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ESTIMATION OF MARKETING EFFICIENCY AND PRODUCTION QUANTITY AT THE BREAK-EVEN POINT FOR COTTON FARMERS IN IRAQ (BAGHDAD PROVINCE: A CASE STUDY)

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Abstract

The research aimed to estimate the marketing efficiency and the quantity and value of production at the break-even point for cotton farmers, which is one of the most important criteria for the economic feasibility of farms and the boundary between the losing volume and the profitable volume of production. It also aimed to determine the trend and time development for the area, production, and productivity of cotton in Iraq and Baghdad province. Initial field data for the last agricultural season of 2016 were used, and collected in 2022 by designing a questionnaire for cotton farmers in Baghdad province. This data encompassed the entire process, from the beginning of crop cultivation until its marketing, for a simple random sample of farmers, constituting about 18% of the study population (333 farmers) distributed over various agricultural areas specialized in cotton cultivation in the province. The results showed that the quantitative break-even point for the unit area was about 166 kg/dunum, which is the minimum required to cover the costs of cultivating one dunum of the crop, ensuring a net profit for the farmer. The monetary break-even point for the unit area amounted to about 202,432 Iraqi dinars/dunum, equivalent to about 135 US dollars. Notably, the average productivity of a dunum in the research sample was about 215 kg/dunum, meaning that the farmers of this crop can achieve profits from

cultivating one dunum of 49 kg of cotton. The research recommends that sample farmers should pre-prepare and plan for all production processes related to the crop, starting from cultivation till the final marketing process.

Keywords: Profitable Volume, Losing Volume, Marketing Performance, Marginal Concept, Total Concept.

تقدير الكفاءة التسويقية وكمية الانتاج عند نقطة التعادل لمزارعي القطن في العراق (محافظة بغداد: دراسة حالة)

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الخلاصة

استهدف البحث تقدير الكفاءة التسويقية وكمية وقيمة الانتاج عند نقطة التعادل لمزارعي محصول القطن التي تعد واحدة من اهم معايير الجدوى الاقتصادية للمزارع والحد الفاصل بين الحجم الخاسر والحجم المربح للإنتاج، وايضا تحديد الاتجاه والتطور الزمني لكل من المساحة والانتاج والانتاجية للمحصول في العراق وفي محافظة بغداد. تم استعمال بيانات اولية ميدانية لآخر موسم زراعي 2016، جمعت عام 2022 بتصميم استمارة استبانة خاصة بمزارعي محصول القطن في محافظة بغداد بدأً من بداية زراعة المحصول حتى جنيه وتسويقه ولعينة عشوائية بسيطة منهم شكلت نسبتها حوالي 18% من مجتمع الدراسة (333 مزارعا) موزعين على مختلف المناطق الزراعية المتخصصة بزراعة القطن في المحافظة. أوضحت النتائج المقدرة ان نسبة الكفاءة التسويقية لمحصول القطن قد بلغت نحو 98% وهو مؤشرا قوياً لمستوى الاداء التسويقي على مستوى العينة المبحوثة. كما أوضحت نتائج البحث ان نقطة التعادل الكمية لوحدة المساحة قد بلغت حوالي 166 كغم/ دونم كحد أدنى لتغطية تكاليف زراعة دونم واحد من المحصول ليتحقق بعد ذلك الناتج ربحا صافيا للمزارع، أما نقطة التعادل النقدية لوحدة المساحة فقد بلغت حوالي 202432 دينار عراقي/ دونم أي ما يعادل نحو 135 دولار امريكي. علما ان متوسط انتاجية الدونم في عينة البحث بلغ نحو 215 كغم/ دونم بمعنى ان مزارعي هذا المحصول بإمكانهم تحقيق ارباحا عن زراعة دونم واحد بلغت كميته 49 كغم من القطن. يوصي البحث بضرورة قيام مزارعي العينة بالتحضير المسبق والتخطيط لجميع العمليات الإنتاجية المتعلقة بالمحصول، بدءًا من الزراعة وحتى عملية التسويق النهائي.

