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EVALUATION OF THE JAPANESE RICE COMBINE HARVESTERS USED AFTER RECOMMENDED SALVAGE LIFE

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ABESTRACT

This study aims to evaluate the anticipated performance and costs of Yanmar, C-385EG and Kubota, R2-48 rice combine harvesters, when used after their recommended salvage life (the first five operating years). The study includes the operating conditions throughout the second five years of combine's life (T_1, T_2, T_3, T_4, T_5, and the average T_a) compared with the average values of the first five operating years (T_0). The obtained results indicated that the total harvested area, actual field capacity, field efficiency, revenues and total costs decreased in average by 45.3, 37.6, 37.5, 45.9 and 58.3% respectively, for Yanmar combine and by 36.8, 24.3, 24.1, 28.2, and 56.7% respectively, for Kubota combine. While the operating costs and net gain increased with the average of 25.2 and 18.5% for Yanmar combine and 23.1 and 30.4% for Kubota combine. The Kubota combine gave the higher values of harvested area, actual field capacity, field efficiency, revenues, operating costs, net gain, and lower value of total costs as compared with the Yanmar combine. The statistical analysis revealed no significant effect of T_1, T_2, T_3, T_4, and T_5 on the harvested area, actual field capacity, field efficiency, revenues, operating costs and net gain, while there is a low effect of the same treatments on the total costs with Kubota combine. On the other hand, there is a high significant effect of the treatments on harvested area, actual field capacity, and field efficiency and simple effect on the total costs while there is no significant effect on the revenues, operating costs and net gain of Yanmar combine.

INTRODUCTION

Rice is considered the most important crops in the national income in Egypt. It is evident, that the increase of rice crop production in quantity and quality does not depend only on the improvement of soil and plant condition, but also largely on using improved methods and modern technology to fulfill the agricultural processes at the appropriate time, and keep down production cost. Egyptian government encouraged the use of modern mechanical applications in the harvesting and threshing operations to overcome the high cost of traditional harvesting and labor shortage especially in the harvesting time, improve the rice grain quality, increase the productivity and to reduce the grain losses. Therefore, it is necessary to mechanize rice harvesting to reduce losses costs. Combine harvester should be used for its minimum production losses and low cost (*El-Nakib et al.* 2003). The main types of rice harvester operating in Egypt are Japanese combines namely, Yanmar and Kubota which appear about 95% from total Japanese combine's layout in Egyptian Market (*Soliman et al.,* 2001).

Ghonimey and Rostom (2002) stated that, in the last ten years, the annual cultivated area increased from 1.08 to 1.56 million feddans and the grain yield increased from 3.14 to 5.80 million tons with the average grain productivity of 3.42 ton/fed. *Baiomy* (2002) added that 20% from the cultivated area is harvested using rice combine harvester while, the remaining area is harvested using the other systems of harvesting.

El-Khateeb (2005) mention that harvesting operation is one of the most labor consuming operations and grain losses due to traditional harvesting reached at least to 25% of total yield in addition to poor quality of the grain. He added that the combine harvester is the most efficient and economic system (89.70 L.E. /fed) compared with manual harvesting and gathering followed by threshing and winnowing (181.650 L.E. /fed).

A study to select the optimum combine size in respect to unite plot area, *Morad and Arnaout* (1994) found that the total grain losses for rice crop was 40 kg/fed., using Yanmar combine. They added that the grain losses decreased from 50 to 36 kg/fed as the plot area increased from 0.25 to 5 fed. *El-Haddad et al.* (1995) reported that combine harvesting give the lowest cost of about 229 LE/fed in comparison with 283.4 LE/feddan for mounted mower and 300 LE/feddan for manual sickle system. *El-Sharabasy* (2007) compared between three rice harvesting systems namely; traditional harvesting, partial mechanization and full mechanization (Yanmar combine). His results indicated that, the minimum total grain losses was 1.84% for combine compared with 3.64% and 4.73% for traditional harvesting and partial mechanization respectively. The results also showed that, the energy consumed was 40.62 kWh/fed for Yanmar combine compared with 44.91 and 45 kW h/fed for traditional harvesting and partial mechanization respectively. While the minimum costs for Yanmar combine was 140.91 L.E./fed compared with 227.83 and 327.21 L.E./fed for partial mechanization and traditional harvesting respectively. He also recommended that using partial or full mechanization for harvesting rise crop save time, effort, and total cost requirements and also clear the rice crop from the field as fast as possible than traditional system.

