

A Study of Some Economic Indicators of Hulling and Bleaching Machines on the Cultivar of Rice, Tarm Hashemi

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Abstract

The present experiment has been conducted to evaluate of some economic indicators of hulling and bleaching machines of cultivar rice, Tarm Hashemi in the laboratories of the University of Tehran to 2015. Research has included use of two types of machines Satake and Yanmar, under three levels of a moisture content of grain, 10-12 %, 12- 14% and 14-16%), and three levels of clearance between cylinders 0.4, 0.6 and 0.8 mm. The results indicated that the machine type Satake is significantly better on the machine type Yanmar in all studies factors. When increase grain moisture content leads to an increase in the costs, while when increase clearance among cylinder leads to a decrease the costs to all studied traits. The overlap between the machine type Satake and moisture content of grain 10-12% is superior significantly and also overlap between the machine type Satake to clearance 0.8. in all studied factors as compared with the machine type Yanmar with a moisture content of grain and two clearance 0.4 mm in all studied factors. The best results have come from the triple overlap among machine type Satake, grain moisture 10-12%, and clearance 0.8 mm in all studies factors.

Keywords: Fixed Costs, Variable Costs, Total Costs, Fixed Costs Average, Variable Costs Average, Total Costs Average.

الخلاصة

اجريت التجربة لتقييم بعض الصفات الاقتصادية لمكائن التقشير والتبيض الرز صنف تارم هاشمي في مختبرات جامعة طهران لعام 2015 تضمن البحث دراسة نوعين من المكائن Satake و Yanmar تحت تأثير ثلاث مستويات من رطوبة الحبوب 10-12%، 12-14% و 14-16% وثلاث مستويات من الخلوص بين الاسطوانات 0.4، 0.6 و 0.8 ملم . أظهرت النتائج تفوق نوع المكائن Satake معنويا على نوع المكائن Yanmar في جميع الصفات المدروسة . عند زيادة رطوبة الحبوب أدى الى زيادة نسبة التكاليف بينما عند زيادة الخلوص أدى الى انخفاض التكاليف . التداخل بين نوع المكائن Satake ورطوبة الحبوب 10-12% كان معنوي وكذلك التداخل بين نوع المكينة Satake والخلوص 0.8 ملم ايضا كان معنوي في جميع الصفات المدروسة مقارنة بالتداخل بين نوع المكائن Yanmar مع رطوبة الحبوب والخلوص 0.4ملم . افضل النتائج كانت عند نداخل نوع المكائن Satake ورطوبة الحبوب 10-12% والخلوص 0.8ملم .

الكلمات الافتتاحية: التكاليف الثابتة، التكاليف المتغيرة، التكاليف الكلية، متوسط التكاليف الثابتة ، متوسط التكاليف المتغيرة ، متوسط التكاليف الكلية.

Introduction

In Iraq, rice is the staple food more than 50% of the Iraqi population it depends upon. Rice contributes about 43% of total food grain production and 46% of total cereal production in the country, and continues to play a vital role in the national food grain supply Iraq. With the growing of demand for food crops, especially the rice and

