Economic study of agricultural pricing policies for wheat production in Salah al-Din Governorate for the production season 2023/2024

Hashem Mahmoud Qaddouri Al-Najjar, Muhammad Omar Sharif
Department of Agricultural Economics and Extension, College of Agriculture, Tikrit University, Salahuddin, Iraq.
: 07706690536
Home: Salahuddin , Tikrit, Iraq.
Email: hq230048pag@st.tu.edu.iq

Abstract:
The agricultural policy is an important means for achieving food security and promoting economic sustainability in the agricultural sector. This policy objective to increase agricultural production by improving resource efficiency and providing financial support to farmers. Through the study conducted and the analysis of the results using a policy analysis matrix, the following results were obtained. The nominal input protection coefficient was estimated at (1.68), indicating the absence of clear government support in this sector, as local producers the cost of purchasing tradable inputs at prices higher than global prices. The nominal production protection coefficient (1.79) indicates the presence of clear government support, as the domestic price of wheat is higher than the international selling price and the price producers receive is higher than the global price. The effective protection coefficient (1.81) indicates the presence of government intervention policies to support wheat production, as the value added at private prices is greater than the value added at social prices. The private cost ratio coefficient was (0.30), demonstrating the positive impact of the support policy, as the wheat commodity system generates profits through private prices, as it covers its production costs. The social profitability coefficient (4.63) indicates weak government support, as profits from private prices are higher than profits from social prices. The value of the domestic resource cost factor (comparative advantage) was (0.72), indicating that wheat enjoys a high comparative advantage compared to other crops.

Keywords. Wheat, analysis, agricultural policy matrix.

Introduction:

Agricultural policy is considered one of the main branches of economic policy within the Iraqi agricultural sector, and this sector is affected by a group of policies related to production, marketing, and internal and external trade within the national economy, and it plays a prominent role in formulating some other agricultural policies. Perhaps the most important and prominent economic policies that help develop the agricultural sector are agricultural pricing policies. [1] The

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objectives of agricultural pricing policies vary with the different stages of economic development, and they play an effective role in stimulating agricultural production forces, as well as the economic policies followed in the country. [2] Some private bodies contribute to them in order to achieve specific goals included in agricultural development plans. Agricultural policies are embodied in an integrated set of administrative, legislative, and executive measures through programs adopted by the public authorities in the country. These goals often aim to encourage increased production to achieve food security, [3] and thus achieve the highest degree of self-sufficiency, increase export returns, and intensify efforts to narrow the gap between demand for food and its production, and secure the requirements of agricultural work, including financing, agricultural support, production, marketing, storage, irrigation sources, irrigation methods, and others. Wheat is one of the most important food grain crops, as it occupies an advanced economic position in terms of consumption and nutrition, as it is considered the staple food in most countries of the world, due to its various nutritional elements, most notably carbohydrates, which are a source of high calories. Wheat occupies an important strategic position in international economic relations due to the breadth of its trade exchanges. Wheat is considered a fundamental pillar in achieving food security,[4] and it is also used as a weapon in political and economic crises between countries.[5] Cereal crops are grown in Iraq, the most important of which is wheat in the winter season. Cereal crops represent an important place in the Iraqi agricultural sector, as the cultivated area of wheat in Iraq for the year 2023 reached about 8 million and 420 thousand dunams, of which 4 million and 248 thousand tons were harvested. In Salah al-Din Governorate, the cultivated area reached about 1 million and 169 thousand dunams. [6]

The agricultural pricing policy for wheat can be expressed by calculating the Policy Analysis Matrix (P.A.M). The P.A.M is considered an important tool in analyzing agricultural policies and the agricultural pricing policy implemented by the state in the production of the most important agricultural crops. [7] The matrix measures price distortions occurring in crop production and the extent of deviation of local prices from global prices by estimating nominal and effective protection coefficients. This then identifies the policy pursued by the state, whether this policy is protection, or a policy of imposing direct or indirect taxes on the producers of that crop. It also estimates the cost coefficient of local resources to determine the comparative advantage in wheat conversion production. [8]

Research objective:

- Studying the impact of pricing policy and government support policy on wheat crops and knowing their role in increasing the quantities produced.
- Study the reality of wheat production in Iraq and Salah al-Din Governorate and explain the role of agricultural pricing policies.
- study the impact of global wheat prices on local prices and the extent of their impact through some standard transactions.

