The Economic Feasibility for Operating the Algerian Combine Harvester PMA at Nineveh Area Conditions

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SUMMARY

The study was conducted in Nineveh Governorate by conducting a comparison of agricultural crops (wheat, barley, lentils) for the seasons (2014 – 2015 – 2016) to determine the economic feasibility of operating the Algerian combine harvester (PMA) and its impact on some of the factors and characteristics studied. (A. Maintenance before operation B. Maintenance during operation C. Oils, greases and fuel, D. Transportation costs E. Food costs F. Costs of technicians and administrators G. revenues from the three crops) The data was analyzed according to the design (R.C.B.D.) and the results were as follows:

A. The year 2016 recorded the lowest pre-operation maintenance cost, reaching 862000 dinars, while the year 2014 recorded the highest value, reaching 863667 dinars, B. The year 2014 recorded the lowest value, reaching 647667 dinars, while the year 2016 recorded the highest value, reaching 920933 dinars, C. The year 2014 recorded the lowest value, reaching 210000 dinars, while the year 2016 recorded the highest value, reaching 633667 dinars, D. The year 2016 recorded the lowest value, reaching 378333 dinars, while the year 2015 recorded the highest value, reaching 718667 dinars, E. The year 2016 recorded the lowest value, reaching 171466 dinars, while the year 2016 recorded the highest value, reaching 232000 dinars, F. The year 2016 recorded the lowest value, reaching 139133 dinars, while the year 2015 recorded the highest value, reaching 917000 dinars, G. The year 2015 recorded the highest value of revenues for crops, respectively (wheat, barley, lentils), while the year 2016 recorded the lowest value of revenues for crops, respectively (wheat, barley, lentils).

Keywords: operating cost, economic feasibility, harvesting process, wheat, barley

INTRODUCTION

The harvesting process is defined as the process of reaping the ripe crop from the fields, either mechanically or manually. Therefore, the harvesting process is considered one of the important stages that establishes another stage (post-harvest operations), on which general activity depends and is measured by determining the amount of profit and loss as well as absorbing the largest amount of capital (Al-Banna, 1998).

The costs of using harvesting machines (mechanical harvesting) are significantly low compared to the manual harvesting process, which relies heavily on manpower, which makes the costs high, which reflects negatively on the net profit in the first place (sanders, 2005).

Due to the harsh operating environment of the harvester in the field, it is easy for malfunctions to occur. The process of maintaining the harvesters is considered one of the most important things that the farmer must be careful to do quickly. This includes maintenance before starting the harvesting process. This process begins

before the harvest date arrives, by performing a maintenance process. Preparing the harvesters and machines that stopped working after the end of the harvest season, where the old damaged parts are replaced with new parts, and this process continues for a month or more. As for the maintenance process during the harvesting process, it begins when any malfunction occurs that leads to the machine stopping (Craessaerts and Others, 2010).

From the above, this study aims to know the economic importance of harvesting equipment, maintenance and operation costs, and their impact on net profit

RESEARCH MATERIALS AND METHODS

The study was conducted in Nineveh Governorate by conducting a comparison of strategic crops (wheat, barley, lentils) for the seasons (2014 – 2015 – 2016). The data was analyzed according to the design (R.C.B.D.), and Duncan's multiple range test was used under the 5% probability level to find the significance of the differences between the averages of the characteristics of the studied factors (Al-Sahoky and Karima, 1990), while simple and multiple predictive regression equations were used to predict the values of some of the studied factors and characteristics, in addition to using correlation analysis between the studied characteristics to determine the nature of the relationship between them and their degree of significance, whether simple or high, through the SAS data analysis program, the following technical characteristics were studied:

1. Costs and maintenance of the harvester before and during the harvesting process,

According to the following equation (Al-Tahan and Others ,1990)

$$C = \frac{V*N}{W} \qquad \text{.....(1)}$$

C = Cost of maintenance (Dinar . Hour^{-1})

