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Estimating the Amount of Resources Achieved for the Economic Efficiency of Watermelon Farms in Samarra District for the Production Season (2023)

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Abstract

The research aimed to estimate the optimal quantities of resources used in producing the watermelon crop in Samarra district for the 2023 production season, through which it is possible to achieve economic efficiency in the farms of the research sample. The data was obtained by designing a questionnaire in the style of random sampling of the farms in the field, as the sample size is based on its proportion in the population for 30 farms. The research relied on the method of descriptive and quantitative analysis in accordance with the logic of economic theory, using the DEAP program to analyze data and estimate the size of the surplus and deficit of the resources used in producing the watermelon crop. The results of the research showed that there is a waste in the amount of resources used. The fertilizer supplier ranked first in the quantities used, while the pesticide supplier ranked last in the amount of waste. The reason for this is the increase in the use of the resource in a way that is outside the quantities recommended by the competent authorities necessary for cultivating one dunam, as well as the absence of agricultural guidance and counseling that must be provided, which In turn, it had a negative impact on the use of this resource, and the research recommended the need to activate the role of the extension system in educating farmers about the optimal use of the resource, which enables them to achieve economic efficiency in the farms.

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تقدير حجم الموارد المحققة للكفاءة الاقتصادية ومقدار الفائض والعجز فيها لمزارع محصول البطيخ في قضاء سامراء للموسم الانتاجي (2023)

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الملخص العربى:

هدف البحث الى تقدير الكميات المثلى من الموارد المستخدمة في انتاج محصول البطيخ في قضاء سامراء للموسم الانتاجي 2023 والتي يمكن من خلالها الوصول الى تحقيق الكفاءة الاقتصادية في مزارع عينة البحث، وتم الحصول على البيانات من خلال تصميم استمارة استبانة بأسلوب العينة العشوائية للمزارع ميدانياً اذ تم تحيد حجم العينة حسب نسبتها في المجتمع لـ 25 مزرعة، ووقد اعتمد البحث على اسلوب التحليل الوصفي والكمي بما يتطابق وفق منطق النظرية الاقتصادية باستخدام برنامج DEAP لتحليل البيانات وتقدير حجم الفائض والعجز للموارد المستخدمة في انتاج محصول البطيخ، واظهرت نتائج البحث ان هناك هدر في كمية الموارد المستخدم اذ احتل مورد الاسمدة المرتبة الاولى في الكميات المستخدمة منه بينما جاء مورد المبيدات بالمرتبة الاخية في كمية الهدر منه ويعود السبب في ذلك الزيادة في استخدام المورد بصورة خارجة عن الكميات الموصي بها من قبل الجهات المختصة اللازمة لزراعة الدونم الواحد وكذلك غياب التوجيه والارشاد الزراعي الواجب توفيره والذي بدوره أنعكس سلباً على استخدام هذا المورد واوصى البحث الى ضرورة تفعيل دور الجهاز الارشادي في توعية المزارعين في استخدام الامثل للمراد والي يمكنهم من الوصول الى تحقيق الكفاءة الاقتصادية في مزارع عينة البحث.

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الكلمات المفتاحية: حجم الموارد، الكفاءة الاقتصادية، الفائض والعجز، محصول البطيخ.

INTRODUCTION:

Watermelon is one of the important crops of the Cucurbit family in Iraq and is grown in large areas. Its fruits are eaten as an important food item (Wien, 1997). There are several varieties of it, including: - reticulated watermelon: the fruits are small with a reticulated striped surface, and European watermelon: the fruits have a hard, ribbed, non-reticulated, rough peel, and smooth watermelon. Cucumber: The fruit has a soft, smooth skin, late maturity, and retains its validity for a long time. Cucumber: The fruit is long, cylindrical, with a length of 45-90 cm, curved or twisted, and is used for preservation. Cantaloupe: The fruit is small, the size of an orange, with a brown marble surface with an aromatic smell. (Abdel, & Bamerni, 2011) Watermelon is characterized by a high percentage of carotene and vitamin C, and its fruits contain a high percentage of water, 91%, proteins, carbohydrates, calcium, phosphorus, and potassium. (Elias, M. S., & Al-Jubouri, 2022) There are different dates for planting watermelon in Iraq. In the middle, it begins planting seeds after the danger of freezing has passed, from March 15 until its end. It is also grown on the banks of rivers during the month of July as an autumn crop. As for northern Iraq, it is grown regularly after the end of the spring rains, from April to May. It is also grown during the period from late September to the end of October for glass and plastic houses. Watermelon crop production reached (181) thousand tons in 2022, with an estimated decrease of (12%). The production of last year was estimated at (205) thousand tons (Shaker et al., 2000).

