Indian Agricultural Trade: Examine the Competitiveness of International Trade in Rice

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ABSTRACT: Rice is grown in more than a hundred countries, with a total harvested area of approximately 158 million hectares, producing more than 700 million tonnes annually (470 tonnes of milled rice) .It increased more than tripled between 1961 and 2014, with a compound growth rate of 2.34 per cent per year. In India rice is the major staple food for more than 70 per cent of the Indian population with more than 4,000 varieties and hybrids of rice grown throughout the country to cater to varied consumer preferences, typically consumed as boiled rice or variants with various additives (flavours, pulses, vegetables, meat, etc.).This study has examined the issue of comparative advantage between major rice producing countries in the world. This study also analysis the trade performance of major rice producing as well as exporting countries. Result shows that Pakistan has rank 1st in comparative advantage for rice export, followed by Thailand, Vietnam and India during the 2006 to 2014. This study highlights that most of the increase in rice production was due to higher yields, which increased at an annual average rate of 1.23 per cent compared with an annual average growth rate 0.58 per cent for area harvested during the 1961 to 2014. Rice farming is associated with poverty in many areas. About 900 million of the world's poor depend on rice as producers or consumers, and of these some 400 million poor and undernourished people are engaged in growing rice, mostly on land holdings of less than 20 hectare.

Keywords: Comparative Advantage Index, Agriculture, Trade, Subsidies, Rice, Balance of Trade.
JEL Classification: F1, F13, Q11 & Q17.

I. INTRODUCTION

International trade is the exchange of capital, goods, and services across international borders or territories, could involves the activities of the governments and individuals. In most countries, such trade represents a significant share of gross domestic product (GDP).

There are two basic types of trade between countries:

- The first in which the receiving country itself cannot produce the goods or provide the services in question, or where they do not have enough of it to meet its demand.
- The second, in which they have the capability of producing the goods or supplying the services, but still import them.

The rationale for the first kind of trade is very clear. So long as the importing country can afford to buy the products or services they are able to acquire things which, otherwise they would have to do without. The second kind of trade is of greater interest because it accounts for a majority of world trade today and the rationale is more complex. The UK imports motor cars, coal, oil, TV sets, domestic appliances and white goods, IT equipment, clothing and many more products which it was well able to produce domestically until it either transferred production abroad or ceased production as local industries became uncompetitive. At first sight, it would seem a waste of resources to import goods from all over the world in which a country could perfectly well be self-sufficient.

In recent years, India has become one of the biggest refined product exporters in Asia with petroleum accounting for around 20 per cent of total exports. The country also exports: engineering goods (19 per cent of total shipments[1]), chemical and pharmaceutical products (14 per cent), gems and jewellery (14 per cent), agriculture and allied products (10 per cent) and textiles and clothing (10 per cent). India's main export partners

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[1] Total exported goods

are: United Arab Emirates (UAE, 12.1 per cent of total exports), The United States of America (USA, 12 per cent), Singapore (4.5 per cent), China (4.5 per cent), Hong Kong (4 per cent) and Netherlands (3.5 per cent)[2]. India is the second largest producer of rice after China. Performance of trade in rice shows the Table 1. India's rice export values have top per cent age among the all cereals.

Table: 3.1 Rice Trade Background during the last three years FY (2013-14 to 2015-16)

Value in million (INR)

	Export					Import			
Year	Basmati	Non-Basmati	B's % Share in Total Cereals$ Export	NB's % Share in Total Cereals$ Export	% Share of Rice@ in Total Agricultural Export	Basmati	Non-Basmati	% Share of Rice@ in Total Cereals$ Import	% Share of Rice@ in Total Agricultural Import
2013-14	2929.99	1774.99	46.18	27.97	34.36	0	829.23	6.225	0.037
2014-15	2759.79	2442.85	47.35	41.92	39.61	0	1059.63	7.910	0.037
2015-16	2271.84	1512.91	56.19	37.42	35.70	0	591.18	0.484	0.016

Source: Agricultural & Processed Food Products Export Development Authority (APEDA).
Note:
- @ It's shows total basmati and non-basmati's value.
- Total Agricultural products values, agricultural products which is registered with APEDA.
- $ Its shows total product which consider in cereals namely; Rice (B & NB), wheat, Maize and other cereal.
- Financial year
- India Imported only Non-Basmati