Rostom (2004) concluded that, the occurred failure percentage of combine was 15% and the failure rate was 0.0066 time/h while, the average idle period was 20 h/year. He added that the idle lost cost value increasing with the increase of idle period.

Khadr et al. (2003) used General Linear Model (GLM) procedure to analyze the effect of machine type (Yanmar CA 385 EG, Kubota R1-40 and Kubota R2-48) and sites (Kafer Eldwar, Etai-Elbarood, Kom-Hamada and Eldalangat) on mechanical harvesting cost of rice crop. The results showed that the combine type has significant effect on mechanical harvesting cost of rice crop, while the sites and the interaction between combine type and sites have no significant effect. The results also, showed that there were lost in actual combine productivity and increase in time consumed during rice harvesting with 35% and 71% respectively. On the other hand, the averages of mechanical rice cost were 90.2 L.E/h and 160 L.E./fed, while the average of time consumed and combine productivity during rice harvesting were 1.99 h/fed and 0.56 fed/h respectively. *Soliman et al.* (2001) and *Khadr et al.* (2003) concluded that the rental price of the rice combine in Automated Service Station for agricultural mechanization should be associated with the operating how rather than the served area. *Megahed and Krutz* (1994) showed that the mechanical harvesting of rice realize a higher revenues for the farmer compared with the manual harvesting.

Soliman et al. (2001) demonstrate that the most effective input in the variation of the profit per year is the served area, followed by the costs of repair and maintenance and the combine's power, while the fuel and oil costs were insignificant. Their results indicated that the average rice harvesting cost is 3.86 L.E. /fed. hp and the average of harvesting time is 1.99 h/fed.

All previous investigations were conducted to evaluate the performance and efficiency of the Japanese rice combine harvesters throughout their salvage operating life which estimated as five operating years (about 400 hr/year). The aims of this investigation are to evaluate the anticipated performance and costs of the Japanese rice combine harvesters after the recommended salvage life.

MATERIALS AND METHODS

This investigation was carried out to evaluate the performance, efficiency and the net gains of different types and models of Japanese combine harvesters. The combine harvesters types include in this study are; the Yanmar combine CA-385 EG with different models; 1998, 1999, 2000 and 2001 and Kubota combine R2-48 with models of 1998, 2000 and 2002. The data of rice combine harvesters were collected from Private and Governmental sectors. The Governmental sector includes two Automated Service Stations for agricultural mechanization; Abees and Kafer El-Dwar Stations.

The theoretical field capacity for harvesting combines is calculated based on the combine specifications. For Yanmar combine CA-385EG, the operating width is 1.45 m, and the minimum operating speed is 0.72 m/s. While for Kubota combine R2-48, the average operating width is 1.475 m and the minimum operating speed is 0.72 m/s. The specifications of different combines under study are listed in Table (1).

Table (1): The price and the specifications of rice combine types of Yanmar and Kubota with different models

Type	Model	Purchase price (L.E.)	Operating width (m)	Operating Speed (km/s)	Engine Power
Yanmar, CA 385 EG	1998	136371	1.45	2.6-4.5	38 hp (28.36 kW) at 2800rpm
	1999	106371			
	2000	110671			
	2001	112521			
Kubota, R2-48	1998	112000	1.45-1.5	0-4.39	48 hp (35.82 kW) at 2700 rpm
	2000	116745.5			
	2002	121568			

The operating efficiency was estimated based on the recommended operating time of 2000 hours through the salvage life of the combine harvester, which equal to five operating years with the rate of 400 h/ year (*Soliman et al.* 2001). The theoretical and actual field capacities and the field efficiency were determined using the general equations. The theoretical annual harvested area was calculated according to the following equation (*Lees* 1992):

$$\text{Annual harvested area} = \frac{\text{Annual fixed cost (L.E./ year)}}{\text{custom rate (L.E./ fed.)} - \text{operating cost (L.E./ fed.)}} \text{, fed/year}$$

Costs:

One of the most important costs influencing profit in farming operations is the cost of owing and operating machinery. There are two main types of machinery costs namely fixed and operating costs. The fixed costs include Depreciation, Taxes, Shelter, Insurance and Interest costs. The fixed costs can be calculated as follow (*Lees* 1992):

1- The Depreciation was determined by sum-of the- digits depreciation methods.
2- Remaining value (R.V.) = Purchase price - The Depreciation
3- Taxes = 1 - 2% × R.V.
4- Shelter = 1 - 2% × R.V.
5- Insurance = 0.25 - 0.5% × R.V.
6- Interest = 8 - 12% × R.V.