RESEARCH PROBLEM:

The problem of the research is centered on the low yield per acre of watermelon crop production in the research area, as well as the lack of optimal use of the resources used in the production process of the watermelon crop in the Samarra district, which led to a waste in the use of resources, which led to a decrease in production, as well as the inability of watermelon crop farmers to achieve Completely economic efficiency of crop farms in the study area.

RESEARCH OBJECTIVES:

The research aims to:

(1) Estimating the actual amount of resources used in producing the watermelon crop.

(2) Estimating the quantity of resources at the lowest cost (lowest point of average costs) at which economic efficiency is achieved.

(4) Estimating the surplus or deficit in various resources by comparing the amount of actual resources involved in the production process of each sample farm with its counterpart achieving economic efficiency.

DATA SOURCES:

Data were obtained by designing a questionnaire form using a random sampling method for field farmers, and the sample size for the watermelon crop was determined according to its percentage in the community. (30) Questionnaire forms were collected, all of which were entered into the study plan and represented a limit of (5%).

MATERIALS AND METHODS:

The research relied on the descriptive and quantitative analysis method, which is based on the foundations, principles and concepts of economic theory and mathematical analysis methods to achieve the research objectives by

applying the data envelopment analysis method (DEA) in estimating the volume of resources used in the production process, through which economic efficiency can be achieved.

THEORETICAL FRAMEWORK:

Optimal size of production: The concept of optimization currently plays an important role in economic analysis. Optimization acts as an indicator of appropriate farmer behavior in making the right economic decisions. (Barkley & Paul, 2013: 73) Determining the optimal size of production is done to know the optimal behavior of the farm manager or farmer; This is based on cost functions that can be obtained from cross-sectional data at the farm level. The optimal production quantity (Q) is the one in which the average cost curve is at its lowest level, and therefore the optimal production volume is defined as that volume that achieves the greatest capacity savings, the lowest possible cost, or the highest net return per unit of production. Any facility can be efficient. Economically, when the costs of one unit of output decrease, the appropriate criterion for this is the extent to which economic efficiency increases with increasing size, that is, the extent to which the average cost curve decreases with increasing size. (Al-Jazairli, 2018: 197)**.**

Optimal farm size: The level of production at which the average total costs are the lowest possible is the production that determines the optimal size of the project in the long run. At this size, the marginal costs are equal to the average total costs, and the production unit's share of the average costs is less than possible. At this level level of production, the efficiency of production factors is as high as possible. (Al-Sariti et al., 2019: 268) The optimal size can be defined as the size that achieves the greatest capacity savings, the lowest possible cost, or the highest net return for the production unit. The discrepancy in determining the optimal size of the farm is due to differences in the nature of agriculture, environmental conditions, the level of technology adopted in agriculture, the degree of risk and uncertainty, the nature of tenure, and the level of inflation. (David 2012: 276)

Economic Efficiency Indicators: To estimate the amount of resources achieved for the economic efficiency of the watermelon crop in the research sample, specifically for the main research variables of (amount of seeds/g), (amount of fertilizers/kg), (amount of pesticides/litre), (mechanical work/hour), and (human work/worker). The data envelopment analysis method (DEA) was adopted according to the cost function, as the quantity of resources was estimated at the lowest cost (the lowest point of average costs), at which economic efficiency is achieved, and from there the surplus or deficit in the various resources was calculated through a quantitative comparison. The actual resources involved in the production process for each of the sampled farms and their counterparts that achieve economic efficiency (Al-Hadidi, 2012: 102), as:

The amount of surplus or deficit of the resource = the actual quantity of the resource (used) - the quantity of the resource achieved for efficiency (the lowest point of average costs).

