Mesopotamia J. of Agric. ISSN: 2224 – 9796 (Online) مجلــة زراعــة الرافديــن
Vo1. (48) No (3) 2020 ISSN: 1815 – 316 X (Print) 2020 (3) العدد (48) المجلد

A STUDY OF THE ECONOMIC EFFICIENCY OF TOMATO CROPS FOR THE PRODUCTIVE SEASON 2019 IN NINEVEH GOVERNORATE, ZAMMAR DISTRICT, AS AN EXAMPLE

Ali N. S. Al-Jubouri Nassif J. M.Alihbabi
Department of Economics and Agricultural Extension –Agricultural Economics,
College of Agriculture, University of Tikrit, Tikrit, Iraq.

E-mail: nasaifjasim@tu.edu.iq

Reseived: 23 /7 /2020, Accepted: 12/8 /2020.

ABSTRACT

The study aimed to measure Economic Efficiency and its components, Technical Efficiency and Allocative Efficiency on the input side, and to impose a change in returns to scale VRS by using the DEA method of data envelope analysis, as well as to review the structure and items of costs for tomato production, and knowing The extent to which economic units achieve a rational use of production resources. the data necessary to study in the field were collected through a questionnaire carried out in a personal interview of (124) farmers of the tomato crop in the open cultivation method in Nineveh Governorate (Zammar district as an application model) for the production season 2019, Included explanatory variables (seeds, fertilizers, pesticides, mechanical work, human work) As for The approved variable is tomato crop production, and the study reached many conclusions, the most important, That three farms (2.4%) achieved complete technical, allocation , economic efficiency (100%), and the results of showed that the average economic efficiency reached about (50.8%), meaning that these farms can achieve the same level Of production in light of reducing production costs by 49.2%, and the study recommended that farmers use resources Economic needs according to the crop's need for these resources and in a way that minimizes costs and maximizes profit, and it is necessary to study the reasons for the success of many farms that have achieved complete Economic Efficiency (100 %), To be references to farms that have not achieved Economic Efficiency Although it in the same circumstances.

***KeyWords*:** Economic Efficiency, Technical Efficiency, Allocation Efficiency, Tomato Crop.

INTRODUCTION

The tomato harvest is one of the crops important for daily use of commodities and services, whether it is sweet, cooked or manufactured for a large percentage of the population, where the consumption of most vegetable crops is concerned to its availability, and it is rich in salts and vitamins necessary for the human physical structure. Iraq is exposed and covered by tunnels and in greenhouses, as it is an

*Part of M.Sc. thesis submitted by the first author.

important and necessary crop as food and a serious source of income for workers from the social groups contributing to the cultivation of the crop. The tomato is one of the plants of the nightshade family, and it is one of the main vegetable crops in Iraq and the world. It comes at the forefront of summer vegetable crops in terms of daily consumption in various forms. And it lead to an important percentage in the Iraq agricultural economy) Increasing the demand for tomato crops requires providing it in quantities sufficient for the need of local markets, at the very least. Therefore, it is necessary to correct the path of the agricultural process in Iraq from solid agricultural scientific research and the development of short, medium, and long-term plans and good financing to develop the capabilities and skills of farmers in exploiting Land optimization and economic efficiency in agricultural production processes to contribute to improving the income of the farmer and providing the main crops for the country through agricultural growth and self-sufficiency and the progress of the wheel of agricultural development forward, thus achieving food security, maintaining hard currency and supporting the national economy.

The research problem lies in the fact that tomato crop farmers use the elements of production without looking at economic standards in the best role of economic resources, and that reflects the irrational use of available economic resources and thus high production costs,

Research goal measuring Economic Efficiency and its Components, the Technical Efficiency and the Specific Efficiency of the Tomato crop farmers in Nineveh Governorate (Zammar district as an application model) using the DEA data envelope analysis according to the entry guidance model and in light of the change of the VRS size returns, and Estimate the amount of Economic Resources achieved for the Economic Efficiency of the Tomato crop, and estimate the percentage of surplus or deficit in the use of these resources.

The Hypothesis of the Research is that most farmers do not have the ability to choose the optimum combination of production elements because they rely on the inherited skills in crop cultivation away from scientific methods through which the elements of production can be mixed in a way that achieves the optimal combination that minimizes costs, maximizes profit, Consequently, they were not able to make the best use of the resources used, which resulted in a variation in achieving Economic Efficiency and its components in the research sample farms.

MATERIALS AND METHODS

Economic Efficiency is determined the possibility of obtaining the largest amount of return at the same cost or obtaining the same return at the lowest cost (Debertin, 2012), and Farrell's idea, 1957, explained that the efficiency of a farm consists of two elements. The first is technical competence that represents the farm's ability to obtain the maximum Output from a group of inputs, and the second is the allocative efficiency, which represents the farm’s ability to use the inputs at optimal rates (the lowest prices), meaning that there are two ways to calculate the economic efficiency values, which are economic efficiency from the input side (costs) and the economic efficiency is called use or input guidance (Input Orientated Measures), and the economic efficiency of the output (output) and is called the Output

Orientated Measures. To achieve the objectives of the study, a data envelopment Analysis (DEA) was adopted. This method is defined as a mathematical method that uses linear programming to measure the relative efficiency of a number of administrative units (DMU) Decision Making Units by defining the optimal mixture of an input group and an output group based on her actual performance. (Cooper et al, 2003) The beginning of the data envelope analysis method began in 1957, where Farrell proposed an approach to measure efficiency based on the idea of efficiency curves, and in 1978 Charnes, Cooper and Rhodes first introduced the concept of data envelope analysis Through a prototype focused on trying to estimate possible improvements in inputs (economy in inputs) while achieving the same current level of outputs, assuming what is known in economics as the stability of the return on production (called the Constant Size Economics model) CRS In 1984, (Banke, Charnes, and Cooper) presented another model of data envelope analysis that takes into account the assumption of a change in the return on production (called the Variable Returns of Scale (VRS) model (Al-Rashidi, 2018). The data envelope analysis is one of the frontier analysis methods, it exceeds the methods of measuring efficiency based on cost functions or function production because it estimates efficiency in relation with the best results achieved through the administrative units under analysis and not on the based on average results (Rubenstein, 2005), and therefore data envelope analysis estimates are called Relative Efficiency, and efficiency is derived by a number of institutions that together form the Performance Frontier, which encapsulates all observations, so the institutions (units) that fall on Curve Frontier enjoys the efficiency in the process of distributing its inputs and producing its output while it is considered inefficient for institutions that are not located on the boundary curve, and this method is to evaluate each institution in relation to the best institutions or what is called "Best Performance".(Al-Saqa, 2008). The assumption of CRS stability is proportional only when production is optimal and represents the space and surface of the average cost curve in the long run, but in reality, there are many obstacles that prevent units from achieving these volumes, such as full competition and funding constraints .....etc. As for the assumption of change The VRS yield allows it to measure both technical and customization efficiency, which when estimating it is necessary to have information on input prices (Ali, 2014).