The summation of Taxes, Insurance, Shelter and Interest costs (TSII) was taken as the average of 13% {Taxes, (1.5%); Shelter, (1.5%); Insurance, (0.5%) and Interest, (9.5%)} from the remaining value of combine age. The fixed costs including Depreciation and TSII were determined throughout the first five years of the combine age (the salvage age). While, through the other years the fixed costs including only Shelter (1.5%) and Insurance (0.5%) with total of about 2% from remaining value of combine after the recommended salvage life.

The operating costs were recorded from the combine report. While the labor cost was estimated based on the month salary of 300 L.E. (about 1 L.E. /h assumed the operating time was 10 hours per day).

Data analysis:

Excel spreadsheet was used to determine the averages of combines performance (theoretical and actual field capacity, field efficiency, operating time losses, and operating efficiency), costs included fixed costs (Depreciation, Remaining value (R.V.), Taxes, Shelter, Interest, and Insurance), operating costs (spare parts, repair and maintenance, grease and oil, and labor) and total costs, and the net gain of the combines. The collected data were statistically analyzed according to the technique of analysis of variance (ANOVA) and the least significant difference (L.S.D.) test. Student-Newman-Keuls Test at 5% level was used to test the differences between the treatment means, as procedures outlined by (*Snedecor and Cohran* 1990). The statistical design is completely randomize blocks design. All statistical analysis were performed using analysis of variance technique by means of COSTAT 6.311 win Computer Software Package (2005).

RESULTS AND DISCUSSION

The obtained data of different types of Japanese rice combine harvesters and the calculated parameters of actual field capacity and the field efficiency are listed in Table (2).

Table (2): Effect of the operating years of Yanmar and Kubota combines on the harvested area, operating time, actual field capacity, and field efficiency.

Trt's	Harvested area, feddan		Operating time, h		Actual field capacity, Feddan/h		Field efficiency, %	
	Yanmar	Kubota	Yanmar	Kubota	Yanmar	Kubota	Yanmar	Kubota
T_o	267.0 a	312.6 a	422.3 a	518.0 a	0.57 a	0.60 a	63.8 a	66.7 a
T_1	153.5 b	223.7 a	463.5 a	430.3 a	0.42 b	0.52 a	46.8 a	58.3 a
T_2	147.3 b	215.0 a	380.0 a	457.7 a	0.38 b	0.47 a	42.7 a	52.7 a
T_3	151.3 b	188.1 a	432.5 a	405.5 a	0.35 b	0.47 a	39.3 a	51.9 a
T_4	151.5 b	181.2 a	470.0 a	428.3 a	0.32 b	0.42 a	36.0 a	47.3 a
T_5	126.5 b	180.8 a	405.0 a	466.0 a	0.31 b	0.39 a	34.7 a	43.0 a
T_a	146	197.7	410.2	437.6 a	0.36	0.45	39.9	50.6

T_0 = the average data of the first operating five years.
T_1 = the operating data of the sixth year.
T_2 = the operating data of the seventh year.
T_3 = the operating data of the eighth year.
T_4 = the operating data of the ninth year.
T_5 = the operating data of the tenth year.
T_a= the average data after the salvage life, (T_1, T_2, T_3, T_4, and T_5).
a, and b means, designated by the same letter(s) in the same column are not significantly different at 0.05 level.

