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Bahaeddin Najafi

**Professor of Agricultural Economics, Department of
Agricultural Economics, Shiraz University, Shiraz, Iran**

Telephone: + 98-711-6238063

Fax : + 98-711-2286082

e-mail: banajfi@gmail.com

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Bahaeddin Najafi

Professor of Agricultural Economics' Department of Agricultural Economics Shiraz University, Shiraz, Iran

Abstract

The objective of study is to evaluate government policies towards wheat, a staple food, in Iran. To achieve the objective of study Policy Matrix Analysis was used. Time series data for 1990 to 2001 period extracted from national survey were used for the study. The results revealed that Iranian government protective policies have had negative impact on wheat producers income. This has caused the cultivated area to decrease and import to increase sharply toward the end of period under study. Findings of the study also indicated that wheat producers could earn higher profit in the absence of government intervention. The upward trend of DRC, NSP and NCB indicated that although production of wheat has comparative advantage, as a result of government policies, its level has been declined. The results of sensitivity analysis suggested that among income factors change in yield per hectare and foreign exchange value had greatest effect on comparative advantage of wheat. Finally some recommendations are made to improve the prevailing government policies.

Keywords: wheat, government policies, policy matrix analysis, comparative advantage, Iran

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Introduction

Iranian government has a long history of subsidizing wheat as a staple food. On one hand the government has pursued a policy of input subsidy by subsidizing new inputs such as fertilizer, pesticides and bred seed together with low interest rate on agricultural credit. On the on other hand, the government has followed a program of general subsidy on bread to support consumers. The bread subsidy which was limited to urban consumers at the beginning was extended to rural consumers at later stage. Besides that, the government has pursued a policy of purchasing wheat from farmers at guaranteed price. The guaranteed prices in most of years have been a source of complaint from wheat producers. These two dimensional policies have raised question on positiveness of government policy as for as wheat producers' incentives are concerned. The main objective of the study is to determine the effects of protective government policy on economic incentives of wheat producers. In addition attempts will be made to determine the comparative advantage of wheat and its determinant factors.

Considering the importance of food as a basic need and providing cheap food to keep wages low in the process of economic development have caused governments to intervene in food markets in various ways. The effects of these policies on producers' incentives have been the subject of a considerable number of studies. Krueger, Schiff and Valdes (1988) have studied the effects of government policies on agricultural sectors of 18 developing countries and have concluded that, with the exception of South Korea, the net effect of the policies has been negative in all other countries. Yao (1997) has studied the effects of government policies on diversification of products by using policy analysis matrix. He concluded that the government input subsidy and relative high prices have caused farmers to substitute other products for rice. Fang and Beghin (1999) have studied Chinese government protective policies and comparative advantage of major agricultural products by using PAM and have reached the conclusion that labor intensive had advantage over land intensive crops.

Shahabuddin and Dorosh (2002) have studied the comparative advantage of major corps and government export policies in Bangladesh utilizing PAM and concluded that Bangladesh by using new technology and lower costs of production could gain comparative advantage in oilseeds and increase their export. Kubursi (2000) has studied the effects of government policies on economic incentives for production of major agricultural products in Lebanon and has concluded that these policies have not contributed to improvement in resource allocation.

Methodology

Government protective policies, mainly, implemented through agricultural input subsidy, product prices or both. To evaluate the effects of these policies on producers' behavior and incentives various criteria are used. The first group of these approaches is called "protection criteria" which determine the deviation of domestic from international prices by calculating nominal and effective protection coefficients. In addition, by using "comparative advantage" criteria, we can measure the effects of government protection on economic efficiency of factors of production in domestic production. Notable among various comparative advantage criteria is supplyside which illustrates the real condition. To achieve the objectives of the study the policy analysis matrix (PAM) was used. The advantage of PAM is that covers the other criteria such as nominal and effective protection and comparative advantage. By using, PAM the difference between cost and revenue of products in terms of market and shadow (real) prices could be determined and make judgment on the efficiency of government protective policies possible. The theoretical framework of PAM has been shown in Table 1.

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The elements of matrix are defined as follows:

A & E = Total income of one hectare of product at market and shadow prices respectively.

B&F = Total cost of tradable inputs of one hectare of product at market and shadow prices respectively.

C&G = Total cost of non-tradable inputs of one hectare of product at market and shadow prices respectively.

D&H = profit of one hectare of product at market and shadow prices respectively.

