GLOBALIZATION OF AGRICULTURE AND ITS IMPACT ON RICE-WHEAT SYSTEM IN PAKISTAN

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What would happen to rice wheat production system in Pakistan under WTO regime as agreed under Uruguay round agreement? Study in hand examines this question through estimation of effective incentives and resource use efficiency in wheat rice cultivation in Pakistan through effective rate of protection and domestic resource cost. Results indicated that, under free trade regime cultivation of rice for export promotion and of wheat for import substitution purpose is likely to gain benefit. These results were compared with that of India. This comparison helped to examine that where the wheat rice cultivation of Pakistan would stand if distortions (subsidies) in the production of wheat and rice in Pakistan and India were eliminated. The results indicate that under such scenario cultivators of wheat and basmati rice in Pakistan and India are likely to gain benefit. However, Pakistan will have to face some competition from India in Rice production for export promotion purposes.
Keywords: Globalization, rice-wheat system, Pakistan

INTRODUCTION

With the commencement of World Trade Organization (WTO), Pakistan along with other member countries endorsed an Agreement on Agriculture (AOA), bringing agriculture into the purview of the global trading system. The agreement stipulates that member countries must undertake specific commitments in the area of market access through tariffication of quantitative restrictions of imports and exports, reduction of domestic support to agriculture, and reduction of export subsidies.

Whether or not Pakistan can take advantage of the trading opportunities would depend upon its economic efficiency, without subsides or with limited subsides that were permitted for all trading partners by the rules governing the new trading environment. It is therefore imperative in this situation to examine the efficiency status of Pakistan's agriculture, especially its principal crops as rice-wheat cropping system (one of the major cropping systems of Pakistan) and see what may happen to these crops once globalization in agriculture takes place.

The rice-wheat production system of Pakistan is one of the most dominating cropping systems covering an area of 2.2 million hectares; a major portion (57 percent) falls in the Punjab followed by Sindh providing livelihood for more than 15 million people in the country. Being, the staple food and major source of calorie intake of the people of Pakistan wheat ranks first both in acreage and production and rice ranks 2nd position (Government of Pakistan, 2005-06).

On the world level, Pakistan ranks 14th in rice production. It is the 6th largest exporter of rice. Rice export accounts for 6 percent foreign exchange earning from the merchandize exports (APCOM, 2005-06).

The production of rice has constituted 17.7 percent of overall production of food grains with its contribution in value added by major crops at around 17.23 percent (Government of Pakistan, 2005-06). Rice grown in Pakistan comprises of two major groups: Basmati (high quality aromatic rice) and irri (coarse rice). Share of basmati rice in total rice production is 48 percent. On the other hand, wheat being major staple food crop always occupies a central position in agricultural production systems. At present, it contributes 13.8 percent to value added agriculture and 3.2 percent to GDP. Among the important wheat producing countries, Pakistan ranks 9th in terms of area and 8th in production, but lies way behind at 49th in terms of yield per hectare (APCOM, 2005-06). This is indicative of the vast potential for improvement on the productivity frontier. Harnessing this yield potential Pakistan can go a long way towards the quest for self-sufficiency.

Keeping in view the importance of rice-wheat system in Pakistan and implication of AOA under WTO regime it is important for rice and wheat crops to survive and compete in international market under WTO regime. In fact removal of market interventions will demand the change in structure of economic incentives, so it will be imperative for Pakistan to prepare and adjust its production and marketing strategies to face the emerging challenges in domestic and global market structure. With this background in mind the present study aims at to examine the impact of policies on the "effective incentives" for the cultivators of wheat and rice, in Pakistan; to examine the issue of "economic efficiency" in the use of resources in wheat and rice cultivation; and to estimate crop specific effects of withdrawal of subsidies on wheat and rice cultivation in Pakistan and India if free trade takes place.

MATERIALS AND METHODS

The study covers two major rice and wheat producing regions, namely Punjab and Sindh provinces of Pakistan, for six harvesting years i.e. 2000-01 to 2005-06. The two provinces were selected due to their major contribution to rice and wheat production.

Study was based on time series data that were collected from various sources like APCOM, and other government and non-government publications. The data on exchange rate, producer price, world prices and direct and indirect payments on the crops under considerations were collected from various sources like websites of WTO, FAO reports and working papers, both for India and Pakistan.

