. 51)	2 nd (616125. 13)	1 st (634769.3 3)	1 st (728823. 29)
Yemen	6 th (14119. 41)	6 th (17912. 66)	7 th (15451. 15)	5 th (37632. 62)	5 th (50388. 4)	5 th (40689.2)	5 th (49958.5 3)	7 th (31475.6 8)	5 th (61809.9 2)	6 th (70042.1)	7 th (92112. 14)
France	7 th (9083. 5)	7 th (13106. 7)	8 th (12027.6 5)	8 th (16340)							
Belgium	8 th (7194. 86)	8 th (10146. 8)	9 th (11573.1 6)	9 th (15804)	7 th (31021)	7 th (24386.5)	10 th (13346.5 9)				
Canada	9 th (7126. 27)	10 th (9032.0 4)			10 th (13497. 95)	9 th (15869. 79)	8 th (13565. 22)	9 th (17835. 2)	9 th (9244. 81)		
Germany	10 th (6051. 17)		10 th (9161.5)	10 th (14958. 19)							
Southafrica		9 th (9671.8 5)									
Italy			6 th (19143. 3)	7 th (19888. 76)	8 th (22808. 11)						
Netherland					9 th (18405. 97)	8 th (18850. 61)	7 th (17851. 68)	10 th (11147. 3)		10 th (23097. 67)	10 th (37275)
Iran						10 th (15110.8)		3 rd (170947. 47)	3 rd (364602. 51)	3 rd (450657.1 6)	3 rd (614922. 16)
Qatar							9 th (13430)				
Oman								8 th (25119. 61)			
Singapore									8 th (9672)		
Jordan									10 th (9235.9)	9 th (25602. 15)	9 th (52928.9 8)
Iraq										8 th (36907.9)	5 th (151961. 25)

from India between 2001 and 2011. It had consistent long term trading partners during the whole study period. Some diversifications in the basmati rice export market for India was seen after 2005 in the form of inclusion of new countries as importers. These were new

destinations which India had tapped and these prospective markets included Middle Asian countries like Iran, Iraq, Qatar, Oman and Jordan and East Asian countries like Singapore. India was no longer worried about having enough rice for its own people.

Share of importing countries in total export of basmati rice

India's ratification of the Agreement on Agriculture (AoA) with WTO also had a major impact leading to redefining of its agricultural trade. For India, agriculture serves as an important sector which has significant share in country's GDP and contributes major share in total exports from India. The steady increase in production, availability of buffer stocks and the growing demand for basmati rice in the international market made India as an important rice exporting country of the world. About 50-70 per cent of basmati produced in the country is exported mainly to Saudi Arabia (68 per cent), UAE, UK, Kuwait and others (Rangi *et.al.* 2001). In total India had exported 3178174 metric tons of basmati rice to various countries. Saudi Arabia imported more than half i.e. 61 per cent of the total basmati rice export from India during 2001 and nearly half i.e. 48 per cent of total basmati rice exported from India during 2006. However, fluctuation in the share were observed over time. Export of Indian basmati rice from India to Saudi Arabia was later on drastically reduced to only one fourth which was 23 per cent of total basmati rice exported from India during 2011.

Fig. 1: Destination of India's Basmati Rice Exports (2001)

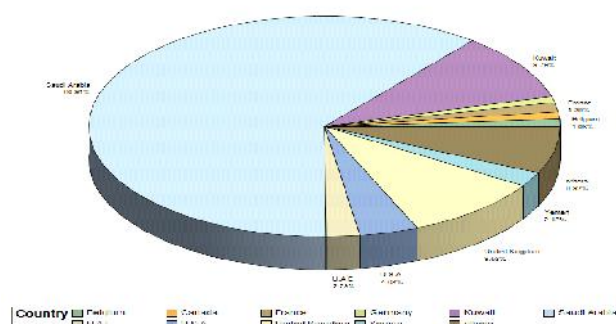
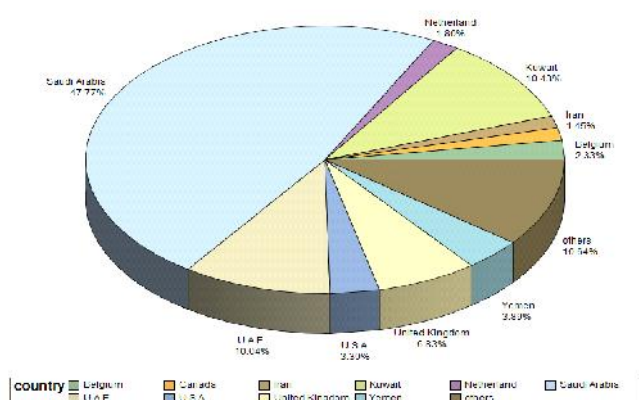
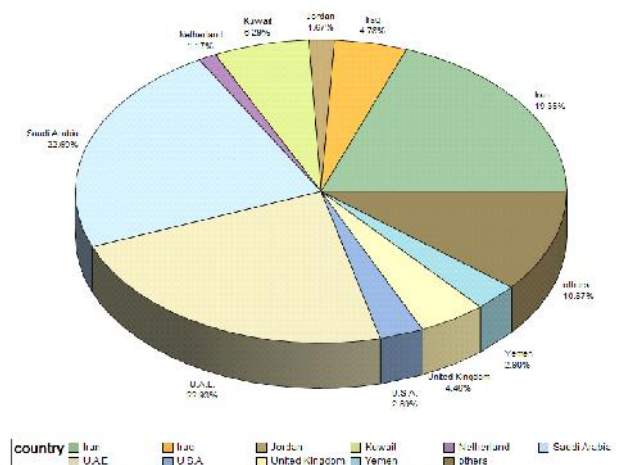


