ESTIMATION OF THE POLICY ANALYSIS MATRIX FOR THE BARLEY CROP IN IRAQ AND THE EFFECT OF CHANGING THE EXCHANGE RATE FOR THE SEASON 2020–2021

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Abstract
Barley is one of the important forage crops in Iraq, The production of this crop is affected by the success of the economic policies pursued by the state through its agricultural policies, especially those that are progressing towards supporting production requirements or supporting production. In order to identify the features of the agricultural price policy. The effect of changing the exchange rate and comparative advantage and competitiveness The policy analysis matrix was calculated according to the currency exchange rates for the years 2020 and 2021, In addition to some important indicators associated with it, The results showed the presence of local product support and input subsidy, Investment in barley cultivation generates profits for the farmers, The nominal protection factors for production and production inputs were calculated, And the effective protection factor and the value of the product subsidy ratio at the exchange rate for the year 2020 amounted to about (1.83, 1.05, 2.68, 82.33). While for the year 2021 it amounted to about (1.5, 1.05, 1.85, 50.16) for each, respectively. As for the cost of the local resource, its value was about (2 and 1.38). According to my exchange rate. This means that the production of barley crop does not have a comparative advantage. We recommend increasing subsidies to productive input prices, subsidizing production prices, targeting more subsidies to small-area owners, and reducing barley acreage to cover domestic consumption.

1. Introduction

Barley is at the forefront of the important winter fodder crops in Iraq. The cultivated areas were generally characterized by fluctuation, due to several reasons, the most important of which are the environmental, social and political conditions surrounding production conditions. The cultivated area recorded an average capacity of about (2148.4) thousand acres for the period 2016-2020 The level of Iraq, as for the average production, amounted to about (853.5) thousand tons. Concerning productivity, the average productivity for the mentioned period at the level of Iraq reached (390.5) kg/dunum. Continuous support from the Iraqi governments, which focused on encouraging production, supporting production prices and subsidizing production factors, in addition to scientific research efforts and the use of modern technology represented in the use of agricultural mechanization, chemical fertilizers, harmful weed killers and certified seeds, as well as the accumulated experience of farmers, which contributed to increasing local production. The agricultural sector is affected by financial and monetary economic policies. Therefore, it requires the adoption of a special agricultural policy for its effective role in the agricultural sector through influencing production and the use of production factors. The price policy sets out price support for production and a policy of subsidizing prices for production factors to increase production and increase farmers' incentives (Al-Zoba'i, 2014).

There is an ongoing trade-off in the use of the two policies. The agricultural sector in Iraq faces some obstacles and challenges, which led to the fluctuation of agricultural production in its various fields, and that government intervention, whether at the prices of production factors or production prices, has a major role in influencing production, as government efforts focused on encouraging production in light of the availability of resources and capabilities and supporting prices. production and subsidizing the factors of production, which resulted in the abundance of barley

production, Despite government support, production costs are high due to low productivity, and thus lead to increased costs and reduced profit margins. Production must be maximized and costs reduced due to the difficulties of government support and international competition, as achieving self-sufficiency or abundance of production is directed towards foreign markets, and on the other hand, it must That agricultural policy supports the stability of farmers' income, research covering their livelihood and rural stability, hence the importance of analyzing agricultural policy and evaluating its impact on the efficiency of resource use and market distortions, the comparative advantage of national production and because of the global economic crisis that resulted from the repercussions of the Corona pandemic and the sharp decline in oil revenues.

1.1. Research Problem

Economic Instability and pandemic and the sharp decline in oil revenues, the currency exchange rate in Iraq was changed at the end of 2023, as well as a decision was taken to stop supporting inputs for the production of barley for irrigated areas, and the fodder barley crop for the next season is marketed in the local markets. Crop production In addition to the potential for higher prices of agricultural inputs, stores as well as comparative advantage and competitiveness in global markets.

1.2. Research Objectives

Estimating the Policy Analysis Matrix (PAM). Measuring the impact of the intervention policy through protection factors and production comparative advantage. Explanation of the effects of the increase in exchange rates.

2. Method

2.1. Data Sources

The primary data obtained in the field was relied upon for a random sample of barley farms in Wasit Governorate, which amounted to (85) farms. As for the secondary data, it relied on the World Bank report on prices (World Bank, 2021) as well as the global stock exchanges of cereals.