India's basmati export now has above 50 per cent share in total cereals. In calendar year 2015, India has emerged as the largest exporter of rice – both basmati and non-basmati[3]. Non-Basmati rice export India is restricted[4]. Because non-basmati is used for PDS system in India. Government's PDS and other food security programmes of the government it was consistently purchasing about 30-35 per cent of total production in the last few years[5]. Export value of rice is increased within the cereal group but declined share with respect to total agriculture. India's rice demand in Middle East countries has declined since 2015. After liberalization period rice market worldwide has expanded. The international rice market is thin, non-homogeneous, and highly influenced by trade restrictions (Cramer et al., 1993) It has been predictions that based on expected population growth & income growth, and rice acreage decline, the global demand for rice will continue to increase from 479 million tons milled rice in 2014 to 536 million tons in 2030, with little scope for easy expansion of agricultural land or irrigation-except for some areas in Africa and South America.

Rice farming is associated with poverty in many areas. About 900 million of the world's poor depend on rice as producer or consumers and of these, some 400 million poor and undernourished people are engaged in growing rice, mostly on land holding of less than 20 hectare[6].

Objective of this paper are;
a) To major the Comparative advantage of trade in rice.
b) To analyse the performance of Indian rice trade.

Rest of the paper is organised as: sections 2 discusses the methodology of this paper, while section 3 deals with an overview of rice and also examines Government Policies related to rice. Section 4 measures the

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[2] http://www.tradingeconomics.com/india/exports

[3] http://articles.economictimes.indiatimes.com/20141008/news/54784844_1_nonbasmatiindia riceexportersassociationglobalricemarket

[4] ITC-HS, 2012 Schedule 2, Export Policy Chapter 10.

[5] http://77bfa03ddb2941ae/1B90E9B.jpg, Global Agricultural Information Network, February 26, 2016 GAIN Report Number: IN6033.

[6] Rice Agri-Food System CRP, RICE

competitiveness of India in rice production and trade through Revealed Comparative Advantage. Section 5 summarizes the main findings of this study.

II. METHODOLOGY AND DATA SOURCES

The present study is based on secondary data. Data are extracted from Agricultural Statistics at a Glance, 2014 (GOI), Agricultural & Processed Food Products Exports, Development Authority (APEDA), and World Integrated Trade Solution (WITS), and Food and Agriculture Organisation of the United Nation (FAO). To examine the agricultural production and trade performance trends have been computed through, Compound Annual Growth Rate. And comparative advantage in export has been computed using the Revealed Comparative Advantage (RCA) index.

Measure the performance in production, area under cultivation and yield of rice, using the Compound Annual Growth Rate (CAGR).
CAGR is the method of measurement of average yearly changes over a period of time.

$$Y_t = Y_o (1 + r)^n \qquad \text{... (1)}$$

$$r = \left[\frac{Y_t}{Y_o} \right]^{1/n} - 1 \text{ ... (2)}$$

Y_t = Area, Production, or Yield or Export-Import of rice in the last year.

Y_o = Area, Production, Yield Export-Import in the base year.

n = Numbers of years (Time period)

r = Compound Annual Growth Rate

Equation 1 is the general equation of Compound Annual Growth Rate and equation (1) has been transform in to the equation (2) for simplicity of calculation in excel file.

2.2 Standard RCA

The Balassa index of Revealed Comparative Advantage (RCA) gives an indication of industry/sector in which a given country may have a comparative advantage. The standard calculation of revealed comparative advantage measures how much a country is exporting a given commodity relative to its total trade, in comparison to the share of that commodity in world trade. Country$_i$ is said to have a "revealed comparative advantage" in a commodity when the share of that commodity in its exports is bigger than the share of that commodity in world exports.

The Revealed Comparative Advantage (RCA) is calculated as follow: (values in US$ used in this index)
Formula

$$RCA_{iw}^k = \frac{\left(x_{iw}^k \right)}{\left(X_{iw} \right)} \Big/ \frac{\left(x_{ww}^k \right)}{\left(X_{ww} \right)}$$

RCA_{iw}^k = Revealed Comparative Advantage index of (k) rice's production for i (countries like India) in the world.

x_{iw}^k = India's (i) Total Rice Export (x) to all countries in the world (w).

X_{iw} = India's (i) Total Export (X) to all countries in the world (w).

x_{ww}^k = Total Export (x) Value of Rice (k) for one year in the world.