quality product, the need for improved technology of paddy processing industry has been realised. This improvement of technology saves post-harvesting losses to some extent. However, the viability of the industry depends on the economics of paddy processing done by different mills. The basic economics of paddy processing remains with out-turn ratios and quality of output of the mills. (Owaid *et al.*, 2009) Said that the rice produced in Iraq is lost in processing and storage. Further, he estimated that about 9% of paddy is lost due to the use of old and out-dated methods of drying and milling, improper and unscientific methods of storage, transport and handling (Shwetha ,2011) Explored that major components like, insurance, depreciation charges and administrative charges are included. Depreciation charges may vary considerably according to the age of machine used, even the two mills using same technology. In addition, this component is more significant for the modern mills than the traditional ones because the modern mills use advanced technology involving huge investment. Fixed cost estimation excludes investment on machines (seed cost). However, the variable cost consists of labor cost, electricity (especially for modern mills), packaging charges, maintenance and storage charges, etc. This cost varies as production changes (increase or decrease). (Ashraf 2000) Inferred that cost of production is an important variable that influences the profits, which are also an indicator of management efficiency. Rice milling is not an exception to this. Many rice processing units have to be closed down. The main reason for closure of conventional units and continued operation of modern units could be higher costs and lower net returns associated with conventional rice milling units. The modern mills are overvalued by adopting new technology and the recovery percent of head rice is more compared to the conventional units also modern rice mills: Modern rice mills are the units, in which the paddy processing is carried out by using rubber roll shellers, a modern technology which is more efficient. Majority of the activities are carried out using machineries like driers, aspirators, graders, polishers etc. (kinga 2013) mentioned that the cost of milling of the paddy into rice is the major operation with other operations also equally important to deliver the milled rice to the consumers. The cost of milling/ton with this investment on plant and infrastructure . It also includes if rental is charged at 10-30% to the mill users when investment is from the government. It is clearly shown that if milling cost/ ton is to be brought to Nu1000/ton then, the operating days should be 105 days with investment, 118 days with 10% rental per annum, 130 days with 20% rental per annum and 176 days with 30% rental per annum for using the mill and the infrastructure. (Ghoneim1981, Berry *et al.*, 2007) Said that the costs influenced of the type of the machine and of the type of crop (increase and decrease) of depend on efficiency and productivity of the machine (Siebenmorgen,et al 2008) Broken kernels reduce milling yield. Broken kernels produced during milling are generally the result of immature, chalky, or fissured kernels, all of which are weak and typically break during milling due to the substantial forces imparted to kernels in order to remove bran. Since broken kernels are only worth approximately 60% of the value of head rice, head rice yield directly determines the economic value of a rice lot, e.g., if the value of head rice is \$0.20/lb and broken kernels \$0.13/lb, the discount for head rice yield reduction would be \$0.07 for every percentage point change in head rice yield for each 100 lbs of rough rice. Thus, if head rice yield decreases by 10 percentage points, e.g., from 60% to 50%, the price decrease would be \$0.70 for every 100 lbs of rough rice, or \$0.32 per bushel. (Alshrifi, 2007) mentioned that the completion of the machine means the ability of the machine to work efficiently without claim to have in the product and this is influenced by the type of machine and grain moisture content. (Kepner *et al.*, 2005), mentioned

that the total annual cost includes both fixed cost and variable cost. The capacity of the machines is its performed capacity in acre/year The cost of milling has been calculated based on three categories :

- a. The initial investment as zero as the both the construction and purchase are done by the government .
- b. The initial investment calculated on rental basis at 10%, 20 and 30% respectively
- c. The initial investment included as if it is operated by private without any government support.

The rice milling recovery was considered at 67% from the paddy as 20-22% includes the husk and remaining included in the polishing. The cost of the paddy purchased is assumed at Nu 30/kg and the selling of the rice in the market is assumed at Nu70/ kg as surveyed from the farmers. The moisture content of the paddy at purchase time is assumed at 22% m.c w.b.

Metrails and methods

The experiment has been carried out at the labrotaries university of Tehran ,the used of two machine types for hulling and bleaching are (Satake and Yanmar) is a main factor , under three levels of moisture content of grain 10-12% , 12- 14% and 14-16%is a secondary factor ,and three levels from clearance between cylinders 0.4 , 0.6 and 0.8 mm is also a secondary factor. And used the rice cultivar is Tarm Hashemi . Of following indicators are calculated:

1-Fixed costs: These costs are calculated only this machine used or not used .include:

1.1-Extinction:

It is the distribution of the cost of existing fixed on the number of years that are expected to benefit from them or it is a gradual and continuous decrease in the value of hard existence as a result of many factors including corrosion and inadequate productivity. And will be calculated according to Eq 1 (Adam et al 2000).:

$$D_{EP} = \frac{P_{PR} - V_A}{O_L} \quad (1)$$

Where;

D_{EP} -Is annual extinction Dollar/ hr.

