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Original Research Article

Economic return of water unit used for barley crop production in newly reclaimed lands

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Abstract

Barley a members of the Poaceae family is an important grain crop globally. It occupies fourth place in importance after wheat, maize and rice and locally. It is one of the, is one of the important grain crops planted by humans for food thousands of years ago (The study aimed at estimating crop production costs and expected returns, estimating the productivity and economic efficiency of the water unit, this point will used to irrigate a Feddan of the barley crop by following the new irrigation systems and determining the spray irrigation system, identifying the economic and social characteristics of the farmers in an easy area, that estimation of the economic revenue of the water unit used in irrigating of barley crop Feddan. When using the new irrigation systems (sprinkler irrigation), the farmer achieves a saving in the productivity of the Faddan and the quantity of irrigation water from the barley crop by 16.7% and 25%, respectively, of the average productivity of the Faddan and the user of the irrigation water per Faddan of the barley crop in the case of surface irrigation And the adult at a significant level 0.01 barley yield in the study area, the value of (f) 135.75.195.67.49.76,227.61,160.04, respectively.

Keywords: Water unit return, Net revenue, Faddan productivity, New irrigation systems

INTRODUCTION

Barley was considered one of the important grain crops which planted in Egypt for domestic consumption, It was considered one of the most important grain crops grown by humans for its food for thousands of years in Egypt . It was an annual winter grain crop which consisted of about 50 species, In terms of importance barley was Occupied fourth place after wheat, corn and rice finally barley was favorite crop of wheat in the manufactured of bread until the sixteenth century AD in Europe and some other countries.

Barley has been used as a food for humans and animals for more than ten centuries BC, and this crop had unique qualities more than other grain crops, barley was featured than the other grain crops which adopted with the environmental conditions, and it was used for human and animal feed. Barley was cultivated in the desert areas of Egypt,. Barley was cultivated in new lands had salinity problems with water irrigation or soil and at the ends of the canals which do not reached the enough amount from water irrigation.

An adequate amount of irrigation water is used in the production of barley necessary to feed the agricultural animal, such as milk and meat animals, barley was cultivated in the new lands, which are either sandy or saline lands and lack irrigation water. The need for green and dry fodder production to feed livestock has increased significantly in previous years, This is primarily due to increased per capita income and changes in all goods and services.

Economic and Agricultural Importance of barley Crop, several uses including

Barley is a reclamation crop of the soil because it is attractive to salinity from soil and improve fertility and resistant to climate changes, Buds contained a substance preservative of the plant and therefore not less than one seed, however, stays in the ground and the buds are pointed like a thorn which protect the barley from birds eating, Barley is used as animal fodder especially sheep and camels because the hey contain high percentage of protein, carbohydrates and a small proportion of fibers, the crop is grown in the winter and is economically low in the amount of water irrigation required. Salinity is highly tolerated and therefore irrigation is suitable for salty water wells. It takes a short period during winter (3 – 4) months, human and animal feeding, food Industry and green fodders.

Land suitable for barley cultivation

Barley was widespread in all agricultural lands, whether clay, yellow, sandy or limestone, and it was preferred to cultivate in the yellow lands and barley can grow in saline lands and give an economic crop until the concentration of six thousand ppm dissolved salts, whether the source of these salts is the soil or water irrigation or both.

Barley is more prevalent than wheat in some areas where barley was cultivated in desert lands unsuitable for wheat cultivated because barley was increased tolerance to the adverse environmental conditions more than wheat. Therefore, Barley productivity more than wheat productivity in unsuitable weather conditions, barley used to help in reclamation Saline-concentrated lands.

Study Problem

The emergence of the problem of water shortage and the high demand for high-water fodder crops resulted in loss of irrigation water, resulting in a decrease in the amount of water used for irrigation through the use of traditional irrigation system (surface irrigation) as well as the introduction of green fodder crops that do not have. The ability to tolerate soil salinity, water salinity and drought resistance to consider the feasibility of applying the traditional irrigation system to grow barley. The barley crop is used as a green feed in the first stages of growth and then obtained the grain yield at the end of the season. Did not High yields for irrigation water and non-salinity for both water and soil salts.