كلمات مفتاحية: الحجم المربح، الحجم الخاسر، الاداء التسويقي، المفهوم الحدي، المفهوم الكلي.

Introduction

The agricultural sector represents an important source of Iraq's national income, as the development of this sector is a prerequisite for laying the foundations for an industrial renaissance necessary for the agricultural renaissance itself, where industrial crops occupy an important place in the Iraqi economy as raw materials in many foods and manufacturing industries (18). However, the cultivation and production of these crops in Iraq have witnessed a significant decrease, especially in recent decades, and one of the reasons for this is the change in the relative prices of alternative and competing crops on the ground (9). So, the farmers are shift to other more profitable and less expensive crops. The cultivation of many industrial crops such as flax was stopped during the seventies, and the production quantities of some of them decreased, such as sugar beet (4). The areas planted with most industrial crops witnessed a significant decrease in Iraq, amounting to about 59% during the last decades (8). However, the cotton crop continued to occupy a leading position among industrial crops, as well as the country's interest in it, which prompted the Ministry of Agriculture and relevant decision-makers to introduce the National Cotton Program that was interested in developing cotton varieties and spreading them among farmers and supporting the process of its production and marketing with mechanisms in line with its economic importance (7). The cotton crop is at the forefront of the important summer industrial crops after the rice crop in Iraq, where its contribution to the value of the agricultural plant product is about 15% (1), and its economic importance is due to the fiber it produces primarily used in the textile industry, medical cotton, furniture, crackers and paper, and to the oils content of its seeds ranges between 18-26% in the second degree. It is used in the manufacture of vegetable oils for direct cooking purposes, as well as in the manufacture of soap, and the use of the remnants of oil manufacturing plants (meal cakes) as fodder for cows mixed with other feed materials (9). Cotton is grown in Iraq from mid-March to the end of April, and its cultivation is concentrated in the northern and central regions, as it is grown in large areas, while smaller areas are cultivated in the southern region due to the lack of environmental conditions suitable for its growth, and the most important governorates producing it are Nineveh, Kirkuk, Salah al-Din, Baghdad, Anbar, Diyala, Wasit and Babylon (18). Cotton cultivation in most regions of Iraq is limited to only one variety, which is (Coker Wald) for its good features and its acceptance in the local and foreign markets and to preserve it without the other lesser quality varieties as well as its suitability to Iraq's environmental conditions (1). Despite the economic importance of the cotton crop and the increasing interest in it by the state during successive periods of time (7 and 8), its cultivation in Iraq began to decline, especially in Baghdad province, and it was noted that in recent years many farmers have stopped cultivating it and its productivity has decreased and the inability to meet the needs of textile factories and vegetable oil factories from it (4). Therefore this study is complementary to other studies that preceded it in the same field, and Baghdad province was chosen as a case study for the following reasons:

1- It has the largest population density among the governorates of Iraq.

2- The decrease in its production capacity of cotton relative to the rest of the governorates producing it for one reason or another.

The research mainly aims to estimate the marketing efficiency and the volume of production at the break-even point for cotton farms in Baghdad province, by achieving the following sub-objectives:

1- Studying the reality of cotton cultivation and production in Iraq and Baghdad province for the period 2000-2020, and identifying the most important reasons that led to the failure of its cultivation in the province in recent years.

2- Calculating the marketing efficiency and determining the best levels of productivity of the cotton crop in Baghdad province, which do not expose the financial position of the farmers to the losses.

Materials and Methods

The research relied on two types of data to reach its goals, the first of which is the official data issued by specialized institutions such as the Ministry of Agriculture and the Ministry of Planning, and the second is the field data and its source is the agricultural producers of cotton crop by designing a questionnaire for the study, in which the personal interview was conducted with 60 farmers out of about 333 farmers in areas that its cultivation is concentrated in Baghdad province (Al-Tarmiyah and Al-Madain districts) during 2022 year, and data were collected from the cultivation of the crop until the stage of harvesting and marketing to the local markets concerned with receiving and selling the crop.

