# Economic assessment of the impact of efficiency indicators and investment risks on the size categories of wheat farmers in Samarra district for the 2025 production season

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## Abstract

This study aimed to evaluate the economic performance and analyze efficiency indicators and investment risks of wheat farmers in Samarra District for the 2025 production season. Field data was collected from a random sample of 150 farms distributed across three size categories (60, 80, and 120 dunams) and using center-pivot irrigation systems. The research relied on a set of economic indicators, including economic profit, net cash income, capital payback period, return on invested dinars, and production profitability. Investment risk was also measured using break-even price and break-even quantity methods for total and variable costs. The results showed a clear disparity in economic performance among the size categories. The medium-sized category (80 dunams) achieved the best economic performance, recording the highest economic profit, net cash income, return on invested dinars, and production profitability, along with a relatively lower risk indicator compared to the other categories. The small category (60 dunams) demonstrated an acceptable capacity to achieve an economic surplus, but it was more exposed to price and production risks due to the relatively high burden of fixed costs. As for the large category (120 dunams), the results showed that expanding the holding size was not accompanied by a similar improvement in economic efficiency. Instead, it was associated with higher costs, longer payback periods, and increased investment risks. These findings are consistent with several previous studies that confirmed that a medium economic size represents the closest level to achieving efficiency and stability in agricultural production, and that increasing or decreasing holding size below this level leads to a decline in efficiency and a higher degree of risk. The study recommends directing agricultural policies toward supporting medium-sized holdings and improving resource management in both small and large holdings, thereby contributing to enhanced food security and economic sustainability.

**Keywords:** Wheat, Samarra District, Economic Profit, Break-Even Price

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## Introduction

Wheat is one of the most important agricultural crops in Iraq, and indeed, it is the primary strategic crop directly linked to food security. Bread is the daily staple for most Iraqi families, and any disruption in wheat production immediately impacts people's lives and budgets. Therefore, the government and farmers have consistently strived to increase productivity, improve efficiency, and ensure the optimal use and equitable distribution of resources between the current and future generations [1], especially given the difficult circumstances facing the agricultural sector, including water scarcity, high input costs, and price volatility. In recent years, center pivot irrigation systems have become widespread in large areas of Iraq, including the Samarra district. This system is not merely a modern irrigation method, but a response to water challenges, as it helps farmers rationalize water use and ensure its balanced distribution, which in turn stabilizes production. However, the success of center pivot irrigation depends less on the technology itself and more on how farmers manage their resources, including land, seeds, fertilizers, water, labor, and fuel [2]. This raises an important question: Are farmers using these resources efficiently? And is the gap between actual potential production and actual production large or small? This study was designed to answer these questions. A community of 436 farms using center-pivot irrigation in Samarra was selected, and a field sample of 60 farms, equally distributed across four main areas (Al-Mu'tasim, Al-Tharthar, Samarra, and Dijla), was chosen. The aim was for the sample to accurately reflect the farmers' situation and provide a clear picture of what is actually happening on the ground. The research employs economic analysis tools to measure efficiency indicators, investment risks, and the factors most influential on production. The expected results are not limited to static figures but will reflect the farmers' ability to manage their resources and reveal the gap between current levels and what could be achieved with more efficient resource utilization. The importance of this study lies in the fact that it not only presents a picture of the current situation but also seeks to formulate practical recommendations that farmers can use to improve their income and policymakers can use to develop more effective agricultural policies. Ultimately, every increase in wheat production efficiency represents a step towards achieving food security and economic stability for Iraqi society.

### Research Objectives

This research aims to:

1. Evaluate the economic performance of wheat farmers in Samarra District according to different scale categories.

### Research Problem

Despite the increased use of center pivot irrigation systems in Samarra District in recent years, wheat production remains below the level required for self-sufficiency and food security. This is due to several factors, including limited efficiency in agricultural resource utilization, high costs, and varying input management skills among farmers. Therefore, the research problem is addressed in the following main question:

What are the economic and technical indicators affecting wheat production under center pivot irrigation systems in Samarra District, and to what extent do investment risks impact wheat production in Samarra District?

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2. Measure the economic efficiency indicators of wheat farmers, represented by economic profit, net cash income, capital payback period, return on invested dinars, and production profitability.
3. Analyze agricultural investment risks using break-even price and break-even quantity indicators for total and variable costs.
4. Provide practical recommendations that contribute to improving resource management and increasing agricultural productivity.

