



LA IMPORTANCIA ECONÓMICA DEL CULTIVO DE TRIGO PARA APOYAR LA CANASTA DE ALIMENTOS IRAQUÍ Y GARANTIZAR LA CONTINUIDAD DE LA CARTA DE RACIONAMIENTO

The Economic Importance Of Wheat Cultivation To Support The Iraqi Food Basket And Ensure The Continuity Of The Ration Card

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RESUMEN

Este estudio tiene como objetivo analizar la realidad agrícola de la producción de trigo en la región y establecer una línea base para evaluar el impacto del proyecto nacional de desarrollo del cultivo de trigo en los años posteriores y garantizar la continuidad de la tarjeta de racionamiento. La investigación se basó en un enfoque analítico descriptivo y un enfoque cuantitativo estándar basado en la econometría. El estudio se llevó a cabo en tierras de la región de Al-Numaniyah, sembradas con trigo durante siete temporadas agrícolas anteriores, desde 2015 hasta 2016. El cultivo de trigo en años anteriores arrojó resultados positivos aceptables desde una perspectiva económica, según lo medido mediante análisis estadístico. El valor actual neto fue de 12,7 con un factor de descuento del 8%, y la relación beneficio-costos fue de 1,1 con un factor de descuento del 8%. La tasa interna de retorno fue del 29,3%. Para predecir el estado actual del cultivo de trigo en la región para las temporadas posteriores, a partir del período 2022-2023, se utilizaron series de tiempo, apoyándose en la ecuación de regresión lineal estadística $Y = a + bx$. Según esto, las previsiones de producción de trigo fueron de 44, 48, 52 y 57 mil toneladas para los años siguientes, de 2026 a 2029. Los resultados del análisis revelaron una disminución en las asignaciones de apoyo a la tarjeta de racionamiento en Irak durante el período 2004-2023, lo que se reflejó en una reducción en los artículos de la tarjeta de racionamiento y en una disminución en el número de meses en que se recibió. Si bien la tasa de pobreza en Irak para el período 2004-2023 fue del

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21,7% y su promedio para los años 2020-2023 fue del 28%.

Palabras clave : Trigo, Factor de descuento, VPN, TIR, BCR, Tarjeta de racionamiento

ABSTRACT

This study aims to develop the agricultural reality of wheat production in the region and establish a baseline from which to assess the impact of the national wheat cultivation development project in subsequent years and ensure the continuity of the ration card. The research relied on a descriptive analytical approach and a standard quantitative approach based on econometrics. The study was conducted in the lands of the Al-Numaniyah region, which were planted with wheat for seven previous agricultural seasons, starting from 2015-2016. wheat cultivation in previous years yielded acceptable positive results from an economic perspective, as measured by statistical analysis. The net present value was 12.7 at a discount factor of 8%, and the benefit-to-cost ratio was 1.1 at a discount factor of 8%. The internal rate of return was 29.3% To predict the current state of wheat cultivation in the region for subsequent seasons, starting from 2022-2023, time series were used, relying on the statistical linear regression equation $Y = a + bx$. According to this, wheat production forecasts were 44 , 48 , 52 , and 57 thousand tons for the subsequent years, from 2026 – 2029. The results of the analysis revealed a decrease in ration card support allocations in Iraq for the period 2004-2023 which was reflected in a reduction in the ration card items and a decrease in the number of months the ration card was received , although the poverty rate in Iraq for the period 2004-2023 became 21.7% and its average for the years 2020-2023 is 28%

Keywords : Wheat, Discount factor , N P V, I R R , BCR , Ration card

INTRODUCTION

Wheat is a grain commodity that is of significance. It is the most significant crop in the world in terms of both importance and cultivated area, and it is a staple diet for over two-thirds of the global population. This is due to the fact that its grains contain carbohydrates and proteins in balanced amount [Al-Dhalmi et al.,2024]

Wheat is cultivated worldwide and is grown on an area of about 224.98 million hectares and production of about 735.5 million tonnes with productivity of 3.27 tonnes per hectare [Sabirjan Isaev et al.,2023]. China, India, the United States of America, Russia, France, Canada, Germany, Turkey, Australia, and Ukraine are the leading wheat-producing nations [Maninder Singh et al.,2024]

According to FAO about 30% of the irrigated area is suffering by salinity problems, which corresponds to an area of more than 100 million ha worldwide. Soil salinity, resulting from natural processes or from crop irrigation with saline water, occurs in many arid and semi-arid regions of the world [Meloni, & Marco Antonio Oliva, 2004].