The percentage of surplus or deficit is calculated from the following equation:

Surplus or deficit ratio = (the amount of increase or decrease in resources / the amount of actual use of resources) * 100

If the sign of the difference in resources is negative, this indicates a (deficit), meaning it represents the amount of increase that must be provided in order to achieve optimal use. If the sign is positive, this indicates (surplus), that is, it represents the amount of reduction in the use of the resource that must be achieved to achieve the optimal use of these resources. Below is a presentation of the results of the amount of deficit or surplus in the resources used for the research sample.

RESULTS AND DISCUSSION:

The amount of seeds achieved economic efficiency:

By looking at Table (1) and after making a comparison between the amount of the resource (amount of seeds)/g actually used and its counterpart, the amount of the resource (amount of seeds)/g achieved for economic efficiency, it becomes clear to us that there is a surplus in the total amount of the resource used, about (264.09). g, with an average of (17.04) g, as the total amount of the resource (amount of seeds)/g actually used amounted to (4770) g, with an average of (307.74) g, while the total amount of the resource (amount of seeds)/g achieved for economic efficiency) At the lowest point of average costs, the value reached (4505.91) grams, with an average value of (290.7) grams. The results presented in Table (1) indicated that the number of farms that achieved a surplus in the resource (quantity of seeds) reached (14) farms, which It represented a percentage of (47%) of the total number of farms in the studied sample. The number of farms that achieved a deficit in the resource (quantity of seeds) reached (11) farms, which represented a percentage of (37%) of the total number of farms in the sample. As for the number of farms that were able to work in balanced proportions between the amount of the resource (quantity of seeds) used In fact, the amount of the resource (the amount of seeds) achieved economic efficiency (i.e. the farms that did not have a surplus or deficit in the resource), their number reached (5) farms, with a percentage of their headquarters (16%), and in general, it was as if there was a surplus amount in the resource used in a percentage greater than The amount of the deficit in it, and the reason for this may be due to the increase in the use of the resource in a way that is outside the quantities recommended by the competent authorities in terms of the amount of seeds needed to plant one dunum in order to increase germination rates, and on the other hand and at the same time is the absence of agricultural guidance and guidance that must be provided. This in turn had a negative impact on the use of this resource.

The amount of fertilizer that achieves economic efficiency:

By looking at Table (2) and after making a comparison between the amount of the resource (amount of fertilizer)/kg actually used and its counterpart, the amount of the resource (amount of fertilizer)/kg achieved for economic efficiency, it becomes clear to us that there is a surplus in the total amount of the resource used, about (72398). kg, with an average of (4670.84) kg, as the total amount of the resource (amount of fertilizer)/kg actually used amounted to (321,351) kg, with an average of (20732.32) kg, while the total amount of the resource (amount of fertilizer)/kg achieved for economic efficiency (At the lowest point of average costs, the value reached (248,953) kg, with an average value of (16,061.48) grams.

Table (1) Amount of seeds achieved for economic efficiency and the amount of surplus or deficit for the sample farms

Sequence	Actual quantity of resource (seed quantity) (g/acre)	Quantity of resource achieved economic efficiency	The amount of the supplier's deficit or surplus (amount of seeds) (g/dunum)	Deficit or surplus ratio(%)
1	150	158.963	-8.963	-5.975
2	120	100.626	19.374	16.145
3	200	249.276	-49.276	-24.638
4	100	192.353	-92.353	-92.353
5	120	160	-40	-33.333
6	150	165.638	-15.638	-10.425
7	200	161.52	38.48	19.24
8	160	160	0	0
9	150	100	50	33.333
10	220	160.31	59.69	27.131
11	225	159.503	65.497	29.109
12	100	160	-60	-60
13	160	160	0	0
14	150	159.487	-9.487	-6.324
15	180	150	30	16.666
16	220	160.213	59.787	27.175
17	100	160	-60	-60
18	150	150	0	0
19	100	100	0	0
20	225	152.491	72.509	32.226
21	150	130	20	13.333
22	200	161.838	38.162	19.081
23	100	60.583	39.417	39.417
24	150	152.392	-2.392	-1.594
25	220	160.713	59.287	26.948
26	150	160	-10	-6.666
27	120	100	20	16.666
28	150	150	0	0
29	250	160	90	36
30	100	150	-50	-50
Total	**4770**	**4505.91**	**264.09**	**1.16**
Average	**307.74**	**290.70**	**17.04**	**0.07**

Source: Based on the results of data envelopment analysis according to the cost function.