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Material and Methods:

Prepare samples:

This study conducted in Salah al-Din Governorate for the agricultural season 2023/2024 for wheat farmers. The study sample consisted of 175 farmers distributed in various districts of the governorate. A questionnaire used in this study, which was prepared for this purpose.

As for the analysis, use descriptive and quantitative methods in this study. The descriptive method was used to determine the development of wheat production in Iraq and Salah al Din Governorate, while the quantitative method was used through a policy analysis matrix to measure the impact of price policy on wheat production. In addition using the protection and comparative advantage coefficients from to extract criteria for the policy analysis matrix are extracted.

Results and Discussion:

The policy analysis matrix:

The policy analysis matrix is a method of organizing and arranging commodity and commodity systems as well as budget data in commodity systems and means the different stages that commodities go through starting from the first stage which is production and marketing through manufacturing and ending with domestic consumption or export abroad. Data collection methods allow the assessment of the impact of a set of policy and market distortions on the represented commodity systems. The matrix can be interpreted as a quantitative mathematical analysis method and a tool for analyzing comparative advantage by measuring the impact of government intervention policies and market distortions on the vertical commodity system or commodity chain, starting from the first stage (i.e. the farm), up to final consumption and exports. The policy analysis matrix is defined as a mathematical framework that helps to separate the commodity system into its basic components, namely the private or real profitability estimated at private prices, and the social or real profitability estimated at social or shadow prices . The difference between these two measures of profitability is the difference between the two prices, and the reason for its effect is the price policy. Apart from this, the policy analysis matrix developed by Pearson Eric A. Monke and Scott R in 1989 is a modern tool for policy analysis. It is of great importance in analyzing the effective effects of government intervention policies in the various stages of commodity trading and helping to measure the efficiency of these policies and achieve their goals and effects at the level of producers, consumers and the national economy. [9]

The policy analysis matrix was constructed using the profit equation:

Profit = e(P q) Q – e (P t) It – (P n) In – x

The values of the variables included in the above formula can be expressed firstly as actual market prices or private prices, and secondly as social prices or shadow prices or so-called real prices. Both prices represent the

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effect of price policy, and as an important indicator of the impact of government intervention policies and market failure, it represents transmission. We can use three rows and four columns to express the structure of the policy analysis matrix as shown in the table below. [10]

Table (1) Structure of the Policy Analysis Matrix

Statement	**(Revenue)**	**(Costs)**		**(Profits)**
		(Tradable inputs)	**(Domestic resources)**	
(Private price)	A	B	C	D
(Social price)	E	F	G	H
(Transfers)	I	J	K	L

Measures of protection and comparative advantage:

Nominal Protection Coefficient of Input: (NPC I)

nominal protection factor for tradable inputs and is symbolized by the symbol (NPC I). It can be used to measure and know the differences between the local or private prices of tradable inputs and their social or global prices. This factor is calculated using the following mathematical formula: [11]

NPC I = B/F

Nominal Protection Coefficient of output: (NPC O)

nominal protection factor for tradable output (NPC O) reflects price d differences o between private prices and out prices of the produced goods. It is calculated using the following mathematical formula:

NPC O = A/E

Effective Protection Coefficient: (EPC)

The effective protection factor is a more efficient measure of the policy impact, as it shows the net effect of policies on both the products and inputs traded at their private value and their social value, and is calculated using the following mathematical as it :

EPC = (A-B)/(E-F)

Profitability Coefficient: (PC)

Measures the effect of government intervention policy on the profits generated

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from the commodity system concerned by the intervention policy .It is calculated using the following mathematical formula: [12]

PC = D/H=(A-B-C)/(E-F-G)