**Research Hypotheses**

This research is based on a set of scientific hypotheses that reflect the relationship between farm size, resource utilization efficiency, and investment risk. These hypotheses can be formulated as follows:

1. There are economically significant differences in economic efficiency indicators (economic profit, net monetary income, return on invested dinars, and productive profitability) among different farm sizes of wheat farmers in the Samarra district.

2. Farm size significantly affects the level of investment risk, measured by the break-even price and break-even quantity, for wheat farmers in the study area.

3. Medium-sized wheat farmers achieve a higher level of economic efficiency and return stability compared to small and large-sized farmers.

4. Expanding farm size does not necessarily lead to improved economic efficiency or reduced investment risk if productive resources are not optimally utilized.

**The Importance of the Research**

The importance of this research stems from its focus on wheat as the most important strategic crop linked to food security in Iraq, as well as its emphasis on one of the modern systems in agricultural production: center-pivot irrigation. The research's significance lies in:

1. Providing an up-to-date field database reflecting the economic realities of wheat farmers in the Samarra district.

2. Highlighting the role of farm size in achieving economic efficiency and reducing investment risks.

3. Assisting decision-makers in formulating more efficient agricultural policies regarding the distribution of subsidies and the allocation of investments.

4. Enabling farmers to make production and marketing decisions based on sound economic principles.

5. Filling a research gap related to analyzing efficiency indicators and investment risks within the framework of farm size categories in the Iraqi context.

**Research Methodology**

The research adopted a descriptive and quantitative approach by collecting primary data through a field questionnaire. The sample consisted of 150 farms, equally distributed across four geographical strata (Al-Mu'tasim, Al-Tharthar, Samarra, and Dijla), representing the agricultural community of 436 farms. These farms were divided into size categories (60, 80, and 120 dunams) for center-pivot irrigation. The sample was further divided into 60 farms in the 60-dunam category, 53 farms in the 80-dunam category, and 37 farms in the 120-dunam category. Performance and economic efficiency indicators for wheat farmers in

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these size categories were estimated (economic profit, net cash income, capital payback period, return on investment, and production profitability). Investment risk was also measured using the break-even price of fixed and variable costs and the break-even quantity of fixed and variable costs. Practical recommendations were then formulated.

**Previous Studies**

**The study by Osborne & Trueblood (2006) [3]** analyzed the economic efficiency of crop production in Russia during the period of economic reform. The results showed that medium-sized farms achieved higher efficiency compared to small and large holdings. This was attributed to a lower relative burden of costs and improved management organization. These results are consistent with the findings of the current research regarding the medium-sized farm category.

**The study by Salman and Hassan ([4]) (2024)** focused on the financial evaluation of wheat production projects under center-pivot irrigation systems in Anbar Governorate, aiming to measure economic feasibility, net profit, and capital payback period. The researchers employed a quantitative analytical approach, relying on field data and applying economic feasibility indicators. The results showed that most projects achieved positive net profits, with varying levels of economic efficiency among farmers, confirming that efficiency does not necessarily equate to high profitability. The study recommended improving cost management and reducing operating expenses to increase the profitability of wheat projects.

**The study by Kumar et al. (2025) ([5])** addressed the economic evaluation and profitability analysis of wheat production in the Gwalior region of India, aiming to study the impact of costs on net profit and investment efficiency for farmers. The researchers used quantitative analysis, employing a questionnaire administered to a sample of farmers and applying economic profitability indicators. The results showed that lower average total costs increase profitability, with varying results among farmers depending on farm size, experience, and educational level. The study recommended supporting farmers to reduce production costs, improve economic efficiency, and implement best agricultural practices to increase yields.

**The study by Elsafty, Elgendy & Kamel, 2025) [6]** This study analyzes the productive and economic efficiency indicators of wheat in the Desouk district of Kafr El-Sheikh Governorate, Egypt, focusing on how these indicators differ among various landholding categories. The study includes an analysis of economic profitability, net income, and the efficiency of economic resource utilization within a 2025 agricultural sample, employing quantitative comparisons between actual and optimal performance of production resources. The study provides clear estimates of resource utilization and how close farmers are to full efficiency, thus enhancing the understanding of the factors that determine the efficiency of agricultural investment in actual production.