V = The basic value of the machine (Dinar)

N = Estimated annual standard of repair (%)

W = Productivity (Hour)

2. The amount of fuel consumed, according to the following equation (Al-Tahan and Others ,1990)

$$F = \frac{Qr-Pk}{W} \qquad \text{.....(2)}$$

F = Cost of fuel consumed (Liter . Dinar^{-1})

Qr = The quantity of fuel consumed (Hour)

Pr = Fuel price (Liter . Dinar^{-1})

W = Productivity (Hour)

3. Total transportation costs, according to the following equation (Al-Tahan and Others ,1990)

CT = W * C * N..... (3)

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CT = To tal transportation costs (Dinar)

Qr = The quantity of fuel consumed (Hour)

Pr = Fuel price (Liter . Dinar^{-1})

W = Productivity (Hour)

4. Food costs, according to the following equation (Al-Tahan and Others ,1990)

$$P = \frac{\sum \mathbf{Pr}}{\mathbf{W}} \qquad \text{……(4)}$$

5. Harvesting costs for the three crops

Harvesting costs = worker's wage * number of working hours per day

Note: The fee for harvesting one dunum has been adopted according to the price in that season

RESULTS AND DISCUSSION

Maintenance before and during operation

We conclude from Table (1) the year 2016 was superior because it recorded significantly lower maintenance costs compared to the previous years, and the reason is due to recording the lowest harvester preparation costs, but the year (2015) witnessed the highest maintenance costs before the harvest, and this is due to the fluctuation in the prices of spare materials in the local markets, in addition to the increase in labor wages. This means that harvest preparation costs have become unstable due to market instability. On the other hand, maintenance before harvest is directly related to maintenance after the harvest because it meets the readiness of the harvester mechanics in the harvest process, This is due to the age of the machine (harvester), because the older the machine is the more its maintenance costs increase, and this is consistent with what was found by (Dawood and Zaki ,1990), Also, the high maintenance costs during harvesting are due to the experience of workers in the harvesting process and how to manage the machine unit, and this is consistent with what mentioned by (Al-Tahan ,1990).

Table (1) shows the averages before maintenance and during harvest in the studied traits in dinars

Year	Post-harvest maintenance	Maintenance before harvest
2014	647667 **C**	863667 **A**
2015	727000 **B**	939833 **A**
2016	920933 **A**	862000 **A**

Oils, greases and fuels

It is clear from Table No. (2) that the harvest season (2014) was the best, followed by the season (2015), but the costs of fuel and oils increased more in the season (2016). This is due, firstly, to the high prices of fuel, oils and greases, and the fluctuation of their prices from time to time, in addition to the high prices in the parallel markets for oils and fats, especially fuel. On the other hand, the high costs of the three components are due to the obsolescence (extinction) of the machine, the harvester engine, and the mechanical units that make up the harvester, and this means an increase in fuel consumption and this is consistent with what mentioned by (8). The duration of use of the mechanical harvesting unit at the highest capacity per hour is

one of the main factors that affect the operating cost and this is consistent with what (Dawood and Zaki, 1990), the engine does not operate at full capacity during its operation period, but at certain times depending on the nature of the machine.

Transportation Costs

We conclude from Table No. (2) that transportation costs (the costs of transporting crops, whether for direct marketing or for warehouses) are that the (2016) season was less expensive and significantly superior compared to the two seasons (2014-2015), as the harvest period was (26) days, while the (2014) season It was (40) days, while the (2015) season was (49) days, in addition to the proximity of the machine to the fields, where the harvester can be transported by itself without relying on a truck to transport it, as in the (2014-2015) seasons. In addition to the disparity in the harvested areas in the three seasons and the type of crop, as well as the difference in transportation distances between fields to agricultural warehouses within one region and the low productivity of one dunum for the year (2016).