(Comparative Advantage): (DRC)

It is an way of the relative Advance commodity system and the extent of this indicator's ability to compete globally. This coefficient is calculated using the following mathematical formula: [13]

DRC = G/(E-F)

Producer yield Ratio (PSR)

It is an indicator used to identify the ratio of net transfers (L) to the value of social revenues (E) of the commodity system. Distortions in the intervention policy and market failure affect the increase or decrease of this indicator in the total social revenues of the system (E) and is calculated using the following mathematical formula:

PSR = L/E= (D-H)/E × 100

cost ratio (PCR)

This indicator reflects the competitiveness of the commodity system. This ratio is calculated using the following mathematical formula: [14]

PCR = C/(A-B)

Field calculation of the Policy Analysis Matrix (PAM):

Table (2) Technical transactions for wheat production

Average amount per dunum	**Production elements**	**Inputs**
50	Seeds (kg)	
45	Compound fertilizer	
35	Urea fertilizer	**Traded inputs**
0.8	Pesticides (L)	
37	Fuel (liter)	
1 dunum	Land area (dunum)	
8%	Capital (dinar/dunum)	
3.4	Human labor (hour/dunum)	**non-traded inputs**
1.6	Mechanical work (hour/dunum)	
728	**Productivity rate (kg/dunum)**	

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Table (2) shows the technical specifications of the wheat crop, representing the commercial inputs of seeds, fertilizers, pesticides and fuel. The average amount of seeds used per dunum was (50) kg, while the average amount of compound fertilizer added before planting was (45) kg. As for urea fertilizer, it is added to the crop approximately (40) days after germination, and the average dose is (35) kg. As for pesticides added to the soil to control shrubs and tall and broad weeds, the dose per dunum is (0.8) liters. The same applies to the fuel used to operate pumps and central pivot irrigation systems at a rate of (50) liters/dunum .

The second part, non-traded inputs, includes the cultivated land area (1 dunum), as well as capital (8% of the total cost of the dunum), which is calculated in the case of drilling wells or purchasing pumps and pivot irrigation systems. Manual labor includes (land preparation work - compound fertilizers and urea - and pest control) with an average time of (1.1) hours/dunum. The same applies to mechanical or automated labor at a rate of (1.6) hours/dunum. The table also shows that the average wheat crop productivity based on the questionnaire data is (728) kg/dunum

Calculate the first row in the policy analysis matrix (special prices):

Table (3) Costs of production elements (at special prices)

Cost of production elements (dinar/dunum)	Unit price (dinar)	Production elements	
45000	904	Seeds (kg)	
51000	1275	Fertilizers (kg)	**Traded inputs (B)**
14400	18000	Pesticides (L)	
16650	0.450	Fuel (litre)	
127,050	**Total traded inputs (B)**		
50850	50850	the land	
28,230	352.940	Capital	
26750	7867	Human labor (hour)	
34400	21500	Mechanical work (hour)	**Non-traded inputs (C)**
5250	-	Maintenance	
16500	-	Marketing costs	
16750	-	Harvest	
150528	**Total non-traded inputs (C)**		
277578	**Total cost of traded and non-traded inputs**		

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619000	850000	0.728	**Revenue (A)**
341422	**Profitability (D)**		

Table (3) shows how to calculate the elements of the first row of the policy analysis matrix at market prices (i.e. private prices) as they include the costs of tradable and non-tradable inputs (local resources) as well as returns and profits. Calculate the unit price of each factor of production, such as seeds, fertilizers, pesticides and fuel, taking into account tradable inputs, and then calculate the cost per dunum of these factors. The average cost of seeds is (45,000) thousand dinars per dunum, and the average cost of fertilizers is (51,000) thousand dinars, so the total cost of tradable inputs is (127,050) thousand dinars. As for non-tradable inputs, they include land, capital, After adding the total cost of all current and non-current inputs, we get (277,578) thousand dinars. After subtracting these costs from production revenues (619,000) thousand dinars, a special profit of (341,422) thousand dinars was achieved, which means that the agricultural project has achieved a profit in the above amount.