P_{PR} - Is the purchase price of the machine Dollar/hr .

V_A – Is the price of the machine after the end of life Dollar/hr .

O_L -Is operation life span of the machine . Dollar/hr

1-2 - Interest on Turnover:

It is the amount paid for the use of capital as well as a compensation or remuneration for the use of capital investor for a period of time will be . calculated according to Eq 2 (Bakri 2015),

$$I_{N.T} = \frac{\{P_{PR} - \frac{V_A}{2}\}}{Y \times rat.I_{N.T}} \quad (2)$$

Where;

$I_{N.T}$ -Is interest on share capital Dollar/hr .

$rat.I_{N.T}$ -Is interest price as a percentage of 8% in Iraq banks .

Y -Is the number of annual operating hours . (1000 hours/year)

1-3 - Taxed, insurance and shelter: It is paid by the consumer whenever he buys a commodity and different the tax value in Iraq is from 7-20 % of the price of the item .will be calculated according to Eq 3 (Mahayni et al 2005)

$$T_{S.I} = \frac{P_{PR}}{Y} \times [T_{S.I} rat] \quad (3)$$

Where:

$T_{S.I}$ -Is taxes , insurance and shelter costs,

$T_{S.I} rat$ -Is tax costs , insurance, shelter value estimates of 2% .

Fixed costs will be calculated according to Eq 4 (Al tahan et al 2011)

$$F_C = D_{E.P} + I_{N.T} + T_{S.I} \quad (4)$$

2-Variable costs;

They are costs that change with the level of production and include;

2-1-Wage costs the labor;

They are the monetary compensation to be paid to industrial workers based on the amount of production or on the basis of time, will be calculated according to Eq: 5 (Schnitkey, 2001; Abdulwahab, 2012)

$$L_C = \frac{D_L}{P_{Pd}} \quad (5)$$

Where:

L_C -Is works wages . Dollar/hr

D_L -Is wage worker Dollar/hr .

P_{Pd} - Is the daily number of hours of work (8 hours in day).

2-2 -Maintenance Costs

They are the fault detection, diagnosis or replace it then be sure to fix it. .Include wages maintenance and repair services machinery and spare parts and disbursements on the machine for a full year take all this information from the records by machines in the silo. :will be calculated according to Eq : 6 (Schnitkey 2001; Abdulwahab, 2012)

$$M_{R.C} = \frac{\sum M_R}{P.P} \times Y \quad (6)$$

Where:

$M_{R.C}$ -Is maintenance costs. Dollar/hr

$\sum M_R$ -Is total maintenance for the entire year . Dollar/hr .

Y -Is number annual operating (1000/year).

2-3 -Electrical Energy Costs;

They are calculated by ammeter for the entire year. Dollar/hr

Variable costs will be calculated according to Eq; 7 (Berger et al 2005)

$$V_A = L_C + M_{R.C} + E_e \quad (7)$$

Where: E_e . Electrical energy costs

Or variable costs will be calculated as a percentage of 80% from the fixed costs.

Source : (Berger et al., 2005).

3-Administra Tive Costs

They are all costs that arise as a result of operations planning , control and management of onsite. Will be Calculated as a percentage of 10% from the fixed costsand variable costs. Eq : 8 (Al tahan et al 2011) .

$$M_{a.C} = V_C + F_C \times 0.1 \quad (8)$$

Where:

$M_{a.C}$ - Is administrative costs. Dollar \hr

4- So the total cost of the machines hulling and bleach will be calculated according to Eq :9 (Al tahan *et al.*, 2011)

$$T_C = F_C + V_C + M_{a.C} \quad (9)$$

Where:

T_C -Is total costs for machines hulling and bleach. Dollar\hr

5- Net income will be calculated according to Eq: 10 (Altahan et al 1990).

$$N_Y = P_{SP} - T_C \quad (10)$$

Where:

N_Y -Is the net yield of machines. Ton/hr.