The results presented in Table (2) indicated that the number of farms that achieved a surplus in the resource (amount of fertilizer) reached (21) farms, which It represented a percentage of (70%) of the total number of farms in the studied sample. The number of farms that achieved a deficit in the resource (amount of fertilizer) reached (5) farms, which represented a percentage of (17%) of the total number of farms in the sample. As for the number of farms that were able to work in balanced proportions between the amount of the resource (amount of fertilizer) used In fact, the amount of the resource (the amount of fertilizer) achieved economic efficiency (i.e. the farms that did not have a surplus or deficit in the resource), their number reached (4) farms, and the percentage of their headquarters was (13%), and in general, it was as if there was a surplus amount in the resource used at a percentage greater than The amount of the deficit in it, and the reason for

this may be due to the increase in the use of the resource in a way that is outside the quantities recommended by the competent authorities in terms of the amount of seeds needed to plant one dunum in order to increase germination rates, and on the other hand and at the same time is the absence of agricultural guidance and guidance that must be provided. This in turn had a negative impact on the use of this resource.

Table (2) Amount of fertilizer achieved for economic efficiency and the amount of surplus or deficit for the sample farms

Sequence	Actual quantity of resource (Quantity of fertilizer) (g/acre)	Quantity of resource achieved economic efficiency	The amount of the supplier's deficit or surplus (Quantity of fertilizer) (g/dunum)	Deficit or surplus ratio(%)
1	9765	5744	4021	41.177
2	6532	8532	-2000	-30.618
3	10965	6729	4236	38.632
4	15872	10630	5242	33.026
5	15349	8723	6626	43.168
6	12822	7500	5322	41.506
7	3456	5000	-1544	-44.675
8	8000	8000	0	0
9	10500	7500	3000	28.571
10	7850	7850	0	0
11	5626	8910	-3284	-58.371
12	9734	6300	3434	35.278
13	11098	7412	3686	33.213
14	10652	8350	2302	21.610
15	13654	10401	3253	23.824
16	4332	8720	-4388	-101.29
17	13456	9525	3931	29.213
18	11322	7731	3591	31.717
19	10234	8450	1784	17.432
20	10752	10500	252	2.343
21	12843	7250	5593	43.5490
22	9500	9500	0	0
23	10000	10000	0	0
24	12859	8611	4248	33.035
25	17534	9118	8416	47.998
26	9075	5500	3575	39.393
27	6532	7000	-468	-7.164
28	12546	10250	2296	18.300
29	16735	8715	8020	47.923
30	11756	10502	1254	10.666
Total	**321351**	**248953**	**72398**	**419.46**
Average	**20732.32**	**16061.48**	**4670.84**	**27.06**

Source: Based on the results of data envelopment analysis according to the cost function.

The amount of pesticides achieved economic efficiency:

By looking at Table (3) and after making a comparison between the amount of the resource (amount of pesticides)/liter actually used and its counterpart, the amount of the resource (amount of pesticides)/liter achieved for economic efficiency, it becomes clear to us that there is a

surplus in the total amount of the resource used of about (127) liters, with an average of (8.19) liters for the watermelon crop, as the total amount of the resource (amount of pesticides)/liter actually used amounted to (935) liters, with an average of (60.32) litres, while the total amount of the resource (amount of pesticides)/liter achieved for efficiency The economic value (at the lowest point of average costs) reached (808) liters, with an average value of (52.13) liters per farm.