X_{ww} = Total Exports (X) value of all products, create by all country in the world (means total International Trade).

If the share of product k in total exports of country i is higher than the share of product k in world exports,

i.e. $\left(\dfrac{x_{iw}^k}{X_{iw}} \right) > \left(\dfrac{x_{ww}^k}{X_{ww}} \right)$, then $RCA > 1$ and country i is classified as having a *revealed comparative advantage*

in sector k. Since the RCA results in an output which cannot be compared on both sides of 1 (its natural

value), we propose making the index symmetric, as $(RCA - 1)/(RCA + 1)$, thus this measure ranges from -1 $to +1$. We call this measure *revealed symmetric comparative advantage (RSCA)* index. An index of less than *zero* suggests a revealed comparative disadvantage in a given product, and an index of greater than *zero* suggests revealed comparative advantage in the product. The normalisation means the index is suitable for a cross country, a cross sector and a cross time comparisons (Sachin Kumar Sharma, 2013).

Overview of rice

Rice is grown in more than a hundred countries, with a total harvested area of approximately 158 million hectares, producing more than 700 million tonnes annually (470 tonnes of milled rice). It's increased more than tripled between 1961 and 2010, with a compound growth rate of 2.24% per year (2.21% in rice-producing Asia). Most of the increase in rice production was due to higher yields, which increased at an annual average rate of 1.74%, compared with an annual average growth rate of 0.49% for area harvested. In absolute terms, paddy yields increased at an annual average rate of 51.1 kg/ha per year, although this rate of increase has recently declined in both percentage and absolute terms.

Nearly 640 million tons of rice is grown in Asia, representing 90 per cent of global production. Sub-Saharan Africa produces about 19 million tonnes and Latin America some 25 million tonnes. In Asia and Sub-Saharan Africa, almost all rice is grown on small farm of 0.5-3 hectare.

Yield range from less than 1 tonne/hectare under very poor rain fed conditions to more than 10 tonnes/hectare in intensive temperate irrigated systems. Small, and in many areas shrinking, farm sizes account for the low incomes of rice farm families. The highest rice yields have traditionally been obtained from plantings in high-latitude areas that have long day length and where intensive farming techniques are practiced, or in low-latitude desert areas that have very high solar energy. South-western Australia, Hokkaido in Japan, Spain, Italy, northern California, and the Nile Delta provide the best examples.

Table: 3.2 Top ten producer countries' overview of CY 2014. (% Share of Production)

Country	Consumption	Import	Export
China	99.80	1.228	0.20
India	97.21	0.001	2.79
Indonesia	101.17	1.192	0.02
Bangladesh	101.19	1.195	0.01
Viet Nam	93.41	0.00	6.59
Myanmar	98.29	0.00	1.71
Philippines	100.00	0.00	0.001
Japan	106.10	6.34	0.24
Brazil	118.10	5.13	2.90
United States of America	76.50	7.393	30.90

Source: Author's calculation

Table 3.2 shows the situation or overview of the rice in a given period of time, for the top ten rice producers in world. Five countries among the top ten producers are the net importers, however; rest five do not have a big share except the USA. Among top ten producers USA has got first position in net exporters in the world, but Thailand has first position in export at all over world. Rice is the primary food in India, Bangladesh, and China due to not able to export more quantity of rice.

Table: 3.3 Compound Annual Growth Rate

Time Period	Area	Production	Yield	Area under Irrigation
1994-95 to 1998-99	0.009	0.010	0.001	0.010
1999-00 to 2003-04	-0.012	-0.003	0.009	-0.005
2004-05 to 2009-10	0.000	0.012	0.012	0.010
2010-11 to 2015-16	-0.001	0.012	-0.531	0.001

Source: Author's Calculation

Table 3.3 shows the twenty years growth trend in Area harvested of rice, Production of rice, Yield per hectare and the Area under Irrigation. Rate of growth of above four variables is not significant, it's negative or

slightly low rate of growth. Because growth of production depends upon area, irrigation seed variety etc. after green revolution these did not show any significant improvement.