T_C -Is product sale price Dollar/hr

1-2- Average Costs in the Short Term

The costs in the short term can be calculated by knowing the following ;

1-2-1- Variable Costs Average

The Average Variable Cost (AVC) is the total variable cost per unit of output. This is found by dividing Total Variable Cost (TVC) by total output (Q). Total Variable Cost (TVC) is all the costs that vary with output, such as materials and labor. The easiest way to determine if a cost is variable is to see if as output changes, does the cost change as well. If it does, then it is a variable cost. Will be calculated according to Eq : 11 (Mustafa 1998; Dehez et al., 2003)

$$A_{VC} = \frac{V_C}{Q} \quad (11)$$

Where:

A_{VC} -Is average variable costs. Dollar\hr.

Q -Is the level of production. Ton/hr.

1-2-2-Fixed Costs Average

A generating unit share of the costs and the relationship between the volume of production and the fixed costs average is an inverse relationship in the sense if the increased volume of production, led to decreased the fixed costs average drop. Will be calculated according to Eq: 12 (Ghoneim 1981; Berry *et al.*, 2007).

$$A_{FC} = \frac{F_C}{Q} \quad (12)$$

Where:

A_{FC} -Is fixed costs average. Dollar /hr.

1-2-3- Average Total Costs; :

The per unit cost derived by dividing total cost by the quantity of output. Will be calculated according to Eq : 13 (Jasim et al 2014).

$$A_{TC} = A_{VC} + A_{FC} \quad (13)$$

Where:

A_{TC} -Is average total costs. Dollar\hr

Then repeating of the same method and measurements of the previous by using of the machine type Satake ,moisture content of grain 12-14%, 14-16% and clearances 0.6,0.4 mm and three replications of rice clutivar (Tarm Hashemi) .Results are analyzed statistically by using the design C R D and tested the difference among treatment of each factor according to the test LSD less significant difference 0.05. (Oehlent, 2010) .

Results and Discussion:

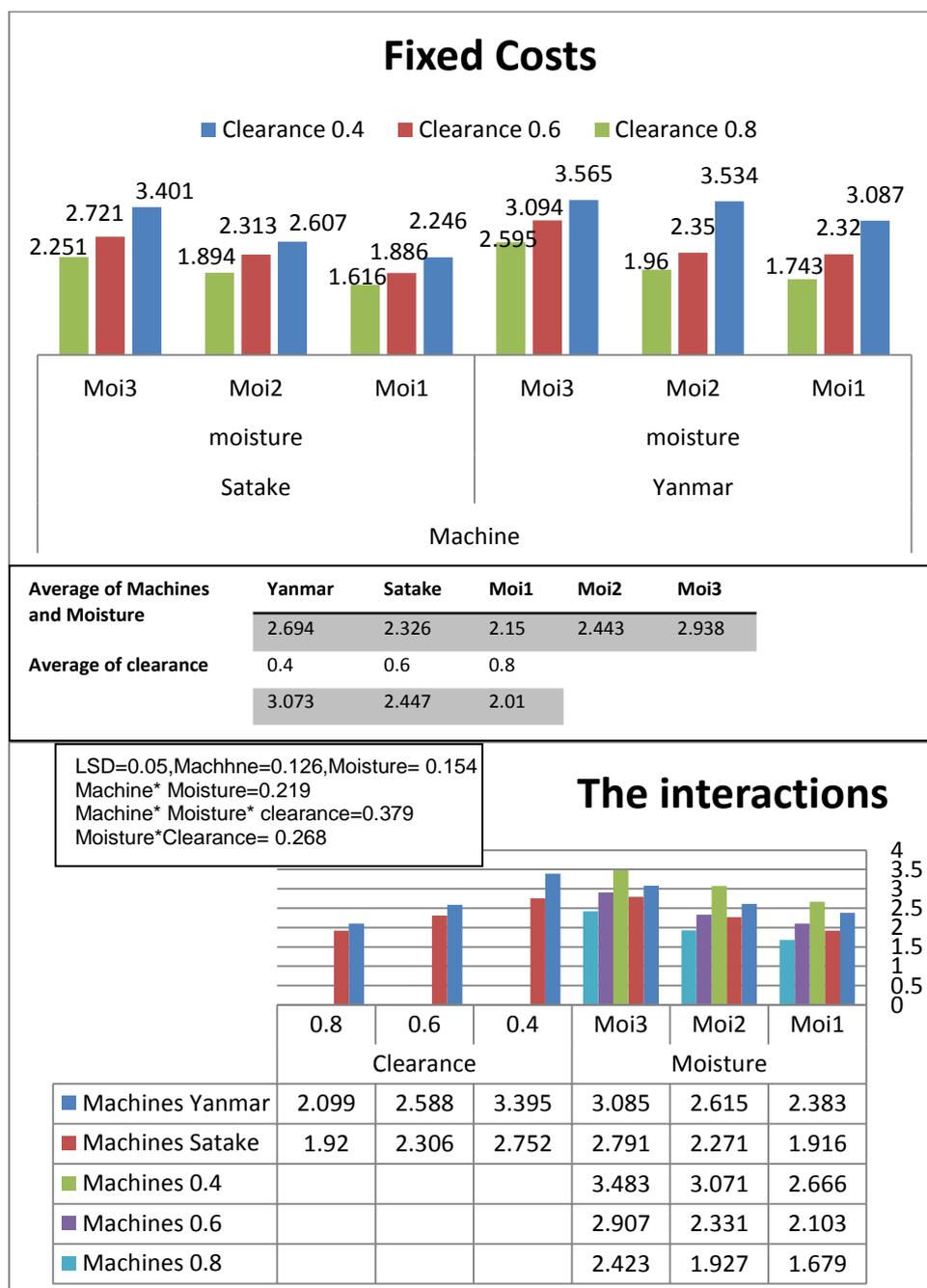


Fig (1) Illustrates the Effect of Machines Types , Clearance and Grain Moisture on the Fixed Costs \$/Ton.

Figure 1 shows the influence of the type of machine, clearance, and grain moisture in the fixed costs. The results indicate that the machine type, Satake, is significantly better than the machine type Yanmar. The results gained from this process are 2.694, 2.326 $\$/\text{ton}$ respectively, by an increase of 15.8%. Because of increasing the productivity of the machine type Satake as comparing with the machine type Yanmar which provided the lowest value of productivity. These findings are consistent with the findings of (Al tahan *et al.*, 1990). Increasing the grain moisture content leads to an increase the fixed costs 2,150, 2,443 and 2.938 $\$/\text{ton}$ respectively by an increase 13.6% and 20.2%. This is due to the increasing of grain moisture content leads to increase fixed costs because increase breakage percentage and decrease productivity process of the machine. These results are consistent with results that gained by (Keprer *et al.*, 2011). However increasing the clearance between cylinders leads to a decrease the fixed costs 3.073, 2.447 and 2.010 $\$/\text{ton}$ respectively with low percentage 25.5% and 21.7% respectively. This is due to the increasing of clearance between cylinders leads to an increase of the productivity process of the machine and decrease the fixed costs. These results are consistent with the results that gained by (Kinga, 2013). The overlap between the machine type and grain moisture is significantly important because the overlap between the type machine Satake and the grain moisture 10-12% provides the lowest value of 1.916 $\$/\text{ton}$ as comparing with the machine type Yanmar to the grain moisture content 12-14% which provides the highest value of fixed costs 3.085 $\$/\text{ton}$ by a decrease 61.0%. In addition, the overlap between the machine type and clearance was significant too because the overlap between the machine type Satake and the clearance 0.8 mm provides the lowest value of fixed costs 1.536 $\$/\text{ton}$ as comparing with the machine type Yanmar to the clearance 0.4 mm which provides the highest value of fixed costs 2.786 $\$/\text{ton}$, by a decrease 81.3%. Also, the overlap between the grain moisture and clearance is significant because of the overlap between the grain moisture content 10-12% and the clearance 0.8 mm provides the lowest value of fixed costs 1.679 $\$/\text{ton}$ as comparing with the grain moisture content 14-16% to the clearance 0.4 mm which provides the highest value of fixed costs 3.483 $\$/\text{ton}$, by a decrease 107.4%. The best results 1.616 $\$/\text{ton}$ have come from the triple overlap among machine type Satake, grain moisture 10-12%, and clearance 0.8 mm.