We must think about growing wheat and maximizing its production by relying on the latest agricultural technology of seeds, fertilizers and irrigation methods. We must also face obstacles and impediments such as salinity by choosing seed varieties suitable for these soils.

Since the Iraqi Ministry of Agriculture has created a national program to develop wheat cultivation, it is necessary to complete a scientific introduction to evaluate the agricultural process of the wheat crop during the past seven years and the following years and to conduct an economic evaluation. This target will be achieved only, if global wheat production is increased by 2.5% per annum [Satyavir Singh et al., 2017]

In conclusion, improving water-use efficiency is an essential factor for ensuring food security in the face of climate change and water scarcity. By implementing innovative strategies and exploiting the power of technology, we can enhance WUE in agriculture, optimize crop production, conserve natural resources, and contribute to a more sustainable future [Saif Alharbi et al.,2024]. Sprinkler irrigation was superior to surface irrigation because it makes the moisture permanent in the root system and reduces the air temperature, and these results are consistent with what previous research has reached [Raji Ali Mousa & Abdullah Ulas.2022]. The concept of food security does not mean wheat production, but rather self-sufficiency in this crop and drawing up production, pricing and marketing policies in order to achieve a balance between the producer and the consumer [Zeina Khaled .2023].

Iraq has gone through a critical period with increased demand for food commodities, whose prices have risen globally, and the hostile deficit has increased with increased dependence on external sources to feed the population, and the per capita share of Iraqis in agricultural production has declined, which in turn has reduced its contribution to the gross domestic product [Ibrahim Harbi & Yasmine Hussein 2023]. So in 2008 the government returned to support farmers through the agricultural initiative by providing large interest-free loans [Al-Kaabi, Talib Jas, 2025]

MATERIALS AND METHODS

The Numaniyah region was chosen as a study sample for wheat cultivation for seven agricultural seasons, starting from 2016 - 2022. This was based on the records of the Numaniyah City Agriculture Department.

The cultivated areas were identified as 40, 500, 520, 59, 77, 82, and 83 dunums, and the produced quantities were 12, 17, 28, 29, 26, 34, and 41 tons, respectively as shown in Table 1. which represents the cultivated areas and total production.

Agricultural season	Implemented area 1000 dunum*	Marketed production 1000 ton
2015-2016	40	12
2016-2017	50	17
2017-2018	52	28
2018-2019	59	29
2019-2020	77	26
2020-2021	82	34
2021-2022	83	41

One Iraqi dunam equals 2,500 m² *

STATISTICAL ANALYSIS

Time series and the linear regression equation

$Y = a + bx$ were used, and three statistical criteria were selected: net present value, benefit-to-cost ratio, and internal rate of return, using discount rates of 8% and 10% to eliminate the effect of time, as approved by the Economic Development Institute of the World Bank for Reconstruction and Development.

The Food Ration Card and the Poverty Rate in Iraq

Most Iraqi families rely on the food ration card program, which covers 96 percent of Iraq's population. We have observed a decline in the quantity and quality of food ration card items and their financial allocations. The number of beneficiaries in 2004 was 27 million, while in 2022 it reached 41 million. Spending on the ration card program reached 4.2% of total government spending, estimated at \$4.2 billion [Alaa Abbas & Shaima Rashid.2024]

Table 2.
Poverty rate table in Iraq for the period 2004-2023

Year	Poverty rate	Year	Poverty rate
2004	22	2014	22
2005	22	2015	19
2006	22	2016	18
2007	22	2017	20
2008	22	2018	21
2009	21	2019	24
2010	21	2020	32
2011	20	2021	31
2012	19	2022	26
2013	16	2023	23