The research was based on a questionnaire that targeted a random sample of (124) farmers of the tomato crop (open cultivation) in the Zammar region for the productive season 2019, and the sample made up (41%) of the study population, collected by personal interview and randomly, and included explanatory study variables (seeds) Fertilizers, pesticides, mechanical work and human work) The adopted a variable is the production of tomato crops, and table (1) shows the contribution rate of both fixed and variable costs to the total costs, as it was found that the contribution rate of the variable costs of the tomato crop reached (58.32%) which is greater From the percentage of the contribution of fixed costs, which amounted to (41.68%) of the total costs of the study sample.

Table (1): The percentage of fixed and variable costs Contribution from the total costs of the research sample farms.

Cost items	The costs/ thousand dinars	contribution percentage%
The Fixed costs	1403195	41.68
The variable costs	1963163	58.32
The Total costs	3366358	100

Source: Prepared by the two researchers using the questionnaire

As for the fixed costs, they were divided into four items: family work, interest on capital, extinction, and land rent. From table (2), it was shown that family work had the largest contribution to fixed costs as it reached (78.39%), then interest on capital at a contribution rate (10.30%) then the lease of land and extinction (5.82%, 5.49%), respectively, and the interest on capital has been calculated based on the interest rate (8%) for short-term loans with the Agricultural Cooperative Bank for the year 2019.

Table (2): Contribution percentage for fixed cost of the research sample farms.

Fixed costs items	The costs/ thousand dinars	contribution percentage%
Famil t work	1099930	%78.39
Benefit	144503	%10.30
Extinction	77071	%5.49
The rent	81691	%5.82
The Total Fixed costs	1403195	%100

Source: Prepared by the two researchers using the questionnaire

The variable costs were divided into seven items (seed costs, fertilizer costs, pesticide costs, mechanical work costs (tillage), leased human labor costs, fuel and maintenance costs, transport costs and funds), and the costs of transporting the

Table (3): Contribution percentage for variable cost of the research sample farms.

Variable costs items	The costs/ thousand dinars	contribution percentage%
Seeds	140476	% 7
Fertilisers	424081	% 22
Pesticides	82267	% 4
Mechanical work	63991	% 3
Leased human work	315486	% 16
The fuel and maintenance	444347	% 23
Transport and funds	492515	% 25
Total	1963163	%100

Source: Prepared by the two researchers using the questionnaire

product to the markets achieved the highest percentage of the variable costs items (25%), fuel and maintenance costs came second (23%), and fertilizer costs came third (22%), and the rest of the variable cost items combined (30%), and table (3) clarifies these details.

The total area of the study sample farms reached (1121) dunums, and the study sample achieved a productivity rate of (21.12) tons / dunum, where the selling price of the crop fluctuated between (50000 - 600000) dinars per ton, and most of the study sample farms achieved economic profits, while they achieved (22) Loss farm and table (4) shows these details.

Table (4): Average area, production, productivity, cost and revenue rates per ton and dunum per sample of study.

The details	The value
Area / dunum	1121
Average farm area / dunum	9.04
Total production / ton	23677
Average production for farms / ton	190.94
One dunum productivity: ton/dunum	21.12
The cost of one dunum / dinar	3003000
Average sale price: ton/dinar	244000
Total revenue of one dunum/dinar	5215000
Net revenue for one dunum/dinar	2212000
Cost per ton / Dinar	142000

Source: Prepared by the two researchers using the questionnaire.

RESULTS AND DISCUSSION

Results of economic efficiency, technical efficiency, and allocation efficiency for the sample:

Table (5) the results of estimating the economic efficiency, technical efficiency, and allocating efficiency of the total study sample, and the highest value for technical efficiency (TE) was (100%) and the lowest value was (39.7%) with an average of (73.9%) and this means that farmers can reduce the quantities used Of the elements of production at a rate of (26.1%) with the same level of production being achieved, (21) a farm achieved a complete technical efficiency 100% (16.93%) of the sample size, and (25) a farm achieved a technical efficiency between (80%) and less than (100% (i.e. its percentage) (20.16%), (49) achieved a technical efficiency farm between (60%) and less than (80%) at a rate of (39.52%), and (28) achieved a technical efficiency farm between (40%) and less than (60) %), I.e. (22.58%), and one farm achieved technical efficiency less than (40%) and its percentage (0.81%) of the total size of the study sample.

Table (5): Results of estimating economic efficiency, technical efficiency, and locative efficiency for the study sample

Farm	Technical Efficiency %	Allocative Efficiency %	Economic Efficiency %	Farm	Technical Efficiency %	Allocative Efficiency %	Economic Efficiency %
1	0.457	0.738	0.337	64	0.519	0.899	0.466