Market prices are affected by government protective policies while shadow or real prices are determined in the competitive market and without government interference. Tradable inputs are those inputs that could be traded in international market such as seed, fertilizer and pesticides. For this group of inputs border prices are considered as shadow prices. Non-tradable inputs are inputs such as land and labor that could not be traded in international market due to their immobility. For this group of inputs, their opportunity cost are considered as shadow prices. The same definition are applied for products. Profit is calculated in terms of market and shadow prices. In this way, Valuable information produced for evaluating government protective polices in both input and product markets. On this basis, profit in terms of market price could be calculated as follows:

$$D = A - (B+C)$$

In the above equation, $D > 0$ indicates that farmers produce above break-even point and tends to expand production and $D < 0$ indicates that under prevailing government policies, farmers are facing loss and it is expected to decrease production of the specified product.

Profit in terms of shadow price calculated as follows:

$$H = E - (F + G)$$

Shadow priced profit is called net social profit (NSP) and shows the efficiency or inefficiency of resources used in production of products. $H > 0$ indicates that under prevailing government policies the resources are allocated efficiently in production of specified product while $H < 0$ indicates that misallocation of resources prevails. In other words, the resources could be used more efficiently in production of other crops if government would not intervene. Similarly, by calculating the difference between income and cost components in terms of market and shadow prices, the effects of government protective policies both in input and product market could be evaluated. Based on relationships among various elements of the matrix, criteria for measuring the effects of protective government policies on producers' incentive could be introduced.

Protection coefficients

Production coefficients describe the nature of government production in both input and product markets. This could be done by comparing domestic and international prices which indicate the degree of distortion caused by government intervention. Protection coefficients could be determined under two categories, namely, nominal protection coefficients (NPS) and effective protection coefficients (EPC). The first group (NPC) is used to measure the effects of government protection policies in input and product markets separately. Effective protection coefficients (EPC) calculated to compare value added resulted from using tradable inputs under government protection and free trade. These coefficients measure the combined effects of government policies in both input and product markets.

Comparative advantage

As it was pointed out, comparative advantage of products could be determined by PAM. Governments could create nominal comparative advantage for a product through protective policies. Since shadow prices are constant in the short-run, this would result allocation of resources into production of crops with comparative disadvantage. Notable among various approaches for determining comparative advantage is supplyside criteria which are utilized in this study. These approaches include, domestic resource cost (DRC), net social profit (NSP) and social cost benefit ratio (SCB).

Procedure

In this study, to calculate total cost' chemical fertilizer, pesticides and seed are considered as tradable and land, labor, water and manure as non-tradable inputs. With respect to machinery cost, 64 percent was accounted as tradable and 36 percent as non-tradable. Time series data on costs, income' quantity of inputs and outputs was extracted from national survey related to 1990-2001 period. To calculate shadow prices of inputs and product the equivalent of border prices was utilized. To calculate shadow price of foreign exchange, Purchasing Power Parity (PPP) was adopted. For this purpose, the data was collected from IMF and world Bank databases.

Results

Wheat is a dominant crop in Iran and it is the government policy to increase production to meet increase in demand. Table2 shows the cultivated areas, total production, import and domestic price of wheat in 1989-2001 period. As Table 2 indicates the cultivated area of wheat has steadily increased from 6.27 million hectares in 1989

<INSERT TB 2.HERE>.

to 6.8 million hectares in 1993, but it decreased rapidly to 4.73 million hectares in 1999 and then increased to 5.55 million hectares in 2001. Total production with same variations increased substantially from 6.01 to 11.2 million tons in 1998 but decreased rapidly to 8.08 million tons in 2000 and increased to 9.45 million tons in 2001. These variations in both cultivated areas and production, apart from climate factor is believed to be the result of government policies. Table 2 also shows the rapid increase in wheat imports from 0.54 in 1989 to 6.55 million tons in 2001. This indicates that agricultural sector has not been able to meet increase in demand resulted mainly due to increase in population.

Policy Matrix Analysis

Evaluation of government policies on wheat resulted from application of PAM has been illustrated in Table 3. As it was pointed out earlier, I is the gap between shadow and market income per hectare of wheat. The absolute value of I, according to table3, has increased from 6662 to 170720 ten Rls. Considering the negative sign of I values, it could be concluded that government protective policies have had negative impact on producers' incentive, on the whole, and there was an upward trends during the period under study. In table 3, J and K show the difference between shadow and market prices of tradable and non tradable inputs respectively. The negative sign of I indicates that government has

implemented input subsidy policy to decrease cost of production.