2.2. Theoretical Framework

The method of quantitative analysis was used through the policy analysis matrix to apply the criteria and indicators of the impact of economic policies on barley production, which is an arithmetic framework that helps in segmenting the economics of the commodity system into its components, which are individual profitability measured at private prices and social profitability measured by parallel prices, and the difference between the two prices Resulting from the effect of interventional policy, market distortions, and price policy interventions and their impact on the commodity system.

The policy analysis matrix is built based on the following profit or net income equation (Monke & Pearson, 1989):

$$\boldsymbol{Profit = e(P_q)Q - e(P_t)I_t - (P_n)I_n} \quad \textbf{(1)}$$

Where e is the exchange rate of the local currency against foreign currencies, P_q is the price of production, Q is the quantity of production, P_t is the price of traded inputs, P_n is the price of nontraded inputs (domestic resources), I_t is the quantity of traded inputs, and I_n is the quantity of nontraded inputs (local resources). The costs are divided into two parts: the costs of traded production inputs and the costs of non-traded production inputs, which represent local resources. As for transfers, or the effect of price policy, it is calculated through the difference between private and social prices, and their size reflects the extent to which distorted private prices deviate from social prices. The structure of the policy analysis matrix consists of three rows and four columns as shown in Table 1. The first row of the matrix represents the private prices (market prices) of the commodity system for each of the total revenue (A), traded inputs (B) and the cost of local resources (C), and own profits (D), which is the difference between the total sum of revenue (A) per unit sold and production costs, which includes the costs of traded inputs (B) and the costs of local resources (C) (Al-Zoba'i, 2014) according to the following formula:

$$D = A - (B + C) \quad (2)$$

The second row of the social price policy analysis matrix for each of the total revenue (E), the cost of traded inputs (F), the cost of local resources (G) and social profits (H), which represents the difference between revenues and costs (trade and local) assessed at social prices, which provides a measure of comparative advantages (Fang & Beghin, 2000). The positive value of economic profitability means that production is economically profitable and that the state has a comparative advantage in production, and it can be obtained according to the following formula (Monke & Pearson, 1989):

$$H = E - (F + G) \quad (3)$$

As for the third row, which represents the transformations of the impact of intervention policy and market failure, it includes: 1) Return transfers (I), which is the difference between the return at the private rate and the return at the social rate. 2) Transfers of the cost of traded inputs (J), which is the difference between the cost of traded inputs at special prices and their cost at social prices. 3) Transfers of the cost of domestic resources (K), which is the difference between the cost of domestic resources at social prices. 4) Net transfers (L) represent the effects of government intervention and market failure on the commodity system.

Table 1. Policy analysis matrix structure

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

Source: Monke and Pearson (1989).

2.3. Protection Coefficients and Comparison Indicators

Some parameters and comparison indicators can be derived from the Policy Analysis Matrix (PAM) system that enables the measurement of the impact of intervention policies and market failure on the commodity system (Nguyen, 2005), and as shown below:

2.3.1. Protection Coefficients

Nominal protection coefficient for output (NPCO): It is a measure of the impact of agricultural policy on production, and it is calculated by dividing the revenue at private prices (at the market price) to the revenue at social prices (at the border price). If the nominal protection coefficient is equal to the right one, this indicates that the policy adopted is fair, that is, no taxes are imposed on production, as well as no A protectionist policy is taken to protect production, but if it is more than the correct one, this means that there is a protectionist policy, i.e. production support, while it is lower than the correct one means that there are implicit taxes on production.

Nominal protection coefficient for input (NPCI): It is a measure of the impact of agricultural policy on production inputs, and is calculated by dividing the cost of inputs traded at private prices (market price) to their cost (F) at social prices (border price). If the nominal protection coefficient is equal to the correct one, this indicates that the policy followed is fair, i.e. the private prices of production inputs are equal to their world prices, i.e. there is no subsidy. Prices of production inputs.

Effective protection coefficient (EPC): It represents the ratio of value added at private prices to value added at social prices. The value added at special prices is the revenue at special prices minus the cost of inputs traded at special prices. The value added at social prices is the revenue at social prices minus the cost of inputs traded at social prices. If the effective coefficient of protection is equal to the correct one, this indicates that the crop is produced locally, adding to the national economy an amount equal to everything added by its counterpart in social prices. Whereas, if it is less than the correct one, it means that the state imposes taxes on the producers of the crop or subsidizes what is imported.