Table (3): The amount of pesticides achieved economic efficiency and the amount of surplus or deficit for the sample farms

Sequence	The actual quantity of the resource Amount of pesticides) (in liters/acre	Quantity of resource achieved economic efficiency	The amount of the supplier's deficit or surplus Amount of pesticides in) (litres/dunum	Deficit or surplus ratio (%)
1	20	25	-5	-25
2	50	30	20	40
3	39	30	9	23.076
4	51	25	26	50.980
5	44	20	24	54.545
6	23	20	3	13.043
7	20	20	0	0
8	20	20	0	0
9	25	23	2	8
10	18	20	-2	-11.111
11	15	22	-7	-46.666
12	40	30	10	25
13	23	25	-2	-8.695
14	30	27	3	10
15	25	25	0	0
16	18	20	-2	-11.111
17	15	20	-5	-33.333
18	60	40	20	33.333
19	58	50	8	13.793
20	45	40	5	11.111
21	20	20	0	0
22	22	25	-3	-13.636
23	30	30	0	0
24	55	35	20	36.363
25	15	25	-10	-66.666
26	24	25	-1	-4.166
27	45	40	5	11.111
28	40	31	9	22.5
29	20	20	0	0
30	25	25	0	0
Total	**935**	**808**	**127**	**132.47**
Average	**60.32**	**52.13**	**8.19**	**8.55**

Source: Based on the results of data envelopment analysis according to the cost function.

The results presented in Table (3) indicated that the number of farms that achieved a surplus in the resource (amount of pesticides) reached (14) farm, which represented a percentage of (47%) with the same crop arrangement out of the total number of farms in the studied sample. The number of farms that achieved a deficit in the resource (quantity of pesticides) reached (9) farms, which represented a percentage of (30%) of the total number of farms in the studied sample. As for the number of farms that were able to work in balanced proportions (i.e. farms that did not have Surplus or deficit in

this resource. Their number reached (7) farms, and they represented a percentage of (23%). In general, it seemed that there was a surplus in the resource used at a greater rate than the amount of the deficit in it. The reason for this may be due to the increase in the use of the resource. In a way that is outside the quantities recommended by the competent authorities in terms of the amount of pesticides needed to cultivate one dunum in order to eliminate diseases that affect vegetable crops in general and the study sample crops in particular.

The amount of automated labor achieved economic efficiency

Looking at the results of Table (4) and after making a comparison between the amount of the The results presented in Table (4) indicated that the number of farms that achieved a surplus in this resource reached (19) farms, which represented a percentage of (63%) with the same crop arrangement out of the total number of farms in the studied sample. The number of farms that achieved a deficit in the resource (mechanical labor) reached (6) farms, which represented a percentage of (20%) of the total number of farms in the studied sample. As for the number of farms that were able to work in balanced proportions in this resource (i.e. farms that they did not have a surplus or deficit in the resource. Their number reached (5) farms, with a percentage of their headquarters (17%). In general, there was a surplus in the resource used at a rate greater than the amount of the deficit in it. The reason for this may be due to the increase in the use of the resource. Outside of the number of working hours recommended by the competent authorities is the absence of agricultural guidance and extension resource (number of automated work hours)/hour actually used and its counterpart, the amount of the resource (number of automated work hours)/hour achieved for economic efficiency, it becomes clear to us that there is a surplus in the total amount of the resource used about (212.80) hours, with an average of (13.73) hours, as the total amount of the resource (number of automated working hours)/hour actually used amounted to (956) hours, with an average of (61.68) hours, while the total amount of the resource (number of automated working hours) (/hour achieved for economic efficiency (at the lowest point of average costs) reached a value of (743.20) hours, with an average of (47.95) hours. that must be provided, which in turn has had a negative impact on the use of this resource.

The amount of human labor achieved economic efficiency:

By looking at Table (5) and after making a comparison between the amount of the resource (amount of human labor)/men actually used and its counterpart, the amount of the resource (amount of human labor)/the factor achieving economic efficiency, it becomes clear to us that there is a surplus in the total amount of the resource used towards (4475 workers, with an average of (288.71) workers for the watermelon crop, as the total amount of the resource (amount of human labor)/workers actually used amounted to (20.933) with an average of (1350.52) workers per farm, while the total amount of the resource (amount of human labor)/The factor achieved for economic efficiency (at the lowest point of average costs) reached a value of (16458) workers with an average of 1061.81 workers.