The study problem is illustrated by the amount of water lost by barley in the transpiration, in the construction of its tissues and its biological processes, in addition to the decrease in the quantities of available water and the poor use of it in agricultural purposes due to the reliance on the traditional irrigation system in the irrigation of agricultural crops, Water losses, and the difficulty of securing the water needed for agriculture, in return for the high production costs, causing the deterioration of the fertility of the agricultural soil, and consequently the decline in agricultural production and its weak contribution to the availability of food for the population and the low income of the farms consumed quantities in the environmental conditions, especially climatic changes, have a significant impact on the water consumption of crops and the traditional irrigation system (surface), which in turn leads to loss and waste of water through flood irrigation and must be calculated in water needs The barley crop gets sufficient water, and it is necessary to reduce the different types of losses to increase the efficiency of irrigation and maximize the water utilization. This occurs when there is a large loss of water especially when the surface irrigation is increased. However, such deep infiltration may sometimes be required to remove the salinity to remove the salts from the roots and drain them. This requires a good drainage system and therefore treatment is done. (Irrigation) to avoid surface irrigation problems, which in turn affect the productivity of soil and crop. Therefore, the application of modern irrigation system (sprinkler) should be reconsidered and distributed to minimize the damage caused by the traditional application of water loss and waste as well as waste and loss of used irrigation. Therefore, the modern irrigation system must be applied.

Objectives of Study

*Identify the economic and social characteristics of barley farmers in the study area (SahlELTinah).
*Estimate of crop production costs and expected returns.
*Assessment the productivity and economic efficiency of the water unit used to irrigate barley crop Faddan which used modern irrigation systems especially sprinkle irrigation system.
*Estimate the economic return of the water unit used from water irrigation of barley crop Faddan.

Research Methodology and Data Sources

The study relied on data published by governmental bodies, whether those data were in agricultural departments, agricultural directorates, information center in Port Said governorate and SahlELTinah of the mud, and depend on data collected through the questionnaires from barley farmers in the study area, Some methods of statistical analysis were used such as percentages of farmers characteristics, estimate of economic returns water Unit, estimate the cost of producing the crop, estimate the productivity and economic efficiency of the

water unit used to irrigate barley crop Faddan and estimate the value..(f)

Study area description

SahlELTinah was chosen a study area because it was one of the areas of new reclaimed lands, which has a special nature as it has more than a kind of new land and newly reclaimed lands also has a variety of soil types where there is clay soil and sandy soil, there is a variety of traditional and new irrigation systems It was spread by diverse crops of trees, vegetables, nigella crops, wild crops, and crop composition of the salt-tolerant slurry, where soil and soil contain a high concentration of saline and aquatic salts, so it is necessary to grow crops that are tolerated for saline and saline salts. The current crop of barley in the area, where it is one of the most important Nile and Alfalfa crops cultivated by easy clay, because it is considered a reformed crop of the land which has a high concentration of salinity because it is an attractive and tolerant crop of salinity.

The study area was located on the eastern side of the Suez Canal, It is administratively located south of Port Said and the geography of North Sinai, It is one of the areas targeted by the development plan for Peace Canal for the reclamation and cultivation of about 620 thousand Faddans west and east of the Suez Canal, Agricultural and non-agricultural areas, roads, nurseries, agricultural banks and residential buildings are about 15.8 thousand Faddans, and the area allocated for plant farming is about 34.2 thousand Faddans distributed in 7 villages (with an area currently planted about 10.2 thousand Faddans, Z 15.8 thousand acres, and areas under cultivation and fallow and washing of about 8.2 thousand acres), and the lengths of irrigation canals, about 36.3 km, agricultural banks, about 92.1 km (The status of the lands of the plain area, Agricultural Research Center, Soil, Water and Environment Research Institute, June (2015). There are three main categories in the SahlEl-Tinah area: (a) large companies with more than 500 Faddans per company; (b) medium-sized companies with less than 500 Faddans per company; and (c) small-scale farmers, -10 acres (The status of the lands of the plain area, Agricultural Research Center, Soil, Water and Environment Research Institute, June 2015).