Profitability Coefficient (PC): It is the division of the private profits of the commodity system into the social profits. If the profitability coefficient is equal to the correct one, this indicates that private profits are equal to social profits, but if it exceeds the correct one, this indicates that the product benefits from the policy of government intervention to achieve greater private profits at the expense of social profits, while the opposite if it is less than the correct one.

Producer subsidy ratio (PSR): It is an indicator for identifying the percentage of net transfers from the value of the social revenue of the commodity system. The commodity system is like government intervention and the rest of the factors, and the results indicate the extent to which both production and production elements enjoy any real protection or support under the current price policy, and determine the percentage of this support out of the total production costs.

2.3.2. Comparison Indicators

Private Costs Ratio (PCR): It is an indicator that reflects the ability of the commodity system to compete, and it represents the division of the costs of local resources at special prices to the added value at special prices: if the percentage of private costs is less than the correct one, and this means that the farmer achieves special profits Rewarding for local investors and vice versa if the ratio is greater than one.

Domestic resource cost (DRC): An indicator of the comparative advantage of the commodity system and the extent of its competition at the global level. It represents the division of the costs of local resources at social prices to the value added at social prices, if the local resource cost coefficient is equal to the correct one, this indicates that there is no difference In the production of the crop locally or importing it, but if it exceeds the correct one, it means that the state has no comparative advantage in the production of the crop and it is better to switch to the production of other crops, and this means that the country cannot compete at the international level and achieve a surplus in the balance of payments. Whereas, if it is less than one, it means that the country has a comparative advantage in the production of the crop and local production is better than relying on imports.

3. Results and Discussion

3.1. Technical Coefficients and Private and Social Prices

After analyzing the data of the study sample, the technical transactions of the barley crop were determined, i.e. the need per acre of local production requirements, shops, their prices and social prices, as well as returns and profits. The social prices of traded inputs (fertilizers) and production were calculated through border prices that give approximate figures for social prices. Border prices represent the import border price CIF (which is the price at the importer's borders and includes insurance, shipping and transportation costs) for goods that are imported after adjusting according to the exchange rates in the free market or the export border price FOB (which is the price at the border of the source and this price is from without insurance, freight and transportation costs) for the goods being exported. The difference between the two prices is the insurance and transport necessary for entry and exit of the commodity and the border price changes through imposing taxes or subsidies or indirectly through the exchange rate. Where the equal import prices were calculated for the commodities that are imported from abroad represented by chemical fertilizers according to the following equation:

$$IPP = BP_{CIF} \times ER + HCP + TCBM + IC - TCFM - TPC \quad (4)$$

Where *IPP* is the import parity price, BP_{CIF} is the import border price, *ER* is the equilibrium exchange rate, *HCP* is the loading and handling costs, *TCBM* is the transportation costs from border to market, *IC* is the insurance costs, *TCFM* is the transportation costs from farm to market, and *TPC* is the manufacturing costs.

When calculating the equal export prices for goods that are produced locally and exported abroad, which are the local surplus of the barley crop, it is done according to the equation:

$$IPP = BP_{FOB} \times ER - HCP - TCBM - IC - TCFM - TPC \quad (5)$$

When calculating the equal export prices for goods that are produced locally and exported abroad, which are the local surplus of the barley crop.

3.1.1. Traded Inputs

Seeds at a rate of 50 kg/dunam, with an average actual price of 420 dinars/kg, and a social price of 420 dinars/kg, because all the seeds used are local commercial.

The amount of fertilizer used is 36 kg/dunum, with an average price of 653 dinars/kg, and a social price of 478 and 573 dinars/kg according to the exchange rate for the years 2020 and 2021, respectively, so there is no subsidy on dab fertilizer, but the use of fertilizer quantities less than recommended by the Ministry Agriculture, and the quantity is purchased from the commercial markets, and in comparison with the social price, the price becomes an increase of (175 and 80) and it is considered as taxes on animal manure.

The amount of urea fertilizer distributed by the state is 25 kg/dunam, with an average price of 280 dinars/kg, and a social price of 350 and 418 dinars/kg. Thus, the subsidy is estimated at 70 and 138 dinars, according to the exchange rate for the years 2020 and 2021, respectively.