Table: 3.4 Top 10 Countries' Area, Production and Yield

Country	Production (in million tonnes)				Yield (Kg/Hectare)				Area (million Hectare)			
	1994-98	1999-03	2004-08	2009-14	1994-98	1999-03	2004-08	2009-14	1994-98	1999-03	2004-08	2009-14
China	193.13	181.63	185.31	203.85	11689	11840.38	12041.42	7702.18	31.42	29.27	29.19	30.49
India	*122.67*	*128.48*	*138.83*	*155.21*	*2822.1*	*2935.76*	*3169.7*	*3519.78*	*43.46*	*43.71*	*43.76*	*43.39*
Indonesia	49.22	51.37	56.02	68.68	4348.08	4410.44	4666.10	5069.47	11.32	11.65	12.00	13.51
Bangladesh	27.51	36.86	41.34	50.98	2725.46	3433.30	3879.76	43648.83	10.09	10.73	10.64	11.61
Viet Nam	26.31	33.01	36.50	43.03	3771.94	4371.86	4971.84	5513.17	6.97	7.55	7.34	7.72
Myanmar	17.51	21.66	29.51	28.12	3083.6	3400.90	3871.02	3913.35	5.68	6.37	7.61	7.23
Philippines	10.44	12.78	15.50	17.58	2835.5	3170.16	3671.22	3770.17	3.67	4.03	4.22	4.61
Japan	13.01	11.10	10.97	10.61	6457.76	6436.82	6537.78	6643.78	2.01	1.72	1.68	1.59
Brazil	9.30	10.76	12.22	12.04	2572.36	3183.68	3772.50	4737.00	3.63	3.39	3.27	2.52
USA	8.26	9.28	9.54	9.42	6560.26	7148.74	7750.68	8143.25	1.26	1.31	1.23	1.16

Source: Food and Agriculture Organisation.

Diagram: 3.1 Production or Export of India (value in laks)
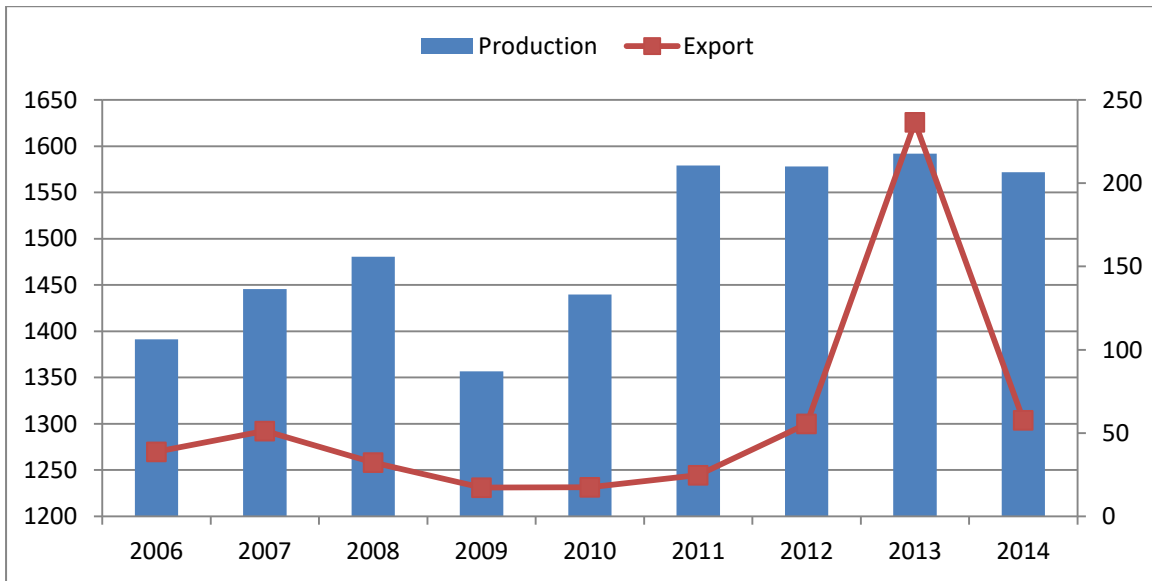
Source: Food & Agriculture Organisation& Agricultural and Processed Food Products Export Development Authority, GOI, New Delhi.