We conclude from this that the 2016 season recorded the lowest costs – and was significantly superior compared to previous seasons, as the harvest period was (26) days, while the previous seasons (2014) (40) days. It could be harvested in adjacent fields on its own without relying on a truck to transport it, as in the two previous seasons (2014-2015), in addition to the difference in harvested areas between the three seasons and the types of crops, as well as the difference in means of transportation between fields to agricultural warehouses within one point, and the decrease in durum wheat productivity in 2016 as stated in agricultural statistics (6), and the decline of farmers from cultivating large areas due to high agricultural production costs.

Table (2) The effect of years on the costs of harvesting the three crops in Dinar

	Costs			
Year	**Technicians and administrators' costs**	**Food costs**	**Transportation costs**	**Oils, greases and fuels**
2014	**B** 149366	190700 **B**	435667 **B**	210000 **C**
2015	917000 **C**	232000 **A**	718667 **A**	216333 **B**
2016	139133 **A**	171466 **C**	378333 **C**	633667 **B**

Technicians and administrators' costs

The data presented in Table (2) indicate that the costs of technicians and administrators indicate that there are large differences between the three seasons, as the third season (2016) was significantly superior to the seasons (2014 and 2015) and recorded the lowest operational costs due to the number of harvest days, compared to the two seasons (2014 and 2015) and this is what mentioned by the researcher (12).

Food costs

The data in Table (2) indicate that there is a difference in food costs for the three seasons and that (2016) was the least expensive compared to the years (2014-2015) and recorded the lowest operational costs due to the number of harvest days, compared to the two seasons (2014 and 2015) and this is what mentioned by the researcher (12).

HARVEST REVENUES FOR THE THREE CROPS

A. Wheat crop costs Dunum/Dinar.

The data in Table (3) indicate that the wages of harvesting one dunum for the three seasons have a clear

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significant effect on the studied characteristics were the 2016 agricultural season is significantly superior to the two seasons, as the lowest wages were paid per dunum for this season, while the cost of the crop for the dunum increased for the 2014 and 2015 seasons due to the rise in workers' wages and spare materials. On the other hand, the dunum cost rate increased very significantly for many reasons, including the significant increase in the prices of fuel, oils and grease and the emergence of the black market for these materials. On the other hand, increased labor wages and food prices, and all of this is combined in one category, which is the increase in the wages of one dunum harvesting, as it came about due to the interconnectedness of the reasons, and all of them are involved in the harvesting process and the type of crop. All of these factors mentioned above led to an increase in the cost of the harvesting process. The researcher (10) denies that there is a common interaction between the harvesting process and the type of harvesting.

B. Barley crop costs Dunum/Dinar.

It is noted from the data presented in Table (3) that there are differences between barley seasons, It turned out that the 2014 harvest season recorded a large number of differences between seasons and it is in the first place, while for the 2016 season, it was less important and it is in the second place. The 2015 season recorded the highest increase in harvest wages for many reasons that intertwined with each like the number of harvest days, the rise in the prices of spare materials, absence of the government support on the spare materials, the rise in the prices of fuel, oils and grease, and other increases in labor wages and the general increase in market prices. As mentioned by the researcher (10) and agreed with the findings of the researcher (11).

C. Lentils crop costs Dunum/Dinar.

It is clear from the results of Table (3) that the costs of harvesting the lentil crop dunum/dinar. The results showed that there were significant differences between the three harvest seasons of the same crop. It also showed that the 2016 season was noticeably superior and recorded the lowest costs of harvesting per dunum, while a clear increase was observed in 2015 due to the changes that occurred in the Iraqi market. There was consistency with what mentioned by the researcher (5).