Effect of the operating years on the performance of Yanmar and Kubota combines after the recommended salvage life:

The data listed in Table (2) and illustrated in Fig. (1) showed that the harvested area was decreased with increasing the operating years of two combine harvesters. With Yanmar combine the decreasing percentages were; 42.5, 44.8, 43.3, 43.3, and 52.6% at T_1, T_2, T_3, T_4, and T_5 respectively, as compared with T_0. While with the Kubota combine these percentages were; 28.5, 31.3, 39.9, 42.1, and 42.4% at the same treatments respectively. The results also, revealed that the Kubota combine gave the higher values of harvested area compared with the Yanmar combine. The increasing percentages were; 45.7, 45.8, 24.3, 19.5 and 42.3% at T_1, T_2, T_3, T_4, and T_5 respectively, compared with Yanmar combine, this is may be due to increase the operating width and the power of Kubota combine. On the other hand, Fig. (2) illustrated that, the average of harvested area (T_a) was lower than T_0 with about 45.3% and 36.8% with Yanmar and Kubota combine respectively, while (T_a) for Kubota combine was higher than Yanmar combine with about 35.2%. The statistical analysis indicates that, there is non-significant difference in harvested area between the various treatments (T_1, T_2, T_3, T_4 and T_5) compared with the main treatment T_0 with Kubota combine, while there is a high significant difference between the same treatments and T_0 using the Yanmar combine.

On the other hand, the theoretical annual harvested areas of the Yanmar and Kubota combines were: 202.74 and 179.35 fed./year respectively. The actual average harvested areas throughout the recommended salvage life of two combines (T_0) were: 267 and 312.7 feddan, the increasing percentages are: 32 and 74% respectively, compared with the theoretical annual harvested area. While at the second operating five years, the actual average harvested area of Yanmar combine was: 146 feddan with decreasing percentage of about 28% and 197.5 feddan for Kubota combines with increasing percentage of about 10%.These results mean that the two combines were economically operated throughout the recommended salvage life, while after the salvage life, the Yanmar combine showed non economic operation but the Kubota combine gave an economic operation throughout this period.

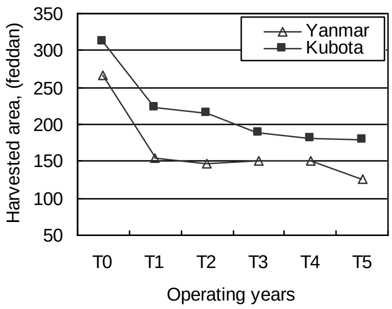

Fig. (1): The effect of operating years of two combines on the harvested area after the recommended salvage life

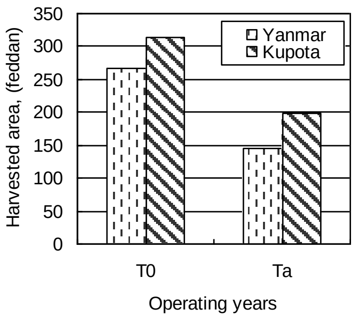

Fig. (2): The average harvested area of two combines through and after the recommended salvage life (T_0 and T_a).

However, the data illustrated in Figs.(3) and (4) indicated that, the actual field capacity reduced after the salvage life of Yanmar and Kubota combines as compared with the first five years (T_0). The actual field capacity of Yanmar combine after the salvage life were; 0.42, 0.38, 0.35, 0.32, and 0.31 fed./hr at T_1, T_2, T_3, T_4, and T_5 respectively, with the average (T_a) of 0.36 fed./hr. While with Kubota combine these values were; 0.52, 0.47, 0.47, 0.42, and 0.39 fed./hr at the same treatments respectively with the average (T_a) of 0.45 fed./hr. The actual field capacity at the first operating five years (T_0) were; 0.57 and 0.60 fed./hr for Yanmar and Kubota combines respectively. The decreasing percentages of actual field capacity using Yanmar combine were; 26.7, 33.1, 38.4, 43.6, and 45.6% at T_1, T_2, T_3, T_4, and T_5 respectively, with the average (T_a) of 37.5% compared with T_0. These decreasing percentages for Kubota combines were; 12.6, 21.0, 22.2, 29.1, and 35.5% at the same treatments respectively, with the average of 24.1%. Meanwhile the actual field capacity of Kubota combine was higher than Yanmar combine by about 23.8, 23.7, 31.3, 31.3 and 25.8% at T_1, T_2, T_3, T_4, and T_5 respectively, with the average (T_a) of 27.0%. The statistical analysis indicates that, there is non-significant difference in actual field capacity of Kubota combine between the various treatments (T_1, T_2, T_3, T_4 and T_5) compared with the main treatment T_0, while there is a high significant difference between the same treatments and T_0 with the Yanmar combine.