The research follows the objective approach, adopting the quantitative method, in measuring the impact of time development on the area, production and productivity of the cotton crop in Iraq and Baghdad province, and then estimating the marketing efficiency and the break-even point for the crop under study, which is the point at which the levels of output are determined at which the opportunity to make profits begins for the farmer according to the total and marginal concepts of the relevant economic functions (6), which are the concepts adopted in the agricultural management of any agricultural crop.

Marketing efficiency is one of the most important economic criteria used in measuring market performance, and improving marketing efficiency is a common goal for both producers, consumers and marketing facilities for food commodities and society in general (2). Marketing efficiency can be defined as the highest ratio between the output of the marketing activity needed to satisfy the consumer with goods and services and the total cost of the resources used in the production process (5). Based on this, marketing efficiency can be increased in two ways (5):

1- Making changes that reduce the cost of functional performance of a particular product without accompanying a decrease in the saturation obtained by the consumer.

2- Increasing marketing benefits without accompanying an increase in marketing costs.

Some economists have been able to measure marketing efficiency as follows (2):

$$\mathrm{ME} = 100 - \frac{\mathrm{MC}}{\mathrm{MC} + \mathrm{PC}} \times 100$$

Where: ME = Marketing Efficiency.

MC = marketing costs.

PC = production costs.

Thus, we have a concept linking production activity and marketing activity through costs. And when the differences or marketing costs are equal with production costs, the marketing efficiency is equal to 50%, and it decreases from that percentage if the marketing costs exceed the production costs, and vice versa, it increases from that percentage if the marketing costs are less than the production costs (5).

Relating to the break-even point, which is one of the criteria for the economic feasibility of farms, it is related to (technical) policies in the short term that are required by investment and financing decisions and related to estimating the relationship between the volume and costs of production, prices and profits achieved, which fall within the expectations of the producer, which are no more than complete certainty (15). The problem facing the farm administration is the inability to read the near future (special expectations related to the volume of output, costs and profits) as well as the general expectations related to price policies, the volume of resource use, taxes and other policies at the level of the agricultural sector in the long term that are difficult to predict (14).

The break-even point is a means and tool used by the farm manager to determine the amount of production that represents the minimum monetary units or quantity so that the revenues generated from it are equal to the total production costs in order to avoid loss (14), and the difference in the volume of production at the break-even point between one farm and another depends on the disparity in the productivity of a dunum of the crop and the different fixed and variable production costs and the selling prices of the crop, on which the investment decision and financing in the farm are depend on it (12). As such a decision is tactical (short-term) policies that fall within the foreseeable future and do not depart from the framework of planning for working capital and determining the necessary needs for it, and long-term financing policies related to the volume of investments in fixed assets (3), As for how to calculate the break-even point, there are two concepts used in farm management to determine the break-even point for the agricultural crop, and they are as follows (13):

1- According to the marginal concept: According to this concept, the production quantity can be obtained at the break-even point, and according to this method, the break-even point can be calculated (by quantitative aggregates) as follows (16):

$$Y = \frac{TFC}{MR - MC}$$

Where: Y = the quantity of production at the break-even point (in quantitative aggregates).

2- According to the total concept: According to this concept, the value of production can be obtained at the break-even point, as the break-even point is determined by the equality of total costs with total revenues, so the equation is as follows (17):

$$Y = \frac{TFC}{1 - \frac{TVC}{TR}}$$

Where: Y = the value of production at the break-even point (in monetary aggregates).

The previous two equations can be expressed in another form, as follows:

First// Quantity of production at the break-even point (marginal concept) = fixed costs ÷ (selling price per unit of output - unit variable costs).

Where the difference between the unit selling price and the unit variable cost is called the marginal profit or contribution margin, which helps in knowing the extent to which one unit sold of production contributes to covering fixed costs.

Second// the value of production at the break-even point (total concept) = the quantity of production at the break-even point x the selling price of the output unit.