This Diagram shows the production of rice & export share in relative terms export of rice. However, share of rice export is in total agricultural export is significant but in comparison to its production, exported quantity is low.
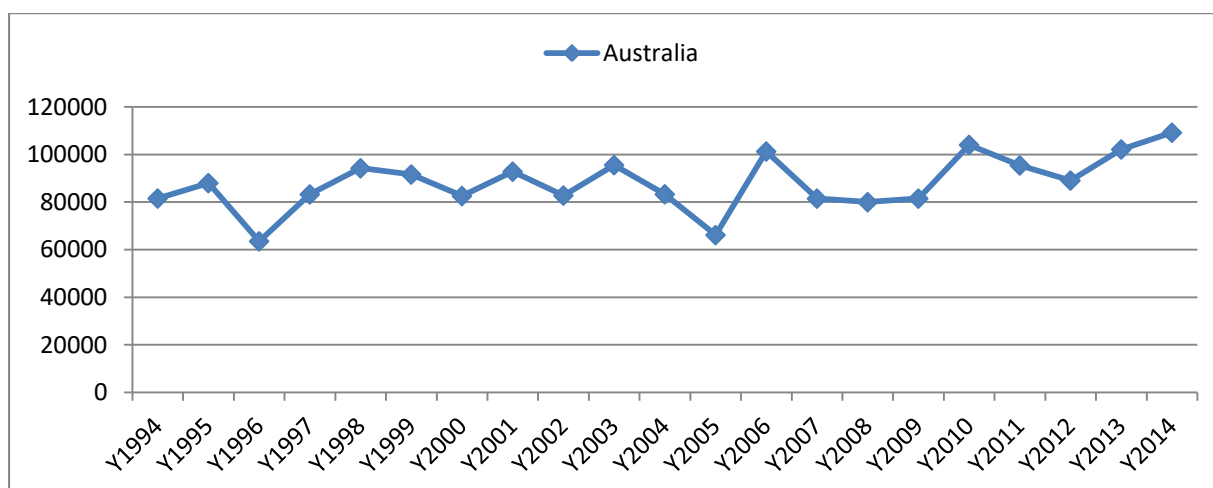
Diagram: 3.2 Yield of Rice India
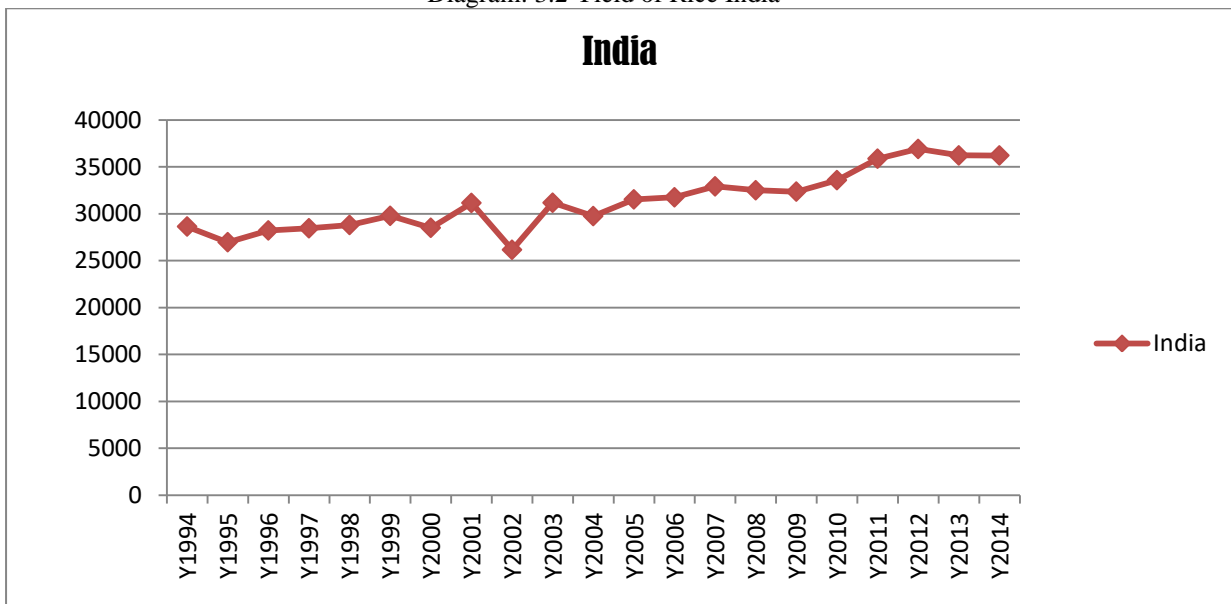
Source: Food and Agriculture Organisation

Diagram 3.2 &3.3 show the trend in rice per hectare productivity or yield. In diagram 3.2 explain India productivity trend in rice crop, and 3 for Australia. Australia has first rank in rice productivity due to highly mechanisation of agriculture.