In addition, the field efficiency of the two combines after the salvage life was decreased by about 26.6, 33.1, 38.4, 43.6, and 45.6% with the average (T_a) of 37.5% at T_1, T_2, T_3, T_4, and T_5 for Yanmar combines respectively compared with T_0 and 12.6, 21.0, 22.2, 29.1, and 35.5% with the average of 24.1% at the same treatments respectively for Kubota combine. On the other hand, the field efficiency values of Kubota combine were highest than those for Yanmar combine with about 24.6, 23.4, 32.1, 31.4, and 23.9% with the average of 26.9% at T_1, T_2, T_3, T_4, and T_5 respectively. The statistical analysis indicates that, there is non-significant difference between the various treatments (T_1, T_2, T_3, T_4 and T_5) compared with the main treatment T_0.

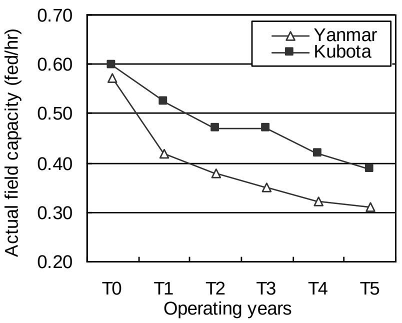

Fig. (3): The effect of operating years of two combines on the actual field capacity after the recommended salvage life.

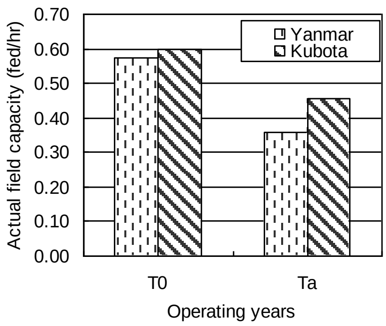

Fig. (4): The average actual field capacity of two combines through and after the recommended salvage life (T_0 and T_a).

Effect of the operating years on the different costs of Yanmar and Kubota combines after the recommended salvage life:

The data of revenues and different costs of the Yanmar and Kubota combine harvesters under study were collected and analyzed to estimate the gain of both Yanmar and Kubota combines; the results are listed in Table (3) and illustrated in Figs. (5 through 10).

The data illustrated in Fig. (5) showed that the revenues values decreased after the recommended salvage life of Yanmar and Kubota combines. The decreasing percentages were; 36.4, 47.4, 50.8, 45.4 and 39.3% at T_1, T_2, T_3, T_4, and T_5 respectively, with the average (T_a) of 45.9% with Yanmar combine compared with the salvage life (T_0). These decreasing percentages with Kubota combine were; 22.2, 26.0, 33.3, 28.8, and 31.0% at the same treatments respectively, with the average (T_a) of 28.2%. On the other hand, the data illustrated in Fig.(6) revealed that, the revenues values of Kubota combine were highest than those of Yanmar combine with about 34.1, 54.2, 48.5, 42.8, and 49.0% at T_1, T_2, T_3, T_4, and T_5 respectively, with the average (T_a) of 45.2%.

Table (3): Effect of the operating years on the revenues, operating and total cost, and net gain of Yanmar and Kubota combine.

Trt's	Revenues (L.E.) (L.E./ year)		Operating costs, (L.E./ year)		Total costs (L.E./ year)		Net gain (L.E./ year)	
	Yanmar	Kubota	Yanmar	Kubota	Yanmar	Kubota	Yanmar	Kubota
T_o	47407.4 a	51925.4 a	13013.3 a	12090.7 a	39129.0 a	34937.7 a	8278.0 a	16987.7 a
T_1	30153.1 b	40422.2 a	18521.8 a	18613.7 a	18754.5 b	18847.7 ab	11396.3 a	21574.5 a
T_2	24939.1 b	38447.5 a	13663.5 a	12081.3 a	13896.5 b	12314.7 b	11042.5 a	26132.8 a
T_3	23320.7 b	34637.4 a	15720.5 a	20298.5 a	15953.5 b	20528.5 ab	7367.0 a	14108.8 a
T_4	25904.5 b	36984.0 a	21166.0 a	14610.5 a	21408.7 b	14834.5 ab	8186.4 a	22149.5 a
T_5	24025.4 b	35805.0 a	12398.5 a	8813.0 a	12641.0 b	9037.0 b	11058.3 a	26768.0 a
T_a	25668.56	37259.21	16294.06	14883.4	16331.8	15112.48	9810.1	22146.73

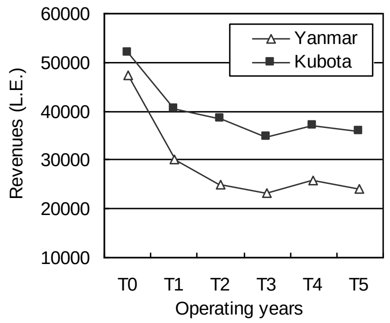

Fig. (5): The effect of operating years of two combines on the revenues after the recommended salvage life.