**Theoretical Framework**

**Economic Efficiency Indicators**

Economic efficiency indicators are quantitative and qualitative tools used to measure the extent to which an economy can utilize its available resources in the best possible way to achieve growth and development.

**Economic Profit**

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This is one of the production efficiency indicators used by producers in cost and profit calculations. It represents the difference between the total revenue of agricultural activity and the total agricultural costs. This concept is used to evaluate the efficiency of agricultural resource utilization, not just to determine accounting profit. If the economic profit is positive, this indicates that the agricultural activity is generating a return exceeding the best alternative use of resources. If the economic profit is negative, this means that the revenue does not cover the total costs, and the resources used could have generated a higher return if used in an alternative agricultural activity. This situation is considered an indicator of the low economic efficiency of the agricultural activity in the long term. [7] Net Cash Income

This is the difference between total revenues generated from agricultural activity and variable costs paid in cash. This concept focuses on the actual cash flows entering and leaving the farm during the growing season. This criterion is considered the minimum revenue for the producer, as it provides an indicator of technical efficiency. Based on this criterion, the farmer can continue production if net income exceeds variable production costs, or cease production if losses are incurred, since net income is less than variable production costs[8] .

**Recovery Period**

This is the time required to recover the value of the capital invested in the production process through the economic returns generated. This criterion is an analytical tool used to measure the time a project needs to recover its entire initial investment based on the annual cash flows generated from production activity. The payback period is calculated by dividing the total initial investment costs by the total expected annual cash flow (or annual profits). This relationship reflects the time required to fully recover the invested capital from operating returns. This method is used as a quick indicator of project liquidity and investment risk. The shorter the period, the faster the return on investment and the lower the financial risk[9].

**Return on Investment**

This is an economic indicator that measures the amount of revenue or profit generated for each dinar invested in an agricultural project over a specific period. It is calculated by comparing the revenue generated to the total production costs. This indicator reflects the efficiency of financial resource utilization and the project's ability to generate effective returns per dinar. Based on this principle, different agricultural projects can be evaluated in terms of the speed of profit realization and the efficiency of financial performance. A high return indicates higher productivity per unit of capital invested, while a low return indicates increased risk and lower relative returns. Therefore, this indicator is considered a fundamental tool in economic feasibility analysis and in guiding decisions towards the most productive and profitable agricultural projects per dinar invested[10].

**Productivity Profitability**

This is a ratio that measures a farm's profitability and economic efficiency in operating capital. It represents the final outcome of the decisions and policies implemented by the producer during the production period. This indicator can be found by dividing economic profits by productivity and multiplying by the percentage. It reflects the efficiency of resources used in converting inputs into tangible output. The higher this ratio, the

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higher the productivity profitability and the more efficient the use of agricultural resources[10].

**Measuring Investment Risks on a Farm**

Due to the biological nature of agricultural production, risk accompanies the farmer from the beginning of the production process until the crops ripen. Risks may arise from natural factors such as weather fluctuations and floods, or from agricultural pests that affect fruits and trees, in addition to other risks that threaten production, such as fires. The level of risk can be estimated using break-even analysis, which clarifies the relationship between revenues and production costs. It determines the production volume that generates revenues equal to the total production costs, thus enabling the evaluation of the efficiency of the agricultural project and the analysis of its associated economic risks.[11] First, the break-even price as a measure of price risk has two aspects:

**The first aspect:** The break-even price to cover total costs: This is the price at which the revenue from selling the produce equals the total production costs. At this point, the project neither makes a net profit nor incurs a loss. This is calculated by dividing the total cost by the total output. This price represents the minimum price at which the product must be sold to ensure the recovery of all expenses related to agricultural production, including fixed and variable costs. The break-even price is used as a tool to assess price risk, as it shows the agricultural sector the extent to which a project is exposed to market price fluctuations. The higher the break-even price, the greater the economic risk for the farmer, while a lower price indicates the ability to cover costs more easily and achieve relative financial stability. Therefore, this indicator is considered essential in production planning and marketing decisions in agricultural projects.