Table (3) represents harvest fees, harvested area, and revenues for the three crops

Year	Wheat harvest wages Dunum /Dinar	Harvested area of wheat Dunum	Harvested area revenues Dunum /Dinar	Barley harvest wages Dunum/ Dinar	Harvested area of Barley Dunum	Harvested area revenues Dunum /Dinar	Lentils harvest wages Dunum /Dinar	Harvested area of Lentils Dunum	Harvested area revenues Dunum /Dinar
2014	480000 B	450 A	27000000 A	400000 A	365 A	18000000 A	520000 A	186 B	15000000 A
2015	637000 A	510 B	29400000 B	588000 B	413 B	18375000 B	735000 B	225 B	22050000 B
2016	364000 C	300 C	16900000 C	364000 C	250 C	9750000 C	416000 C	115 C	11700000 C

CONCLUSIONS

Through the study, the following was reached:

1. The 2016 season recorded the lowest costs compared to previous seasons, as the harvest period was (26) days, while the previous seasons (2014) (40) days, and the (2015) season (49) days, in addition to the difference in harvested areas between the three seasons and types of crops, as well as the difference in means of transportation between fields and the agricultural warehouses within one point.
2. It is clear from Table (2) that the harvest season (2016) was the most superior with the lowest costs, followed by the season (2014).
3. It turned out that the increase in the (2015) season recorded the largest costs for technicians and administrators due to the expansion of the market and that the increase in workers' wages is directly related to the expansion of the market, and this is what controls the increase in workers' wages. The breadth of the market is evidence of rising labor wages.
4. The data indicate that the wages of harvesting of one dunum from the three seasons have a significant effect on the studied traits.

REFERENCES

1. Al-Banna, Aziz R., (1998) Harvesting Equipment, Dar Al-Kutub for Printing and Publishing, Mosul University, Dar Al-Kutub for Printing and Publishing, Mosul University, Ministry of Higher Education and Scientific Research, Iraq.
2. Sanders, K. F. (2005). Orange harvesting systems review. Biosystems Engineering, 90(2), 115-125.
3. Craessaerts, G., De Baerdemaeker, J., & Saeys, W. (2010). Fault diagnostic systems for agricultural machinery. Biosystems Engineering, 106(1), 26-36.
4. Al-Tahan, Yassin Hashem Yunis, Medhat Abdullah Hamida and Mohammed Qudri Abdulwahab (1991), Economics and Management of Agricultural Machinery, Dar Al-Kutub for Printing and Publishing, Mosul University, Ministry of Higher Education and Scientific Research, Iraq.
5. Ezzat, Abdel-Salam Mahmoud and Lotfi Hussein (1978), field crop mechanization equipment, University of Baghdad Press, Iraq.
6. Spacey Dibasky: The Economic Efficiency of Using Agricultural Machinery in Industrial Agricultural Communities, Agricultural Machinery Review, Second Issue, Ninth Year 1978.
7. Salem Abdul Hassan, Sadiq Ali Tahman and Abdel Aziz Abbas (1990), Economics and Management of Agricultural Machinery. Ministry of Education and Scientific Research. Technical Education Authority, Dar Al-Hekma Press.
8. Majzab bin Al-Anad, Khalaf Abdel-Hussein Kannad, and Ismail Abbas Muhammad Mahmoud (1981), the management of the socialist sector farms. Ministry of Higher Education and Scientific Research. Basra University Press.
9. Dawood Khaled Muhammad and Zaki Abd Elias (1990). Statistical methods for agricultural research. Dar Al-Kutub for Printing and Publishing, Mosul University Ministry of Higher Education and Scientific Research, Iraq.
10. Donnel Hunt. 2001, Farm Power and Machinery Management. Iowa state university, Ames Iowa**.**
11. Tarner, J.C, 2006, Farm Machinery, Cassel, London.
12. Nik, M. E., Khademolhosseini, N., Abbaspour-Fard, M. H., Mahdinia, A., & Alami-Saied, K. (2009). Optimum utilisation of low-capacity combine harvesters in high-yielding wheat farms using multi-criteria decision making. Biosystems Engineering, 103(3), 382-388.