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Export Competitiveness of Indian Rice: A Policy Analysis Matrix Approach

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Abstract:
Rice is a major food crop in the world. It is being consumed by more than half of the world population. Available data indicate that world output has witnessed some decline for the recent past. Production of milled rice in the world totaled 409.2 million tonnes in 1999 but declined to 384.4 million tonnes in 2002. In India, rice production and its export witnessed fluctuations as it declined during 2009-10, but however went high in 2011-12. However Indian Agricultural trade will in future operate in an external trade framework mainly due to the global openness in trade in agriculture. To avail the new trade opportunities, right decisions need to be made regarding which crop to grow more and which one to grow less or, which one to purchase more and which to purchse less. The most important to such decisions lies in finding out the export competitiveness of a crop in relation to the prevailing world market prices, therefore; this paper tries to assesed the export competitiveness of Indian rice. Results of the policy analysis matrix for the years under consideration (Table 1 to 4) depicts that social revenues were much higher than the private revenues. Implying that Rice grown in country is net taxed, the average nominal protection coefficient (NPC) was 0.48 thus indicating that Rice producers in country were disprotected and also the average effective protection coefficient (EPC) was found to be 0.44 indicating a high export competitiveness of the India Rice. However, the average domestic resource cost (DRC) was found to be less than one (0.37) this means that domestic resources were efficiently utilized in case of rice crop in the country and also indicated that they have comparative advantage in the production of rice crop. All the indicators (NPC, EPC and DRC) were less than unity thus a reflection that the domestic price of Rice in the country is lower than the world market price and hence competitive worldwide. It is therefore recommended that, in order to improve the competitiveness of Indian Rice in particular and Agriculture in general, attention needs to be given to domestic market thereby rationalizing subsidies on certain inputs and improvement of domestic market performance.

Keywords: *Export, competitiveness, rice, policy analysis matrix, India*

1. Introduction

Rice is a major food crop in the world. It is being consumed by more than half of the world population. Available data indicate that world output has witnessed some decline for the recent past. Production of milled rice in the world totaled 409.2 million tonnes in 1999 but declined to 384.4 million tonnes in 2002 (USDA, 2002)[1]. Rice production and its export in India witnessed fluctuations as it declined during 2009-10, but however went high in 2011-12(Makama, *et al* 2015)[2]. The top five producers then were China, India, Indonesia, Bangladesh and Vietnam. The international rice market accounts for only about 5-6 percent of global output despite the expansion of trade. Unlike other bulk commodities, the rice market is segmented into a number of different varieties and qualities, each with strong consumer loyalty. The major rice exporters are Thailand, Vietnam, China, USA, India and Pakistan.

Rice production in India crossed the mark of 100 million MTnes in 2011-12 accounting for 22.81% of global production in that year. The productivity of rice has increased from 1984 kg per hectare in 2004-05 to 2372 kg per hectare in 2011-12 (Wailes and Chavez, 2012)[3].

In many developing countries (India Inclusive), rice self-sufficiency objectives continue to be pursued as a means to achieve food security. As a result, trade in rice largely remains a residual option, and it is not infrequent to see nations shifting from being a net importer to a net exporter, depending on the outcome of their paddy season. To protect producer and consumers from large price fluctuations, a number of governments intervene to stabilize their market, either through changes in border measures or through

government procurement programmes at minimum prices and management of rice government-owned stocks. Concerns over scarcity of supplies have often led to the imposition of rice export limitations, including export bans, ceilings, taxes, minimum prices, etc.(FAO,2004)[4].

India is among the five world's exporter of rice exporting over 4million MT at Rs. 948,280.58 (USD 15,545.5833) in the year 2012/2013 (AgriXchange, 2014)[5].

Therefore, the main objective of this paper is to asses the competitiveness of Indian rice in the international market using policy analysis matrix approach.