There are three main categories in the Sahl al-Tinah area: (a) large companies with more than 500 Faddans per company; (b) medium-sized companies with less than 500 Faddans per company; and (c) small-scale farmers, -10 acres (The status of the lands of the plain area, Agricultural Research Center, Soil, Water and Environment Research Institute, June 2015).

The geographical division of Sahl EL Tina:

*Study area villages description in the plain of the clay.

Seven villages SahlEL-Tinah had typical

The study area (SahlELTinah) was mainly composed of seven villages (1), (2), (3), (4), (5), (6), (7). The distribution of housing units, which forced the beneficiaries to form their own communities by self-effort: (5 bridges, 10 bridges, 1750 division, 1200- Qantara al-Hajj) (Monitoring and evaluation of the comprehensive agricultural development of the areas adjacent to the Peace Canal).

Localization villages in Sahl al-Tinah

When planning the beneficiaries localization in the study area (Sahl al-Tinah), the target was to establish a number of (7) typical villages (villages 1, 2, 3, 4, 5, 6, 7) the infrastructure was constructed for (5) localization villages (1,2,3,4,7). (Monitoring and evaluation of the comprehensive agricultural development of the areas adjacent to the Peace Canal).

Natural characteristics of the study area

The studies conducted on the lands of the study area (Sahl al-Tainah) showed the study area had muddy and sandy lands, which contained a high amount of salts, which were considered highly saline, the ground water analysis sample indicates that it contained a high concentration of salts.

Different sources and irrigation systems in study area (SahlELTinah)

SahlELTinah was irrigated from two sources the first Sheikh Jaber canal, the second branch of the east peace canal ,also irrigated from the combination of mixed water, fresh water from the Nile River and agricultural drainage water the traditional irrigation is prevailing irrigation system in the study area was surface irrigation, but because of the surface irrigation system of many defects, the most important of which is the waste and loss of large amounts of irrigation water In addition, farmers have recently resorted to following modern irrigation systems in the region. The most important of these was the use of a sprinkler irrigation system. The drip irrigation system is also used in very limited areas southeast of the plain of Tina (Port Said Governorate - Agriculture Directorate, Agricultural Services Department, unpublished data, 2017).

Surface irrigation system

The surface irrigation system is one of the oldest irriga-

tion systems and is the most common in the Egyptian lands, especially the old ones, because it does not need high technology and high cost, compared to other modern irrigation systems, but at the same time caused a great loss and waste of water irrigation used and waste of large amounts of seeds were used in agriculture.

The concept and importance of new irrigation systems

New irrigation systems means new Inferred methods in new and developed irrigation systems were used in reclaimed agricultural lands irrigation, depending on the quality of soil, geology and terrain Lands, to exploiting water resources and rationalizing their uses and raising the efficiency of agricultural irrigation for larger cultivation areas of agricultural lands or raising the efficiency of using water in the agricultural area unit.

Subsequently increase Agricultural productivity, agricultural production, reducing production costs and achieving higher economic returns compared to conventional irrigation, the use of modern scientific and technological methods in irrigation was not an environmental treatment of water scarcity and water crises, but to keep pace with the scientific and technical development in the field of irrigation to overcome all the obstacles facing the problem of traditional irrigation (surface) and the most important low efficiency of water use for irrigation, which is the cause and the first axis to keep abreast of these developments and the resulting methods of modern irrigation.

The use of conventional irrigation methods requires large quantities of water, accompanied by large water losses and losses, due to surface runoff, evaporation and flooding of amounts of water deep inside the earth.