Table (4): The amount of mechanized labor achieved for economic efficiency and the amount of surplus or deficit for the sample farms:

Sequence	The actual quantity of the resource Amount of automated) (work/hour	Quantity of resource achieved economic efficiency	The amount of the supplier's deficit or surplus Amount of automated) (work/hour	Deficit or surplus ratio (%)
1	28	25	3	10.714
2	47	20	27	57.446
3	30	30	0	0
4	16	25	-9	-56.25
5	25	25	0	0
6	48	33.4	14.6	30.416
7	50	35	15	30
8	67	28.9	38.1	56.865
9	51	33	18	35.294
10	35	32	3	8.571
11	30	30	0	0
12	56	24	32	57.142
13	14	20	-6	-42.857
14	18	18	0	0
15	24	25	-1	-4.166
16	23	20	3	13.043
17	30	22.7	7.3	24.333
18	19	20	-1	-5.263
19	28	25	3	10.714
20	55	31	24	43.636
21	34	30	4	11.764
22	21	20	1	4.761
23	15	15	0	0
24	25	20	5	20
25	12	15	-3	-25
26	41	26.2	14.8	36.097
27	10	18	-8	-80
28	26	25	1	3.846
29	34	20	14	41.176
30	44	31	13	29.545
Total	**956.00**	**743.20**	**212.80**	**311.83**
Average	**61.68**	**47.95**	**13.73**	**20.12**

Source: Based on the results of data envelopment analysis according to the cost function.

The results presented in Table (5) indicated that the number of farms that achieved a surplus in the resource (amount of human labor It reached (16) farms, respectively, which represented a percentage of 53.33% of the total number of farms in the sample studied. As for the number of farms that achieved a deficit in the resource (amount of human labor), it reached (7) farms, which represented a percentage of 23.33% of total number of farms in the studied sample. As for the number of farms that were able to work with balanced proportions of this resource (i.e. farms that did not have a surplus or deficit in the resource), their number reached (7) farms, with a percentage of their headquarters (23.34%), and in general In general, it appears that there is a surplus in the resource used at a greater rate than the amount of the deficit in it, and the reason for this may be due to the increase in the use of the resource in a way that is outside the quantities recommended by the competent authorities in terms of the amount of human labor necessary to

cultivate one dunam, as well as the absence of agricultural guidance and counselling. What must be provided, which in turn has a negative impact on the use of this resource.

Table (5): The amount of human labor achieved for economic efficiency and the amount of surplus or deficit for the sample farms

Sequence	The actual quantity of the resource Amount of human) (labor/worker	Quantity of resource achieved economic efficiency	The amount of the resource's deficit or surplus (amount of human labor/worker)	Deficit or surplus ratio(%)
1	761	538	223	29.303
2	453	550	-97	-21.412
3	1368	661	707	51.681
4	690	349	341	49.420
5	500	500	0	0
6	250	250	0	0
7	341	427	-86	-25.219
8	1525	812	713	46.754
9	750	492	258	34.4
10	571	371	200	35.026
11	701	404	297	42.368
12	1321	726	595	45.041
13	250	250	0	0
14	500	500	0	0
15	603	500	103	17.081
16	415	500	-85	-20.481
17	856	530	326	38.084
18	620	620	0	0
19	1250	588	662	52.96
20	550	611	-61	-11.090
21	300	300	0	0
22	156	643	-487	-312.179
23	497	421	76	15.291
24	451	500	-49	-10.864
25	1433	677	756	52.756
26	641	428	213	33.229
27	780	750	30	3.846
28	550	500	50	9.090
29	350	560	-210	-60
30	1500	1500	0	0
Total	**20933**	**16458**	**4475**	**95.09**
Average	**1350.52**	**1061.81**	**288.71**	**6.13**

Source: Based on the results of data envelopment analysis according to the cost function.

It is clear from Table (6) that there is a surplus in the resources used in the watermelon crop in Samarra district, as the difference in the amount of seeds reached (17.07) grams, and the difference in the value of fertilizers amounted to about (4670.84) kilograms, and as for the amount of pesticides, the amount of difference amounted to about (8.19) liters, while the amount of difference in automated work was about (13.73) hours, while the amount of human work was (288.71) workers. It became clear that the fertilizer resource is the resource that is most wasted in its use to grow the watermelon crop in Samarra District, while the least resource is it the amount of pesticides, and this is shown in Figure (1).