The study in hand aims to assess the impact of trade and pricing policies on the "effective incentives" for the cultivators of wheat and rice and to estimate the "economic efficiency" in allocation of resources in wheat and rice cultivation in Pakistan.

For the analysis of the data Policy Analysis Matrix (PAM) model was adopted from (Monke and Pearson, 1989) as shown in Table 1.

world (social) price. This ratio indicates the impact of policy on divergence between the two prices for output (NPCO) and tradable inputs (NPCI).

As an indicator of policy effects, an NPCO lower than one, means that the production of a particular commodity is taxed either because of market failure or government interventions. Conversely, an NPCO greater than unity suggest inefficiency of a country in producing that particular commodity and that the price is heavily affected by government policies or other factors including subsidies to output. In the PAM context

NPC (On out put) = A/E = $P_c T_c / P_{c(s)} T_c = P_c / P(s)$

Where, A and E are revenues estimated at domestic and border prices of the output respectively.

NPCI is defined as the ratio of domestic price of tradable input to its border price. If subsidies are given on inputs, it leads to NPCI smaller than one and vice versa.

NPC (On input) = B/F = $\sum_{i=1}^{n} P_i Q_i \Big/ \sum_{i=1}^{n} P_i(s) Q_i$

Table 1. Policy Analysis Matrix

	Revenues	Costs		Profits
		Tradable Inputs	**Domestic Factors**	
Valued at private prices	A	B	C	D
Valued at social prices	E	F	G	H
Divergences	I	J	K	L

Table Notes:

Private profits (D) = A -B - C.   Social profits (H) = E - F - G.
Output transfers (I) = A - E.   Input transfers (J) =B - F.
Factor transfers (K) =C - G.   Net transfers (L) = D - H = I - J - K.

The PAM framework for a production system can help to determine simultaneously the economic efficiency of production system, the level of distortion on input and output markets, and the extent to which resources are transferred among agents.

By filling in the elements of the PAM for an agricultural system, an analyst can measure the impact of policies on the "effective incentives" by measuring effective rate of protection which has different variants such as nominal protection coefficient (NPC) and effective protection coefficient (EPC). Each variant has increasing level of sophistication to take care of complex issues ranging from prices of output to prices of tradable inputs (Gulati, 1999). The Nominal Protection Coefficient (NPC) is the simplest indicator of policy effects. It comes directly from the assumption that the border price is the shadow price of a commodity. The nominal protection coefficient (NPC) is a ratio of an observed (private) price with a comparable

B and F are cost of tradable inputs estimated at domestic and border prices respectively. The EPC is a more reliable indicator of the effective incentives than the NPC, as the former recognizes the full impact of a set of policies includes both output price enhancing effects (e.g. import tariffs) and cost reducing effects (e.g. input subsidies). It reveals the degree of protection accorded to the value added process in the production activity of the relevant commodity (Mohanty 2002, Fang 1999 and Chaudhary, 1995). Using PAM elements.

EPC = (A-B)/ (E-F) = $P_c T_c - \sum_{i=1} P_i Q_i \Big/ P_c(s) T_c - \sum_{i=1}^{n} P_i(s) Q_i$

Using the border price as the reference price, an EPC greater than unity implies price protection and positive incentives to the domestic producer of that commodity while the opposite true when the EPC is positive but

less than unity. If EPC is equal to one, the structure of protection is neutral. Producers are neither favored nor discriminated against.

Concept of DRC examines the issue of "economic efficiency" in the use of resources in wheat and rice cultivation. This concept covers all factors of production and other input costs, values them at their real economic prices to find out the "true resource cost" of producing any commodity. The DRC analysis is a great achievement toward the development of more practical measures to compare the relative efficiency. The DRC can be defined as the value of domestic resources (primary, non-traded factors of production such as land, labor and non-traded capital) needed to earn or save a unit of foreign exchange through the production of the commodity under consideration.

In the PAM context: $DRC = G/ (E-F)$

In this ratio G is the cost of domestic factors (i.e. land, labor and capital) while E is revenue and F the cost of tradable inputs. The difference (E-F) is value added of the activity when every thing is valued at social costs. The relationship between DRC and relative efficiency is straightforward: a country has efficiency in an activity if DRC ratio is less than unity. Conversely, a DRC ratio greater than unity indicates inefficiency of the country in producing that particular commodity.

To prepare social prices, the parity prices of rice and wheat were used. The tradable inputs, for which the parity prices were not utilized, were whighted by premium. The premium is ratio of shadow exchange rate (SER) to official exchange rate (OER) and for study period on an average it was estimated as 1.112.