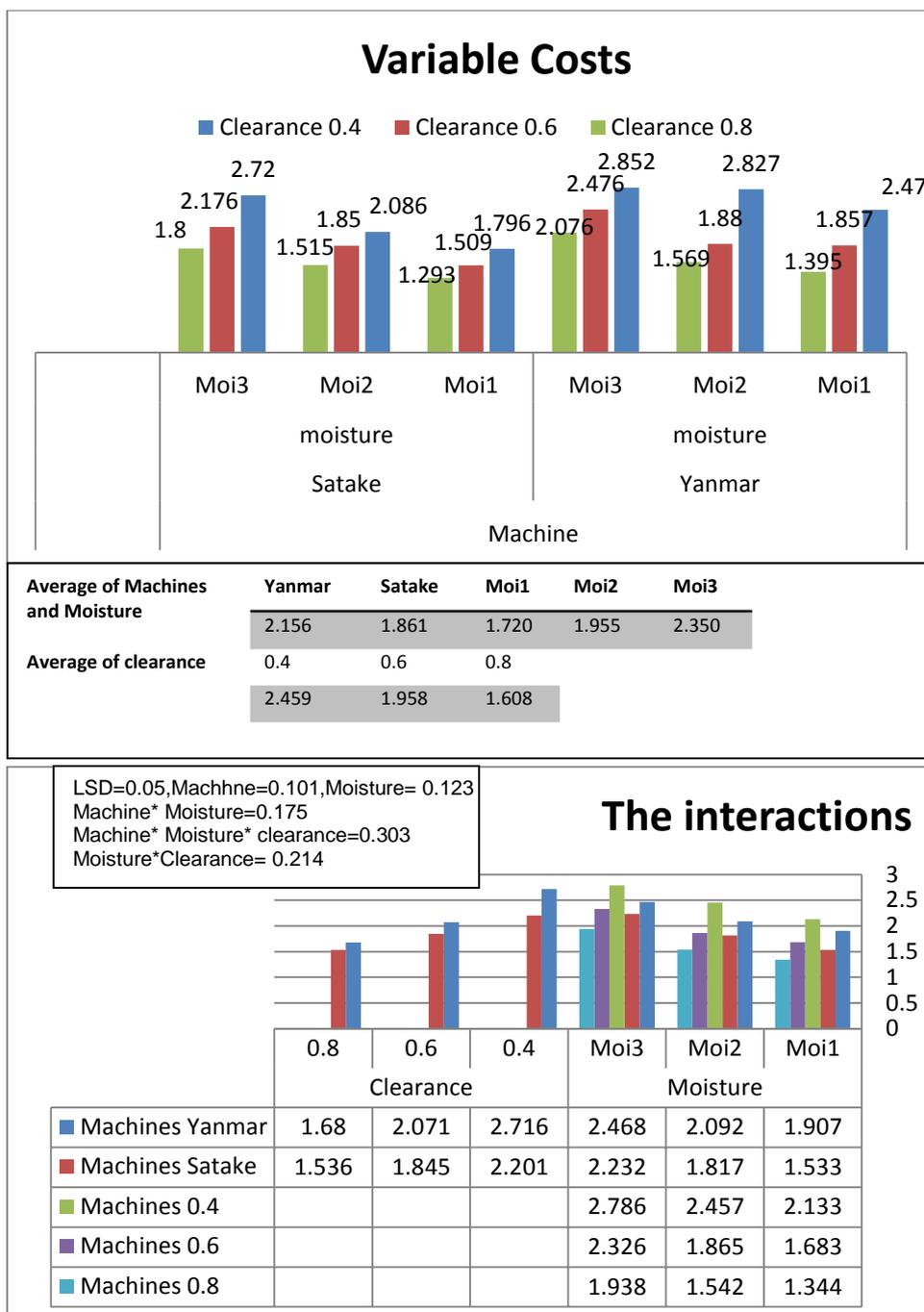


Fig (2) Illustrates the Effect of Machines Types , Clearance and Grain Moisture on the Variable Costs \$/Ton.