Results and Discussion

First: Studying the reality of cotton cultivation and production in Iraq and Baghdad province for the period (2000-2021): Table 1 shows the nature of the changes that occurred in the area, yield and production after changing many economic development plans in Iraq during the research period, as well as clarifying the role of economic development strategies in expanding the base of agricultural investments and achieving the required agricultural growth rates from industrial crops. The area allocated to cotton cultivation witnessed an annual decline of 43 dunums, while productivity also witnessed an annual decrease of 5%. The changes taking place in the mentioned indicators have reflected their effects on the quantities produced from the crop in Iraq. Cotton production witnessed an annual decrease of 48 tons during the research period, as the period that extended from 2000 to 2003 was devoid of tight development plans and remained under directing and monitoring the Planning Commission, which replaced the abolished Ministry of Planning, along with the economic embargo on Iraq since August 1990. Therefore, the attention of the Ministry of Agriculture and the Planning Commission was engaged to directing and following up the expansion of the area of cereal crops, especially wheat and barley, in order to meet the requirements of the ration card without growth the rest of the crops, including industrial crops, where the government's procedures necessitated the imposition of wheat cultivation on irrigated lands throughout Iraq, which was negatively reflected on the cultivated areas and the production of industrial crops, including cotton.

Table 1: Annual growth rates for the area (dunum), production (ton) and productivity (kg/dunum) of cotton crop in Iraq and Baghdad province for the period 2000-2021.

Year	Iraq			Baghdad province				
	Area	Production	Yield	Area	%	Production	%	Yield
2000	78900	32800.00	416	8677	11.00	1200	3.66	138
2001	160700	65200.00	406	9523	5.93	2800	4.29	294
2002	191400	112800.00	589	14439	7.54	4123	3.66	286
2003	67300	13200.00	196	6303	9.37	1325	10.04	210
2004	79800	36800.00	461	6334	7.94	1734	4.71	274
2005	108000	42800.00	396	16128	14.93	3411	7.97	212
2006	89200	37500.00	420	9858	11.05	2387	6.37	242
2007	65800	29000.00	441	5060	7.69	1708	5.89	239
2008	30600	11600.00	379	8762	28.63	2182	18.81	249
2009	53200	23900.00	449	6911	12.99	1529	6.40	221
2010	82300	45300.00	550	7836	9.52	1855	4.09	237
2011	54200	34500.00	637	7373	13.60	1760	5.10	239
2012	65500	26600.00	406	6115	9.34	1250	4.70	204
2013	53000	27700.00	523	2048	3.86	430	1.55	210
2014	3300	1400.00	424	798	24.18	290	20.71	363
2015	500	75.00	154	533	106.60	112	149.33	210
2016	697	84.00	121	269	38.59	37	44.05	138
2017	930	86.00	93	**The crop was not grown in the province**				
2018	130	37.00	280					
2019	26	2.00	77					
2020	60	22.00	367					
2021	13	3.00	231					
Mean	**53800**	**24600**	**364**	**6880**	**-**	**1655**	**-**	**233.3**
***Growth**	**43 -**	**48 -**	**0.05 -**	**0.2 -**	**-**	**0.18 -**	**-**	**0.01 -**

Source: Ministry of Planning, Ministry of Agriculture / Baghdad Agriculture Directorate, * Calculated by researchers based on the following annual growth equation:

$$Y = e^{B+B_1T} \ldots\ldots\ldots (1) \qquad Lny = Bo + B_1T \ldots\ldots\ldots (2)$$