Farm	Technical Efficiency %	Allocative Efficiency %	Economic Efficiency %	Farm	Technical Efficiency %	Allocative Efficiency %	Economic Efficiency %
2	0.530	0.786	0.416	65	0.406	0.903	0.367
3	0.560	0.680	0.442	66	0.624	0.710	0.443
4	0.420	0.756	0.318	67	0.594	0.607	0.361
5	0.748	0.629	0.470	68	0.825	0.641	0.529
6	0.648	0.570	0.369	69	0.646	0.481	0.310
7	0.572	0.843	0.482	70	0.658	0.539	0.355
8	0.550	0.652	0.359	71	1.000	0.854	0.854
9	0.970	0.599	0.581	72	0.706	0.624	0.441
10	1.000	0.701	0.701	73	0.894	0.444	0.397
11	1.000	1.000	1.000	74	1.000	0.415	0.415
12	0.555	0.795	0.441	75	1.000	0.565	0.565
13	0.616	0.612	0.377	76	1.000	0.562	0.562
14	0.646	0.630	0.407	77	0.958	0.644	0.617
15	0.732	0.572	0.418	78	0.755	0.612	0.462
16	0.867	0.731	0.633	79	0.659	0.609	0.401
17	0.826	0.629	0.520	80	0.777	0.611	0.475
18	0.631	0.732	0.462	81	0.738	0.605	0.447
19	0.466	0.890	0.415	82	0.751	0.616	0.463
20	0.526	0.756	0.397	83	0.819	0.764	0.626
21	0.652	0.731	0.476	84	0.731	0.767	0.561
22	0.545	0.780	0.425	85	0.938	0.439	0.411
23	0.545	0.775	0.422	86	1.000	0.488	0.488
24	0.621	0.707	0.439	87	0.903	0.754	0.681
25	1.000	0.494	0.494	88	0.752	0.521	0.392
26	0.562	0.677	0.380	89	1.000	0.551	0.551
27	0.892	0.802	0.716	90	1.000	0.509	0.509
28	0.499	0.858	0.428	91	0.939	0.442	0.415
29	0.637	0.733	0.467	92	1.000	0.440	0.440
30	1.000	1.000	1.000	93	0.837	0.640	0.536
31	1.000	0.881	0.881	94	0.987	0.747	0.738
32	0.897	0.760	0.682	95	0.860	0.644	0.554
33	0.695	0.575	0.399	96	0.903	0.548	0.494
34	0.719	0.730	0.525	97	0.763	0.940	0.717
35	0.732	0.722	0.528	98	1.000	1.000	1.000
36	0.522	0.691	0.361	99	1.000	0.567	0.567
37	0.561	0.770	0.432	100	0.709	0.571	0.405
38	0.452	0.807	0.365	101	0.818	0.960	0.785
39	0.504	0.787	0.397	102	0.772	0.605	0.467
40	0.837	0.680	0.569	103	0.619	0.699	0.432
41	0.837	0.679	0.568	104	0.839	0.554	0.465
42	0.638	0.621	0.396	105	1.000	0.659	0.659
43	0.733	0.640	0.469	106	1.000	0.765	0.765
44	0.446	0.778	0.347	107	0.826	0.843	0.696
45	0.502	0.772	0.387	108	0.738	0.663	0.489
46	0.517	0.805	0.416	109	0.738	0.654	0.483
47	0.613	0.754	0.462	110	0.585	0.887	0.518
48	0.751	0.750	0.563	111	0.545	0.766	0.418
49	1.000	0.716	0.716	112	0.545	0.775	0.423
50	0.625	0.796	0.497	113	0.860	0.634	0.545
51	0.736	0.737	0.543	114	1.000	0.621	0.621
52	0.754	0.543	0.410	115	0.604	0.556	0.336
53	0.608	0.704	0.428	116	0.708	0.515	0.364
54	0.397	0.799	0.317	117	1.000	0.709	0.709
55	0.739	0.896	0.662	118	0.479	0.724	0.347
56	0.637	0.649	0.413	119	0.873	0.552	0.482
57	0.859	0.745	0.640	120	0.834	0.780	0.650
58	0.647	0.640	0.414	121	0.694	0.739	0.513
59	0.662	0.649	0.430	122	0.693	0.827	0.573

Farm	Technical Efficiency %	Allocative Efficiency %	Economic Efficiency %	Farm	Technical Efficiency %	Allocative Efficiency %	Economic Efficiency %
60	0.560	0.693	0.388	123	0.708	0.874	0.619
61	1.000	0.619	0.619	124	0.655	0.786	0.515
62	0.709	0.826	0.585				
63	0.651	0.855	0.557	Average	0.739	0.696	0.508

Source: Prepared by the two researchers based on the data of the questionnaire and the DEAP statistical program

The allocation efficiency is the other, the values of which ranged between the highest value (100%) and the lowest value (41.5%) and an average of (69.6%), where (3) farmers achieved complete allocation efficiency (100%) at (2.42%), and achieved (19) A specialty efficiency farm between (80%) and less than (100%), i.e. its percentage (15.32%). Likewise, (76) achieved a specialized efficiency farm between (60%) and less than (80%), at a rate of (61.29%), and achieved (26) A specialized efficiency farm between (40%) and less than (60%) at (20.97%) of the total size of the study sample, as in Table (6).

Table (6): Number and percentage of farms that achieved economic efficiency and components for the total study sample.

Efficiency level	Technical Efficiency		Allocative Efficiency		Economic Efficiency	
	Number of farms	Percentage%	Number of farms	Percentage%	Number of farms	Percentage%
100	21	16.93	3	2.42	3	2.42
100<80≥	25	20.16	19	15.32	2	1.61
80<60≥	49	39.52	76	61.29	21	16.94
60<40≥	28	22.58	26	20.97	73	58.87
40<20≥	1	0.81	0	0	25	20.16
Total	124	100	124	100	124	100

Source: Prepared by the two researchers, based on Table (5).

As for the economic efficiency, its values ranged between the highest value (100%) and the lowest value (30.10%) and an average of (50.80%), and only three farmers achieved complete economic efficiency (100%) at a rate of (2.42%), which is the same farms that achieved Full technical and allocation efficiency, and (2) a farm achieved economic efficiency between (80%) and less than (100%), i.e. its percentage (1.61%), and (21) a farm achieved economic efficiency between (60%) and less than (80%) by (16.94%, and (73) farms achieved Economic Efficiency between (40%) and less than (60%) at a rate of (58.87%), and (25) farms achieved Economic Efficiency between (20%) and less than (40%) and by (16.16%)) Of the total size of the study sample, as shows that in Table (6).

Estimate the size of the economic resources and the amount of surplus and deficit for the total farms of the study sample.

The first resource: The quantity of seeds

The total amount of seeds used for the total of the study sample was (30812) grams, with an average of (249) grams per farm. From table (7), we notice that the

quantity of seeds achieved for economic efficiency reached an average of (345) grams, meaning that there is a deficit in the amount of seeds used (96) grams (38.6%). From the results of the analysis, it was found that (3) farms achieved complete economic efficiency with a deficit or a surplus in seed quantity of zero, and (30) farms achieved a surplus, and (91) farms achieved a deficit.

Table (7): The amount of surplus or deficit in the quantity of seeds for the study sample.