2. Review of Literature

Competitiveness is defined as a set of institutions, policies and factors that determine the level of productivity of a country. The level of productivity, on the other hand, determines the sustainable level of prosperity which can be created by an economy. The more competitive an economy is, the more competent will it be to produce a higher level of income to its citizens (Stanisavljev, *et al* 2012)[6].In the globalized world, the concept of the competitiveness has gained and has been gaining an unprecedented importance in the recent years (Arslan and Tatlıdil, 2012)[7]. The period of 1970s can be regarded as the turning point in the view of globalization, however, during 1980s, many developing countries started to be more liberal in their economic policies (Arslan and Tatlıdil, 2012)[7]. Privatization, increasing market economy, financial liberalization and the attempts of the countries for the articulation to the world economy existed in these countries started to be in great demand. Then, developing countries began to be more connected to each other which brought an increasing competition in the world (Arslan and Tatlıdil, 201)[7].

No single measure of international competitiveness has general acceptance in the literature, but an important aspect is the level of prices across countries (Fertő and Hubbard, 2002)[8]. However, different studies by different authors are been reviewed below;

Mohanty *et al* (2003)[9] used Policy Analysis Matrix (PAM) to assess the competitiveness of Indian cotton, which is produced under a complex set of policies including price supports, and various input subsidies such as fertilizer, power, irrigation, and credit. The results of the Protection Coefficients (NPCO coefficients) shows that domestic cotton prices in Punjab, Maharashtra and Haryana were very close to one indicating that domestic prices in these three states were at par with their corresponding international reference prices.

Varghese (2004)[10] studied the export potential and Competitiveness of groundnut in her study on the Export of Groundnut from India under the Liberalization Regime using the Policy Analysis Matrix. Nominal protection coefficient (NPC), Effective protection coefficient (EPC) and Domestic resource cost (DRC) were worked out using the PAM. The average NPC under exportable hypothesis was 0.47 indicating that groundnut producers in Karnataka are getting lower incentives than what they would get under free trade scenario, if the production is for export. Also, the average EPC was at 0.29 indicating that the value added at domestic prices was higher than the value added at border prices and hence groundnut producers in Karnataka are net taxed. Moreover, the average DRC was at 0.23 indicating that Karnataka has comparative advantage in producing groundnut and groundnut produced in Karnataka is export competitive.

Guledgudda (2005)[11] examined the competitiveness of Indian cashew export using Nominal Protection Coefficients (NPC). The nominal protection coefficients of cashew kernel were estimated for the year 2004-05 under importable and exportable hypothesis and the results of the analysis depict the nominal protection coefficients of cashew kernel for the year 2004-05 under importable hypothesis to be less than unity (0.88), which indicates a good import substitute of raw cashew nut. While the nominal protection coefficients of export of cashew kernel were found to be lower than unity (0.98) under exportable hypothesis. This implies that cashew kernel is a good exportable product.

Ogbe, *et al* (2011)[12] assesses the competitiveness of Nigerian rice and maize production ecologies using the policy analysis matrix (PAM). Results of the PAM revealed that outputs from the production ecologies are taxed. This is further confirmed by the Effective protection coefficient (EPC) and Subsidy ratio to producers (SRP) values, however, the production ecologies are subsidized on the use of tradable inputs. The production ecologies show a strong competitiveness at the farm level (under irrigated rice, upland rice and upland maize) and a strong comparative advantage.

3. Methodology

The study mainly relies on secondary data compiled from various published sources. Monthly prices, cost of cultivation of rice as well as the FOB price of rice were analysed using the policy analysis approach.

A matrix is an array of numbers (or symbols) that follows two rules of accounting – one defining relationships across the columns of the matrix and the other defining relationships down the rows of the matrix.The PAM matrix consists of two accounting identities – the profitability identity and the divergences identity.The profitability identity in PAM is the accounting relationship across the columns of the matrix.Profits are defined as revenues less costs.The divergences identity in PAM is the relationship down the rows of the matrix.

All entries in the PAM matrix under the third row, defined as "effects of divergences," thus are identically equal to the difference between entries in the first row, measured in "private prices," and those in the second row, measured in "social prices." This can be best seen in the table below;

	Revenue	Costs		Profits
		Tradable Input	Domestic Factor	
Private	A	B	C	D
Social	E	F	G	H
Divergences	I	J	K	L

Table 1: A Policy Analysis Matrix

The principal purposes of the policy Analysis Matrix (PAM) methodology are to provide information and analysis to assist policy makers in these three central areas of agricultural policy (private costs, returns, and profit).