Diagram: 3.3

Source: Food and Agriculture Organisation

Diagram 3.3, shows trend in Australian productivity fluctuations, it is high over a time period. But in the context of India, trend is not much fluctuating, however, trend is increasing but rate is very low. Because, after green revolution, have do not any break points in terms of technology or of others initiatives.

Table: 3.5 Areas, Production and Yield of Rice during FY 2013-14 in the Major Producing States in India.

State	Area (Million Ha)	% rate in All India	Production (Million Tonne)	% to all India	Yield (Kg/Ha)
West Bengal	5.50	12.51	15.31	14.37	2786.00
Uttar Pradesh	5.98	13.60	14.63	13.73	2447.00
Andhra Pradesh	4.51	10.25	13.03	12.23	2891.00
Punjab	2.85	6.49	11.27	10.58	3952.00
Odessa	4.18	9.51	7.58	7.12	1815.00
Chhattisgarh	3.80	8.65	6.72	6.30	1766.00
Tamil Nadu	1.79	4.06	5.54	5.20	3100.00
Bihar	3.11	7.07	5.51	5.17	1774.00
Assam	2.27	5.17	4.78	4.48	2101.00
Haryana	1.23	2.79	4.00	3.75	3256.00
Karnataka	1.33	3.02	3.76	3.53	2828.00
Maharashtra	1.56	3.55	2.95	2.77	1891.00
Madhya	1.93	4.40	2.78	2.61	1438.00
Jharkhand	1.22	2.79	2.74	2.57	2238.00
Gujarat	0.79	1.79	1.62	1.52	2053.00
Kerala	0.20	0.45	0.51	0.48	2551.00
Others	1.71	3.89	3.83	3.60	@
All India Total	43.95	100.00	106.54	100.00	2424.00

Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation.
@ Since area/production is low in individual states; yield rate is not worked out.

Table: 3.6 Export and Import of Agricultural Commodities and Rice (US$ in millions) CY 2006-14

Year	Export	% of Total Agri-Exports	Import	% of Total Agri-Imports	Trade Balance
2006	1546.94	38.83	0.16	0.010	1546.78
2007	2383.78	40.25	0.08	0.000	2383.70
2008	3473.46	37.11	0.04	0.002	3473.42
2009	1788.34	32.97	0.16	0.004	1788.18
2010	1748.14	26.57	0.11	0.003	1748.02

2011	2369.10	24.43	1.18	0.034	2367.91
2012	4012.51	26.56	0.58	0.013	4011.93
2013	4031.14	27.62	1.30	0.029	4029.84
2014	3906.10	31.48	1.64	0.030	3904.46

Source: Agricultural & Processed Food Products Export Development Authority, GOI

Table 3.5 shows trade position of rice, its export revenue as a share in total agricultural exports. Rice exports share is significant in total agricultural export.

Table 3.6 show the *Revealed Symmetry Comparative Advantage (RSCA),* this index has the range between $+1 \, to -1$. Index value if greater than $ZERO$, it means which country has comparative advantage and less than

$ZERO$ means country has comparative disadvantage. Pakistan has got rank first throughout the period followed by Thailand, India and Vietnam. However, India and Vietnam top ten producer countries. Thailand has reached a mature stage of development, with a high degree of specialization in high-value native rice. Although Thailand has had the lowest yield among the world's top 10 rice-producing countries, even lower than the world average, Thailand has been the largest rice-exporting country for almost 30 years now[7]. Pakistan enjoys the strong combative advantage in rice export. Pakistani exporters have been able to get a better price for basmati rice in world market. India produced both types of rice namely basmati as well as non-basmati. Basmati rice is exported to the rest of the world but non-basmati is consumed and procured by the government and a fixed share of export to Bhutan, Nepal and Somalia. Indonesia's RCA values shows its export of rice is very highly disadvantage, because Indonesia's primary food is rice. Indonesian population consumed rice very high quantity so, Indonesia imports the Rice.