Seeds / Gram					Seeds / Gram				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
1	500	501	-1	-0.2	64	313	144	169	54.0
2	232	246	-14	-6.0	65	625	297	328	52.5
3	219	341	-122	-55.7	66	288	173	115	39.9
4	375	348	27	7.2	67	300	569	-269	-89.7
5	63	93	-30	-47.6	68	82	161	-79	-96.3
6	125	182	-57	-45.6	69	188	467	-279	-148.4
7	313	277	36	11.5	70	344	787	-443	-128.8
8	619	963	-344	-55.6	71	25	50	-25	-100.0
9	125	246	-121	-96.8	72	169	309	-140	-82.8
10	94	161	-67	-71.3	73	125	352	-227	-181.6
11	50	50	0.0	0.0	74	44	110	-66	-150.0
12	213	229	-16	-7.5	75	405	908	-503	-124.2
13	375	807	-432	-115.2	76	405	908	-503	-124.2
14	250	535	-285	-114.0	77	75	188	-113	-150.7
15	476	964	-488	-102.5	78	150	343	-193	-128.7
16	75	86	-11	-14.7	79	282	373	-91	-32.3
17	188	316	-128	-68.1	80	625	819	-194	-31.0
18	175	214	-39	-22.3	81	94	214	-120	-127.7
19	375	82	293	78.1	82	188	284	-96	-51.1
20	188	152	36	19.1	83	113	99	14	12.4
21	113	173	-60	-53.1	84	250	150	100	40.0
22	1094	947	147	13.4	85	219	734	-515	-235.2
23	1094	947	147	13.4	86	94	362	-268	-285.1
24	250	309	-59	-23.6	87	344	348	-4	-1.2
25	313	807	-494	-157.8	88	438	979	-541	-123.5
26	219	407	-188	-85.8	89	157	443	-286	-182.2
27	63	95	-32	-50.8	90	438	925	-487	-111.2
28	200	163	37	18.5	91	125	411	-286	-228.8
29	175	288	-113	-64.6	92	100	237	-137	-137.0
30	1000	1000	0.0	0.0	93	250	420	-170	-68.0
31	94	144	-50	-53.2	94	94	173	-79	-84.0
32	282	246	36	12.8	95	175	373	-198	-113.1
33	563	983	-420	-74.6	96	313	896	-583	-186.3
34	107	105	2	1.9	97	500	475	25	5.0
35	144	239	-95	-66.0	98	313	313	0.0	0.0
36	300	379	-79	-26.3	99	38	122	-84	-221.1
37	188	212	-24	-12.8	100	219	543	-324	-147.9
38	263	161	102	38.8	101	750	579	171	22.8
39	338	326	12	3.6	102	250	399	-149	-59.6
40	94	198	-104	-110.6	103	313	450	-137	-43.8
41	94	198	-104	-110.6	104	94	267	-173	-184.0
42	132	250	-118	-89.4	105	125	161	-36	-28.8
43	125	226	-101	-80.8	106	50	52	-2	-4.0
44	250	124	126	50.4	107	313	314	-1	-0.3
45	332	192	140	42.2	108	313	479	-166	-53.0

Seeds / Gram					Seeds / Gram				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
46	157	144	13	8.3	109	313	479	-166	-53.0
47	157	99	58	36.9	110	125	86	39	31.2
48	100	148	-48	-48.0	111	469	373	96	20.5
49	57	63	-6	-10.5	112	469	373	96	20.5
50	625	818	-193	-30.9	113	94	139	-45	-47.9
51	138	260	-122	-88.4	114	64	79	-15	-23.4
52	88	122	-34	-38.6	115	250	532	-282	-112.8
53	138	86	52	37.7	116	282	628	-346	-122.7
54	375	280	95	25.3	117	38	67	-29	-76.3
55	94	63	31	33.0	118	457	511	-54	-11.8
56	288	543	-255	-88.5	119	82	101	-19	-23.2
57	82	156	-74	-90.2	120	82	114	-32	-39.0
58	350	586	-236	-67.4	121	163	309	-146	-89.6
59	250	467	-217	-86.8	122	113	118	-5	-4.4
60	282	297	-15	-5.3	123	157	50	107	68.2
61	63	165	-102	-161.9	124	125	139	-14	-11.2
62	94	137	-43	-45.7					
63	219	156	63	28.8	Average	249	345	-96	-38.6

Source: Prepared by the two researchers based on the data of the questionnaire and the DEAP statistical program

The second resource: The amount of fertilizer

The total amount of fertilizers used at the total of the study sample was (878,867) tons with an average of (7.09) tons for each farm, and from the table (8) we note that the amount of fertilizers achieved for economic efficiency amounted to an average of (4.75) tons, meaning that there is a surplus in the amount of fertilizers used (2.34) tons (33%). From the results of the analysis, it was found that (4) farms achieved complete economic efficiency and the deficit or surplus in the amount of fertilizers was equal to zero, and (72) farms achieved surplus, and (48) farms achieved a deficit.

Table (8): The amount of surplus or deficit in the amount of fertilizers for the study sample.

Fertilizer / Ton					Fertilizer / Ton				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
1	12.87	6.29	6.58	51.12	64	4.50	2.48	2.02	44.91
2	6.43	3.57	2.86	44.51	65	19.25	4.11	15.14	78.63
3	6.83	4.59	2.24	32.76	66	2.35	2.80	-0.45	-18.98