Producer Subsidy Equivalent (PSE) measures the value of monetary transfers to agriculture resulting from agricultural policies in any given year. Producer Subsidy Equivalents (PSEs) are aggregate measures of support and these summarize the effects of different forms of governmental programs and intervention in a single number. The most common interpretation of the PSE is that it represents the amount of compensation that would be required to maintain farm incomes if government intervention (in the form of policies that affect agricultural markets) were eliminated, assuming constant world prices and fixed output (Gulati and Kelley, 1999). This method is superior to other tools like nominal or effective rates of protection, since these often account for only a small proportion of the transfers between the government and the producers of agricultural commodities. PSEs can be represented in many forms depending on the sort of comparison one desires to make. Two in particular are appropriate and suitable for cross-country comparisons. One is PSE per unit of output of a commodity other is percentage PSEs which is considered for this study following (Gulati, 1999).

Symbolically, PSE can be defined as:

%age PSE = Total Transfers/ Value to Producers

$$= \{Q * (P_d - P_w * X) + D + I\}/ (Q * P_d + D)$$

Q is the quantity produced,
P_d is the producer price in domestic currency units,
P_w is the world price in the world currency units,
X is an exchange rate,
D is direct government payments, and
I is indirect transfers through policies such as input subsidies, marketing assistance and exchange rate distortions.

The value of %age PSE could be negative or positive depending upon whether the domestic price is less than or greater than the world references price and whether other payments by the government are able to compensate the farmers for the implicit tax.

PSE here was used for comparison of situation of rice wheat system of India and Pakistan.

Another point worthnoting in this methodological framework is that these indicators of effective incentives can vary significantly depending upon whether they are estimated under importable hypothesis or exportable hypothesis. Under importable hypothesis, it was presumed that the domestic production of that commodity is for import substitution while under exportable hypothesis the domestic production is basically for exports. The results under the two scenarios differed because of the differential treatment accorded to transportation costs and associated marketing expenses (Gulati and Kelley, 1999).

Pakistan was a regular importer of wheat up to 1999-00, annually importing 2 to 4 million tons. Therefore, estimation of import parity price of wheat was imperative. Pakistan had a bumper wheat crop in the year 1999-00 and provided a sizable exportable surplus. Pakistan exported nearly one million tons of wheat in 2001-02 for the first time. Thus, the country has the potential to produce exportable surplus to earn foreign exchange. However, the country faced some difficulties in exporting wheat due to high production cost. Therefore it is imperative to analyze the effective incentives and economic effeciency in production of wheat in both import and exportable scenario. As Pakistan does not import rice so effective incentives and economic effeciency for rice was measured just under exportable scenario.

RESULTS AND DISCUSSION

I. Assessment of effective incentives for wheat in Punjab and Sindh under importable scenario

Table 2 presents the estimates of effective incentives for the cultivators of wheat, by different variants of effective rate of protection in Punjab and Sindh for the period 2000-2006.

As far as the estimation of Nominal protection coefficient for tradable inputs (NPCI) was concerned it was even though less than 1 but close to 1 (i.e. 0.91) as an average of six years under study showing that tradable inputs were subsidized only by 9 percent.

Estimates reveal that the level of effective incentives for cultivators of wheat in Punjab and Sindh has been below unity under importable hypothesis, on an average, for the entire period covered in the study. This indicates that cultivators of wheat were implicitly taxed under importable scenario in Punjab and Sindh. This taxation of producers entails resource transfer to other sectors that acts as a disincentive. The data in table 2 revealed that during the period 2000-2002,

trade but this increase will be less than increase in price of output so farmers of wheat will gain benefit of liberalization under import substitution strategy.

These results indicated that wheat farmers belonging to Punjab and Sindh will be benefited more when they produce wheat for import substitution purpose if trade is liberalized as compare to present conditions.