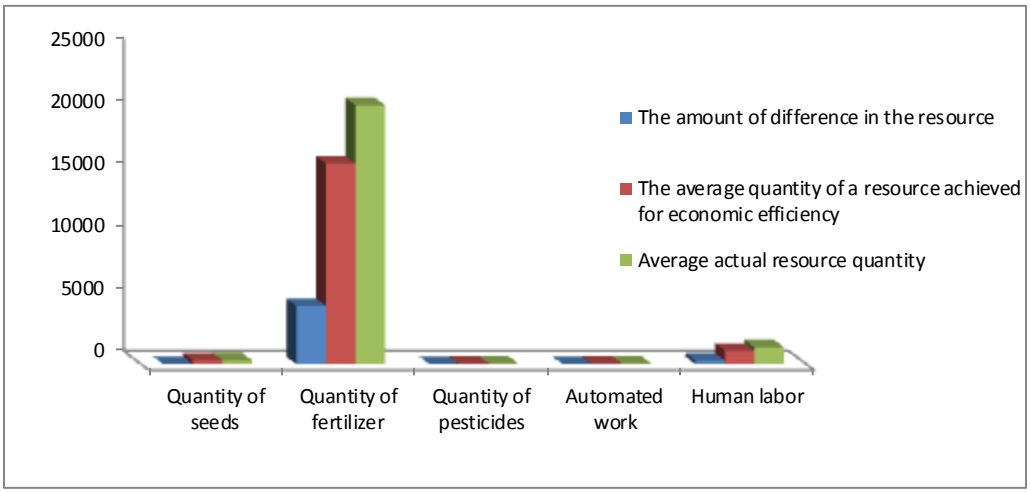

Figure (1) Average amount of resources achieved for the economic efficiency of the watermelon crop.

Source: Prepared by the researcher based on the data in table (6)

Table (6): Average amount of resources achieved for the economic efficiency of watermelon farms in the study sample

Sequence	Supplier	Average actual resource quantity	The average quantity of a resource achieved for economic efficiency	The amount of difference in the resource	Type of difference (surplus or deficit)
1	Quantity of seeds/gm	307.74	290.70	17.04	surplus
2	Quantity of fertilizer/kg	20732.32	16061.48	4670.84	surplus
3	Quantity of pesticides/litre	60.32	52.13	8.19	surplus
4	Automated work/hour	61.68	47.95	13.73	surplus
5	Human labor/worker	1350.52	1061.81	288.71	surplus

Source: Prepared by the researcher based on the results of tables (1, 2, 3, 4, 5.).

CONCLUSIONS:

(1) When estimating the amount of economic resources that achieve economic efficiency using the data envelopment analysis (DEA) method, it turns out that most farms have achieved a surplus in the use of most production elements when comparing the amount of resources actually used with their counterparts that achieve economic efficiency.

(2) The results showed that the number of farms that achieved 100% efficiency in using resources (i.e. farms that did not have a surplus or deficit in the resource) was ranked first in resource, while the last rank was in resource.

(3) The fertilizer supplier ranked first in the quantities used, while the pesticide supplier came in last place in the amount of waste.

(4) The reason for this is the increase in the use of the resource in a way that is outside the quantities recommended by the competent authorities necessary for cultivating one dunum, as well as the absence of agricultural guidance and guidance that must be provided, which in turn has negatively affected the use of this resource.

RECOMMENDATIONS:

(1) Encouraging researchers to use modern programs in analysis, such as the data encapsulation program DEAP, which gives

accurate and detailed results for each farm, which helps the farmer to identify weak points in the production process.

(2) Benefiting from the experiences of farms that were able to achieve economic efficiency and employing them in farms that were unable to achieve efficiency.

(3) The sample farmers benefited from the amount of surplus achieved from the economic resources (seeds, fertilizers, pesticides, mechanical labor, human labor) used, according to the results reached by the research.

(4) Activating the role of the extension system to educate farmers about optimal use of resources and avoiding waste of these resources.

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