Fertilizer / Ton					Fertilizer / Ton				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
4	10.80	4.66	6.14	56.88	67	19.25	7.02	12.23	63.54
5	3.08	1.93	1.14	37.11	68	5.58	2.66	2.92	52.29
6	4.13	2.89	1.24	30.01	69	7.65	5.93	1.72	22.51
7	7.75	3.91	3.84	49.57	70	17.60	9.36	8.25	46.85
8	48.93	11.47	37.46	76.56	71	3.00	1.48	1.52	50.67
9	2.10	3.57	-1.47	-69.90	72	2.65	4.25	-1.60	-60.34
10	1.40	2.66	-1.26	-90.00	73	3.00	4.70	-1.70	-56.77
11	1.48	1.48	0.00	0.00	74	1.30	2.12	-0.82	-62.69
12	5.90	3.39	2.51	42.61	75	4.50	11.24	-6.74	-149.73
13	7.41	9.56	-2.15	-29.01	76	4.50	11.24	-6.74	-149.73
14	4.94	6.66	-1.72	-34.72	77	4.88	2.96	1.92	39.38
15	8.28	11.48	-3.20	-38.59	78	3.13	4.61	-1.49	-47.58
16	1.53	1.87	-0.34	-21.96	79	4.50	4.93	-0.43	-9.56
17	2.08	4.32	-2.24	-108.05	80	12.15	9.70	2.45	20.20
18	3.14	3.23	-0.09	-2.97	81	3.07	3.23	-0.16	-5.15
19	13.15	2.37	10.78	81.95	82	2.10	3.98	-1.88	-89.38
20	8.70	2.57	6.13	70.47	83	2.00	2.00	0.00	0.00
21	8.04	2.80	5.24	65.22	84	12.10	2.55	9.55	78.95
22	26.85	11.06	15.79	58.82	85	3.13	8.79	-5.66	-180.77
23	26.85	11.06	15.79	58.82	86	1.57	4.82	-3.25	-206.75
24	3.82	4.25	-0.43	-11.23	87	17.12	4.66	12.46	72.80
25	4.15	9.56	-5.41	-130.36	88	8.20	11.40	-3.20	-39.00
26	8.40	5.29	3.11	36.99	89	1.95	5.68	-3.73	-191.23
27	2.10	1.96	0.14	6.81	90	10.30	11.31	-1.01	-9.82
28	13.08	2.68	10.39	79.48	91	2.70	5.34	-2.64	-97.70
29	4.15	4.02	0.13	3.08	92	2.80	3.48	-0.68	-24.18
30	11.63	11.63	0.00	0.00	93	4.34	5.43	-1.09	-25.09
31	2.33	2.48	-0.15	-6.39	94	1.86	2.80	-0.94	-50.32
32	3.87	3.57	0.30	7.80	95	6.25	4.93	1.32	21.12
33	10.70	11.55	-0.85	-7.97	96	7.45	10.51	-3.06	-41.11
34	1.89	2.07	-0.18	-9.52	97	10.05	9.43	0.62	6.21
35	2.95	3.50	-0.55	-18.64	98	8.75	8.75	0.00	0.00
36	9.15	5.00	4.15	45.38	99	3.80	2.25	1.55	40.74
37	4.15	3.21	0.95	22.77	100	8.10	6.75	1.36	16.73
38	10.25	2.66	7.59	74.05	101	12.70	9.86	2.84	22.35
39	23.75	4.43	19.32	81.35	102	7.25	5.20	2.05	28.25
40	2.05	3.06	-1.01	-49.12	103	7.30	5.75	1.55	21.27
41	2.05	3.06	-1.01	-49.12	104	8.50	3.80	4.71	55.35
42	3.41	3.61	-0.20	-5.95	105	1.03	2.66	-1.64	-159.51
43	3.13	3.36	-0.24	-7.65	106	1.46	1.50	-0.04	-2.80
44	3.35	2.27	1.08	32.12	107	4.08	4.29	-0.21	-5.25
45	5.20	3.00	2.20	42.29	108	5.75	6.07	-0.32	-5.48
46	4.32	2.48	1.84	42.62	109	5.75	6.07	-0.32	-5.48
47	6.00	2.00	4.00	66.63	110	3.85	1.87	1.98	51.53
48	10.30	2.52	7.78	75.50	111	12.00	4.93	7.07	58.92
49	4.32	1.62	2.70	62.59	112	12.00	4.93	7.07	58.92
50	28.58	10.86	17.72	61.99	113	1.50	2.43	-0.93	-62.20
51	5.71	3.73	1.98	34.73	114	1.15	1.80	-0.65	-56.35
52	6.37	2.25	4.12	64.65	115	4.75	6.63	-1.88	-39.62
53	2.25	1.87	0.38	17.07	116	15.03	7.65	7.38	49.08
54	10.40	3.93	6.47	62.20	117	2.64	1.66	0.97	36.93
55	2.60	1.62	0.98	37.85	118	12.15	6.41	5.75	47.28
56	11.43	6.75	4.69	40.99	119	1.33	2.03	-0.70	-52.83
57	3.43	2.62	0.82	23.76	120	5.05	2.16	2.88	57.17
58	11.46	7.20	4.26	37.18	121	12.55	4.25	8.30	66.14
59	9.17	5.93	3.24	35.35	122	2.50	2.21	0.29	11.76

Fertilizer / Ton					Fertilizer / Ton				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
60	4.00	4.11	-0.11	-2.83	123	2.25	1.48	0.77	34.22
61	3.40	3.02	0.38	11.09	124	10.03	2.43	7.59	75.73
62	3.00	2.41	0.59	19.63					
63	3.95	2.62	1.34	33.80	Average	7.09	4.75	2.34	33

Source: Prepared by the two researchers based on the data of the questionnaire and the DEAP statistical program

The third resource: The quantity of pesticides

The total amount of pesticides used in the total of the study sample was (2997) liters with an average of (24.2) liters per farm, and from Table (9) we note that the amount of pesticides achieved for economic efficiency reached on average (19.6) liters, meaning that there is a surplus in the amount of pesticides used (4.6) liters (19%). From the results of the analysis, it was found that (7) farms achieved complete economic efficiency and the deficit or surplus in the amount of pesticides was equal to zero, and (83) farms achieved a surplus, while (34) farms achieved a deficit.

Table (9): The amount of surplus or deficit in the amount of pesticides for the study sample.

Pesticides / Liter					Pesticides / Liter				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
1	41.0	26.8	14.2	34.6	64	20.0	8.7	11.3	56.5
2	21.0	13.9	7.1	33.8	65	50.0	16.5	33.5	67.0
3	26.0	18.7	7.3	28.1	66	25.0	10.2	14.8	59.2
4	26.0	19.0	7	26.9	67	35.0	30.2	4.8	13.7
5	6.0	6.2	-0.2	-3.3	68	14.0	9.6	4.4	31.4
6	9.0	10.7	-1.7	-18.9	69	26.0	25.1	0.9	3.5
7	20.0	15.5	4.5	22.5	70	51.0	41.3	9.7	19.0
8	45.0	51.6	-6.6	-14.7	71	10.0	4.0	6	60.0
9	10.0	13.9	-3.9	-39.0	72	14.0	17.1	-3.1	-22.1
10	7.0	9.6	-2.6	-37.1	73	20.0	19.3	0.7	3.5
11	4.0	4.0	0.0	0.0	74	16.0	7.0	9	56.3
12	13.0	13.0	0.0	0.0	75	30.0	50.9	-20.9	-69.7
13	52.0	42.2	9.8	18.8	76	30.0	50.9	-20.9	-69.7
14	35.0	28.5	6.5	18.6	77	13.0	11.0	2	15.4
15	30.0	51.6	-21.6	-72.0	78	22.0	18.8	3.2	14.5
16	15.0	5.8	9.2	61.3	79	14.0	20.3	-6.3	-45.0
17	21.0	17.4	3.6	17.1	80	40.0	42.9	-2.9	-7.3
18	23.0	12.3	10.7	46.5	81	18.0	12.3	5.7	31.7
19	37.0	8.9	28.1	75.9	82	23.0	15.8	7.2	31.3
20	14.0	9.2	4.8	34.3	83	6.0	6.5	-0.5	-8.3
21	17.0	10.2	6.8	40.0	84	7.0	9.1	-2.1	-30.0
22	97.0	49.3	47.7	49.2	85	25.0	38.6	-13.6	-54.4
23	96.0	49.3	46.7	48.6	86	13.0	19.8	-6.8	-52.3
24	30.0	17.1	12.9	43.0	87	12.0	19.0	-7	-58.3
25	29.0	42.2	-13.2	-45.5	88	43.0	50.9	-7.9	-18.4