At the level of Baghdad governorate, as it is clear from the same table, the annual growth rate of the area planted with cotton decreased by 20%, the reason for this is the averseness of many farmers to cultivate it due to the length of its stay in the land and the preponderance of competing crops to outweigh the net revenue per unit area of these crops compared to the net revenue per unit area of cotton, which prompted many farmers to shift to planting vegetable crops with higher yields, so this was reflected on the size of the cultivated areas, in addition to the decrease in the demand of cotton due to the termination of the cotton industries. The productivity of the crop also witnessed a decrease of 1% due to the different growth periods of the cultivar (Coker) and the cultivar (Ashur), which requires the application of different agricultural treatments that affect the state of balance between the production of vegetative and fruitful branches, such as the timing of adding fertilizer doses and irrigating periods because the variety (Coker) is late in maturity compared to the period that matures in it the variety (Assyrian) and the increase in vegetative growth during the second period to continue the pursuit for short periods during the period in which the temperatures decrease after October month, which causes a delay in ripening and blooming, and the effect of this appears on the date of the next fairies. The results of Table 1 also showed that production witnessed a decrease of 18% during the mentioned period. The reason for this is due to factors, including the variation in plant density per unit area, due to the

different methods of cultivation on the meadows, or the use of canals opening, due to the lack of ginning machines in many areas of cotton cultivation. The crop was exposed to the phenomenon of sluggishness due to the continuous dust storms in the cotton-growing areas, in addition to the great role that the dominant pests, including spiders and the whitefly that infect the cotton crop during the periods of maturity and openness, which reflects its negative impact on the quantities produced from this crop.

By examining the opinions of the sample farmers about the most important reasons that led to the suspension of crop cultivation in the governorate for the period from 2017 to 2021, it became clear that there are five main reasons that led to this as shown in Table 2, which are according to their importance to farmers: the reasons for both the unavailability of seeds with good productivity and internationally approved, and the lack of fertilizers allocated to the crop as well as their high prices, ranked first in being responsible for this stop by 100%, as these two reasons were confirmed by all the farmers of the studied sample. Followed by the effect in terms of importance is the cause of infecting the crop with some diseases, such as the cotton nut spiny worm with a percentage of 98%, and the deterioration of the security situation in the study districts with ratio 73%. While the reason for the lack of specialized agricultural seminars by qualified experts in the field of cotton cultivation ranked last in being responsible for this halt by 55%, as the number of sample farmers who referred to this reason were about 33 out of 60 farmers.

Table 2: The relative importance of the reasons for stopping the cultivation of the cotton crop in Baghdad province.

No.	Reasons to stop cotton growing	Number of farmers	%
1	Lack of good yielding and globally approved seeds	60	%100
2	Infection of the crop with some diseases, such as the spiny cotton nut worm	59	%98
3	The lack of fertilizers allocated to the crop, as well as the high prices	60	%100
4	The deterioration of the security situation in the districts where its cultivation is concentrated	44	%73
5	Lack of specialized agricultural seminars by qualified experts in the field of cotton cultivation	33	%55

Source: Calculated by researchers based on data of field survey.

Second: Analysis of the fixed costs, variable costs and total revenue of the cotton crop in the study sample for the 2016 agricultural season

1. The relative importance of the variable costs of producing one ton and one dunum of cotton: Table 3 indicates that the costs of chemical and organic fertilizers accounted for about 33% of the total variable costs before harvesting, followed by the mechanical work expenses by about 30%, then the expenses of seeds, temporary maintenance expenses, pesticides, manual labor and irrigation, respectively. The average variable costs before harvesting necessary to produce one ton of cotton is about 1799,132 dinars, or about 1199 dollars. Table 3 also shows the average pre-harvest variable costs required for cultivating one dunum of cotton. The variable costs items occupied the same relative importance that they occupied in the case of producing one ton of the crop. The average pre-harvest variable costs required to produce one dunum of cotton were about 386,833 dinars.

Table 3: The average variable costs of producing one ton and one dunum of cotton before harvesting in the study sample.

Items of TVC before harvesting	Cost dinar / ton	%	Items of TVC before harvesting	Cost dinar / dunum	%
Seed expenses	212170	11.8	Seed expenses	45619	11.8
Fertilizer expense	587264	32.6	Fertilizer expense	126268	32.6
Pesticide costs	129462	7.2	Pesticide costs	27836	7.2
Manual labor expenses	115566	6.4	Manual labor expenses	24848	6.4
Automation expenses	545755	30.3	Automation expenses	117343	30.3
Irrigation expenses	19340	1.2	Irrigation expenses	4158	1.2
Temporary maintenance expenses	189575	10.5	Temporary maintenance expenses	40761	10.5
Total	**1799132**	**100**	**Total**	**386833**	**100**

Source: Calculated by researchers based on data of field survey.