labor, mechanical labor, maintenance, marketing costs and harvesting costs. Land rental support is calculated based on the opportunity cost of (50,850) thousand dinars, while the cost of labor is (26,750) thousand dinars per hour and the cost of mechanical labor is (34,400) thousand dinars per hour. Maintenance costs amount to (5,250) thousand dinars, marketing costs (including transporting crops from the farm to the market to sell them outside the farm) amount to (16,500) thousand dinars, while harvesting costs amount to (16,750) thousand dinars. Thus, the total non-commercial inputs are (150,528) thousand dinars .

Calculate the second row in (social prices):

Table (4) Costs of production elements at (social prices)

Cost of production elements (dinar/dunum)	**Unit price (dinar)**	**Production elements**	
23750	475	Seeds (kg)	
24520	613	Fertilizers (kg)	**Traded inputs (F)**
8448	10560	Pesticides (L)	
18537	501	Fuel (litre)	
75255	**Total traded inputs (F)**		
50850	50850	the land	
35294	352.940	Capital	**Non-traded inputs (G)**
37875	2525	Human labor (hour)	
34400	21500	Mechanical work (hour)	

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5250	-	Maintenance	
16500	-	Marketing costs	
16750	-	Harvest	
196919	**Total non-traded inputs (G)**		
272174	**Total cost of traded and non-traded inputs**		
345800	475000	0.728	**Revenue (E)**
73626	**profitability (H)**		

First: Traded inputs (F) which include:

1 - Seeds: Due to the unavailability of social prices for wheat seeds designated for cultivation in local markets or the availability of a global price, the price of seeds traded at the farm gate for the year (2023) was relied upon, which is the social price. The price of one unit amounted to (475) dinars/kg, i.e. (475) thousand dinars per ton. Based on the quantity of seeds used per dunum, the cost of seeds at the social price amounted to (20) thousand dinars/dunum.

2 - Fertilizers: Considering global prices, the price limit for a ton of compound fertilizers (DAP) reaches (535) dollars/dollar, while the price limit for urea fertilizer reaches (394) dollars/ton, including transportation and insurance costs. The price is adjusted according to the local currency equilibrium price (2023), which is (1320) dinars/dollar, and the price per ton of compound fertilizers is (706,200) dinars/ton. When adjusting prices. As for urea fertilizers, and based on the equilibrium price in local currency, we also get (520,080) dinars/ton, and after adding the prices and taking the average, we get (613,140) dinars/ton for each ton of fertilizers, and based on the quantity of fertilizers used in each category, we get the cost of fertilizers per dunum, which is (24,520) dinars/dunum.

3 - Pesticides: The border price per liter of pesticides was (8) dollars, including transportation and insurance costs. When adjusting this price to the equilibrium price of the local currency, which is (1320) dinars/dollar, we obtain the price of pesticides in Iraqi dinars, which is (10560) dinars/liter. Based on the need for one dunum of pesticides, the social price reached (8448) dinars/dunum.

4 - Fuel: The border price of fuel arriving at the main warehouses, including transportation and insurance costs, for the year (2023) amounted to approximately (77.53) dollars/barrel. By dividing this price by the capacity of the oil barrel, which is 200 liters, we obtain the price of one liter of fuel, which amounted to (0.38) dollars/liter. By adjusting this price to the equilibrium price of the local currency, we obtain the price of one liter in Iraqi dinars, which is (501) dinars/liter. Based on the amount of fuel used per dunum, we obtain the cost of one dunum of (18537) dinars.

Second: Non-traded inputs (G)

1 - Land rent: The annual land rent prevailing in the study area was calculated, which is the special price, and was adopted as a social price

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as alternative opportunity costs. The average rent for agricultural land per dunum was (50,850) thousand dinars.

2 - Capital: Capital was calculated at the social price by calculating the interest on the invested private capital at a rate of (10%). This percentage was set according to international estimates, considering Iraq as a middle-income country. The cost amounted to (35,294) thousand dinars/dunum.