**The second aspect:** The break-even price to cover variable costs: This is the price at which the revenue from selling the produce equals only the variable costs. At this point, the product covers direct operating expenses without considering fixed costs. This price is an indicator of the minimum selling price that allows production to continue temporarily and is used to assess short-term price risks in agricultural projects. The closer the market price is to the variable break-even price, the more sensitive the project is to price fluctuations, while a price exceeding it indicates the possibility of covering variable costs and contributing to covering fixed costs[8].

**Secondly, the Break-Even Quantity as a Measure of Production Risk**

**The break-even quantity can be calculated in two ways:**

**First:** The Break-Even Quantity to Cover Total Costs: This is the production volume at which sales revenue equals total costs, such that the project neither makes a net profit nor incurs a loss. This indicator is used to estimate the minimum production quantity required to ensure that all production expenses, including fixed and variable costs, are covered. The break-even quantity provides a tool for assessing production and marketing risks. The higher the quantity required to break even, the greater the exposure to economic risks, while a lower quantity indicates the project's ability to achieve financial stability more easily. This concept is fundamental in agricultural production planning and in making decisions regarding the optimal level of production.

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**The second aspect:** Break-even quantity to cover variable costs: This is the production volume at which sales revenue covers only variable costs, without taking into account fixed costs, by dividing the variable cost by the average selling price. This indicator is used to determine the minimum production level that allows for the temporary continuation of the production process, and it reflects the project's sensitivity to short-term price fluctuations[11] .

**Results and Discussion**

**Ratio of Average Fixed and Variable Costs to Average Total Costs:**

Table (1) shows that the average fixed cost was (147238 dinars/dunum) out of the total average cost, representing (32%) for the 60-dunum category. The average variable cost was (313203 dinars/dunum) out of the total average cost, representing (68%) for the same 60-dunum category. This is attributed to the fact that agricultural production depends heavily on variable elements depending on the production volume. It was found that the amount of the average fixed costs amounted to (138422 dinars/dunum) of the total average costs, at a rate of (30%) for the 80-dunum category, while the value of the average variable costs amounted to (328549 dinars/dunum) of the total costs, at a rate of (70%) for the 80-dunum category. As shown in Table (1), the amount of the average total costs amounted to (480000 dinars/dunum), as the amount of the average fixed costs amounted to (150000 dinars/dunum), at a rate of (31%) of the average total costs for the 120-dunum category, while the value of the average variable costs amounted to (330000 dinars/dunum), at a rate of (69%) for the 120-dunum category of the average total costs. This is attributed to the fact that agricultural production depends to a large extent on variable factors related to the nature of the production process.

**Table (1) Average of total cost items and the amount and importance of each in the study area**

| Average Costs | 60 dunam category | | 80 dunam category | | 120 dunam category | |
|---|---|---|---|---|---|---|
| | Relative importance% | Value (dinars /dunum) | Relative importance % | Value (dinars /dunum) | Relative importance% | Value (dinars /dunum) |
| Average Fixed Costs | 32 | 147238 | 30 | 138422 | 31 | 150000 |
| Average Variable Costs | 68 | 313203 | 70 | 328549 | 69 | 330000 |
| Average Total Costs | 100 | 460441 | 100 | 466971 | 100 | 480000 |

**Source: Prepared by the researcher based on data from the questionnaire form.**

**Performance and Economic Efficiency Evaluation Indicators for Wheat Farmers in the (60, 80, 120) Dunam Size Groups**

Performance and economic efficiency evaluation indicators were estimated for wheat farmers in the (60, 80, 120) duam size groups. The following are the results of estimating these indicators for each size group of wheat farmers in the research sample:

**Performance, Economic Efficiency, and Investment Risk Assessment Indicators for the 60-Dum Category**

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The results of the economic performance indicators for the 60-dunum category reflect the nature of small agricultural holdings, which rely heavily on direct management by the farming family, with limited utilization of economies of scale.