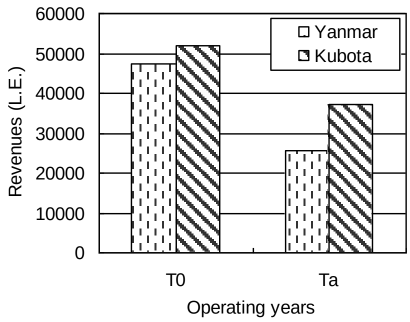

Fig. (6): The average revenues of two combines through and after the recommended salvage life (T_0 and T_a).

However, the results illustrated in Fig. (7) mention that the operating costs of both combines are different from treatment to another. In general, the operating costs of both Kubota and Yanmar combines were almost higher. The maximum increasing percentages were; 62.6 and 67.9% occurred at the ninth and eighth year (T_4 and T_3) of Yanmar and Kubota combines respectively, these increasing percentages were attributed to proceed some significant maintenances and repairs and change the rollers of the combines. Meanwhile, the operating costs of Yanmar and Kubota combines decreased by about 4.7 and 27.1% respectively, at the tenth year compared with the salvage life (T_0). However, the results illustrated in Fig. (8) indicated that the average operating costs of both combines were higher than the recommended salvage life (T_0) with about 25.2 and 23.1% for Yanmar and Kubota combines respectively. On the other hand, the average operating costs of Kubota combine lower than Yanmar combine with about 8.7%. The statistical analysis indicates that, there is non-significant difference in operating costs between the various treatments (T_1, T_2, T_3, T_4 and T_5) as compared with the main treatment T_0 for two combine harvesters.

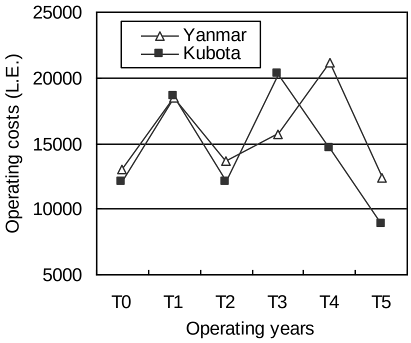

Fig. (7): The effect of operating years of two combines on the operating costs of after the recommended salvage life.

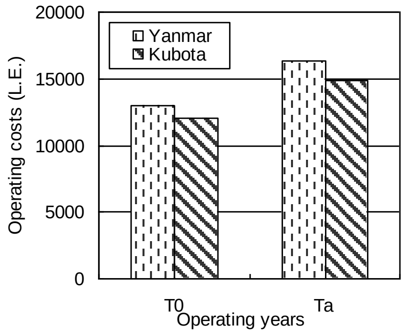

Fig. (8): The average operating costs of two combines through and after the recommended salvage life (T_0 and T_a).

In spite of increase the operating costs through different treatments as compared with T_0, the total costs decreased through the same treatments, these attributed to decrease the fixed costs, which estimated only through the first operating five years of the combine (the salvage life). Fig. (9) illustrated that the total costs were decreased through all treatments as compared with the salvage life of two combines. The decreasing percentages withYanmar combine were; 52.1, 64.5, 59.2, 47.8, and 67.7% at T_1, T_2, T_3, T_4 and T_5 respectively, compared with T_0. While for Kubota combine these percentages were; 46.1, 64.8, 41.2, 57.5, and 74.1% at the same treatments respectively. On the other hand, the results indicated that the total costs of Kubota combine lower than Yanmar combine through the different treatment except at T_3 (the eighth operating year), it was higher with about 28.7% because of increasing the operating costs in this year due to increase the repair and maintenance costs. The average total costs of Kubota combine lower than Yanmar combine with about 7.5%.