Fig. 2: Destination of India's Basmati Rice Exports (2006)



During 2001, the major importing countries were Saudi Arabia, Kuwait and United Kingdom whereas during 2006 major export markets were Saudi Arabia as consistent leading importer, Kuwait as second major importer and United Arab Emirates as third one. In 2001 and 2006, share of Kuwait in total basmati rice export from India during the respective years was around 10 per cent of total basmati rice exported from India but later on during 2011 it decreased in its share was observed, with the emergence of Iran and United Arab Emirates as leading importer countries of Basmati Rice from India which imported 19 per cent and 23 per cent, respectively, of total basmati rice export from India. Iran emerged as major importer country during the year 2011 due to the new bilateral payment mechanism. The share of various importer countries of basmati rice from India have been shown in Figure 1, 2 and 3 during 2001, 2006 and 2011, respectively.

Fig. 3: Destination of India's Basmati Rice Exports (2011)



Demand and Supply function for Basmati rice export from India.

Basmati rice contributed a major share in India's agricultural commodities export as during recent years export of non-basmati rice was banned due to some quarantine measures so the whole emphasis was on the export of basmati rice to meet the increasing demand by the other nations. It was seen that export price and world export price were the two variables which significantly affected the export demand of Indian basmati rice by the world. The export price showed the expected significant negative relationship with the export demand of basmati rice. This indicated that with fall in the export price of basmati rice demand of Indian basmati rice increased in the world market which is in consent with the law of demand. Whereas the world price also showed the

significant negative relationship with the export demand of basmati rice, which means that if the world price decrease then the export demand for Indian basmati rice will still increase. The reason for this may be the fact that India has stable long term trade partners in case of basmati rice exports and thus their demand decision may not be getting affected by short term changes in the prices of competitor countries.

Basmati Rice is a highly valued cash crop that earns substantial foreign exchange for India. During the study it was found that it was the lagged variable which was showing the positive significant relationship with the export supply of basmati rice. That means export of basmati rice was largely dependent on the export of that particular commodity during the previous year. The impact of other variables on export supply of basmati rice was not found significant. The lagged quantity of

exports was the major influencing factor as shown below.

CONCLUSION

The export of basmati rice had increased significantly since 2001. During the study period (2001-11) Saudi Arabia, Kuwait and U.A.E served as stable importing countries of basmati rice from India which indicates that they are consistent long term trading partners during the whole study period. The supply of basmati rice export is affected significantly by it's last years export (lagged supply variable). Thus export supply of Indian basmati rice on the basis of long term contracts with the importing nation whereas World export price level had a significant positive relationship with demand of basmati rice. This showed that world competition does not effect the demand for Indian basmati significantly.

Y_{1it}	=	- 283859	- 663248.5 Y_{3it} **	- 541447 X_{1t} **	+ 6.32E-8 X_{2t}	+ 1.22 X_{6it-1}	+ u_i
		(868027.1)	(499505.7)	(759223.6)	(7.67E-7)	(0.18)	
R^2	=	0.94					

Where, Y_{1it} = Demand for i^{th} product of Indian exports in thousand \$

Y_{3it} = Export Price variable in thousand \$ / ton

X_{1it} = World Export Price in thousand \$/ ton

X_{2t} = World Real Income in constant 2000 US\$

X_{6it-1} = Lagged dependent Variable in thousand US\$

u_i = Stochastic term

Note: * * significant at 5per cent level of significance.

Figures in parenthesis show standard errors of regression coefficients.

Y_{2it}	=	409849.1	- 867850 Y_{3it}	+ 692244.9 X_{1it}	+ 8.60E-7 X_{2t}	+ 0.47** X_{7it-1}	+ e_{2i}
		(961990.8)	(1466249)	(768349.6)	(9.64E-7)	(.82)	
R^2	=	0.96					

$Y_{2it} = 409849.1 - 867850Y_{3it} + 692244.9X_{1it} + 8.60E-7X_{2t} + 0.47**X_{7it-1} + e_{2i}$ (961990.8) (1466249) (768349.6) (9.64E-7) (.82)

$R^2 = 0.96$

Y_{2it} = Supply of Indian exports of i^{th} commodity in t^{th} year in thousand U.S. dollars

Y_{3it} = Export price of i^{th} commodity in t^{th} year in U.S. dollar per thousand metric tonnes.

X_{3it} = Supply shock in the i^{th} commodity during t^{th} year in thousand metric tonnes specified as dummy (one for positive fluctuation, zero for negative fluctuations)

X_{4t} = Demand pressure in t^{th} year at constant price.

X_{7it-1} = Quantity of exports of i^{th} commodity supplied in $(t-1)^{th}$ period in thousand U.S. dollars.

u_i = Stochastic error

Note: * * significant at 5per cent level of significance.

Figures in parenthesis show standard errors of regression coefficients.

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