Pesticides / Liter					Pesticides / Liter				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
26	32.0	22.0	10	31.3	89	21.0	23.9	-2.9	-13.8
27	8.0	6.3	1.7	21.3	90	27.0	51.1	-24.1	-89.3
28	15.0	9.7	5.3	35.3	91	17.0	22.3	-5.3	-31.2
29	35.0	16.0	19	54.3	92	12.0	13.5	-1.5	-12.5
30	52.0	52.0	0.0	0.0	93	24.0	22.7	1.3	5.4
31	5.0	8.7	-3.7	-74.0	94	11.0	10.2	0.8	7.3
32	9.0	13.9	-4.9	-54.4	95	21.0	20.3	0.7	3.3
33	40.0	51.8	-11.8	-29.5	96	22.0	46.7	-24.7	-112.3
34	10.0	6.8	3.2	32.0	97	51.0	45.9	5.1	10.0
35	21.0	13.6	7.4	35.2	98	44.0	44.0	0.0	0.0
36	35.0	20.6	14.4	41.1	99	6.0	7.7	-1.7	-28.3
37	36.0	12.2	23.8	66.1	100	29.0	29.0	0.0	0.0
38	23.0	9.6	13.4	58.3	101	52.0	47.1	4.9	9.4
39	35.0	18.0	17	48.6	102	22.0	22.0	0.0	0.0
40	12.5	11.5	1	8.0	103	19.0	24.2	-5.2	-27.4
41	12.5	11.5	1	8.0	104	12.0	15.0	-3	-25.0
42	18.0	14.1	3.9	21.7	105	11.0	9.6	1.4	12.7
43	16.0	12.9	3.1	19.4	106	6.0	4.1	1.9	31.7
44	18.0	7.8	10.2	56.7	107	19.0	17.3	1.7	8.9
45	20.0	11.2	8.8	44.0	108	40.0	25.7	14.3	35.8
46	27.0	8.7	18.3	67.8	109	40.0	25.7	14.3	35.8
47	12.0	6.5	5.5	45.8	110	9.0	5.8	3.2	35.6
48	18.0	8.9	9.1	50.6	111	34.0	20.3	13.7	40.3
49	4.0	4.6	-0.6	-15.0	112	34.0	20.3	13.7	40.3
50	79.0	49.9	29.1	36.8	113	10.0	8.5	1.5	15.0
51	16.0	14.6	1.4	8.8	114	4.0	5.5	-1.5	-37.5
52	11.0	7.7	3.3	30.0	115	23.0	28.4	-5.4	-23.5
53	7.0	5.8	1.2	17.1	116	20.0	33.2	-13.2	-66.0
54	30.0	15.6	14.4	48.0	117	4.0	4.9	-0.9	-22.5
55	8.0	4.6	3.4	42.5	118	33.0	27.3	5.7	17.3
56	57.0	28.9	28.1	49.3	119	12.0	6.6	5.4	45.0
57	17.0	9.4	7.6	44.7	120	19.0	7.2	11.8	62.1
58	49.0	31.1	17.9	36.5	121	20.0	17.1	2.9	14.5
59	39.0	25.1	13.9	35.6	122	17.0	7.4	9.6	56.5
60	20.0	16.5	3.5	17.5	123	37.0	4.0	33	89.2
61	11.0	11.0	0.0	0.0	124	29.0	8.5	20.5	70.7
62	10.0	8.4	1.6	16.0					
63	17.0	9.4	7.6	44.7	Average	24.2	19.6	4.6	19

Source: Prepared by the two researchers based on the data of the questionnaire and the DEAP statistical program

Fourth supplier: The amount of mechanical work

The total amount of mechanical work used for the total of the study sample was (3263) hours with an average of (26.3) hours for each farm, and the table (10) we note that the amount of mechanical work achieved for economic efficiency amounted to an average (27.4) hours that is, there is a deficit in the amount of work the mechanic used is (1.1-) hour, at a rate of (4.18%). From the results of the analysis it was found that (4) farms achieved complete economic efficiency and the

deficit or surplus in the amount of mechanical work was equal to zero, and (39) farms achieved surplus, and (81) farms achieved a deficit.

Table (10): amount of surplus or deficit in the amount of mechanical work for the sample of the study.

Mechanical Work / Hour					Mechanical Work / Hour				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
1	90	34.4	55.6	61.8	64	20	14.3	5.7	28.5
2	45	20	25	55.6	65	40	22.9	17.1	42.8
3	20	25.4	-5.4	-27.0	66	25	15.9	9.1	36.4
4	56	25.8	30.2	53.9	67	35	38.2	-3.2	-9.1
5	10.5	11.4	-0.9	-8.6	68	7.5	15.2	-7.7	-102.7
6	17.5	16.4	1.1	6.3	69	24.5	32.5	-8	-32.7
7	25	21.8	3.2	12.8	70	37.5	50.5	-13	-34.7
8	166.5	64	102.5	61.6	71	6	9	-3	-50.0
9	6	20	-14	-233.3	72	17.5	23.6	-6.1	-34.9
10	4	15.2	-11.2	-280.0	73	12.5	26	-13.5	-108.0
11	9	9	0.0	0.0	74	5	12.4	-7.4	-148.0
12	36	19.1	16.9	46.9	75	37.5	66.2	-28.7	-76.5
13	52.5	51.6	0.9	1.7	76	37.5	66.2	-28.7	-76.5
14	35	36.3	-1.3	-3.7	77	7.5	16.8	-9.3	-124.0
15	77	63.9	13.1	17.0	78	15	25.5	-10.5	-70.0
16	7.5	11	-3.5	-46.7	79	30	27.2	2.8	9.3
17	21	24	-3	-14.3	80	37.5	52.3	-14.8	-39.5
18	15	18.2	-3.2	-21.3	81	12.5	18.2	-5.7	-45.6
19	30	19	11	36.7	82	14	22.2	-8.2	-58.6
20	10	14.8	-4.8	-48.0	83	7.5	11.8	-4.3	-57.3
21	14	15.9	-1.9	-13.6	84	17.5	14.6	2.9	16.6
22	87.5	59.5	28	32.0	85	30	47.5	-17.5	-58.3
23	87.5	59.5	28	32.0	86	15	26.6	-11.6	-77.3
24	28	23.6	4.4	15.7	87	20	25.8	-5.8	-29.0
25	18	51.6	-33.6	-186.7	88	37.5	61.3	-23.8	-63.5
26	36	29.1	6.9	19.2	89	15	31.1	-16.1	-107.3
27	9	11.5	-2.5	-27.8	90	22.5	65.5	-43	-191.1
28	17.5	15.3	2.2	12.6	91	15	29.4	-14.4	-96.0
29	24.5	22.4	2.1	8.6	92	6	19.5	-13.5	-225.0
30	62.5	62.5	0.0	0.0	93	17.5	29.8	-12.3	-70.3
31	7.5	14.3	-6.8	-90.7	94	7.5	15.9	-8.4	-112.0
32	12.5	20	-7.5	-60.0	95	15	27.2	-12.2	-81.3
33	50	63.2	-13.2	-26.4	96	35	56.6	-21.6	-61.7
34	7.5	12.1	-4.6	-61.3	97	103.5	83.5	20	19.3
35	15	19.7	-4.7	-31.3	98	90	90	0.0	0.0
36	30	27.6	2.4	8.0	99	9	13.1	-4.1	-45.6
37	18	18	0.0	0.0	100	25	36.8	-11.8	-47.2
38	15	15.2	-0.2	-1.3	101	105	79.4	25.6	24.4
39	45	24.6	20.4	45.3	102	15	28.6	-13.6	-90.7
40	12.5	17.3	-4.8	-38.4	103	54	31.5	22.5	41.7
41	12.5	17.3	-4.8	-38.4	104	12.5	21.2	-8.7	-69.6
42	15	20.3	-5.3	-35.3	105	7.5	15.2	-7.7	-102.7
43	10	18.9	-8.9	-89.0	106	4	9.1	-5.1	-127.5
44	17.5	13.2	4.3	24.6	107	20	23.8	-3.8	-19.0
45	15	17	-2	-13.3	108	25	33.2	-8.2	-32.8
46	15	14.3	0.7	4.7	109	25	33.2	-8.2	-32.8
47	7.5	11.8	-4.3	-57.3	110	12.5	11	1.5	12.0
48	10	14.5	-4.5	-45.0	111	30	27.2	2.8	9.3
49	4.5	9.7	-5.2	-115.6	112	30	27.2	2.8	9.3