By reviewing the results of Table 4, it is clear that the variable costs needed to produce a ton of the crop before harvesting accounted for more than 82%, and the contribution of harvest costs was about 15%, and marketing costs were about 2% of the total variable costs needed to produce one ton of cotton, which amounted to about 2179085 dinars, which is approximately 1453 dollars. On the other hand, Table 4 also indicates the ratios of the contribution of variable costs before and after harvest and marketing costs to the total variable costs needed to grow one dunum of cotton, amounting to about 468,526 Iraqi dinars, or approximately 312 US dollars. The proportions of these items were similar to the previous ones needed to produce a ton of the crop under study.

Table 4: The ratio of the contribution of items of variable costs to the total variable costs necessary to produce one ton and one dunum of the cotton crop.

Items of TVC	Cost dinar / ton	%	Items of TVC	Cost dinar / dunum	%
Variable costs before harvest	1799132	82.56	Variable costs before harvest	338683	82.56
Harvest costs	330991	15.19	Harvest costs	71166	15.19
Marketing costs	48962	2.25	Marketing costs	10527	2.25
Total	**2179085**	**100**	**Total**	**468526**	**100**

Source: Calculated by researchers based on data of field survey.

2. The relative importance of fixed costs in cotton production farms in Baghdad province: The items of fixed costs (Table 5) indicate that the depreciation has taken the largest percentage in the total fixed cost of producing one ton of the crop, at about 75%, followed by the opportunity cost of the work of the farm manager and his family members, at about 24%, and then the land rent, as it constituted only 2%, because the leased land is from the land contracted with the agrarian reform and with a simple rental fee. The average fixed costs of producing a ton of cotton amounted to about 741,741 dinars, or approximately $494. Table 5 also indicates the fixed cost items for cultivating one dunum of cotton, and these items occupied the same relative importance as the items of costs needed to produce one ton of the crop, where the item of depreciation acquired the largest share of about 75% of the total fixed costs needed to grow one dunum of the crop, amounting to about 159,482 Iraqi dinars, or approximately 106 US dollars.

Table 5: Average fixed costs in cotton production farms for the study sample.

Items of TFC	Cost dinar / ton	%	Items of TFC	Cost dinar / dunum	%
Land rent	10377.36	1.40	Land rent	2231.24	1.40
Depreciation value	557778.30	75.20	Depreciation value	119927.99	75.20
Family work costs	173584.91	23.40	Family work costs	37322.52	23.40
Total	**741740.57**	**100**	**Total**	**159481.74**	**100**

Source: Calculated by researchers based on data of field survey.

3. The relative importance of fixed and variable costs to the total costs of producing one ton and one dunum of cotton: Table 6 summarizes the contribution of each of the variable and fixed costs to the total costs at the level of the research sample, as the variable costs constituted the highest percentage of about 75% of the total costs and the variable costs before harvest were the highest variable cost items by about 62%. As for the fixed costs, they constituted the lowest percentage of about 25% of the total cost, and the item of depreciation was the highest among the fixed cost items, contributing to the total costs by 19%.

Table 6: Percentage of fixed and variable costs and their items to the total costs in cotton cultivation in the research sample for the 2016 agricultural season.

Items of TC	Total sample costs / dinars	Cost dinar / ton	%	Cost dinar / dunum	%
Variable costs before harvest	190708000	1799132	61.60	386833	61.60
Harvest costs	35085000	330991	11.33	71166	11.33
Marketing costs	5190000	48962	1.68	10527	1.68
Total Variable Costs	**230983000**	**2179085**	**74.61**	**468526**	**74.61**
Land rental costs	1100000	10377.36	0.36	2231.24	0.36
Depreciation cost	59124500	557778.30	19.10	119927.99	19.10
Family work cost	18400000	173584.91	5.94	37322.52	5.94
Total Fixed Costs	**78624500**	**741740.57**	**25.39**	**159481.74**	**25.39**
Total Costs	**309607500**	**2920825.57**	**100**	**628007.74**	**100**

Source: Calculated by researchers based on data of field survey.