Traditional irrigation does not achieve consistency in the distribution of water to plants due to the low efficiency of water transport and distribution. The scientific facts of the use and dissemination of modern irrigation methods confirm the advantages and advantages of these technologies,

Including large control over water resources available to achieve economies of scale, water and control on the processing and reduce the water losses and losses, and avoid waste and waste and waste in water as a result of use in irrational irrigated agriculture, the extension of plants needs the actual need of water without increasing or decreasing. Raising the efficiency of the use of production inputs (fertilizers, seeds, fertilizers, pesticides, etc. with irrigation water) which improves productivity of agricultural crops and increase agricultural production, raising the efficiency and full investment of water and agricultural land without loss, and reduce the processes of adjustment and adjustment of land, and reduce the working hands, and reduce the size of field facilities such as irrigation channels, docks and crossings, and non-obstruction of agricultural operations, which it reflects the positive on the ease of establishment and the low cost of investment first, it does not need to cut dirt channels within the agricultural land, and spend large capital for the reclamation of land and labor costs and energy and others. Of course, this is appropriate for most of the countries suffering from economic problems and funding, rather than their role in improving the environment and raising the level of agricultural activity

Drip irrigation system

The plants need irrigation to grow properly, drip irrigation is one of the main irrigation methods, Water is pumped to the plants in measured quantities and slowly, in a small form, using small parts called points drip irrigation is often used for irrigation Vegetable crops, forests, and ornamental shrubs (Analysis of the impact of the use of modern irrigation techniques in water resources investment And the development of agricultural production in Iraq-College of Economics and Administration – Wasit University).

Drip irrigation disadvantages

The possibility of clogging the holes of deposits with sediments and salts, and the contents of irrigation water. Differential water pressure along the tube, resulting in irregular distribution of water. Plastic pipes may be damaged by rodents, high cost when construction, where you need a dense pipe network and points (Analysis of the impact of the use of modern irrigation techniques in water resources investment and the development of agricultural production in Iraq-College of Economics and Administration – Wasit University).

Sprinkle irrigation system

The idea of sprinkling irrigation is based on simulating rainfall by pushing the water under pressure through air openings or water sprayers, were spread and fallen like drops over the soil surface to reach the roots to desired moisture content and generate pressure by water pipes of the sprinkler Pumps, about sprinkle irrigation system which was distributed of water irrigation in the sprays or a stream of water was tricked into drops by the rush of water under pressure from the opening of the sprinkler, it was preferably in the lands which needed high costs for the settlement operations and in the absence of water irrigation or the high costs of providing which was used in all new lands and When was cultivated high vegetation density crops, this method had succeeded in all reclaimed lands because was Increased irrigation efficiency (75-85%) compared to conventional irrigation

(Analysis of the impact of the use of modern irrigation techniques in water resources investment And the development of agricultural production in Iraq-College of Economics and Administration – Wasit University).

Sprinkling irrigation features

Low-water source with high efficiency. used
Elimination of runoff surface irrigation problems
Easily irrigation terrain lands.
Terrain topographic terrain without compromise
Get frequent light irrigations with high efficiency.
Used of a few labors for a few times per day
Saving the quantity of water through full control and transfer through water pipes and thus eliminate the leakage that occurs when used opened channels (Analysis of the impact of the use of modern irrigation techniques in water resources investment And the development of agricultural production in Iraq-College of Economics and Administration – Wasit University).

RESULTS AND DISCUSSION

The selection of the sample was based on the selection of all barley farmers in the study area. The villages were selected (7.4) to concentrate the agricultural activities in these villages, the traditional irrigation system and the new irrigation system were applied. This is the basis of the selection of (73) farmers, all of them barley crop farmers in the study area which were applied the traditional irrigation systems (surface irrigation) and modern (sprinkle irrigation) (Fodder Materials Part 1 Coarse Fodder - Arab Publishing House, Cairo, Egypt).