Figure (2) shows the influence of the type of the machines , clearance and grain moisture content in the variable costs \$ /ton .The results indicated that increasing grain moisture content leads to increase of the variable costs,and the results are 1.720, 1.955and 2.350 \$/ton respectively by an increase of 12.0% and 20.2% respectively . This is due that increasing grain moisture content causes of the fragility of the rice grains which leads to an increase breakage percentage .These results are consistent with the results the gained by (Adam *et al.*, 2000). And also it is observed that the machine type, Satake, is significantly better than the machine type, Yanmar, the

results gained are 2.156 , 1.861 \$/ton , respectively by an increase 15.8%. The reason for this is the decrease productivity of the machine of type Yanmar which leads to an increase of variable costs. These findings consistent with the findings of (Schnitkey, 2001). it is observe that an increase the clearance between cylinders which leads to the decrease of the variable costs and the results are 2.459, 1.958 and 1.608 \$/ton respectively by a decrease 25.5% and 21.7% respectively. The reason for this is creasing in productivity and decreasing the breakage percentage which leads to decrease variable costs when increasing the clearance between cylinders ,this is consistent with the results obtained (Shwetha, 2011).The overlap between the machine type and clearance is significant ,because the overlap between the machine type Satake and the clearance 0.8mm provides the lowest value of variable costs 1.536 \$/ton as comparing with the machine type Yanmar to the clearance 0.4mm which provides the highest value of variable 2.716 \$/ton,by a decrease 76.8%. The overlap between the machine type and grain moisture is significant because the overlap between the type machine Satake and the grain moisture content 10-12% provides the lowest value of 1.533 \$/ton as comparing with the machine type Yanmar to the grain moisture content 12-14% which provides the highest value of variable costs 2.468 \$/ ton .by a decrease 60.9%.While the overlap between the grain moisture content and clearance is significant because of the overlap between the grin moisture content 10 – 12% and the clearance 0.8 mm provides the lowest value of variable costs 1.344 \$/ton as comparing with the grain moisture content 14 – 16 % to the clearance 0.4 mm which provides the highest value of variable costs 2.786 \$/ton . by a decrease 107.3% .The best results 1.293 \$/ton have come from the triple overlap among machine type Satake, grain moisture 10-12%, and clearance 0.8 mm.