Moreover, the results illustrated in Fig. (10) revealed that the average total costs after the recommended salvage life of two combines were lower with about 58.3% and 56.7% with Yanmar and Kubota combines respectively. The statistical analysis of total costs indicates that, there is a high significant difference between the various treatments (T_1, T_2, T_3, T_4 and T_5) of Yanmar combine as compared with the main treatment T_0, while there is non-significant difference between T_1, T_2, T_3, T_4 and T_5. However, there is a significant difference between T_4 and T_5 as compared with T_0 of Kubota combine, while there is non-significant difference between T_1, T_2, and T_3 as compared with T_0.

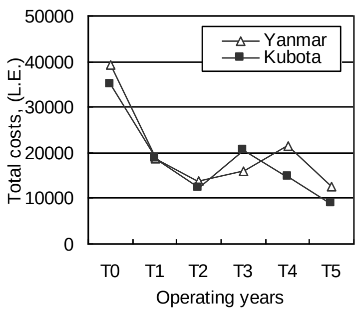

Fig. (9): The effect of operating years of two combines on the total costs after the recommended salvage life.

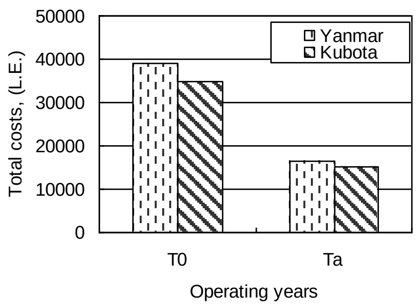

Fig. (10): The average total costs of two combines through and after the recommended salvage life (T_0 and T_a).

Figs.(11 and 12) illustrated the net gain of two combine under study through different treatments and the average net gain through and after the recommended salvage life. The results indicated that the net gain of Yanmar combine increased at T_1, T_2, and T_5 as compared with the main treatment T_0, the increasing percentages were; 37.7, 33.4, and 33.6% at the same treatments respectively. But at T_3 and T_4 it was decreased by about; 11.0 and 1.1% respectively, as compared with T_0, these due to increase the operating costs through these two treatments and consequently total cost. On the other hand, the net gain increased at T_1, T_2, T_4, and T_5 with Kubota combine as compared with T_0, the increasing percentages were; 27.0, 53.8, 30.4, and 57.6% respectively, while it decreased at T_3 by about 16.9%, this also due to increase the operating costs. The results also, mentioned that the net gains of Kubota combine was higher than Yanmar combine with about; 89.3, 136.7, 91.5, 170.6, and 142.1% at T_1, T_2, T_3, T_4, and T_5 respectively with the average (T_a) of 125.8%. Moreover, the average net gain of the two combines (T_a) were higher by about 18.5 and 30.4% for Yanmar and Kubota combines respectively, compared with the main treatment T_0. The increasing of net gain throughout the second operating five years due to decrease the fixed costs of combines and consequently the total costs through this stage and increase the rental price of feddan. The statistical analysis indicates that, there is no significant effect of any treatments (T_0, T1, T_2, T_3, T_4 and T_5) on the net gains of two combine harvesters.

However, we have to mention that these results didn't take in consideration the combine fuel consumption and the grain losses which can be negative effect on the net gain of combines.

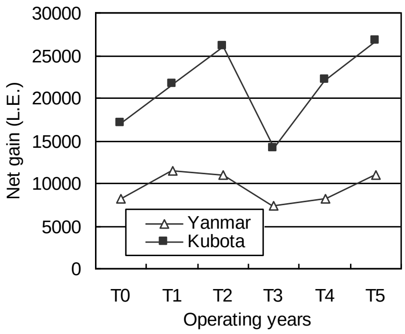

Fig. (11): The effect of operating years of two combines on the net gain after the recommended salvage life.

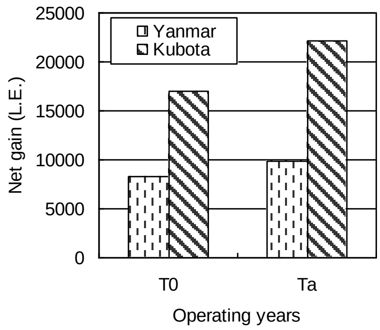

Fig. (12): The average net gain of two combines through and after the recommended salvage life (T_0 and T_a).