Firstly, construction of a PAM for Agricultural systems allows the calculation of private profitability i.e a measure of competitiveness of the system at actual market prices. The calculation of private profitability (competitiveness) of the system is carried out in the first (top) row (D), which is defined as the difference between theobserved revenue (A) and the costs (B+C). Secondly, the PAM approach allows the estimation of agricultural systems social profitability(social oppotunity costs). The calculation of social profitability is carried out in the second (middle) row of the matrix and is defined as E-(F+G). Social profits measures efficiency and comparative advantage. A positive social profits indicates that the country uses scarce resources efficiently and has a static comparative advantage in the production of that commodity at the margin. Also, negative social profits suggest that the sector is wasting resources that could have been utilized more efficiently in some other sector.The third purpose allows for the measurement of the transfer effects of policies. By contrasting revenues (first row) and costs (second row) before and after the imposition a policy, one can be able to explain the impact of that policy. That is to say, the differece between the private and social values of revenue, costs and profits can be explained by policy intervention.

Thus, important indicators for policy analysis viz; Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC) and Domestic Resource Costs (DRC) can be calculated using the PAM framework.

The Nominal Protection Coefficient is the simplest indicator of export competitiveness and domestic protection which measures the degree of protection or otherwise provided to the domestically produced commodities. The domestic price used in this computation is wholesale price while the world reference price is the international price adjusted for transport, marketing and processing cost necessary to make the commodity comparable. NPC is mathematically defined as;

$$NPC_i = {P_i^d}/{P_i^w} = {A}/{E} \quad (1)$$

Where,

NPC_i = Nominal protection coefficient of commodity *i*

P_i^d = Domestic price of commodity *i*

P_i^w = World reference price of commodity i, adjusted for transportation, handling and marketing expenses.

Here, the wholesale price of Karnataka market was taken as domestic price for it gives a better representation of the export price of quality rice. For the reference price, New York (USA) will be considered because it is one of the major markets of rice in the world and couple with availability of data.

If the NPC is greater than one, then it indicates that the commodity is protected compared to the situation that would have prevail under free trade if however, the NPC is less than one, then the commodity is not protected. NPC equal to one indicates that domestic price is equal to its border price (CIF or FOB) and no protection is given to the commodity. Under the exportable hypothesis, the pre-assumption is that Indian Rice would compete in the international rice market. Hence, the price of Indian rice must be low enough to make it competitive in the foreign market.

Effective Protection Coefficient is defined as the ratio of value added in private prices (A-B) to the value added in social prices (E-F). Mathematically EPC can be written as;

$$EPC_i = \frac{Q_i\left(P_i^d - \sum A_{ij} * P_j^d\right)}{Q_i\left(P_i^w - \sum A_{ij} * P_j^w\right)} \quad (2)$$

Where,

EPC_i= Effective Protection Coefficient for commodity *i*

Q_i= Quantity of output of i^{th} commodity

A_{ij}= Quantity of j^{th}input required to produce a unit of commodity *i*

P_i^d = Domestic price of i^{th} commodity

P_i^w = World reference price of i^{th} commodity

P_j^d = Domestic price of *jth* traded input

P_j^w = World reference price (Border equivalent) of *jth* traded input, adjusted for transportation, handling and marketing expenses.

P_j^w = World reference price of the i^{th} commodity

The whole expression in Q_i above can cancel out and be reduced to value added as:

$$EPC_i = \frac{V_i^d}{V_i^w} \quad (2.1)$$

Where,
V_i^d=Value added at domestic prices
V_i^w=Value added at world reference prices
i.e EPC = (A-B)/(E-F)
EPC value of greater than unity suggest that government policies provide positive incentives to producers, and a less than unity values indicate that producers are not protected through the policy interventions.
Domestic Resource Cost is the most widely used and comprehensive measure of resource efficiency in an economy. It is used to compare the relative efficiency or comparative advantage among agricultural commodities and is defined as the shadow value/price of non-tradable factor inputs (land, labor and non-traded capital) used in an activity per unit of tradable value/price added i.e. G/(E – F).It is the value of domestic resources needed to earn or save a unit of foreign exchange through the production or export of the commodity under consideration. Symbolically,