**First: Performance, Economic Efficiency, and Investment Risk Assessment Indicators for the 60-Dum Category**

**1- Economic Profit**

The economic profit reached 155919 dinars/dunum, a positive result indicating that this category is capable of covering all its production costs and achieving an economic surplus. However, the level of this surplus remains relatively limited due to the high share of fixed costs per unit produced, as calculated by the following formula:

Economic Profit = Total Revenues – Total Costs

Economic Profit = 616360 - 460441 = 155919 dinars/dunum

**2-Net Cash Income**

The net cash income of (303157 dinars/dunum) reflects the farmer's ability in this category to generate good cash flows after covering variable costs, which is an important indicator of short-term cash stability. The significant difference between net cash income and economic profit indicates that fixed costs (particularly depreciation) constitute a considerable burden on this size of holdings. The value of net cash income was obtained using the following formula:

Net Cash Income =Total Revenues / Variable Costs

616360 / 313203 = 303157 dinars/dunum

**3- Payback Period**

The payback period of (3.7 years) indicates that investment in this category is considered medium-risk in terms of time, as the capital can be recovered within a reasonable period relative to the productive life of the project. However, this period remains sensitive to any fluctuations in prices or productivity. Capital Payback Period: Investment Costs / Total Annual Cash Flow (Profit)

Investment Costs = Depreciation (39000) * Productive Life (15 years) = 585000 dinars/dunum

Capital Payback Period: 585000 / 155919 = 3.7 years

**4- Return on Investment Dinar**

The results show that the return on investment dinar, which reached (1.3), means that each dinar of total costs generates an additional return of (0.3) dinars. This is a positive indicator, but it also reflects the limited ability to maximize returns given the small size of the holding and the relatively high costs.

Return on Investment = Revenue per Dunam / Total Costs per Dunam

Return on Investment = 616360 / 460441 = 1.3 dinars/dunam

**5- Productivity Profitability**

Productivity reached (2.05), indicating an acceptable economic profit per unit of production. However, this level of profitability remains subject to fluctuation due to climatic or price changes.

Productivity Profitability = Economic Profitability per Dunam / Productivity per Dunam * 100

155919 / 760 *100 = 2.05

**Second: Measuring Investment Risks in the Study Sample Farms (60-dunum Category)**

Regarding investment risks, the break-even price to cover total costs (605843 dinars/dunum) indicates that this category faces relatively high price risks, as maintaining a high selling price is required to avoid losses. Meanwhile, the break-even price for variable costs (412109 dinars/dunum) reflects a relative safety margin in the short term. The break-even

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quantity to cover total costs (0.567 tons/dunum) demonstrates that any decrease in production below this level puts the farm in a loss-making situation, confirming this category's sensitivity to production risks. This can be illustrated through investment risk metrics:

1- Break-even price as a measure of price risk: This can be calculated in two ways:

**First: Break-even price to cover total costs** = Total cost / Total production

460441 / 760 = 605843 dinars/dunum

**Second: Break-even price to cover variable costs** = Variable cost / Total production

313203 / 760 = 412109 dinars/dunum

2- Break-even quantity as a measure of production risk: This can be calculated in two ways:

**First: Break-even quantity to cover total cost** = Total cost / Selling price (tons)

460441 / 811000 = 0.567 tons/dunum

**Second: Break-even quantity to cover variable costs** = Variable cost / Selling price (tons)

313203 / 811000 = 0.386 tons/dunum

The table of economic efficiency and investment risk indicators for the 60-dunum category reflects the nature of small agricultural holdings, characterized by a relatively high burden of fixed costs and limited utilization of economies of scale. The realized economic profit demonstrates the ability of this category to cover all production costs and achieve a positive economic surplus, indicating the economic viability of agricultural activity. However, the limited profit reflects structural constraints associated with the small size of the holding and the high share of total costs per unit produced.

The relatively high net cash income, compared to the economic profit, highlights the ability of farmers in this category to generate positive cash flows after covering variable costs, reflecting short-term cash stability. However, the gap between net cash income and economic profit underscores the significant weight of fixed costs, particularly depreciation, in the cost structure.

The payback period indicates that investments in this category can be recovered within an average period relative to the productive lifespan. However, this period remains sensitive to price and productivity fluctuations, making this size of holding more vulnerable to risks in the event of economic or climatic shocks. The return on invested dinars confirms that each dinar of total costs generates a limited additional return, reflecting acceptable but not high economic efficiency due to the limited ability to reduce costs or significantly increase productivity.

Production profitability, on the other hand, shows an economic profit per unit of production. However, this level of profitability remains vulnerable to fluctuations in production or prices, which is consistent with the characteristics of small holdings. Regarding risk indicators, the relatively high break-even price for covering total costs indicates that this category is exposed to clear price risks, as maintaining a high price level is necessary to avoid losses. Meanwhile, the break-even price for variable costs reflects a limited safety margin in the short term. Break-even quantities also indicate this category's sensitivity to production risks, as any drop in production below the break-even level leads to direct economic losses.