3 - Human labor: It is not possible to move from one field to another in the short term, so the known local price for an hour of work was adopted as a social price (7867) dinars/hour, which is equivalent to a cost of (26750) thousand dinars/ dunum.

4 - Mechanical work: The hourly wage for agricultural machinery was adopted at the local or private price as a social price, as the hourly wage for mechanical work amounted to (21,500) dinars/hour, equivalent to a cost of (34,400) thousand dinars/dunum.

5 - Harvesting: The hourly wage of the mechanical harvester was adopted from the local price as a social price , as the hourly wage of the harvester amounted to (16,750) dinars/hour, i.e. in proportion to the need of the dunum, so the cost amounted to (16,750) thousand dinars/dunum.

6 - Marketing costs: The local prices were calculated as social prices for marketing costs, where their costs amounted to (16,500) thousand dinars/dunum.

The local prices were adopted as social prices for the purpose of maintenance and repair operations for pumps and pivot irrigation systems, with costs amounting to (5,250) thousand dinars/dunum.

Policy Analysis Matrix (PAM) Results:

Table (5) Results of the policy analysis matrix for one dunum of wheat crop

Statement	**(Revenue)**	**(Costs)**		**(Profits)**
		(Tradable inputs)	**(Domestic resources)**	
(Private price)	A 619,000	B 127,050	C 150,528	D 341,422
(Social price)	E 345,800	F 75,255	G 196,919	H 73,626
(Transfers)	I 273,200	J 51,795	K 46,391 -	L 267,796

Table (5) shows the policy analysis matrix for wheat crop per dunum in Salah al-Din Governorate during the production season (2023-2024), which was obtained from a selected sample of (175) people in the governorate. It found that the total inputs of transaction (B) amounted to (127,050) thousand dinars/dunum, while the total cost (F) at social prices amounted to approximately

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(75,255) thousand dinars /dunum and the cost after conversion. . The cost of non-traded supplies (local resources) (C) amounted to (150,528) thousand dinars/dunum, while the cost of non-traded supplies (G) at social prices amounted to (196,919) thousand dinars/dunum. In contrast, the return (A) at private prices amounted to approximately (619,000) thousand dinars/dunum, while the return (E) at social prices amounted to approximately (345,800) thousand dinars/dunum,

From Table (3) the cost of production factors (at private prices) and the cost of production factors (at social prices) (4), it is clear that the total profit obtained by the producer at the market price (D) is (341,422) thousand dinars/dunum. After estimating the matrix on the policy analysis, as shown in Table (5) above, we find that the transfer of benefit (I) is positive and is the result of the difference between the benefit of the private price (A) and the benefit of the social price (E). This indicates that the benefits of private prices are higher than the benefits of social prices, which indicates the government's support for the wheat crop for the current year (2023) through high price intervention in the wheat crop. Enter the market because the social cost is less than the cost. Especially when it comes to trading inputs. As for the transfer of trade inputs (J) , the result of the matrix shows a positive value, which means that the private price of trade inputs is higher than the social price, which indicates the absence of real and clear government support for farmers. As for transfers of non-traded inputs (local resources) (K), the result is the opposite, as their values are negative in the matrix, which indicates the existence of real and clear government support for non-traded inputs.

The matrix results also showed that wheat crop achieves private profits (D) with positive values; on the other hand, (H) shows that wheat crop achieves lower social profits because they are much lower than private profits. This indicates that high productivity or reduced production costs can be achieved by improving non-traded inputs and using them efficiently through introducing new technologies that improve agricultural reality and allocate resources in an optimal way .

The matrix results showed that the net transfer (L) is positive and amounts to (267,796) thousand dinars/dunum. This shows that the government intervention policy in the wheat commodity system is reflected in the prices of tradable inputs, prices of non-tradable inputs and prices of outputs, which is in line with the interests of local producers, and the positive value of the net transfer indicates that production is more profitable for producers.