Table (1) indicates the social and economic characteristics of the population of the study area, which showed that land tenure was one of the most important criteria by which the level of income and the size of agricultural production of barley farmers were measured by the study area. Agricultural activity is the main activity in the study area. Table (1) showed the distribution barley farmers according to the average land tenures, where they can be arranged according to the importance of the average size of land tenures as follows: the first category was (less than 5 feddens), the second category (5-7 feddens) and the last category was more than (7 feddens) by followed percentages: 20.5%, 54.8% and 24.7%, respectively, of the total number of barley farmers, also the table reflected the distribution of barley farmers according to the source and water irrigation systems, The largest number of barley farmers were used the new irrigation system(sprinkle irrigation) the percentage was58.9% reached to about (43) barley farmers, but the smallest percentage barley farmers which applied the(surface irrigation) traditional system about 41.1% towards 30 barley farmers. The average of the animal holdings were: category I (less than 5 animal heads) Category 2 (from 5 to 10 heads), category 3 (more than 10 heads) which percentage were: 27.4%, 52.1%, 20.5% respectively of the total study sample barley farmers, the data confirm that the animal production were one of the most important sources of income in the study area. Therefore it was found that more than 50% of the barley farmers had animal holdings ranging from (5-10) animal heads per family. The distribution of barley farmers in the study area according to age categories first category less than (35yaers old), second category about (35-55 years old) and the third category (more than 55 years old) the percentages were about (13.7%, 79.5%, 6.8%) respectively.

The educational situation of barley farmers in the study area harvest, the largest number of barley farmers concentrated in the above-average qualification, about30 barley farmers were reached 41.1%, the technical education around (14 barley farms) the percentage was almost 19.2%, around (2) barley farms had university education, about 2.7% finally the reading and writing numbers almost (12, 14 barley farmers) about (19.2% and 16.4%) respectively.

The social situation of the barley farmers were found all of barley farmers married and had children the percentage were100%.

The number of family members of barley farmers in study area were concentrated between 5-7 persons about40 barley farmers percentage was reached about 58.4%, less than 5 persons, barley farmers number about 18 farmers and more than 7 persons barley farmers number almost 12 farmers the percentages were reached around 16.4%, 24.7% respectively. The first category of barley farmers had income level between (3000-5000) pounds about 45 barley farmers while the percentage was reached about 61.6%, second category less than (3000) pounds about 15 farmers the percentage was reached almost 20.5%, and the last category had more than (5000) pounds about barley farmers number about 13 farmers 17.9%.

Then the majority of the barley farmers have farms ranging from 5-7 to 54.8% of the total barley farmers. For the irrigation system, most barley farmers in the study area followed the modern irrigation system by spraying with 58.9% because they found the advantages of sprinkler irrigation As a result of the above table, we found that barley farmers own about (5-10) heads of animal possession by 52.1%, and in relation to the majority of barley farmers in the area. The percentage of farmers in the study area is about (100%). In terms of the number of family members, it is noted that the majority of farmers in the study area range from (5-7) individuals with 58.9% Of the total barley farmers in the area of study, and found that the level of income obtained by the majority of barley farmers in the study area ranged between 3 000-5000 pounds, estimated at about 61.6% of the total barley farmers in the study area and the ages

Table 1. Description of personal and socio-economic characteristics barley cropfarmers

