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A CASE STUDY

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Export of fresh and frozen potatoes from India - An economic analysis

N. KUMARASAMY* AND C. SEKAR[1]

Department of Agricultural and Rural Management, Centre for Agricultural and Rural Development Studies, Tamil Nadu Agricultural University, COIMBATORE (T.N.) INDIA (Email: kumarasamytnau@gmail.com)

[1]Post Harvest Technology Centre, Tamil Nadu Agricultural University, COIMBATORE (T.N.) INDIA (Email: csekar2000@gmail.com)

*Author for Correspondence

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SUMMARY :

In India, potato is a major vegetable crop. India exported about 114,245 t of potato to Nepal, Sri Lanka, Pakistan, Mauritius and Bangladesh (2012-13).For the study, secondary data were used. The collected data were analyzed using compound growth rate, instability index, Markov chain analysis and Nominal Protection Co-efficient (NPC). It was found that during 1990-2013, the growth rate of both fresh and frozen potatoes was positive and instability in the value of fresh and frozen potato export was high. The Markov chain analysis showed that Nepal and 'other countries' were the stable importers of fresh and frozen potatoes from India and it retained its original share of about 66 per cent and 94 per cent, respectively(2001-2011). The NPC results showed that fresh potatoes were price competitive in the international markets and have greater potential for expansion of the domestic industry in the years to come.

KEY WORDS : Fresh and frozen potatoes, Compound growth rates, Export performance, Indian potatoes, Instability, Markov Chain, NPC

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Potato plays an important role in global food and nutritional security especially for the poor (Thiele *et al.*, 2010). Potato is the fourth most important food crop in India after rice, wheat and maize with just 0.8 per cent of gross cropped area (Scott and Suarez, 2011; 2012). In India, potato is a major vegetable crop and is grown in a wide range of climatic conditions (Pandit and Chandran, 2011).Potato produces more dry matter (47.6 kg/ha/day) than any other food crop and therefore, requires higher amount of nutrient inputs (Kushwah and Singh, 2011). India has tremendous export potential of potatoes (Singh and Rana, 2005), however, due to the lack of adequate initiatives (Kumar, 2009) the country has always been a marginal potato exporter. India has exported about 114,245 t of potato in 2012-2013 which is 26 per cent less than that of 2011-12.The countries to which India exported potatoes were Nepal, Sri Lanka, Pakistan, Mauritius and Bangladesh during the period 1994-2011. In case of exports of frozen potatoes, Sri Lanka, Nepal, United Arab Emirates, Mauritius and Maldives were the leading importers during 1990-2011. The specific objectives of the study are (i) to analyze the trend in export of fresh and frozen potatoes (ii) to assess the instability of fresh and frozen potatoes trade from India and (iii) to estimate the export competitiveness of fresh potato and to analyze the direction of trade for fresh and frozen potatoes.

EXPERIMENTAL METHODS

To carry out this study, secondary time series data from

1990-2013 were collected from the Food and Agriculture Organization (FAO), Agricultural and Processed food Products Export Development Authority (APEDA) and National Horticulture Board (NHB). Data on export quantities, export value, major destination of exports of potato from India were collected for two different periods. Various tools were used to analyze the data *viz.*, compound growth rate, instability index, Nominal protection co-efficient and Markov chain analysis. From the available information, it was understood that the demand for potato and frozen potato has increased significantly since 2000 and hence to understand the nature of change in import and export value, the year of 2000 was taken as a base year. Another reason for separating the period into two (period I : 1990-2000) and (period II : 2001-2013) was to determine the growth impact, instability and structural changes of Indian fresh and frozen potatoes. The compound growth rates were used to analyze the trends in export of fresh and frozen potatoes in terms of quantity, value and unit value during period I (1990-2000) and period II (2001-2013). The NPC is a measure of competitiveness and calculated as a ratio between domestic prices and international prices of fresh and frozen potatoes. If NPC is greater than one, then the commodity is protected and NPC is less than unity then the commodity is treated as globally more competitive. For Markov chain analysis, time series data from 1990-2011 on potato exports were used to determine market share and changing direction of trade over time. The assumption was that average export of fresh and frozen potatoes from India to importing countries in any period depends on export in the previous period and this dependence would be the same along all periods. Values in the transitional probability matrix have different interpretations. Values in diagonal elements of the matrix indicates probability of retention of the previous year's values, values in columns reflect probability of gain of a particular country from other countries and values in rows reflect probability that a country might lose to other countries with respect to specific commodity exports.