Results of protection and comparative advantage Coefficients :

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Table (6) Protection coefficients and comparative advantage of wheat crop

Coefficients	absolute value
Nominal protection coefficients on tradable inputs	1.688
Nominal protection coefficients on the output	1.790
Effective protection coefficient	1.818
Private cost ratio	0.305
Product subsidy rate	77.44%
Profitability Coefficient	4.637
Domestic resource cost coefficient	0.727

Nominal Protection of Coefficient for Inputs (NPC I): From the table above, the nominal protection factor for tradable transactions reached (1.68), and this value was positive and greater than one, and indicates that local producers bear the costs of purchasing tradable inputs at prices that are higher than global prices, and this indicates the absence of real and tangible support from the state for these inputs.

Nominal Protection Coefficient for Outputs (NPCO): When referring to the table above and noting the results, the value of the nominal protection factor for outputs was (1.79) positive and greater than one. This indicates that the local price of the wheat crop is greater than the global price offered for sale and that producers receive prices higher than global prices through this policy followed. This indicates the existence of clear government support for the wheat crop output.

Effective Protection Coefficient (EPC): The value of coefficient was (1.81) and its value was positive, as this indicates that the added value of wheat production at special prices is greater than the added value at social prices, and this indicates that local producers obtain investment returns for their resources due to the government intervention policy supporting wheat production.

Private Cost Ratio (PCR): The private cost ratio, which had a value of (0.30), the commodity system for the wheat crop achieves profits at private prices because it covers its production costs and achieves profitable profits for producers and investors in wheat cultivation.

Producer Subsidy Ratio (PSR): By observing the table above, the producer subsidy ratio, which was (77.44%) and also positive, showed that means there is support

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and positive provided to local Wheat farmers crops by purchasing the crop by the state at high prices, which amounted to (850) thousand /per ton.

Social profitability Coefficient (PC): The value of the factor (4.63), which is a positive value, indicates that the system of wheat production in Iraq does not benefit greatly from the government support policy, because the profits at the special prices of the wheat crop are higher than the profits at the prices.

Local Resource Cost Coefficient (DRC): the local resource cost coefficient, i.e. the coefficient (comparative advantage), appeared with a positive sign (0.72) and was less than one. This indicates that Iraq in general and Salah al-Din Governorate in particular enjoy a comparative advantage in wheat production. This indicates that the costs of local resources are lower than the add value.

Conclusions:

The study proved the hypothesis of low government support for inputs through the values of the nominal protection factor for inputs, which appeared positive and greater than one, indicating that agricultural producers bear the costs of purchasing inputs traded at prices higher than global prices.

The value of the effective protection coefficient, which was positive and greater than one (1.81), showed that the added value of wheat production at private prices is higher than the added value at social prices, through which local producers obtain returns on investment of their resources due to the government intervention policy.

The coefficient of the private cost ratio, which was positive (0.3) and less than one, indicated that the commodity system for the wheat crop is competitive, achieves profits at private prices, and covers its production costs.

The value of the local resource cost coefficient (comparative advantage), which is positive (0.72) and less than one, indicates that the wheat crop in Iraq enjoys a high comparative advantage, which encourages investors to spend more money in this field.

Recommendations:

Increasing the level of government support for commercial inputs such as fertilizers of all types (DAP - urea) and providing them at subsidized prices to farmers, and providing high-yield seeds to achieve the greatest possible agricultural production.

The need for continuous support for farmers by establishing agricultural policies that help farmers continue their profession and not abandon it, given that agriculture is one of

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the most important sectors and one of the most prominent pillars of the country's economy, and is considered a renewable industry.

As the competitiveness of the wheat crop in Iraq due to its high comparative advantage, the production capacity of the wheat crop must increase to achieve self-sufficiency and reduce imports from abroad to preserve hard currency.

Through the results of the matrix analysis, which showed that the net effect of the government pricing policy, symbolized by (L), was positive. This indicates that the policies followed by the state are in the interest of local producers. The researcher recommends the continuation of government support to maintain profitability for the producers.

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