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The increase in absolute value of J from 19069 to 48822 ten Rls. shows the amount of government subsidy has been increasing. The negative sign of k indicates that opportunity costs of non tradable resources are higher than their market prices. The gap has been widened especially in 1995 with value of (-34928) which decreased finally to (-16077) ten Rls. In 2001. In Table 3, D shows profit earned from one hectare of wheat production at market price which has increased from 4203 to 98407 ten Rls. in 2001. In table 3, L indicates the gap between market and shadow prices. The negative sign of L indicates that, in the absence of government intervention, wheat producers could earn higher profit. The absolute value of L has some variation but has upward trend starting from 41957 in 1990, reached the highest level (137223) in 1997 and decreased to 105821 ten Rls. in 2001. On this basis, we can conclude that wheat producers earn less profit under prevailing government policies.

Comparative advantage of wheat

To determine comparative advantage of wheat, domestic resource cost (DRC), net social profit (NSP) and social cost benefit ratios were calculated. The ratios have been shown in table 4. DRC and SCB ratios for the period under study have been less than one which implies that wheat has comparative advantage. NSP has positive value and upward trend,

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starting from 4.62 thousand Rls. in 1990 and increasing to 2042 thousand Rls. in 2001. The results reveals that inspite of government policy of subsidizing tradable inputs, due to low guaranteed prices for wheat the net effect of government policies has weekend producers' incentives.

Sensitivity analysis

The major weakness of above mentioned comparative advantage ratios is their static nature. As a result, those ratios could not be used for planning purposes. By using PAM, this shortcoming could be overcome to some extent. PAM provides a framework by which major factors that affect comparative advantage could be determined. Sensitivity analysis of these factors could help planners to put more emphasis on factors that could maintain or increase the comparative advantage of the specified products. In this study, wheat production costs data in 2001 were used for sensitivity analysis. For this purpose, first, share of each factor in total costs was determined. Then, sensitivity analysis on major production factors has been

made, assuming 30 percent change. Table 5 shows the share of each input in total costs of wheat production in 2001.

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According to Table 5, land and machinery have the highest share (30.7 and 19.4 percent respectively) in total costs of wheat production while water and labor with 16.4 and 16.2 percent stand in the second place. Table 6 shows the share of tradable and non tradable inputs in total cost of wheat in terms of both market and shadow prices.

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As table 6 indicates, share of nontradable inputs in terms of market and shadow prices is equal to 70.3 and 60.1 percent respectively and is higher than tradable inputs, indicating that wheat production is heavily dependent on nontradable inputs. On this basis, in order to make sensitive analysis four major cost items were selected. The items selected were:

1. Labor cost
2. Water cost
3. Tradable inputs
4. Nontradable

In addition, tree determinant factors in producers' income namely, yield per hectare, border price and foreign exchange were selected.

To study the effects foreign exchange on DRC, three values for one American dollar (7500, 8100, 1000 Rls.) were assumed. The effects of 30 percent change on selected factors are shown in Table 7 and 8. As table 7 indicates decrease in components of total costs would cause DRC to increase and vice versa but decrease in nontradable inputs would cause DRC to decrease from 0.45 to 0.32

<INSERT TB 7.HERE>.

<INSERT TB 8.HERE>.

As far as DRC change on income factors are concerned as table 8 shows both yield per hectare and border prices have considerable effect on DRC. Yield per hectare has a greater effect and 30 percent increase in yield per hectare causes DRC to decrease from 0.45 to 0.33. On the other hand, increase in value of foreign exchange to 10000 Rls. would cause DRC to decrease to 0.43 while decrease in value of foreign exchange causes DRC to increase to 0.55.

Conclusions and Policy Implications

In this study PAM approach was used to evaluate the government protective policies and comparative advantage of wheat in Iran. Findings of the study revealed that government has pursued dual policies of subsidizing tradable inputs, especially fertilizer and pesticides on one hand, and keeping price of wheat at lowest level on the other hand. This has caused the absolute value of income (the difference between shadow and market price of income) increases which indicated that government protective policies have had negative impact on producers' income. The upward trend of I during the period of study has caused the cultivated area to decrease from 6.8 in 1993 to 4.7 million hectares in 1999. As a result' wheat production has not met the increase in demand and country had to use scarce foreign exchange resources to import wheat. Consequently wheat import reached the highest level of 6.5 million tons in 2001 and country became the first importer of wheat in the world. The negative sign of L (the gap between shadow and market price of profit) and upward trend in its absolute value indicate that wheat producers could earn higher profit in the absence of government intervention.