Items	Description	Frequency	Percentage
Age	Younger than 40 years	10	13.7
	Between(40-60)year	58	79.5
	Older than 60 year	5	6.8
	Total	73	100
Education Status	Non education	2	2.7
	Read and write	14	19.2
	Primary education	-	-
	Preparatory education	-	-
	Technical education	25	43.3
	University education	2	2.7
	Education above average	30	41.1
	Total	73	100
Marital Status	Married and have children	73	100
	Married andhavenochildren	-	-
	Single	-	-
	Divorcedorwidowed	-	-
	Total	73	100
Number of family members	Less than 5 members	18	24.7
	Between(5-10) members	43	58.9
	Greater than(10) members	12	16.4
	Total	73	100
Income /month	Less than(3000) L.E	15	20.5
	Between(3000-5000) L.E	45	61.6
	More than 5000 L.E	13	17.9
	Total	73	100
Farm size	Less than 10 Faddan	15	2.5
	Between 10-20 Faddan	40	54.8
	More than 20 Faddan	18	24.7
	Total	73	100
Irrigation system	Sprinkler irrigation	43	58.9
	Surface irrigation	30	41.1
	Total	73	100

Source: collected by questionnaires (2017-2018).

of barley farmers in the study area between (35-55) With 79.5% of the total number of barley farmers in the study area.

From the above it is clear to us that barley farmers in the plain of the mud have large areas of barley and the majority of them follow the modern irrigation system (sprinkler irrigation) and most of them irrational situation groups with qualifications, which means that the rate of awareness and awareness are high to accept all the latest in irrigation systems, It is also noticeable that their age is still small and the level of income is weak and also they are all married and have families, which means that all these characteristics qualify them to apply the sprinkler irrigation system as their awareness and awareness of all the advantages of sprinkling irrigation from the lack of water used for irrigation of barley fed Faddan and increased productivity The vessels and increase the cultivated crop area of barley because it crop Astslahy soil where it attracts salinity in addition to the awareness and understanding of barley farmers in the study area all this leads to accept them everything new in the implant, especially the application of modern specifically irrigation systems (spray irrigation), which rules.

Table (2) reflected the effect of using the new irrigation systems in the study area (SahlELTina) particularly the sprinkler irrigation system on the productivity costs of barley crop Faddan compared to the productivity costs of barley crop Faddan which irrigated by surface irrigation system, the data in Table 2 represented the variable costs included of (mechanical work, human labor, irrigation, mineral fertilizers, organic fertilizer , pesticides, and seedling cost) were estimated about (50,150,150,150, 80,100, 200) pounds respectively, for the variable cost items of the barley crop in the study area. This surplus represents about (14.2, 37.5, 37.5, 21.4, 19, 17, 20%) Respectively To the variable cost items of barley fed in the case of a system of surface irrigation of about (350, 400, 400, 700, 430, 600, 100) pounds respectively for fedden in the case of

Table 2. Effect of using new irrigation systems on barley crop fedden costs in study area

Costs items	Irrigation systems		*Saving of total costs and items compared to surface irrigation%	
	Sprinkler irrigation	Surface irrigation	Sprinkler irrigation	Surface irrigation
Mechanical labor	800	1000	200	20
Human labor	500	600	100	17
Irrigation cost	350	430	80	19
mineral fertilizers	650	700	150	21.4
Organic fertilizers	350	400	150	37.5
Seeding	350	400	150	37.5
Pesticides	300	350	50	14.2
Total variable costs	3303	3880	577	14.9
Rent	1000	1000	-	-
Irrigation network	1050	850	200	23.5
Totalfixed cost	2050	1850	200	10.8
Total costs*	5351	5730	379	6.6
Total return*	9000	7200	1200	16.6
Net return*	3649	1470	2179	148.2
Water unit return*	6	3.6	2.4	67

Source: Collected and calculated from questionnaires (2017-2018).

Table 3. Effect of using new irrigation systems on Fedden productivity and Using of water irrigation for barley crop in study area

Variables	Irrigation systems		*Saving of total Variables and items compared to surface irrigation	
	Sprinkler irrigation	Surface irrigation	Sprinkler irrigation	%
Fedden productivity (ardab)	15	12	3	25
Using of water irrigation(m^3)	1500	2000	500	25

Source: Collected and calculated from questionnaires (2017-2018)

following surface irrigation leads to that the barley farmers bear the additional costs in the cost of the seed for the occurrence of water flow occurs and the loss of the seed and therefore works to add More seeds to compensate for the loss of seed.