EXPERIMENTAL FINDINGS AND ANALYSIS

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Growth rate of potato export :

It could be inferred from Table 1,that the export of fresh potato showed that there was a significant difference between periods I and II. It also indicates that the growth of export of fresh potato for the overall period was only 16.97 per cent. In case of frozen potato, trend in export quantity showed increase in period II compared to period I but there was a decrease in unit price (4.25 %) and increase in export value (26.99 %) during period II(2001-2013).This shows that there had been a higher demand for Indian frozen potato. For the overall period (1990-2013), the export quantity and export value of fresh and frozen potatoes and unit value of frozen potatoes were significant at 1 per cent level. The results conclusively showed that the export of both fresh and frozen potato had significantly increased in the recent years and there would be a greater demand in the future.

Instability in the potatoes export :

The Coppock's instability index was worked out for fresh potatoes and frozen potato trade in India for the two time periods to analyze the extent of temporal instability. It could be observed from Table 2 that the fluctuations in the export quantity of fresh potatoes were marginally high (220.40) during period II (2001-2013), whereas during period I (1990-2000) there was

Table 1 : Compound growth rates for export of fresh and frozen potatoes in India during 1990-2013

Year	Export quantity (%)		Export value (%)		Unit value (%)	
	Fresh potato	Frozen potato	Fresh potato	Frozen potato	Fresh potato	Frozen potato
1990-2000	24.07** (2.92)	2.32 (0.31)	11.74 (1.31)	12.05 (1.79)	-9.93 (-2.66)	9.51** (3.19)
2001-2013	19.33** (4.41)	14.81*** (3.02)	26.99*** (6.07)	19.69*** (4.20)	6.41*** (6.13)	4.25** (3.51)
Overall	16.97*** (8.47)	10.07*** (4.73)	15.08*** (6.48)	15.27*** (8.03)	-1.61 (-1.35)	4.72*** (6.41)

Note : Figures within the parenthesis indicate 'estimated t' values
** and *** indicate significance of values at P=0.05 and 0.01, respectively
Source : Directorate General of Commercial Intelligence and Statistics (DGCI&S)

Table 2 : Coppock's instability indices of fresh and frozen potatoes trade in India

Particulars	1990-2000		2001-2013		Overall (1990-2013)	
	Fresh potato	Frozen potato	Fresh potato	Frozen potato	Fresh potato	Frozen potato
Quantity	177.98	283.17	220.40	136.31	381.14	423.88
Value	223.96	185.52	281.61	153.30	499.00	304.63
Unit Value	118.67	52.82	217.93	304.63	310.60	72.81

Note : Figures within the parenthesis indicate the percentage to values
Source : Directorate General of Commercial Intelligence and Statistics (DGCI&S)

less instability (177.98).This indicates that export growth during period I fluctuated marginally. The instability in the total value of fresh potato export was marginally high during period II (281.61), compared to period I (223.96).For the overall period (1990-2013) the export quantity, value and unit value of fresh and frozen potatoes became highly instable in the international markets.

In case of frozen potato, the fluctuation in the export was high (283.17) during period I, in comparison to period II (136.31). The instability in the total value of frozen potato export was high during period I (185.52), compared to period II (153.30). The unit value showed a lower instability during the period I. It showed a high instability during the period II.

Direction of trade of fresh potatoes :

The transitional probability presented in Table 3, depicts a broad idea of change in the direction of trade of Indian fresh potato in period I (1994-2000). The five major countries which imported Indian fresh potatoes were Nepal, Sri Lanka, Pakistan, Mauritius and Bangladesh. The export to remaining countries was pooled under the category of other countries. It could be seen from Table 3 that Sri Lanka was the stable importer of Indian fresh potatoes since it retained its original share of around 93 per cent over the period. It gained a major share from the Mauritius and other countries to an extent of 51 and 52 per cent, respectively.

The 'other countries' retained 24.12 per cent of its original share and was likely to gain from Bangladesh and Pakistan with the moderate probability gain of 0.85 and 0.72 per cent, respectively. Pakistan was also found to be a third most stable importer as it retained its share of 17.99 per cent.

Direction of fresh potatoes export :

The transitional probability presented in Table 4, depicts a broad idea of change in the direction of trade of Indian fresh potato in period II. The five major countries which imported Indian fresh potatoes were Nepal, Sri Lanka, Pakistan, Mauritius and Bangladesh. The export to remaining countries was pooled under the category of other countries. It could be seen from the table that Nepal was the stable importer of Indian fresh potatoes because it retained its original share of around 66 per cent over the period. It gained a major share from the Pakistan

Table 3 : Direction of trade of fresh potatoes export from India (1994-2000)