3.1.2. Local Resources

Land rent at a rate of one dunam and an average annual rent of 4500 dinars/dunum. The mechanized work included various agricultural works (ploughing, levelling, harrowing, opening water fountains) at a total cost of about 65,000 thousand dinars/dunam. Manual work, as it included various agricultural works (harrowing, sowing and watering) with a total amount of 15 thousand dinars. The cost of capital (interest on invested capital) was calculated based on an interest rate (8%) determined by the Central Bank on loans granted to farmers, while the interest according to the classification of high-risk countries was 10%.

3.1.3. Revenue

The average sale of one kg of barley was 400 dinars/kg and productivity was 540 kg/dunum, meaning that the return from the production of one dunum of the barley crop was estimated at 216 thousand dinars. As for the social price, it was relied on the average price per ton of barley Barley in the producing countries, estimated at USD 235 (World Bank, 2021), and by adopting the equilibrium exchange rate against the US dollar, the ton price reached (350) thousand Iraqi dinars/ton, and after taking into account the costs of transportation, shipping and insurance costs, which amount to about (EPP) and packaging costs, It was possible to calculate the equal value of export at the farm gate for one ton of barley at about (229) thousand dinars/ton, which represents the social return. We will get a reduction in production costs by half. As for the yield from plant residues (hay), it amounted to about 20,000 dinars/dunam.

3.2. Policy Analysis Matrix of the Barley Crop

After obtaining the costs and returns at private and social prices, based on which the policy analysis matrix can be built and the profitability and transfer indicators are measured, as shown below and in Table 2:

Calculating the elements of the first row of the policy analysis matrix for the barley crop at special prices (actual prices), as the total costs of traded inputs (B) amounted to about (65,400 dinars/dunum) and the costs of local resources (C) were estimated at (109,452 dinars/dunum), The private profitability was (D) at a rate of about (41148) dinars/dunum.

Calculating the elements of the second row of the policy analysis matrix after adjusting the global prices of barley, fertilizers and transportation and converting them into the local currency and at social (parallel) prices according to Equation 1 and 2, as the total costs of traded inputs (F) amounted to about (58788 and 62160 dinars/dunum), either The return at the social price was (118,288 and 143630) dinars per dunam, and thus the social profitability amounted to (−52,496 and −30,896) dinars/dunam according to the exchange rate for the years 2023 and 2024, respectively.

Calculating the third row elements of the policy analysis matrix (transfers), which represents the difference between the first row (private evaluation) and the second row (social evaluation). If there is no market failure, then the entire difference between private and social prices for output and trade inputs will be caused by distorted policies and methods include Which can cause the difference such as subsidies, taxes and quantitative restrictions that apply to domestic production or trade in the commodity, and price policies can also cause distortions: 1) Revenue transfers (I) were valued at about (98212 and 72870) and with a positive value. This means that the value of social revenues is less than private revenues. This indicates that the government subsidizes output prices, meaning that the government buys production at prices higher than the prevailing prices in the international market and according to the current price. Exchange The exchange rate 2020 is more in favour of producers. 2) Traded input transfers (J) had a positive value of about (6642 and 3240), which means that there are no subsidies on production inputs. This indicates the private cost of tradable inputs is greater than the social cost, and this means that the government imposes a tax on the inputs used by producers The net effect of this situation is that the prices that farmers pay for the inputs are higher than the world market prices. 4) Transfers of local resources (K) were negative, and this means that the government affected local resources through the interest of capital as an incentive for producers to use capital-intensive inputs such as machinery and fertilizers, meaning that the cost of the local resource is less than the social cost. 5) Net transfers (L) refers to the net transfer of all policies affecting the commodity system under study and came with a value of about (93,644 and 72044), with a positive sign, meaning that the comprehensive impact of all policies on input prices, output and exchange rate is not in favour of the product.

Table 2. Policy analysis matrix per acre of the barley crop

Item	Exchange rate (IQD/USD)	Revenue	Costs		Profit
			Traded inputs	Domestic resources	
Private prices	–	216500	65400	109450	41148
Social prices	1,230	118288	58788	112026	−52496
	1,490	143630	62160	112366	−30896
Transfers	1,230	98212	6641.9	−2574	93644
	1,490	72870	3240	−2914	72044

Source: Prepared by the researchers based on the data in Table 1.