4. The net revenue per unit area and production unit for the cotton crop: Table 7 shows that the net revenue of the area unit amounted to about - 366 thousand Iraqi dinars, which is equivalent to about 244 US dollars. As for the net revenue of the production unit, that is, the net revenue realized from producing one ton of cotton, it amounted to about -1.702 million Iraqi dinars, which is equivalent to about 1135 US dollars.

Table 7: The average total costs and net return per unit area and production for the cotton crop in the study sample for the 2016 agricultural season.

Items of TC & TR	Total value/ dinars	Value / dinars per ton	Value / dinars per dunum
TC	309607500	2920825.57	628007.74
TR	129197500	1218844.34	262063.895
Net Return (Profit)	**180410000 -**	**1701981.2 -**	**365943.84 -**

Source: Calculated by researchers based on data of field survey.

Third: Estimating the marketing efficiency of the cotton crop in Baghdad province for the 2016 agricultural season.

By estimating the marketing efficiency of the cotton crop from its mathematical

equation, it was found that the efficiency ratio reached about 98%, as shown in the equation:

$$\mathrm{ME} = 100 - \frac{\mathrm{MC}}{\mathrm{MC} + \mathrm{PC}} \times 100$$

$$ME = 100 - \frac{5190000}{5190000 + 225793000} \times 100 = 97.75\%$$

This percentage is a strong indicator of the level of marketing performance of the cotton crop in Baghdad province, which means that the marketing costs borne by the farmers of the crop are less than the production costs spent, the reason for this is that most farmers sell their production to traders in the markets near their place of residence because there is no specialized marketing centers receive the crop after a pound, as indicated by the respondents in the study, and this indicates that most of the marketing costs are borne by intermediaries or traders, as well as their control of the prices of selling the crop in local markets.

Fourth: Estimation of the quantity and value of production at the break-even point for cotton farmers in Baghdad province for the 2016 agricultural season

- Break-even point in quantitative aggregates (the amount of production at the break-even point):

1. Quantity of production at the break-even point at the level of the sample farms: The amount of production at the break-even point was calculated for all sixty farmers included in the study sample, the results were as follows:

Quantity of production at the break-even point = total fixed costs ÷ (rate of revenue per ton - rate of variable costs per ton)

$$y = \frac{TFC}{MR - MC} = 78624500 \div (1218844.34 - 2179085) = 81.9 \text{ ton} = 82000 \text{ kg}$$

Means the amount of production at the break-even point that was calculated, which is about 82 tons, is the minimum output that must be produced by all the cotton farmers covered in the study in order to cover all their costs, and what exceeds this volume of output is considered a profit, while what is less than this amount is a loss. But in practice, the cotton farmers in the research sample work in isolation from each other, and then the amount of production at the break-even point for all farmers may not serve them in making an individual decision. So in order to enable the managers of individual farms in the research sample to know the volume of production at the break-even point, this volume must be calculated at the level of the unit area (one dunum).

2. The amount of production at the break-even point at the unit area level (tons / dunum): It can be calculated by dividing the volume of production at the break-even point of the total area obtained in the first step (82 tons) by the total area planted with cotton for the research sample, which is 493 dunums, as it is explained below:

$$Q = \frac{Y}{493} = 81.9 \div 493 = 0.166 \text{ ton/dunum} = 166 \text{ kg/dunum}$$

So, the amount of production at the break-even point per dunum is about 166 kg, meaning that the minimum productivity of a dunum of cotton at the level of the individual farm, which is required to be achieved for the purpose of covering the costs of cultivating one dunum of the crop, is that it should not be less than 166 kg, and what exceeds this limit is it is a profit, and what is less than it is a loss.