**Performance, Economic Efficiency, and Investment Risk Assessment Indicators for the 80-Dum Category**

**First: Performance and Economic Efficiency Assessment Indicators (80-Dum Category)**

**1- Economic Profit**

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The economic profit reached (176089 JOD/dunum), the highest among the three categories. This reflects this category's ability to achieve a better balance between production volume and cost levels, and to partially benefit from economies of scale without incurring significant administrative complexities.

Economic Profit = Total Revenues – Total Costs

Economic Profit = 643060 – 466971 = 176089 JOD/dunum

**2- Net Cash Income**

This category recorded the highest net cash income (314511 JOD/dunum), indicating the strength of the farmers' financial position and their ability to self-finance agricultural activity and meet short-term obligations more efficiently. Net Cash Income: Total Revenue - Variable Costs

= 328549 - 643060 = 314511dinars/dunum

**3- Capital Recovery Period**

The capital recovery period was 3.8 years. Although slightly longer than the 60-dunum category, it remains within economically acceptable limits and is not a negative indicator given the high level of profitability achieved.

Capital Payback Period: Investment Costs / Total Annual Cash Flow (Profit)

Investment Costs = Depreciation (45172) * Productive Life (15 years) = 677580 dinars/dunum

3.8 years = 176089 / 677580 =

**4- Return on Investment Dinar**

The value of the return on investment dinar (1.37 dinars) indicates that this category achieves the highest economic efficiency, as each dinar of total costs generates an additional return of (0.37) dinars. This reflects the optimal use of inputs and the reduction of relative waste in resources.

Return on Investment = Revenue per Dunam / Total Costs per Dunam

Return on Investment = 643060 / 466971 = 1.37 dinars

**5- Productivity Profitability**

Production profitability (2.22) reached the highest value among the categories, indicating that this category achieves the best economic return per unit of production. This reflects the efficiency of organizing production processes and improving input management.

Economic profitability per dunam / Productivity per dunam * 100

176089 / 790*100 = 2.22

**Second: Measuring investment risks in the study sample farms (80-dunam category)**

The investment risk results indicate a lower break-even price to cover total costs (591102 dinars/dunam) compared to the 60-dunam category, suggesting lower price risk. Furthermore, while the break-even quantity (0.573 tons/dunam) is similar to the first category, the higher actual productivity reduces the likelihood of reaching the break-even point, making this category more stable and less exposed to risk.

**1- Break-even price as a measure of price risk: This can be calculated in two ways:**

**First: Break-even price to cover total costs = Total cost / Total production**

**466971 / 790 =591102** dinars/dunum

**Second: Break-even price to cover variable costs = Variable cost / Total production**

328549 / 790 = 415884 dinars/dunum

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**2- Break-even quantity as a measure of production risk: This can be calculated in two ways:**

**First: Break-even quantity to cover total cost = Total cost / Selling price (tons)**

466971 / 814000 = 0.573 tons/dunum

**Second: Break-even quantity to cover variable costs = Variable cost / Selling price (tons)**

328549 / 814000 = 0.403 tons/dunum

The results of the economic efficiency indicators table for the 80-dunum category indicate the best economic performance among the studied categories, reflecting a relatively ideal balance between landholding size, cost levels, and productivity. The economic profit recorded the highest value, demonstrating this category's ability to maximize the economic surplus generated from agricultural activity. This is due to improved resource management and partial utilization of economies of scale without incurring high regulatory burdens.

The high net cash income also reflects the strong financial position of farmers in this category and their ability to meet short-term financial obligations and finance production operations more efficiently, thus reducing their reliance on external financing sources. The capital payback period, while similar to that of the smaller category, indicates relative investment stability, especially when compared to the high level of profitability achieved.

The highest return per invested dinar among the categories confirms that this category achieves the highest economic efficiency in input utilization. Every dinar of total costs generates an additional return exceeding that achieved by the other categories, a clear indicator of optimal use of production factors. High productivity also reflects achieving the best economic return per unit of production, indicating improved technical and organizational efficiency in managing agricultural operations.