3.3. Measuring the Impact of the Intervention Policy (Protection Coefficients and Comparative Advantage)

Relying on the estimates of the policy analysis matrix shown in Table 2, it is possible to reach some indicators through which the effect of government intervention policy on prices can be measured, which include protection factors and comparative advantage, which are shown in Table 3, which are as follows:

The value of the nominal protection coefficient of NPCO outputs was (1.83 and 0.5) according to the exchange rates for the years 2020 and 2021, respectively. This means that local producers receive prices greater than global prices (social prices) by (0.83 and 0.5) respectively and that the value of the nominal protection factor for the output has decreased by about 33% due to the change in the exchange rate.

The value of the nominal protection factor for the traded NPCI inputs was (1.05 and 1.05), which appeared with a positive value and greater than the correct one, which indicates that the prices of the traded inputs are greater than the prices of their international counterparts, and this means that the farmers have incurred an increase in the costs of the inputs by (0.05) (%), meaning that the costs of the actual production inputs are greater than their economic costs.

The value of the effective protection coefficient EPC was about (2.68 and 1.85) according to the exchange rates in 2023 and 2024, respectively, and it is greater than one. This means that local producers receive their returns in the event of the price intervention policy being greater than the returns in the absence of it. The value added at private prices is greater than the value added at social prices, and the value added at social prices according to the exchange rates for the year 2020 is greater than the value added at social prices according to the exchange rate for the year 2021.

The value of the product subsidy ratio PSR: The results indicate that both production and production factors enjoy real protection and support in light of the current price policy, and the percentage of this support constituted (82.33 and 50.16) % of the total production costs according to exchange rates in 2020 and 2021, respectively.

The percentage of private costs (PCR): If the percentage of private costs is less than the correct one, about (0.73), and this means that the farms achieve special profitable profits for local investors.

The cost of the local resource DRC: Its value was about (2 and 1.38) according to the exchange rates in 2020 and 2021, respectively, and it is greater than one. This means that the production of barley farms does not have a comparative advantage and does not compete with any production of barley offered in international markets However, the balance of local production remains due, as the crop is grown on land that does not have fertility that meets the requirements of other crops, as well as being a transformer of fodder that is consumed for the animals of farmers, as well as the added values that can be obtained through the analysis of value chains for society and the economy as a whole.

Table 3. Protection factors and comparative advantage of barley production in Wasit Governorate

No.	Indicator	Exchange rate (IQD/USD)	
		1,230	**1,490**
1	Nominal protection coefficient for output (NPCO)	1.83	1.5
2	Nominal protection coefficient for input (NPCI)	1.05	1.05
3	Effective protection coefficient (EPC)	2.68	1.85
4	Producer subsidy ratio (PSR, %)	82.33	50.16
5	Private cost ratio (PCR)	0.73	0.73
6	Domestic resource cost (DRC)	2	1.38

Source: Calculated by the researchers based on the data in Table 2.

4. Conclusion

There is support for the local product in light of the adopted policy, as local producers receive more prices for their products than the social prices. There is also a subsidy for traded and local inputs. Investment in barley cultivation brings modest private profits to farmers. Iraq's lack of comparative advantage in the production of barley and the inability to compete with any supply of barley in the international markets. The effects of the change in the exchange rate for the year 2024 are not in the interest of the producer, as the nominal protection coefficients for outputs and inputs, the effective protection factor, as well as the product subsidy ratio decrease. By comparing the private profitability of barley producers who own small areas with the average family spending in Iraq, it does not cover their livelihood and rural stability. And the recommendations are: 1) Continuing to provide both subsidies for the prices of production inputs and support for product prices and to address the effects of the change in the exchange rate by increasing the subsidies for production inputs. 2) Reducing the cultivated areas of barley to cover local consumption only and for areas that do not meet the requirements of other crops. 3) Given that the profitability is related to covering the costs of living and stability of farmers, especially the owners of small areas, we recommend targeting more subsidies than the rest of the farmers. 4) Directing agricultural policies in the use of modern technology and increasing the productivity of the dunum, as the effects of low productivity were reflected on costs, returns and profits, and thus protecting transactions and comparison indicators. 5) Adopting clear and stable agricultural policies based on scientific foundations that take into account any effective changes.

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