II. Assessment of Effective Incentives for Producers of Rice Wheat System in Punjab and Sindh under Exportable Scenario

With the hypothesis that in future Pakistan may be net exporter of grains, incentive indicators under exportable scenario were estimated. As shown in table
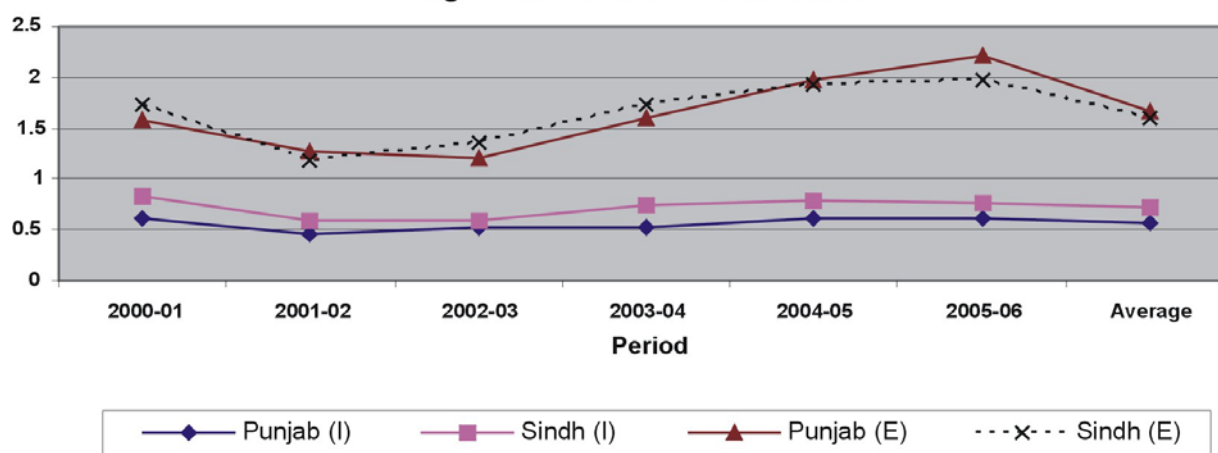
Table 2. Incentive indicators for wheat

Crop/Incentive Indicators	Province	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average
Importable Scenario								
Wheat								
NPCI	PUNJAB	0.905	0.891	0.893	0.909	0.990	0.910	0.912
	SINDH	0.909	0.893	0.901	0.915	0.932	0.912	0.915
NPCO	PUNJAB	0.692	0.597	0.647	0.640	0.735	0.716	0.674
	SINDH	0.856	0.701	0.703	0.793	0.835	0.818	0.786
EPC	PUNJAB	0.624	0.460	0.524	0.530	0.617	0.614	0.560
	SINDH	0.826	0.595	0.598	0.738	0.780	0.757	0.714

implicit taxation has been on rise as domestic producer prices in the wake of comfortable stock position have fallen. However, domestic market prices improved in

3, estimates of effective incentives for wheat cultivators approach towards unity as one move from importable to exportable hypothesis which is also clear from fig. 1.

Fig. 1 Behaviour of EPC of Wheat

2002-03 that reduced the extent of implicit tax in subsequent years. As NPCI suggests that market prices of tradable inputs were less than social prices, so prices of tradable inputs, will increase under free

Thus wheat cultivators have been disprotected largely under importable scenario while for export promotion, government has to subsidize intensively to wheat cultivators. Average value of EPC indicates that there

Table 3. Incentive indicators for rice and wheat

Crop/Incentive Indicators	Province	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average
Exportable Scenario								
Basmati Rice*								
NPCI	PUNJAB	0.899	0.883	0.893	0.769	0.769	0.905	0.845
NPCO		0.547	0.660	0.848	0.724	0.773	0.757	0.729
EPC		0.327	0.529	0.821	0.692	0.777	0.640	0.612
IRRI Rice								
NPCI	PUNJAB	0.901	0.884	0.894	0.909	0.927	0.908	0.906
	SINDH	0.906	0.889	0.8988	0.912	0.931	0.911	0.911
NPCO	PUNJAB	0.868	1.141	1.350	1.01	1.14	1.114	1.11
	SINDH	0.950	1.110	1.157	1.013	1.115	1.112	1.064
EPC	PUNJAB	0.827	1.508	2.144	1.122	1.3	1.257	1.351
	SINDH	0.979	1.348	1.373	1.068	1.202	1.218	1.155
WHEAT								
NPCI	PUNJAB	0.905	0.891	0.893	0.914	0.990	0.910	0.912
	SINDH	0.909	0.893	0.901	0.919	0.932	0.912	0.915
NPCO	PUNJAB	1.282	1.059	1.040	1.215	1.386	1.360	1.226
	SINDH	1.287	1.030	1.106	1.308	1.346	1.311	1.220
EPC	PUNJAB	1.583	1.275	1.209	1.590	1.967	2.223	1.672
	SINDH	1.737	1.180	1.350	1.729	1.925	1.977	1.599

*Basmati production is limited to Punjab

was government intervention in input and output markets and producers of irri rice enjoyed support during study period. So irri rice and wheat production in Pakistan for export promotion will no more be competitive in the environment of liberalization as revenue of producers will reduce after free trade.