22.5 % of the Iraqi population lives below the poverty line of 105 dinars per month, while this percentage reaches 40% in some areas, in addition to 30% of the population facing poverty and food insecurity [Yahya Muhammad & Nabil Mahdi.2023]

Table 3.
The Iraqi person's entitlement to wheat production

Years	Kg Person Year
1990	99.3
1995	72.0
2000	148.6
2005	132.1
2010	124.9
2015	108.3
2020	143.4

That's why the ration card, despite its limited vocabulary, remains an effective tool for controlling the prices of basic commodities and reducing food inflation [Ali Daadoush ,2025]

The Iraqi Ministry of Trade stated that “the graphic sequence of the ration card in the years 2006, 2007, 2008, 2009, 2010, and 2011 showed that the financial allocations for the ration card ranged between 6 and 7 billion dollars, and its value decreased in 2018 and 2019 to 1.5 billion, but the card allocations declined significantly in the years 2020 and 2021 and beyond to less than 650 million Iraqi dinars”.

Table 4.*Showing government support for the Twin Card for the period 2004-2012*

years	2004	2005	2006	2007	2008	2009	2010	2011	2012
Support billion \$	6.0	6.0	4.5	3.9	6.985	4.2	3.5	3.5	4.0

Sources [Al-Zubaidi , 2012]

A study showed that more than 95% of Iraqi families would like to continue receiving their ration cards rather than replacing them with cash [UN World Food Programme,2005]

ECONOMIC ANALYSIS

The primary objective of economic analysis is to determine the expected returns from the project, which are represented by agricultural production on wheat farms, as well as the costs to be borne by farmers.

Since the items included in both returns and costs cannot be subjected to a unified scale, they were analyzed into monetary values through prices. From all of this, we conclude the concept of economic feasibility which is the study that aims to identify the expected returns on the amounts invested in this project and the extent of its profitability

COSTS

Calculating costs is a complex problem because their value varies from one farmer to another. Therefore, we used questionnaire forms based on the following model to distribute them across the agricultural sectors.

We found the average value to be 277,000 dinars per dunum. Plowing and harvesting costs amounted to 50% of the total cost, which is consistent with the findings of previous studies[. Al-Shammar, Karim Muhammad . 2018]. It increased to 313,000 dinars | dunums in 2020

Table 5.*Wheat production costs for cultivated areas*

Agricultural season	The cost of wheat production billion Dinar
2015-2016	11
2016-2017	14
2017-2018	14
2018-2019	16

2019-2020	21
2020-2021	23
2021-2022	23

RETURNS

This refers to all cash generated for the project commitment. Returns are commonly referred to as external cash flows. The value of agricultural crops is estimated based on the quantities produced and the by-products at the prices at which they are sold. The value of agricultural products, such as wheat, was estimated based on the Iraqi Ministry of Trade's price, which was approximately 700,000 dinars per ton of wheat. By-products are derived from wheat harvest waste, which is typically used for livestock grazing.

After conducting personal interviews with some farmers and some intermediaries involved in selling wheat waste, the average price was 25,000 dinars per dunum. Using a simple mathematical method, the total annual return for each of the above-mentioned crops can be obtained by multiplying the achieved production by the selling price plus the return on waste. This can be obtained by dividing the waste selling price per dunum by the cultivated area of the crop.

Table 6.

Shows the returns on wheat production

Agricultural season	Th wheat returns / 1000 billion dinars		
	yield	straw	Total
2015-2016	9	1	10
2016-2017	12	1	13
2017-2018	19	1	20
2018-2019	20	1	21
2019-2020	18	2	20
2020-2021	24	2	26
2021-2022	29	2	31

Time preference criteria give weight to time, favoring returns received early over returns realized later. The same applies to costs, which give a degree of preference to what is spent later over what is spent early, i.e., preferring a dinar spent tomorrow over a dinar spent today.