Country	Nepal	Sri Lanka	Pakistan	Mauritius	Bangladesh	Others
Nepal	0.0000	0.6910	0.0854	0.1925	0.0031	0.0280
Sri Lanka	0.0000	0.9345	0.0000	0.0000	0.0000	0.0655
Pakistan	0.0000	0.0000	0.1799	0.0914	0.0000	0.7287
Mauritius	0.1780	0.5109	0.0000	0.0000	0.0000	0.3111
Bangladesh	0.1271	0.0000	0.0000	0.0174	0.0000	0.8555
Others	0.2340	0.5248	0.0000	0.0000	0.0000	0.2412

Source : FAO Statistical Databases, 2013

Table 4 : Direction of trade of fresh potatoes export from India (2001-2011)

Country	Nepal	Sri Lanka	Pakistan	Mauritius	Bangladesh	Others
Nepal	0.6628	0.1615	0.0000	0.0396	0.0000	0.1361
Sri Lanka	0.7721	0.0826	0.0000	0.1453	0.0000	0.0000
Pakistan	0.9584	0.0000	0.0000	0.0000	0.0416	0.0000
Mauritius	0.0000	0.1561	0.3497	0.0000	0.4943	0.0000
Bangladesh	0.2586	0.0000	0.0000	0.0000	0.0000	0.7414
Others	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000

Source: FAO Statistical Databases, 2013

Table 5 : Direction of trade of frozen potatoes export from India (1990-2000)

Country	Sri Lanka	Nepal	UAE	Mauritius	Maldives	Others
Sri Lanka	0.7615	0.0001	0.0787	0.0580	0.0000	0.1017
Nepal	0.0000	0.0000	0.4288	0.5712	0.0000	0.0000
UAE	0.3453	0.0010	0.3162	0.2060	0.0000	0.1315
Mauritius	0.0000	0.0235	0.7228	0.1727	0.0809	0.0000
Maldives	0.0000	0.0240	0.0000	0.8235	0.1525	0.0000
Others	0.6335	0.0000	0.0000	0.3665	0.0000	0.0000

Source: FAO Statistical Databases, 2013 and Sri Lanka to an extent of 95 and 77 per cent, respectively.

The Nepal retained the original share of 66 per cent and lost to Sri Lanka and other countries to an extent 16 and 13 per cent, respectively. Hence in future Sri Lanka would be one of the stable importers and its growth may be higher in fresh potato import from India. The Pakistan, Mauritius and Bangladesh were not having their own retention share and were likely to gain some extent from Nepal. It showed that both these countries were highly unstable for fresh potato import from India.

Direction of trade of frozen potatoes :

The transitional probability presented in Table 5, depicts a broad idea of change in the direction of trade of Indian frozen potato in period I. The five major countries which imported Indian frozen potatoes were Sri Lanka, Nepal, United Arab Emirates, Mauritius and Maldives. It is obvious from table that Sri Lanka was found to be one of the stable importers of Indian frozen potatoes as it retained its original share of around 76 per cent over the period. It gained a major share from the other countries and United Arab Emirates to an extent of 63 and 34 per cent, respectively.

The United Arab Emirates(UAE) is the second most important country, imported frozen potato from India and retained the original share of 31 per cent and it gained a major share from Mauritius (72 %). Hence in future United Arab Emirates would be one of the stable importers and its growth may be higher in frozen potato import from India.

Direction of trade of frozen potatoes export :

The transitional probability presented in Table 6, depicts a broad idea of change in the direction of trade of Indian frozen potato in period II. The five major countries which imported Indian frozen potatoes were Sri Lanka, Nepal, United Arab Emirates, Mauritius and Maldives. The export to remaining countries was pooled under the category of other countries. It could be seen from Table 6 that 'other countries' were the stable importers of Indian frozen potatoes because they retained their original share of around 94 per cent over the period and they were likely to gain from Mauritius with the probability of 0.83%.

Sri Lanka is the second most important country importing frozen potato from India and it retained original share of 53 per cent. It gained major share from Nepal and UAE. The Nepal, UAE and Mauritius were not having their own retention share and were likely to gain some extent from Sri Lanka. It showed that both these countries were highly unstable for import of frozen potatoes from India.

NPC of potatoes :

The nominal protection co-efficients (NPC) of export of fresh potatoes were found to be lower than unity except during 1990-91 to 1994-95 as shown in the Table 7. This implies that fresh potatoes were a good exportable commodity.

The foregoing results clearly revealed that fresh potatoes were price competitive in the international market and have vast potential for expansion of the domestic industry in the years to come. Similar work related to the topic was also done by Pandit *et al*. (2003); Ezekiel and Khurana (2003); Sanganaria (2003); Sudhozae (2003); Kumar *et al*. (2005); Scott and Surarez (2011 and 2012); Kumar and Singh (1992) on rapeseed mustard, Kumar and Rai (2007) on tomato also worked on the related topic.