While the examination of effective rate of protection coefficients overtime implies that the overall impact of the government policies in both the output and input markets resulted in a net disincentive for basmati farmers in Pakistan. It means that the basmati-rice farmers were somehow "taxed" by the combined government input-output policies and producer prices were less than world prices. However, with the passage of time value of effective rate of protection coefficients (NPCO & EPC) is on increase, showing reduction in implicit taxation. On an average, primary factors in agriculture as a consequence of domestic distortions earned less income than they would earn for each unit of output under free trade in Punjab.

It can be concluded that under free trade regime prices of inputs will increase due to subsidy elimination but less as compared to increase in output prices. As a whole farmer of basmati rice will be benefited more if free trade takes place as compared to the prevailing conditions.

III. Assessment of efficiency indicators for rice-wheat system in Punjab and Sindh under importable and exportable scenario

With regard to issue of economic efficiency, the estimates of DRC of wheat under importable hypothesis were less than unity in both provinces (Table 4) and under exportable hypothesis it was more than unity in Punjab & Sindh. These results suggest that resource cost of wheat production is less than the corresponding wheat import costs, indicating economic efficiency in domestic production and import substitution but do not have efficiency in using resources when produced for enhancing the export (Fig. 2). Estimates of DRC of wheat production showed slightly higher level of economic efficiency in Punjab as compare to Sindh.

Table 4. Efficiency indicators (DRC) for wheat in Punjab and Sindh

Crop/Incentive Indicators	Province	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average
Importable Scenario								
Wheat								
DRC	PUNJAB	0.500	0.505	0.535	0.450	0.541	0.592	0.532
	SINDH	0.663	0.586	0.534	0.475	0.623	0.693	0.584
Exportable Scenario								
Wheat								
DRC	PUNJAB	1.268	1.399	1.237	1.357	1.725	2.144	1.589
	SINDH	1.395	1.164	1.204	1.114	1.539	1.808	1.309
Basmati Rice								
DRC	PUNJAB	0.593	0.600	0.637	0.611	0.812	0.816	0.675
Irri Rice								
DRC	PUNJAB	1.363	1.717	1.887	1.190	0.920	1.047	1.308
	SINDH	0.875	1.266	1.036	0.691	0.625	0.683	0.758

Fig. 2. Behaviour of DRC Value of Wheat
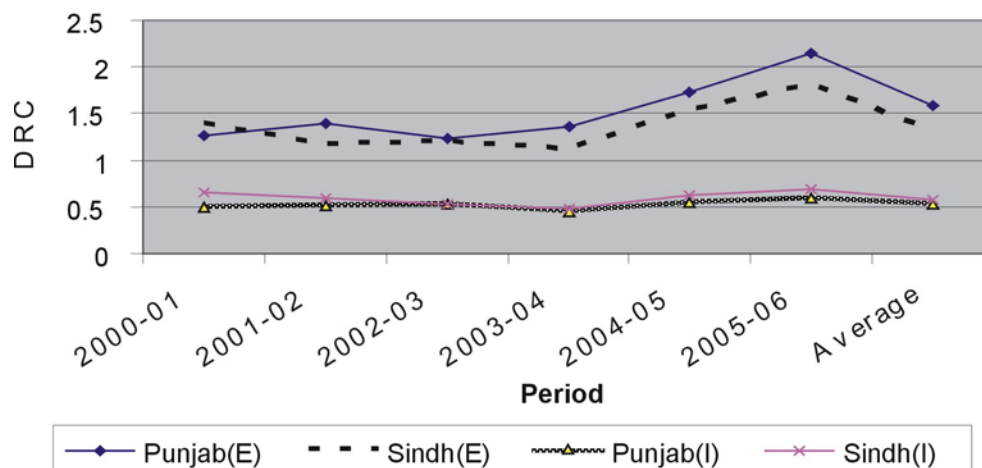
DRC values for basmati has been less than one during the period under analysis implying that Pakistan has economic efficiency in basmati production. The DRC ranging from 0.59 in 2000-01 to 0.82 in 2005-06 further imply that cost of domestic resources involved in earning one US dollar through basmati rice exports has been consistently less than corresponding exchange rates showing that, increasing basmati production for exports will be an economic proposition.