When comparing the output at the break-even point per dunum (166 kg) with the average productivity of one dunum in the research sample of 215 kg (106000 kg ÷ 493 dunums), it is clear that cotton farmers in Baghdad province achieve a productivity per dunum higher than the amount of production at the break-even point of about 49 kg, meaning that the cotton crop is one of the profitable crops that reward the efforts of farmers and encourage the expansion of its cultivation.

- Break-even point in monetary aggregates (production value at break-even point):

1. The value of production at the break-even point at the level of total farmers: The break-even point was calculated in monetary sums for all sixty farmers included in the study, the results were as the following:

$$Y = \frac{TFC}{1 - \frac{TVC}{TR}} = 78624500 \div (1 - (230983000 \div 129197500)) = 99798978 \text{ dinars}$$

This monetary break-even point means that an amount of 99798978 dinars must be achieved by the cotton farmers in the study sample in order to cover their total costs, and what exceeds this amount will be profit and less than it is a loss, meaning that it is the amount that covers production costs at the break-even point. Since the generalization of calculating the break-even point for all farmers in the sample, does not serve the decision-makers at the farm level, given that the sixty farmers in the sample work in isolation from each other, it becomes necessary to measure the break-even point in monetary aggregates at the level of the unit area (dunum) in order for farm managers to be able to make the right decision related to their individual farms, each according to its cultivated area.

2. The value of production at the break-even point at the level of the unit area (dunum): Since the total cultivated area of the farmers of the research sample is 493 dunums, then it becomes possible to calculate the value of production at the break-even point per unit area, as shown below:

$$Q = \frac{Y}{493} = 99798978 \div 493 = 202432 \text{ dinars/dunum}$$

That is, each farmer must achieve about 202,432 dinars as a minimum, equivalent to about $135, in order to cover the total costs of cultivating one dunum of the crop. Through the data of the questionnaire, it became clear that the average production per dunum of cotton at the sample level is 215 kg, and since the average selling price per ton of cotton is 1218844.34 dinars, then the average revenue per dunum is 262052 dinars, which is equivalent to about 175 dollars, which is more than the amount at the break-even point is about 59,620 dinars, or 40 US dollars.

Conclusions

It was concluded from the study that the economic indicators of the cotton crop in Baghdad province, represented in each of the area, production and productivity, have taken a decreasing path during the research period, leading to the stop of its cultivation permanently at the level of the province in recent years, the reason for this may be due to many problems that the farmers mentioned them in the field survey. The results of the analysis of the total costs of the crop also showed that the variable costs formed the largest proportion through their acquisition of about three quarters of the total costs,

due to the lack of fertilizers allocated to the crop by the agricultural departments, as confirmed by the farmers of the study sample. The value of the cotton marketing efficiency index was very high because most farmers sell their product to traders in the markets near their place of residence because there are no specialized marketing centers that receive the crop. It was found that there is a "significant" difference between the quantity of production per dunum achieved in the research sample and the quantity of production per dunum at the break-even point, with a difference of 49 tons. The estimated results also indicated that the average revenue per dunum achieved for the studied sample amounted to about 262 thousand dinars, which exceeds the amount achieved at the break-even point by about 60 thousand dinars, which means that the cotton is one of the profitable and rewarding crops for the efforts of farmers in Baghdad province and encouraging to expansion in cultivation in the future.

Based on the foregoing, the research recommends that the sample farmers prepare and plan in advance for all production processes related to the crop, starting from cultivation to marketing, in a manner that is consistent with the quantity and value of production at the break-even point that was reached through the research, and the need for the agricultural extension agencies to take their role in informing the governorate's farmers of the strategic importance of the crop through holding continuous seminars and holding intensive courses in this regard and under the supervision of a specialized team with the need to guide them using the quantities of productive resources recommended by technicians and those with experience in cultivating the crop to ensure a rewarding economic return for them.

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There are no Supplementary Materials.

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The authors declare there is no conflict of interest.

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