As for the cost of the irrigation, the barley farms bear additional costs of the irrigation network cost of about 200 pounds per share. 23.5% of the cost of the irrigation network of about 850 LE in the case of surface irrigation, which shows that in the case of a spray irrigation system occurs in the total variable and total costs, which is reflected in the net revenue per Faddan, which amounted to about 3049 pounds when the spray irrigation system Estimated at 148.2% of net revenue per Faddan in the traditional system (surface irrigation), the water unit return, when used the new irrigation system (sprinkler) was about6 pounds saving about 67%, when used the traditional irrigation system (surface irrigation), which was estimated at 3.6L.E, meaning that when using water cubic meter in If followed by sprinkler irrigation, the water return was6L.Ebut when used the traditional irrigation the cubic meter of water unit used was given a return about 3.6 pounds.

Total costs: total fixed costs + total variable costs.

Total return: fedden productivity X unit price

Net return: total return-total costs

Water unit return: total return% water quantity for barley Faddan irrigation.

Saving: $\frac{\text{sprinkler irrigation- surface irrigation X 100}}{\text{surface irrigation}}$

Table (3) presented that when using the new irrigation system especially (sprinkler irrigation), the farmers achieves a saving in the fedden productivity and water irrigation used of barley crop were about 3 Ardab, 500m 3 respectively the percentage were 25%, 25% respectively but in the surface irrigation the fedden productivity and water irrigation used were is about 12 Ardab, 2000m 3 respectively, so when barley farmers applied the sprinkler irrigation system the Faddan productivity of barley crop was increased, thus the product and the farmer income were increased.

Table 4. The results(f) analysis of the differences between the production and economic indicators of new irrigation systems compared to the surface irrigation of the barley crop in study area

Variables	*Saving of total Variables and items compared to surface irrigation		Irrigation systems		(f)value
	Sprinkler irrigation	%	Sprinkler irrigation	Surface irrigation	
Fedden productivity(ardab)	3	25	15	12	160.04**
Using of water irrigation(m^3)	500	25	1500	2000	227.61**
Total revenue*(pound)	1800	25	9000	7200	49.76**
Total costs*(pound)	379	6.6	5351	5730	195.67**
Net return*(pound)	2179	148.2	3649	1470	135.75**

Source: Collected and calculated from questionnaires (2017-2018).

Table 5. Economic and Productivity efficiency indicators used for the barley crop water unit irrigation in the study area(2017-2017)

Variables	Irrigation systems	
	Sprinkler irrigation	Surface irrigation
Water unit productivity (k.g)	1.5	0.9
water unit net return*(pound)	2.03	0.735
Ardab irrigation cost*(pound)	25	35.8
Total costs of ardab*(pound)	477.5	382.2
Ardab total variable costs*(pound)	382.2	323.3
Net return of ardab *(pound)	235.9	122.5

Source: Collected and calculated from table (1).

Saving: fedden productivity for sprinkler irrigation- fedden productivity for surface irrigationX100
surface irrigation

Table (4) showed the significance of differences in the most important production and economic indicators and water irrigation used when irrigated by new irrigation systems especially sprinkler irrigation system which compared to traditional irrigation (surface irrigation), the variance analysis was conducted, and there were significant differences in the fedden productivity, water irrigation used, total revenue, the total costs and net return when used the sprinkler irrigation system compared to the surface irrigation system at a significant level 01, for the barley crop in the study area the values of (f)were reached about (160.04,227.61,49.76,195.67,135.75) respectively.