The upward trends of DRC, NSP and NCB during the period under study indicated that although production of wheat still has comparative advantage, as a result of government policies the comparative advantage tended to decrease. To make sensitivity analysis and to find out the effect of 30 percent change' some determinant cost and income factors were selected. The results of the analysis suggest that among the cost factors, decrease in nontradable inputs would cause DRC to decrease considerably. Among income factors yield per hectare had greatest effect on comparative advantage of wheat. This implies that government effort should be directed toward greater investment in this area. Besides that, the foreign exchange policy could affect the comparative advantage of wheat in the sense that prevailing policy of keeping value of foreign exchange artificially at low level would cause comparative advantage of wheat to decrease. Finally, based on findings of the study following recommendations are made :

1. Revising of guaranteed prices in order to cover the complete cost of production is recommended
2. With change from negative to positive price policy there in a lesser need for subsidizing inputs and gradual reduction of input subsidy because of environmental concern is recommended.
3. Since, yield per hectare has the greatest effect on farmers' income, more investment on new technology through building up rural infrastructure, strengthening research institutions and extension agencies is suggested.
4. Because the prevailing policy of overvaluing of foreign exchange has had negative impact on comparative advantage of

wheat production, use of more flexible foreign exchange policy is recommended.

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Table 1. Theoretical framework of Policy Matrix Analysis

	Income	Costs		Profit
		Tradable inputs	Non-tradable inputs	
Market price	A	B	C	D
Shadow Price	E	F	G	H
Difference	$I=A-E$	$J=B-F$	$K=C-G$	$L=D-H$

Table 2. Cultivated area, production, import and guaranteed price of wheat, 1989-2001.

Years	Cultivated (000, ha)	Production (000, tons)	Import (000, tons)	Guaranteed price (Rials/Kg)
1989	6275	6010	5469	102
1990	6279	8012	3382	103
1991	6193	8793	3647.4	136
1992	6640	10179	2453	150
1993	6808	10732	2449.5	225
1994	6781	10870	3224	266
1995	6567	11227	4294	330
1996	6328	10015	381104	422
1997	6299	10045	5941.9	484
1998	6180	11955	3535	565
1999	4739	8673	6155.9	672
2000	5100	8087.7	5612.7	875
2001	5553	9458	6557.7	1048

Source: Ministry of Agriculture

Table 3. Results of Policy Matrix Analysis for wheat, 1990-2001. (10RIs/ha)

Year	I	J	K	D	L
1990	-6662	-19069	-1636	4203	-41957
1991	-57760	-20432	-941	15248	-36387
1992	-70470	-20458	513	13667	-50525
1993	-67766	-20696	-9102	19452	-37967
1994	-67498	-22510	-11065	19277	-33923
1995	-157676	-41545	-34928	19957	-81293
1996	-170151	-62098	-24527	25873	-83526
1997	-233669	-61290	-35157	50177	-137223
1998	-176903	-61680	-19812	66981	-95411
1999	-158887	-68078	-22750	71177	-68059
2000	-170535	-50931	-29771	69047	-89833
2001	-170720	-48822	-16077	68407	-105821

Table 4. Domestic Resource Cost, net social profit and social cost-benefit ratio for wheat (1990-2001)

Year	DRC	NSP(000, Rls)	SCB
1990	0.31	462	0.5
1991	0.29	516	0.48
1992	0.25	642	0.43
1993	0.42	574	0.55
1994	0.53	532	0.64
1995	0.5	1012	0.62
1996	0.48	1094	0.63
1997	0.39	1874	0.53
1998	0.41	1624	0.57
1999	0.48	1392	0.63
2000	0.49	1589	0.61
2001	0.45	2042	0.58

Table 5. Share of inputs in total cost of wheat in terms of market price, 2001 (percent)

Inputs	Share
Land	30.7
Water	16.3
Labor	16.2
Machinery	19.4
Seed	10.8
Fertilizer	5.2
Pesticides	1.09
Manure	0.31

Table 6. Share of tradable and nontradable inputs in total cost of wheat production (percent)

Tradable inputs (market price)	Tradable inputs (shadow price)	Nontradable inputs (market price)	Nontradable inputs (shadow price)
29.7	39.9	70.3	60.1

Table 7. DRC changes due to 30 percent change in selected cost items of wheat

DRC	Labor		Water		Tradable inputs		Nontradable inputs	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
0.45	0.49	0.42	0.5	0.42	0.5	0.42	0.59	0.32

Table 8. DRC changes due to 30 percent change in selected income factors and foreign exchange

DRC	Yield per hectare		Border prices		Foreign Exchange		
	Increase	Decrease	Increase	Decrease			
0.45	0.33	0.72	0.35	0.65	0.55	0.52	0.43