From an investment risk perspective, lower break-even prices compared to other categories indicate reduced price risk. Furthermore, while break-even quantities are similar to other categories, higher actual productivity creates a larger safety margin, making this category less exposed to production risks. Therefore, this category can be considered the most economically stable and the least sensitive to market and climatic fluctuations.

**Performance Evaluation Indicators, Economic Efficiency, and Investment Risks for the 120-Dum Category**

**First: Performance Evaluation Indicators (120-Dum Category)**

**1-Economic Profit**

The results for the 120-dunum category indicate that the economic profit reached 123000 dinars/dunum, the lowest among the three categories, despite the large size of the holding. This reflects the high total costs, particularly fixed and administrative costs, which were not matched by a similar increase in revenues, indicating a weak utilization of economies of scale.

Economic Profit = Total Revenues – Total Costs

603000 – 480000 = 123000 dinars/dunum

**2- Net Cash Income**

Net cash income decreased to 273000 dinars/dunum, reflecting the pressure of variable costs and high operating requirements, which reduces the farmer's resilience to short-term economic shocks. Net Cash Income = Total Revenue - Variable Costs

603000 – 330000 = 273000 dinars/dunum

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**3- Capital Payback Period**

The capital payback period (5.24 years) is the longest among the categories, indicating a high time-based investment risk and reflecting the slow recovery of invested capital due to low relative profitability.

Capital Payback Period = Investment Costs / Total Annual Cash Flow (Profit)

Investment Costs = Depreciation (43000) * Productive Life (15 years) = 645000 dinars/dunum

645000 / 123000 = 5.24 years

**4- Return on Investment Dinar**

The return on investment dinar (1.25) is the lowest, a clear indicator of declining economic efficiency in this category. It suggests that increased size has not necessarily led to improved returns but has been accompanied by regulatory and administrative burdens.

Return on Investment = Revenue per Dunam / Total Costs per Dunam

603000 / 603000 = 1.25 dinars

5- **Productivity Profitability**

The productivity profitability value reached (1.64), the lowest among the categories, indicating a low economic return per unit of production and suggesting a relative waste in resource utilization.

Production Profitability = Economic Profitability per Dunam / Productivity per Dunam * 100

123000 / 750 *100 = 1.64

**Second: Measuring Investment Risks in the Study Sample Farms (120-Dum Category)**

Regarding investment risks, the high break-even price to cover total costs (640 dinars/dunam), along with the high break-even quantity (0.597 tons/dunam), reflects a higher exposure to both production and price risks. This category requires high production levels and selling prices to avoid losses, making it more sensitive to climatic and market fluctuations. 1- Break-even price as a measure of price risk: This can be calculated in two ways:

**First: Break-even price to cover total costs = Total cost / Total production**

480000 / 750 = 640 dinars/dunam

**Second: Break-even price to cover variable costs = Variable cost / Total production**

330000 / 750 = 440 dinars/dunam

**2- Break-even quantity as a measure of production risk: This can be calculated in two ways:**

**First: Break-even quantity to cover total cost = Total cost / Selling price (tons)**

480000 / 804000 = 0.597 tons/dunum

**Second: Break-even quantity to cover variable costs = Variable cost / Selling price (tons)**

330000 / 804000 = 0.410 tons/dunum

The results of the economic efficiency indicators table for the 120-dunum category reflect that the expansion in landholding size was not accompanied by a corresponding improvement in economic performance. Economic profit registered the lowest level among the categories, indicating that high total costs, particularly fixed and administrative costs, limited the ability to achieve a high economic surplus. This reflects the weak utilization of economies of scale and may

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indicate regulatory or technical bottlenecks in managing large holdings.

The relatively low net cash income also demonstrates that high variable costs negatively impacted cash flows, reducing farmers' resilience to short-term shocks. The long payback period confirms that investment in this category carries high time risks, as capital recovery requires a longer period compared to the productive lifespan, thus diminishing the attractiveness of this investment scale.

The low return per invested dinar indicates a decline in the economic efficiency of resource utilization, as each dinar of total costs generates a limited additional return, reflecting relative waste of production factors. Furthermore, the low productivity reflects the weak economic return per unit of production, confirming that increasing scale alone does not guarantee an improvement in economic efficiency. Regarding investment risks, the high break-even prices and quantities indicate that this category is exposed to high price and production risks, as achieving high levels of production and prices is required to cover total and variable costs, making this category more sensitive to climate and market fluctuations, and less economically stable compared to other categories.