Conclusions And Recommendations

- The obtained results showed a decreasing percentage in the most operating parameters (harvested area, actual field capacity, field efficiency, revenues, and total costs) after the recommended salvage life of Yanmar and Kubota combines. While there is an increasing percentage in the operating costs and net gain. The net gain of the combines may be not economically if the fuel consumption and the grain losses were taken into consideration.
- The Kubota combine gave higher percentages of performance revenues, and the net gain, compared with the Yanmar combine, while it gave lower percentages of costs.
- The statistical analysis revealed no significant effect of T_1, T_2, T_3, T_4, and T_5 on the performance, revenues, operating costs and net gain, while there is a low effect of the same treatments on the total costs with Kubota combine. On the other hand, there is a high significant effect of the treatments on the combine performance and low effect on the total costs while there is no significant effect on the revenues, operating costs and net gain of Yanmar combine.
- It can be recommended that further experimental study should be conducted to evaluate the fuel consumption and grain losses and their effects on the performance and income of the combines throughout the recommended salvage life and the following periods.

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مراحع عربية:

سليمان ابراهيم و سامى يونس و مائسة منير مجاهد (٢٠٠١ م) ٠ الكفاءة الاقتصادية و الفنية لنظم الحصاد الآلى٠ المجلة المصرية للاقتصاد الزراعى- المجلد الحادى عشر- العدد الاول- الصفحات ١-١٨ ٠

تقييــــم آلات حصـــــاد الأرز الجامعـــة اليابانيـــة عنـد تشـغيلها بعـد العمـــر الافتراضـــى

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يهدف هذا البحث الى تقييم استخدام آلات حصاد الأرز المجمعة اليابانية فى مصر، خاصة النوعين الرئيسيين (كوبوتا (R2-48) و يانمار (CA 385 EG)، من حيث الأداء، الكفاءة، التكاليف و صافى الربح وذلك بعد عمر التشغيل الافتراضى الموصى به (٤٠٠ ساعة/سنة لمدة خمس سنوات). حيث تضمنت الدراسة خمس سنوات تالية لعمر التشغيل الافتراضى (T_1, T_2, T_3, T_4, and T_5) و كذلك متوسط هذه السنوات الخمس(T_a) ومقارنة معايير التقييم المختلفة مع متوسط القيم لهذه المعايير خلال السنوات الخمس الأولى (T_0).

أظهرت النتائج انخفاض مساحة الحصاد، السعة الحقلية الفعلية، الكفاءة الحقلية، جملة الإيرادات و التكاليف الكلية لكلأ النوعين تحت الدراسة، حيث بلغ متوسط نسب الانخفاض: ٤٥,٣ و ٣٦,٨ % ، ٣٧,٦ و ٢٤,٣%، ٣٧,٥ و ٢٤,١%، ٤٥,٩ و ٢٨,٢% و ٥٨,٣ و ٥٦,٧% للمعايير السابقة للنوعين (اليانمار و الكوبوتا) على الترتيب مقارنة بالمعاملة الرئيسية (T_0). بينما ازدادت تكاليف التشغيل و صافى الربح لكلا النوعين و كان متوسط نسبة الزيادة ٢٥,٢ و ٢٣,١% و ١٨,٥ و ٣٠,٤% لليانمار و الكوبوتا على الترتيب مقارنة بالمعاملة الرئيسية (T_0).

أظهرت النتائج أيضا تفوق النوع كوبوتا على اليانمار من حيث مساحة الحصاد، السعة الحقلية الفعلية، الكفاءة الحقلية، جملة الإيرادات، و صافى الربح، بينما انخفضت تكاليف التشغيل و التكاليف الكلية.

اظهر التحليل الاحصائى عدم وجود تأثير معنوى للمعاملات (T_1, T_2, T_3, T_4, and T_5) على مساحة الحصاد، السعة الحقلية الفعلية، الكفاءة الحقلية، جملة الإيرادات، تكاليف التشغيل و صافى الربح، بينما كان هناك تأثير معنوى لهذه المعاملات على التكاليف الكلية وذلك مع استخدام النوع كوبوتا. بينما مع النوع يانمار كان هناك تأثير معنوى كبير للمعاملات على مساحة الحصاد، السعة الحقلية الفعلية، الكفاءة الحقلية وكذلك تاثير معنوى بسيط على التكاليف الكلية، بينما لم يكن هناك تأثير معنوى على جملة الإيرادات، تكاليف التشغيل و صافى الربح.