Mechanical Work / Hour					Mechanical Work / Hour				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
50	87.5	69.8	17.7	20.2	113	7.5	14	-6.5	-86.7
51	17.5	20.9	-3.4	-19.4	114	5	10.8	-5.8	-116.0
52	6	13.1	-7.1	-118.3	115	30	36.2	-6.2	-20.7
53	17.5	11	6.5	37.1	116	35	41.6	-6.6	-18.9
54	40	21.9	18.1	45.3	117	5	10	-5	-100.0
55	10	9.7	0.3	3.0	118	59.5	35	24.5	41.2
56	35	36.8	-1.8	-5.1	119	7.5	11.9	-4.4	-58.7
57	10.5	15	-4.5	-42.9	120	7.5	12.6	-5.1	-68.0
58	35	39.2	-4.2	-12.0	121	20	23.6	-3.6	-18.0
59	28	32.5	-4.5	-16.1	122	10	12.8	-2.8	-28.0
60	40	22.9	17.1	42.8	123	12	9	3	25.0
61	8	17.1	-9.1	-113.8	124	10	14	-4	-40.0
62	18	13.9	4.1	22.8					
63	12	15	-3	-25.0	Average	26.3	27.4	-1.1	-4.18

Source: Prepared by the two researchers based on the data of the questionnaire and the DEAP statistical program

Fifth resource: the amount of human labor

The total amount of human work used for the total of the study sample was (141477) men / day with an average of (1141) men / day for each farm, and from the table (11) we note that the amount of human work achieved for economic efficiency reached on average (537) men / day that is, There is a surplus in the amount of human labor used (604) men / day, at a rate of (52.9%). From the results of the analysis, it was found that (3) farms achieved complete economic efficiency and the deficit or surplus in the amount of human labor was equal to zero, and all the remaining farms (121) achieved a surplus, and no farm achieved a deficit.

Table (11): The amount of surplus or deficit in the amount of human labor for the study sample.

Human work: Man / Day					Human work: Man / Day				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
1	1826	572	1254	68.7	64	605	282	323	53.4
2	913	365	548	60.0	65	1154	406	748	64.8
3	1061	442	619	58.3	66	713	306	407	57.1
4	1504	448	1056	70.2	67	1840	627	1213	65.9
5	521	241	280	53.7	68	574	296	278	48.4

Human work: Man / Day					Human work: Man / Day				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
6	877	313	564	64.3	69	1809	544	1265	69.9
7	860	391	469	54.5	70	2396	805	1591	66.4
8	3296	1134	2162	65.6	71	242	206	36	14.9
9	655	365	290	44.3	72	986	416	570	57.8
10	437	296	141	32.3	73	1173	451	722	61.6
11	206	206	0.0	0.0	74	621	254	367	59.1
12	826	351	475	57.5	75	2521	1369	1152	45.7
13	2322	820	1502	64.7	76	2521	1369	1152	45.7
14	1548	599	949	61.3	77	532	318	214	40.2
15	2776	1129	1647	59.3	78	1009	444	565	56.0
16	377	235	142	37.7	79	1247	468	779	62.5
17	854	422	432	50.6	80	1928	830	1098	57.0
18	768	339	429	55.9	81	787	339	448	56.9
19	1306	659	647	49.5	82	893	396	497	55.7
20	752	289	463	61.6	83	399	246	153	38.3
21	664	306	358	53.9	84	512	287	225	43.9
22	2425	934	1491	61.5	85	1940	761	1179	60.8
23	2425	934	1491	61.5	86	970	460	510	52.6
24	1007	416	591	58.7	87	688	448	240	34.9
25	1780	820	960	53.9	88	2635	960	1675	63.6
26	1374	496	878	63.9	89	999	525	474	47.4
27	344	242	102	29.7	90	2656	1296	1360	51.2
28	720	297	423	58.8	91	1243	499	744	59.9
29	899	399	500	55.6	92	838	358	480	57.3
30	977	977	0.0	0.0	93	1002	506	496	49.5
31	331	282	49	14.8	94	430	306	124	28.8
32	553	365	188	34.0	95	897	468	429	47.8
33	2840	1051	1789	63.0	96	1916	893	1023	53.4
34	489	251	238	48.7	97	4479	3208	1271	28.4
35	713	360	353	49.5	98	3894	3894	0.0	0.0
36	1394	473	921	66.1	99	475	265	210	44.2
37	814	337	477	58.6	100	1578	606	972	61.6
38	843	296	547	64.9	101	3522	2766	756	21.5
39	1154	430	724	62.7	102	1119	489	630	56.3
40	595	326	269	45.2	103	1320	530	790	59.8
41	595	326	269	45.2	104	848	382	466	55.0
42	968	368	600	62.0	105	466	296	170	36.5
43	775	349	426	55.0	106	274	208	66	24.1
44	786	266	520	66.2	107	634	420	214	33.8
45	859	322	537	62.5	108	1215	554	661	54.4
46	700	282	418	59.7	109	1215	554	661	54.4
47	539	246	293	54.4	110	460	235	225	48.9
48	518	285	233	45.0	111	1201	468	733	61.0
49	304	216	88	28.9	112	1201	468	733	61.0
50	3608	1752	1856	51.4	113	524	278	246	46.9
51	722	377	345	47.8	114	376	230	146	38.8
52	658	265	393	59.7	115	1858	598	1260	67.8
53	559	235	324	58.0	116	1942	675	1267	65.2
54	1310	392	918	70.1	117	313	220	93	29.7
55	327	216	111	33.9	118	1804	580	1224	67.8
56	1558	606	952	61.1	119	526	247	279	53.0
57	468	292	176	37.6	120	406	258	148	36.5
58	1668	641	1027	61.6	121	878	416	462	52.6
59	1334	544	790	59.2	122	470	261	209	44.5
60	1100	406	694	63.1	123	300	206	94	31.3