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[7] Technical Assistance Consultant's Report, 2012

Table: 3.7 Revealed Symmetric Comparative Advantage Index

Year	China	India	Indonesia	Bangladesh	Vietnam	Japan	Brazil	Philippines	Myanmar#	*Thailand*	*Pakistan*	*Italy*	*Spain*
2006	-0.66	0.90	-0.99	-0.41	0.92	-0.92	-0.15	-0.40		0.92	0.97	0.19	0.13
2007	-0.73	0.91	-0.86	-0.36	0.92	-0.93	0.06	-0.99		0.93	0.97	0.24	0.15
2008	-0.81	0.89	-0.98	-0.34	0.94	-0.90	-0.20	-0.91		0.95	0.98	0.25	0.05
2009	-0.73	0.82	-0.97	-0.59	0.89	-0.93	0.48	-0.98		0.92	0.96	0.24	0.08
2010	-0.78	0.81	-0.99	-0.67	0.90	-0.92	0.47	-0.94	0.90	0.94	0.97	0.27	0.21
2011	-0.81	0.79	-0.99	-0.93	0.92	-0.92	0.74	-0.90		0.95	0.96	0.26	0.16
2012	-0.80	0.87	-0.96		0.92	-0.87	0.64	-0.89		0.93	0.96	0.22	0.20
2013	-0.76	0.87	-0.86		0.89	-0.91	0.06	-0.92		0.93	0.97	0.30	0.27
2014	-0.87	0.87	-0.93		0.85	-0.50	-0.05	-0.99		0.95	0.97	0.32	0.28

Source: Author's calculation

Full data not available.

Government policies in the context rice of production and consumption& trade

Indian citizens in the lowest income group face a real deprivation of food, implying the need for policy intervention. For this reason, the largest-scale distribution of rice through the public distribution system (PDS) and other social welfare schemes has remained a key element of the Indian government's food policy. The government's need to procure rice for distribution as well as its desire to maintain price stability, combined with an unprecedented demand for Indian rice exports, made export restrictions unavoidable. The government's initial response was a market bifurcation strategy, involving the use of a minimum export price (MEP) for non-basmati rice. Export restrictions on rice are likely to remain in the Indian government's policy toolbox as long as the provision of food security to its vulnerable citizens remains high on its agenda. However, the need for the government to impose severe export restrictions, such an outright ban, may be lessened through judicious adjustments of its food policy.

In the field of production, the 'Green Revolution' is the name given to the dramatic increase in cereal crop yields through modern agricultural inputs – irrigation, fertilizers, improved seeds, and pesticides – in the 1960s. For rice, the revolution began with the release by IRRI of the high- yielding semi dwarf variety of IR8 in 1966. The world average rice yield in 1960, the product of thousands of years of experience, was about 2 tonnes/ha. Astonishingly, in only 40 more years, as the Green Revolution spread, it doubled, reaching 4 tonnes/ha in 2000. The rice varieties and technologies developed during the Green Revolution have increased yields in some areas to 6–10 tonnes/ha.

III. CONCLUSION

India is the second largest producer of rice in the world, contributing more than a fifth of the world's rice output. Using the population projections from the United Nations and income projections from the Food and Agricultural Policy Research Institute (FAPRI), global rice demand is estimated to rise from 439 million tons (milled rice) in 2010 to 496 million tons in 2020 and further increase to 555 million tons in 2035. This is an overall increase of 26% in the next 25 years, but the rate of growth will decline from 13% for the first 10 years to 12% in the next 15 years as population growth drops and people diversify from rice to other foods. Among the various rice-consuming regions, Asian rice consumption is projected to account for 67% of the total increase, rising from 388 million tons in 2010 to 465 million tons in 2035 despite a continuing decline in per capita consumption in China and India. In addition, 30 million tons more rice will be needed by Africa, an increase of 130% from 2010 rice consumption. In the Americas, total rice consumption is projected to rise by 33% over the next 25 years.

This is a limitation to expansions in area it cannot increase faster, so only one is option left; global rice yields must raise faster than in the recent past if world market prices are to be stabilized at affordable levels for the billions of consumers. Globally, farmers need to produce at least 8–10 million tons more paddy rice each year an annual increase of 1.2–1.5% over the coming decade, equivalent to an average yield increase of 0.6 tonnes/ha during the next decade. Over the longer run, global rice consumption growth is expected to slow down but yields will have to continue to grow faster than at present because of pressure on rice lands in the developing world from urbanization, climate change, and competition from other, high-value agriculture. Rice yield growth of 1.0–1.2% annually, beyond 2020 will be needed to feed the still-growing world and keep prices affordable.

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