This is achieved through what is known as the discount factor. As a general rule, we can adopt the following formula:

Future value of an amount = Present value $\times$ $1/(1 + \text{the chosen interest rate})^n$
n denotes the number of years.

The Economic Development Institute of the World Bank has developed special tables for calculating these values. Through this mechanism, we will use the discount factor of 8% or 10%, as these are more appropriate and suitable for the economies of developing countries.

In this study, we will treat the total cash flows, whether costs or returns, with a discount factor of 8% first and 10% second to eliminate the effect of the time preference mentioned above regarding costs or returns, as follows

Table 7.
Shows Wheat at the price of 8% discount

Agricultural season	Wheat at the price of 8% discount			
	Returns One billion dinars	Discounted returns	Cost One billion dinars	Discounted cost
2015-2016	10	9	11	10
2016-2017	13	11	14	12
2017-2018	20	16	14	11
2018-2019	21	16	16	12
2019-2020	20	14	21	14
2020-2021	26	16	23	14
2021-2022	31	18	23	13
Total	141	100	122	86

Table 8.
shows Wheat at the price of 10% discount

Agricultural season	Wheat at the price of 10% discount			
	Returns One billion dinars	Discounted returns	Cost One billion dinars	Discounted cost
2015-2016	10	9	11	10
2016-2017	13	11	14	12
2017-2018	20	16	14	11
2018-2019	21	15	16	11
2019-2020	20	12	21	13
2020-2021	26	15	23	13
2021-2022	31	16	23	12
Total	141	94	122	82

EVALUATION CRITERIA

NET PRESENT VALUE

This refers to the amount of benefits generated by a wheat cultivation project, measured in current monetary value, i.e., in the first year of project implementation, above the discount rate. Projects are usually ranked according to this criterion based on the result of subtracting negative discounted cash flows from positive discounted cash flows, giving preference to the project with the highest value.

It is well known that a project that achieves a net present value of zero does not mean that it does not generate returns on its investments. The economic evaluation of a wheat project according to this criterion, at a discount rate of 8%, is as follows:

Net Present Value = Total Discounted Returns - Total Discounted Costs

A- Wheat = 100,362 - 87,605 = 12,7

At a discount rate of 10%, the net value was 11,5

From the above result, we note that the net present value is positive at the discount rate determined, which means that this project is commercially acceptable [Helena Gaspars-Wieloch.2019].

BENEFIT –COST RATIO

The Benefit-Cost Ratio (BCR) is a financial metric that helps evaluate the economic efficiency of an investment [Prince Kumar ,2023]. This criterion complements the previous criterion, whereby projects are weighted based on the realized return on invested capital. The World Bank adopted this criterion by dividing the total returns by the total costs. This criterion is based on the achieved ratio, giving priority to the project with the highest ratio, while projects with a ratio greater than one are accepted. In other words, projects with a ratio of benefits to costs greater than one (an integer).

According to this criterion, the result was as follows:

At a discount rate of 8%, the benefit-to-cost ratio was 1.145, meaning that one dinar yields 0.145 dinars.

At a discount rate of 10%, the benefit-to-cost ratio was 1.135, meaning that one dinar yields 0.135 dinars.

INTERNAL RATE OF RETURN (IRR)

The internal rate of return (IRR) represents the amount of returns a project generates per unit of allocated resources[Carlo Alberto Magni.2010]. It is calculated through trial and error, selecting multiple discount rates until the discount rate that reduces the present value to zero is reached. It represents the project's earning potential, i.e., the interest rate. If the IRR is 10%, this means that the funds will be invested at a 10% interest rate. This criterion is one of the most efficient. Finally, this criterion represents the weighting of the project's eligibility for projects that achieve the highest economic and social returns.

The mathematical formula for this standard is as follows:

$$\text{Internal rate of return} = S1 + Q1(S1 - S2) \mid Q2 - Q1$$

Q1: The higher discount price.

Q2: The discount price means the lowest.

S1: Means the net present value at the highest discount price.

S2: Means the net present value at the lowest discount price.

By applying the law to the net present value at the discount rates of 8% and 10%

The following results can be obtained:

$10 + 11.543 \times 2 \mid 12.757 - 11.543 = 29.39\%$ as a good economic return.