The estimates of domestic resource cost of irri rice under exportable scenario were greater than unity for the entire period of study in Punjab, indicating that the production of irri rice was economically inefficient for export promotion. Average estimated domestic resource costs (DRC) of irri rice in Sindh for the entire period under study have value less than unity, but their values were quite high indicating some competing demand on resources for production of other crops from an efficiency point of view.

Fig 3 shows that the value of DRCs estimated for irri rice in Sindh remained more than unity during the period 2001-02 to 2002-2003 signaling economic inefficiency in producing irri rice for export promotion. However, from 2003-04 to onward decreasing trend of DRC value indicated that efficiency has been improved for the use of resources for irri rice in Sindh, implying relative efficiency in global context. This may be mainly due to better export price of irri rice.

IV. Estimation of the Distortions on Rice-Wheat System in India and Pakistan.

As mentioned elsewhere, to compare distortions in the cultivation of Rice and wheat in India and Pakistan "Producer subsidy Equivalent" was used.
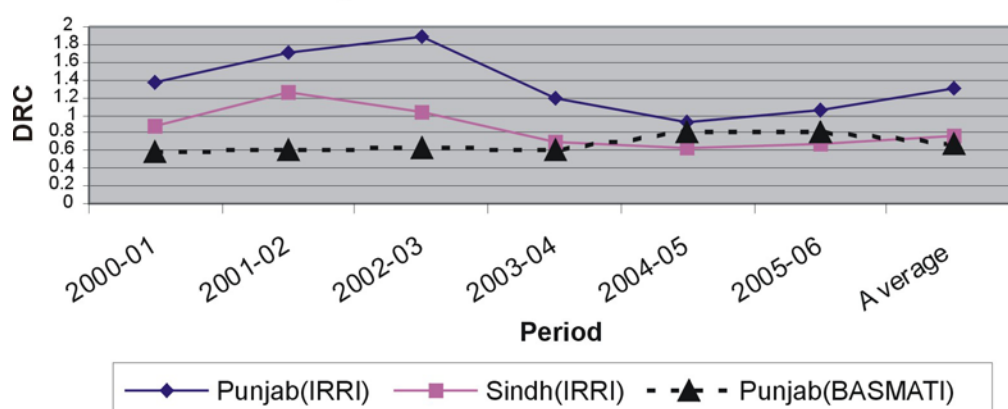
Fig. 3. Behaviour of DRC Value of Rice

Table 5 provides %age PSE of rice and wheat in Pakistan and India over the period 1996-2004 and 1996-2002, respectively. %age PSE was also calculated as average of 2001-2004 for Pakistan, a period almost similar to that covered in our indicators of effective incentives and efficiency in the Pakistan rice-wheat system.

the table 5, after 1999-00 India either has relatively more positive support for its producers or she gave less negative support to its wheat producers as compared to Pakistan showing that Pakistan is more efficient in resource use for wheat cultivation as compare to India. Negative support to rice-wheat system in Pakistan shows that rice-wheat production

Table 5. Country wise support to rice and wheat

	Country wise state support to rice		Country wise state support to wheat	
Year	Pakistan	India	Pakistan	India
1995-96	-90.41	-121.208	-3.04	-6.47
1996-97	-70.06	-176.730	24.78	8.07
1997-98	-72.44	-127.203	29.09	25.79
1998-99	-65.10	-91.969	34.32	28.70
1999-00	-38.66	-67.940	26.84	24.08
2000-01	-30.59	-55.664	4.522	15.22
2001-02	-19.49	-62.269	-25.20	-9.70
2002-03	-18.64		-21.29	
2003-04	-27.24		0.051	
Ave.(2001-2004)	**-23.83**		**-9.96**	

Table 5 shows that Pakistan has a negative support (Implicit taxation) to rice cultivators, a result quite consistent with our findings of effective incentives and efficiency indicators in Pakistan for basmati rice, as Pakistan exports only basmati rice. The result showed that Pakistan has a negative support to the tune of 24 percent during 2001-2004, which is also consistent with our findings for the NPCO of basmati rice. Same is the case for wheat in Pakistan. As far as position of India is concerned, Table 5 shows that India has more negative support for rice production and Pakistan have to face somewhat competition from India. Estimates of %age PSE of wheat in Pakistan and India revealed that both countries started to reduce support for wheat cultivators from 1999-00. But as evident from

will become more profitable with trade liberalization, therefore, should logically expand. This would lead to more efficient use of resources.