**Table (2): Performance and economic efficiency evaluation indicators for wheat farmers across different crop sizes**

| Indicator | 60 dunam category | 80 dunam category | 120 dunam category |
|---|---|---|---|
| | Value | Value | Value |
| Economic Wind | 155919 | 176089 | 123000 |
| Net Cash Income | 303157 | 314511 | 273000 |
| Capital Payback Period | 3.7 | 3.8 | 5.24 |
| Return on Invested Dinar | 1.3 | 1.37 | 1.25 |
| Productivity Profitability | 2.05 | 2.22 | 1.64 |
| Breakthrough Rate to Cover Total Costs | 605843 | 591102 | 640 |
| Breakthrough Rate to Cover Variable Costs | 412109 | 415884 | 440 |
| Breakthrough Quantity to Cover Total Costs | 0.567 | 0.573 | 0.597 |
| Breakthrough Quantity to Cover Variable Costs | 0.386 | 0.403 | 0.410 |

Source: Prepared by the researcher based on data from the questionnaire form.

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**An analytical summary of performance, economic efficiency, and investment risk indicators for wheat farmers of different size categories in the study sample.**

Based on the results obtained from performance, economic efficiency, and investment risk indicators for wheat farmers according to size categories (60, 80, and 120 dunams), a clear disparity in economic performance emerges, reflecting the impact of landholding size on resource utilization efficiency and return stability. The medium-sized category (80 dunams) generally demonstrated the best economic performance, achieving the highest economic profit and net cash income, along with the highest return on invested dinars and the best productivity. This indicates its ability to achieve a relative balance between cost levels and productivity, and to partially benefit from economies of scale without incurring high administrative or technical burdens. In contrast, the small category (60 dunams) demonstrated an acceptable ability to achieve an economic surplus and positive cash flows. However, the relatively high fixed costs and the sensitivity of production and prices made this category more vulnerable to price and productivity risks, and less able to absorb economic shocks. As for the large holding category (120 dunams), the results showed that expanding the holding size was not accompanied by a similar improvement in economic efficiency. This category recorded the lowest levels of economic profit and productivity, the longest payback period, and higher break-even prices and quantities. This reflects a weak actual utilization of economies of scale and a higher level of investment risk. Therefore, it can be concluded that the medium holding category represents the economic size closest to efficiency and stability for wheat farmers in the study sample. Holdings smaller or larger than this size lead to a relative decline in economic performance and a higher degree of risk.

**Conclusions**

**Based on the research findings, the following conclusions were drawn:**

1.The research results showed clear differences in economic efficiency indicators among the different holding sizes of wheat farmers in the Samarra district, confirming the impact of holding size on the level of economic performance and resource utilization efficiency.

2. The medium holding category (80 dunams) achieved the best economic performance, recording the highest economic profit, net cash income, and the best return on invested dinars. This indicates its ability to achieve a relative balance between costs and productivity.

3. The results showed that the small holding category (60 dunams) was capable of achieving a positive economic surplus. However, the relatively high burden of fixed costs made it more vulnerable to price and productivity risks.

4. The large holding category (120 dunams) exhibited the lowest levels of economic efficiency and the longest payback period, indicating that the expansion in holding size was not accompanied by a corresponding improvement in efficiency.

5. The break-even price and quantity indicators confirmed that the level of investment risk varied according to holding size, with the risk being relatively lower for the medium holding category compared to the other two categories.

6. The overall results indicate that the medium holding size represents the closest level to achieving efficiency and investment stability in wheat production within the study area.

The research findings confirm its main hypotheses, as significant differences were found in economic efficiency indicators among the holding categories. The impact of agricultural holding size on both efficiency and investment risk was confirmed, and the

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results demonstrated the superiority of the medium holding category compared to the small and large holding categories. This aligns with the findings of numerous previous studies, which have confirmed that medium-sized farms often achieve the best balance between costs, productivity, and economic stability. Therefore, the results of the current research do not contradict existing literature; rather, they contribute to and reinforce it within a different production environment, providing recent practical evidence from the agricultural sector in Samarra district.

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