Return on Investment (ROI)

Expresses the percentage of profit or return an investment generates compared to the value of the investment itself. It is calculated by dividing the net profit by the capital and multiplying by 100 to obtain the percentage $\text{ROI} = \frac{\text{Returns} - \text{cost}}{\text{cost}} \times 100$ $\frac{141 - 122}{122} \times 100 = 15.5\%$

Table 9.

Shows the results of the statistical analysis

Economic criteria	Result
Net benefit value	
discount factor 8 %	12.7
discount factor 10%	11.5
Benefit –Cost Ratio	
discount factor 8%	1.1
discount factor 10%	1.1
Internal Rate of Return	29.3%
Return on Investment (ROI)	15.5

ESTIMATING AGRICURAL PRODUCTION BY USING THE LINEAR REGRESSION EQUATION

We can forecast future agricultural production using the time series method, which statisticians rely on in forecasting annual agricultural production and population studies. However, there is a difference in population studies, the series are positive (ascending) while in agricultural production studies, they are positive or negative (ascending or descending). However, what is important to us is that the general trend of the time series is a gradual change, not a sudden one.

The linear equation used by the following can be used:

$$Y = a + bx$$

$$B = \frac{N \sum XY - \sum X \sum Y}{N \sum X^2 - (\sum X)^2}$$

$$A = \frac{\sum Y}{N} - B \frac{\sum X}{N}$$

Since the number of points in the time series individually [Huber, P.J.1964], so, the value of x at the middle time point is zero, and the value of x for the previous values is -1, -2, -3, whereas the value of x for the subsequent values will be 1, 2, 3, and note from the x values that each A positive value is offset by a negative value and the sum of the values of x is equal to zero.

The difference between two values at any two successive time points is equal to one, and this reflects the fact that the distances between the points, which are the years of life of the crop, are equal.

Table 10.*Shows the value and direction of the linear regression equation*

Agricultural season	Marketed production / 1000 ton	X	Yx	X ²
2016-2017	12	-3	-36567	9
2017-2018	17	-2	-33592	4
2018-2019	28	-1	-27750	1
2019-2020	29	0	0	0
2020-2021	26	1	25794	1
2021-2022	34	2	67618	4
2022-2023	41	3	123861	9
Total	187			28

Since the sum of x equals zero, so the law for finding coefficients is in the following :

$$A = \frac{\sum Y}{N} = \frac{186792}{7} = 26684$$

$$B = \frac{\sum XY}{\sum X^2} = \frac{119364}{28} = 4263$$

Thus, the formula for the linear equation after finding the coefficients will be $Y = 26684.57 + 4263x$

The expected production for the subsequent years of the wheat crop can be estimated by relying on the base year 2019 through the following:

$$2024-2020 = 4$$

$$2025-2020 = 5$$

$$2026-2020 = 6$$

$$2027-2020 = 7$$

Substituting the values of 4, 5, 6, and 7 into the linear equation with the value of x, we get the expected output from a crop, the wheat for the coming years is: 44 , 48, 52, 57 thousand tons, respectively for the mentioned future years, these obtained results can be compared by statistical methods. With the results of the national program for the development of wheat cultivation

CONCLUSION

- Wheat cultivation is increasing in area each subsequent year, followed by an increase in production without increasing yield.
- Production will increase for the next four seasons, based on the results of statistical analysis provided that weather conditions and other variables remain constant.
- We expect that National Wheat Cultivation Project to contribute to increasing wheat yields per unit area by adopting practical principles and providing agricultural requirements, including the use of micronutrients and biological control of broad- and narrow-leaved weeds, and overcoming all problems and obstacles.

RECOMMENDATIONS

Reducing the costs of wheat production by reducing the prices of production inputs such as seeds and fertilizers etc. Working to increase wheat productivity by securing high-yield seeds, spreading awareness and knowledge, and informing farmers of modern agricultural method. To address poverty and rising prices, it is necessary to continue using the ration card.

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Authors contributions

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