Human work: Man / Day					Human work: Man / Day				
Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%	Farm	The quantity used	Realized quantity Economic Efficiency	quantity of surplus or deficit	Percentage of surplus or deficit%
61	535	323	212	39.6	124	560	278	282	50.4
62	487	277	210	43.1					
63	539	292	247	45.8	Average	1141	537	604	52.9

Source: Prepared by the two researchers based on the data of the questionnaire and the DEAP statistical program

CONCLUSIONS AND RECOMMENDATIONS

The results of the economic efficiency assessment using a data envelope analysis method showed that the average Economic Efficiency was about (50.8%), meaning that these farms can achieve the same level of production in light of the redistribution of economic resources, and provide a percentage of the quantities of resources used and reduce production costs by (49.2%), and three farmers its rate (2.4%) is complete technical, allocation and economic efficiency (100%), meaning that it occurred at the points of contact between the equal output curve and the equal costs line as a result of its being able to achieve the maximum possible production with the lowest possible quantities of production inputs, and the lowest possible costs of production inputs, and when estimating the size of the economic resources achieved for economic efficiency through a method of analyzing the data envelope DEAP shows that most of the farms achieved a surplus in the use of most of the production elements by comparing the amount of resources actually used with their achieved efficiency Economic.

The study recommended the need for farmers to implement agricultural operations at the appropriate times for them, and to use the production elements in optimal quantities and according to the crop's need for them, as well as decision-makers can study the reasons for the success of many Of the farms that have achieved complete economic efficiency (100%) to be references to farms that have not achieved economic efficiency, although they work in the same conditions to be followed in how to choose the optimal resource combination that lowers costs and maximizes profit.

دراسة الكفاءة الاقتصادية لمحصول الطماطة للموسم الانتاجي 2019 في محافظة نينوى ناحية زمار انموذجاً تطبيقياً

الخلاصة

هدفت الدراسة الى قياس الكفاءة الاقتصادية ومكوناتها الكفاءة التقنية والكفاءة التخصيصية من جانب المدخلات وعلى فرض تغير عوائد الحجم (VRS) وباستخدام اسلوب تحليل مغلف البيانات (DEA), وكذلك الاطلاع على هيكل وبنود تكاليف إنتاج محصول الطماطة, ومعرفة مدى تحقيق الوحدات الاقتصادية للاستخدام الرشيد لموارد الانتاج. جمعت البيانات اللازمة للدراسة ميدانياً من خلال استمارة استبانة نفذت بالمقابلة الشخصية لـ (124) من مزارعي محصول

الطماطة بطريقة الزراعة المكشوفة في محافظة نينوى (ناحية زمار انموذجاً تطبيقياً) للموسم الانتاجي 2019, وشملت المتغيرات التفسيرية (البذور, الاسمدة, المبيدات, العمل الميكانيكي, العمل البشري) اما المتغير المعتمد فهو انتاج محصول الطماطة, وتوصلت الدراسة الى العديد من الاستنتاجات اهمها, أن ثلاثة مزارع نسبتها (2.4%) حققت كفاءة تقنية وتخصيصية واقتصادية كاملة (100%) , واظهرت نتائج تقدير الكفاءة الاقتصادية أن متوسط الكفاءة الاقتصادية بلغ نحو (50.8%), اي أن هذه المزارع بإمكانها تحقيق المستوى نفسه من الانتاج في ظل تخفيض تكاليف الانتاج بنسبة (49.2%), واوصت الدراسة بضرورة استخدام المزارعين للموارد الاقتصادية وفق احتياج المحصول لهذه الموارد وبالشكل الذي يدني التكاليف ويعظم الربح, ومن الضروري أن تدرس اسباب نجاح العديد من المزارع التي حققت كفاءة اقتصادية كاملة (100%) لتكون مراجع للمزارع التي لم تحقق الكفاءة الاقتصادية على الرغم من انها تعمل في نفس الظروف.

الكلمات المفتاحية: الكفاءة الاقتصادية, الكفاءة التقنية, الكفاءة التخصيصية, محصول الطماطة.

تاريخ استلام البحث: 2020/7/23، وقبوله:2020/8/12

REFERENCES

Ali, I. H. (2014). Measuring Economic Efficiency and Determining the Economic Size of Diyala Governorate Farms. Doctor's thesis / Agricultural Economics Department, College of Agriculture, University of Baghdad.

Al-Rashidi, M.(2018). Quantitative Methods in Administration, College of Business Administration, King Faisal University, Deanship of E-Learning and Distance Education.

Banker, R. D.(1984). Estimating Most Productive Scale Size Using Data Envelopment Analysis . European Journal of Operational Research 217.

Charnes, A. Cooper, W. W. and Rhodes, E. , (1978). Measurement the Efficiency of Decision Making units. *European Journal of Operational Research, 2*.

Cooper, S .T. (2003). Data Envelopment Analysis: Acomprehensive Text with Models ,Applications ,Refernces and DEA-Solver Software , Kluwer Academic Publishers Group, Norwell ,Massachusetts 02061 USA.

Debertin, L. D. (2012). Agricultural Production Economic Second Edition Macmillan Publishing Company , USA .

El-Saqa, M. I. (2008). Analysis of the Technical Competence of Banks in the State of Kuwait Using the Data Encryption Analysis, Scientific Journal of Economics and Administration, Faculty of Commerce, Ain Shams University, No. 2.

Farrell , M.J.(1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society , A, 120 , No , 3 , P: 253-290.*

Rubenstein, R ,(2005). The Reliability of School Efficienc Measures Using Data Envelopment Analysis , In:L.Stiefel. A. Schwartz; R. Rubenstein. And J. zabel