$$DRC = \frac{\sum A_{ij} P_j^s}{P_i^w - \sum A_{ij} P_j^w} (3)$$

Where,
Aij = Quantity of the *jth* input required to produce a unit of i^{th}output
P_i^s =Shadow price (opportunity cost or social price) of j^{th}non-traded input;P_i^w = World reference price of commodity *i* , adjusted for transportation, handling and marketing expenses; P_j^w= World reference price of j^{th}traded input, adjusted for transportation, handling and marketing expenses.
The non traded inputs are those inputs which are not normally traded internationally. Those considered here are the human labour, Farm yard manure as well as the bullock labour. Traded inputs however, are the inputs that are traded in the international market and they include seed, fertilizer and chemicals. The DRC decision rule is; when DRC value is less than unity, the input is efficiently used and is export competitive. When the estimated DRC value is greater than unity, then the input is inefficiently used and is therefore not export competitive.

3.1. Data Sources
Monthly prices, cost of cultivation, area, production and yield as well as government policy on Agriculture were collected from various sources such as the Directorate of Economics and Statistics (DES), Directorate of Commerce, Industries and Statistics, Ministry of Agriculture, Government of India, APEDA, AgriXchange. Data on FOB prices were also compiled from the World Rice Statistics, FAO, World Bank, and, Journals as well as relevant websites for further references. Data collected were analysed and presented as below;

4. Results and Discussion
Indian Agricultural trade will in future operate in an external trade framework mainly due to the global openness in trade in agriculture. To avail the new trade opportunities, right decisions need to be made regarding which crop to grow more and which one to grow less or, which one to purchase more and which to purchse less. The most important to such decisions lies in finding out the export competitiveness of a crop in relation to the prevailing worldmarket prices.
The result of the policy analysis matrix for the years 2010, 2011, 2012 and 2013 (Table 2 to 5) revealed that social revenues were much higher than the private revenues. This implies that Rice grown in India is net taxed. The tradable costs were higher at social prices compared to private prices during those period. This indicate that government policies of these said periods (2010 to 2013) reduces or rather subsidized the costs of input in the country. The tradable resources were however under priced in the domestic economy. The social prices were positive in both the years under study, this indicates that farmers in India uses scarce resources efficiently and has a static comparative advantage in Rice production.

Parameters	**Revenues**	**Costs**		**Profit**
		Tradable	Domestic	
Private	51747.67	5663.94	31142.43	14941.29
Social	104916.10	7408.566	35734.65	61772.88
Divergence	-53168.4	-1744.62	-4592.22	-46831.6

Table 2: Policy Analysis Matrix for Rice trade in India (2010)Rs./Ha
Source: Authors calculation

Parameters	**Revenues**	**Costs**		**Profit**
		Tradable	Domestic	
Private	50893.06	6737.82	32483.47	11671.77
Social	117118.5	9007.08	35696.31	72415.14
Divergence	-66225.5	-2269.26	-3212.84	-60743.40

Table 3: Policy Analysis Matrix for Rice trade in India (2011)Rs./Ha
Source: Authors calculation

Parameters	Revenues	Costs		Profit
		Tradable	Domestic	
Private	57828.56	9998.501	35783.36	12046.7
Social	124011.5	13195.01	40532.75	70283.76
Divergence	-66183	-3196.51	-4749.39	-58237.1

Table 4: Policy Analysis Matrix for Rice trade in India (2012)Rs./Ha
Source: Authors calculation

Parameters	Revenues	Costs		Profit
		Tradable	Domestic	
Private	57308.16	11132.03	38949.19	7226.938
Social	113303.50	12133.42	40902.52	60267.6
Divergence	-55995.40	-1001.39	-1953.33	-53040.7

Table 5: Policy Analysis Matrix for Rice trade in India (2013)Rs./Ha
Source: Authors calculation

The nominal protection coefficint (NPC), effctive protection coefficient (EPC), and domestic resource costs (DRC) were worked out using the policy analysis matrix for the period 2010 to 2013 and are presented in Table 6. The NPC and EPC are generally used to find out the level of protection or otherwise as well as the level of government intervention in different commodities, while DRC on the other hand is generally used to measure the efficiency and comparative advantage in production vis-a-vis export or import of various commodities. It is base on these measures that one can find out how resources should be re-allocated among different uses to improve their efficiency and also to increase return to these resources.