CONCLUSION

The study in hand was aimed to assess the impact of trade and pricing policies on the "effective incentives" for the cultivators of wheat and rice and to estimate the "economic efficiency" in allocation of resources in wheat and rice cultivation in Pakistan.
Estimated results of DRC showed that the production of basmati rice was consistently efficient in resource use for the study period. Indicators of effective rate of protection showed that cultivators of basmati paddy in

Pakistan were disprotected or implicitly taxed through trade and pricing policies. When irri rice was considered, DRC value indicated that production of irri was not efficient in terms of resource use in Punjab while it was somewhat efficient in Sindh. Effective rate of protection indicated that rice under exportable scenario was nominally protected both in Punjab and Sindh. Farmers of Punjab were getting somewhat more subsidy in producing irri Rice than farmers of Sindh under exportable scenario. Under importable scenario, production of wheat was using resources efficiently and was implicitly taxed both in Punjab and Sindh but it was not recommended to grow for the purpose of export if trade is liberalized because of inefficiency in resource use.

Estimates of distortions by government in the domestic production of rice and wheat in India and Pakistan measured by the Producer Subsidy Equivalent indicated that liberalization would lead to more efficient use of resources for rice-wheat system in Pakistan. Therefore, Pakistan should prepare itself to face some competition from India in rice production for export promotion purpose.

The **policy Implication** of these results are clear: To promote economic efficiency in use of resources, from society's point of view, it would be better to encourage production of wheat for import substitution and rice for export promotion in Punjab and Sindh; In Punjab irri growers must be given incentives to grow Basmati in place of irri and the country should reap the economic efficiency of the wheat crop by increasing the productivity of the crop through high yielding varieties and better management practices. It would be an economical proposition for the country to invest in the wheat production and marketing to maintain hard earned self-sufficiency in staple food crop of wheat.

REFERENCES

Agricultural Price Commission, 2000-01 to 2005-06. Support Price Policy for Wheat Crop, Government of Pakistan, Islamabad, Pakistan.

Agricultural Price Commission, 2000-01 to 2005-06. Support Price Policy for Rice Crop, Government of Pakistan, Islamabad, Pakistan.

Chaudhary, M.G. 1995. Recent Input and Output Price Policy in Pakistan's Agriculture: Effects on Producers and Consumers. The Pakistan development Review 34:1, pp 1-23.

Fang, C. and J. Beghin. 1999. Food Self-Sufficiency, Comparative Advantage and Agricultural Trade: A Policy Analysis Matrix for Chinese Agriculture. Card Working Paper No. 99. pp 223-29.

Government of Pakistan. 2005-06. Economic Survey. Economic Advisor's Wing, Finance Division, Ministry of Finance, Islamabad.

Gulati, A., J. Hanson, and P. Garry. 1990. Effective Incentives in India's Agriculture. Policy Planning and Research Working Paper No. 332 (Trade Policy), World Bank.

Gulati, A. 1999. Globalization of Agriculture and its Impact on Rice-Wheat System in the Indo-Gigantic Plains. Institute of Economic Growth, University Enclave, Delhi 110007, India. Rice-Wheat Consortium Paper Series 5, New Delhi, India.

Gulati, A. and T. Kelley. 1999. Trade liberalization and Indian Agriculture. Oxford University Press, New Delhi.

Mohanty, S., C. Fang and J. Chaudhary. 2002. Assessing the Competitiveness of Indian Cotton Production: A Policy Analysis Matrix Approach. Working Paper 02-WP 301. Center for Agricultural and Rural Development Iowa State University, Ames, Iowa 50011-1070

Monke, E.A. and S.R. Pearson. 1989. The Policy Analysis Matrix for agricultural Development. Ithaca N.Y: Cornell University Press, London.

Scandizzo, P.L. and B. Colin. 1980. Methodologies for Measuring Agricultural Price Intervention Effects. World Bank Staff Working Paper No. 394. World Bank.

UNIDO. 1972. Guidelines for Project Evaluation. Project Formulation and Evaluation Series No. 2, Vienna.

UNIDO. 1978. Guide to Practical Project Appraisal - Social Benefit Cost Analysis in Developing Countries. Project Formulation and Evaluation Series No. 2, New York.