**significant at 0.01

Total costs: total fixed costs+ total variable costs. *

*Total revenue: fedden productivity x unit price

Net return: total return -total costs *

Saving: fedden productivity for sprinkler irrigation- fedden productivity for surface irrigation X100*
surface irrigation

Measuring the most important indicators of productivity and economic efficiency of the water unit used to irrigate the barley crop, table (5) reflected the water irrigation unit net return, ardab irrigation cost ardab variable costs, and ardab net return when applied the surface irrigation system amounted about (735,8,35,5,477.5,3,323,5 122.5)pound respectively, the water unit productivity reached about (0.9) kg, but when applied the sprinkler irrigation system it were about(2.03,25,2,382,9,235,3, 243.3) pounds respectively and the water unit productivity reached about (1.5) kg.

From the previous, it was clear that there is a significant increase in the productivity of the water unit, the net return of the water unit, the net return of the sharpness produced by the well, and the decrease in the total and variable costs in the case of modern irrigation system. This is in line with the results obtained, The application of modern irrigation system (sprinkler irrigation) because of its positive economic return in order to reduce production costs, increase productivity of Faddan, reduce the quantity of irrigation water, increase the productivity of the water unit, net return of the water unit, net yield and decrease in unit cost of production Variable costs and the costs of college acres of barley crop in the study area.

Water unit productivity: Total production% water unit used for irrigated barley crop fedden.*

Water unit net return: Net return% water unit used for irrigated barley crop fedden*

Total costs: total fixed costs+ total variable costs. *

Net return for ardab: total return -total costs*

RECOMMENDATIONS

1- Under the current conditions, should be rationalized water irrigation used and water connections users.

2-reliance on new technologies in irrigation.
3-expansion of the development and cultivation of barley strains tolerant salinity and interest of salt soil.
4-Raising the efficiency of water conduction and reducing the loss of irrigation water by following modern irrigation systems, especially spray irrigation.

SUMMARY

Barley is an important grain crop globally and locally it is one of the members of the Poaceae family and occupies fourth place in importance after wheat, maize and rice, is one of the important grain crops planted by humans for food thousands of years ago, belongs to the family, The study aimed to estimating crop production costs and expected returns, estimating the productivity and economic efficiency of the water unit used to irrigate an acre of the barley crop by following the modern irrigation systems and determining the spray irrigation system, identifying the economic and social characteristics of the farmers in an easy area. Estimation of the economic yield of the water unit used in irrigating an acre of barley crop.

The results of the study are summarized in the following; the majority of barley farmers have farms ranging from 5-7 to 54.8% of the total barley farmers. For the irrigation system, most barley farmers in the study area follow the modern irrigation system (58.9%). The majority of the barley farmers in the study area, who hold the above-average qualification, are estimated at 41.1%. It was also found that all barley farmers in the study area are married and depend on 100% As for the number of family members it is noted that The majority of the farmers in the study area numbered between (5-7) individuals with 58.9% of the total barley farmers in study area., It was also found that the income level obtained by the majority of barley farmers in the study area ranged from (3000-5000) Of the total barley farmers in the area of study. The age of barley farmers in the study area ranged between (35-55) years by 79.5% of the total barley farmers in the area. When the spray irrigation system occurs, the total variable and total costs are saved. Amounted to about 3049 pounds when the system of spray irrigation penny It is estimated at 107% of the net yield of Faddan when the surface irrigation system is applied. As for the return on the water unit, we find that if the modern irrigation system (spraying) was 6 pounds by about 67% when the surface irrigation system was estimated at 3.6 pounds, Meaning that when using the cubic meter of water in the case of spray irrigation, it was given a water return about 6 pounds, but when used the traditional irrigation (surface), the cubic meter of water unit used was given the water return about 3.6pounds.

When using the new irrigation systems (sprinkler irrigation), the farmer achieves a saving in the productivity of the Faddan and the quantity of irrigation water from the barley crop by 16.7% and 25%, respectively, of the average productivity of the Faddan and the user of the irrigation water per Faddan of the barley crop in the case of surface irrigation And the adult at a significant level 01, barley yield in the study area, the value of (f) 135.75, 195.67, 49.76, 227.61, 160.04, respectively.

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