The avarage value of NPC for the years 2010, 2011, 2012 and 2013 were less than unity (0.47) which indicates that the domestic prices received by the farmers in the country were below the international prices. This shows or rather proved that the domestic producers of Ricein the country were net taxed. It also indicates that Rice has a high degree of comparative advantage in the international markets. With this results, India has a great advantage to specialize in the production and export of Rice so as to earn the valuable foreign exchange. The country also needs to capitalize this advantegeous position thereby ensuring its position in the international market as a stable and dependable source of low price quality Rice in the world. This findings is in accordance with results obtained by Jaiparkash, 2014[13] in his study on Competitiveness of Indian Rice Industry in the WTO regime. He reported that "in Andhra Pradesh, Assam, Bihar and Karnataka as well as Haryana, Chhattisgar, Jarkhand, Kerela and Madhya Pradesh, Punjab Orissa under exportable hypothesis, rice crop was very much competitive, as the competitive coefficient NPC was relatively lower than zero".

Eventhough, NPC measuresthe divergence between domestic and international prices, it does not however account for discrepancies in the prices of various tradable inputs in the production of these commodities. The EPC adjust the NPC for the protection of relevant tradable inputs (Gulati and Kelly, 1999[14] in Varghese, 2004[10] and Jaiparkash, 2014[13]). The EPC was less than one in all the years and its average stands to be 0.44.Although, both NPC and EPC measures/indicates the level of protection provided by government to the producers through different policy interventions, the EPC is more reliable indicator compared to NPC as the EPC presumed free trade of inputs along with outputs.

Period	NPC	EPC	DRC
2010	0.49	0.47	0.37
2011	0.44	0.41	0.33
2012	0.47	0.43	0.37
2013	0.51	0.46	0.40
Average	0.48	0.44	0.37

Table 6: NPC, EPC and DRC of Indian Rice for the year 2010 - 2013
Source: Authors calculation

The Domestic Resource Costs values for the period 2010 to 2013 were all less than unity, thus indicating that the domestic resources were efficiently utilized in case of rice crop and also indicate that Karnataka is an efficient producer of rice. The average value of DRC for the said period was 0.37 indicating a high export competitiveness of Rice grown in Karnataka (India). Similar result was obtained by Jaiparkash (2014)[13] for Rice grown in Andhra Pradesh, Assam, Bihar and Karnataka as well as Haryana, Chhattisgar, Jarkhand, Kerela and Madhya Pradesh, Punjab Orissa for the years 1992 to 2010.

According to Varghese (2004)[10] NPC is considered as a very useful measure, but it is criticized as a measure which is highly influenced by variations in exchange rates.

5. Conclusion

The average nominal protection coefficient was 0.48 thus indicates that Rice producers in Karnataka (India) were disprotected and the average effective protection coefficient was 0.44 indicating a high export competitiveness of the India Rice. However, the average

domestic resource cost was found to be less than one (0.37) this means that domestic resources were efficiently utilized in case of rice crop in above mentioned state of the country and also indicated that they have comparative advantage in the production of rice crop. All the indicators (NPC, EPC and DRC) were less than unity thus a reflection that the domestic price of Rice in the country is lower than the world market price and hence competitive worldwide.

Rice export from India fluctuates over the years which may be mainly due frequent policy changes by the government. (Government banand lift the ban of rice export from the country). It is therefore recommended that, in order to improve the competitiveness of Indian Rice in particular and Agriculture in general, attention needs to be given to domestic market thereby rationalizing subsidies on certain inputs and improvement of domestic market performance.

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