Conclusion :

From the results, it was found that during 1990-2013, the growth rate of both fresh and frozen potatoes was positive and significant for export quantity (16.97 % and 10.07 %, respectively) and export value (15.08 and 15.27 %, respectively). The instability index of frozen potato export was high (185.52) during period I(1990-2000) as compared to period II (2001-2013). The unit value showed a lower instability during the period I. It showed high instability during the period II. The Markov chain analysis showed that Sri Lanka was one of the stable importer of Indian fresh potatoes in period I (1994-2000) and it retained its original share of around 93 per cent it gained a major share from the Mauritius and other countries to an extent of 51 and 52 per cent and also stable importer of frozen potatoes in period I(1990-2000) and it retained its original share of around 76 per cent it gained a major share from the other countries and United Arab Emirates to an extent of 63 and 34 per cent, respectively over the period. Nepal and other countries were the stable importer of fresh and frozen potato from India during the period II (2001-2011) and it retained its

Table 6 : Direction of trade of frozen potatoes export from India (2001-2011)

Country	Sri Lanka	Nepal	UAE	Mauritius	Maldives	Others
Sri Lanka	0.5304	0.4069	0.0466	0.0142	0.0019	0.0000
Nepal	0.7768	0.0000	0.1481	0.0000	0.0752	0.0000
UAE	0.6670	0.0000	0.0000	0.0000	0.3330	0.0000
Mauritius	0.0000	0.0049	0.0000	0.0000	0.1649	0.8302
Maldives	0.1495	0.0000	0.1264	0.4005	0.3236	0.0000
Others	0.0587	0.0000	0.0000	0.0000	0.0000	0.9413

Source : Estimated with data obtained from FAO Statistical Databases, 2013

Table 7 : Nominal protection co-efficient of potato from 1990-2011

Sr. No.	Year	NPC
1.	1990-1991	2.63
2.	1991-1992	0.99
3.	1992-1993	0.94
4.	1993-1994	0.89
5.	1994-1995	1.81
6.	1995-1996	0.48
7.	1996-1997	0.60
8.	1997-1998	0.34
9.	1998-1999	0.55
10.	1999-2000	0.31
11.	2000-2001	0.32
12.	2001-2002	0.21
13.	2002-2003	0.26
14.	2003-2004	0.27
15.	2004-2005	0.38
16.	2005-2006	0.35
17.	2006-2007	0.49
18.	2007-2008	0.23
19.	2008-2009	0.29
20.	2009-2010	0.37
21.	2010-2011	0.56

Source : Based on FAO Statistical Databases, 2013

original share of around 66 per cent and it gained a major share from the Pakistan and Sri Lanka to an extent of 95 and 77 per cent, respectively and 94 per cent of the frozen potatoes were stable importer by other countries and they were likely to gain from Mauritius with the probability of 0.83 per cent.

It is concluded that Sri Lanka and Nepal were the stable importers of fresh potatoes. Also, for frozen potato, Sri Lanka was the stable importer from India. These countries have high level probability of retention. The countries such as Pakistan, Mauritius and Bangladesh have not been the stable importers of Indian potatoes. The strategy for export may be oriented towards these countries and effort should be made for stabilizing the export of potato to other countries. The NPC results revealed that fresh potatoes were highly price competitive in the international markets and have vast potential for expansion of the domestic industry in the years to come. To maintain quality of potato, trainings should be organized on Good Agricultural Practices (GAP) and Good Management Practices (GMP) to produce good quality potato. Farmers should be encouraged to adopt improved and high yielding varieties. Some of the varieties that have greater demand in the international markets are Kufri Chandramukhi (in Afghanistan), Kufri Jyoti (in Nepal and Bhutan) and Kufri Sindhuri (in Bangladesh and Nepal) and five Indian hybrids, I-654 (in Mexico); I - 822 (in Sri Lanka); I - 1035 (in Philippines and Mailaka in Madagaskar); I- 1039 (in Bolivia and Red Skin in Vietnam) and I - 1085 (a in Sri Lanka and BSUP - 04 in Philippines). Market information related to export need to be provided by the government particularly to marginal and small farmers to ensure better prices. As of now, marginal and small farmers are not able to export potatoes from India, because they have low marketable surplus. By organizing themselves as potato producers' co-operatives, they can undertake export of potato collectively to realize the benefits of international market. An export promotion strategy has to be evolved to diversify the geographical concentration. There is also a need to disseminate information on arrivals in international markets, price behavior and other trade related information to Indian farmers and institutions to reap the benefits. Further studies could be taken up to analyze the variety wise demand in the international markets as well as the suitability of the varieties for value addition and consumer acceptability and preference of value added potato products.

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