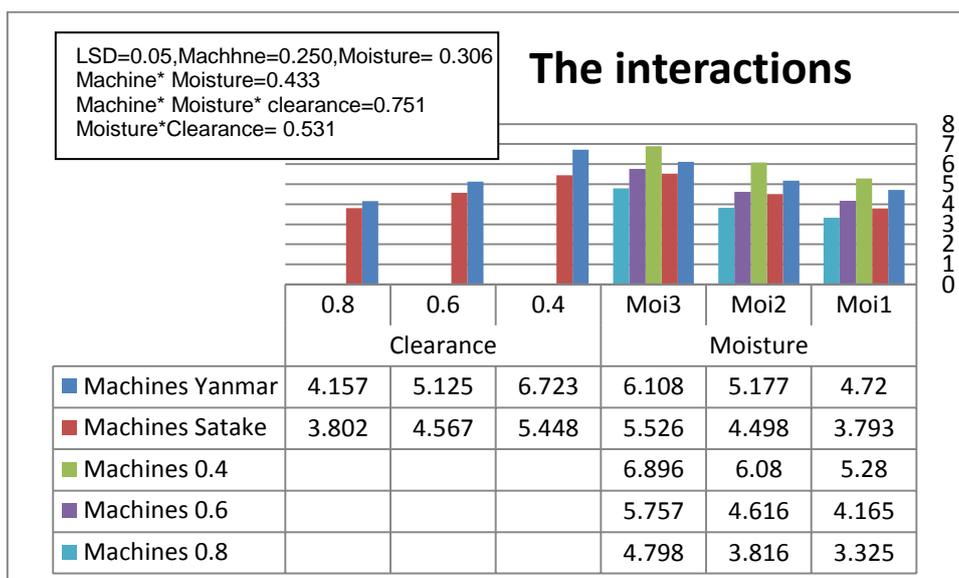
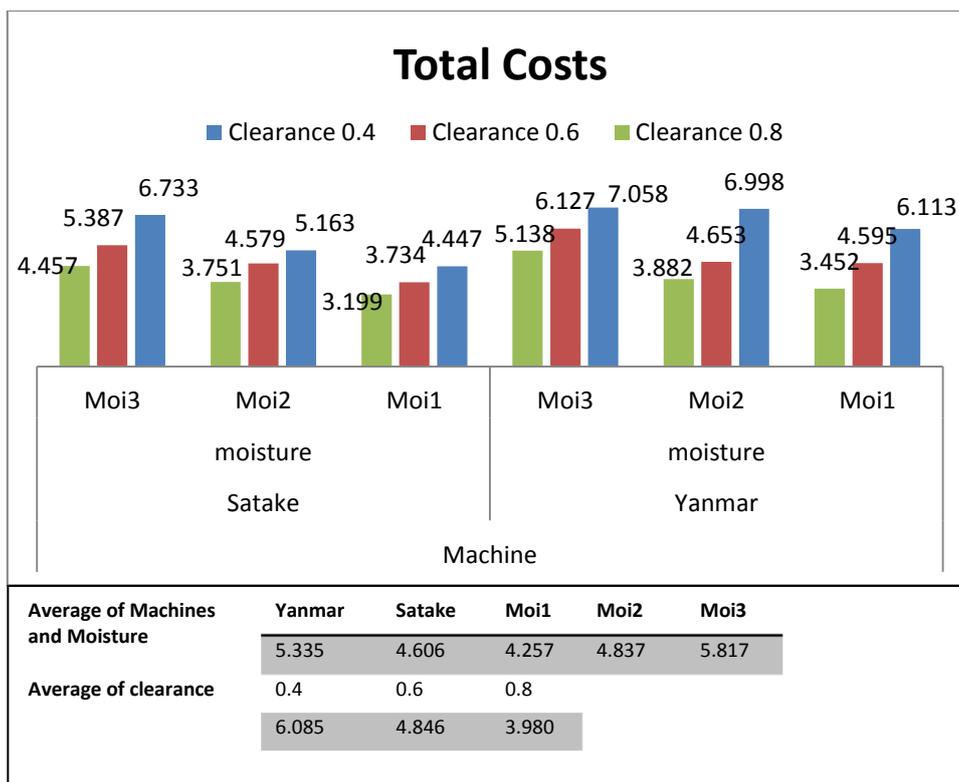


Fig (3) Illustrates Effect of Machines types , Clearance and Grain Moisture on the Total Costs \$/Ton.

Figure (3) observe the influence of the type of the machines , clearance and grain moisture content in the total costs \$ /ton .The results indicated that increasing grain moisture content leads to increase of the total costs,and the results are 4.257, 4.837and 5.817 \$/ton respectively by an increase of 13.6 % and 20.2% respectively. This is due that increase grain moisture content cause an increase fixed and variable cost which leads to an increase total costs .These results are consistent with the results the gained by (Bakri *et al.*, 2015). And also observes that the machine type satake is significantly better than the machine type Yanmar the results that gained are 5.335,4.606 \$/ton, respectively by an increase 15.9%. The reason for this is

decreasing the productivity of the machine of type Yanmar which leads to an increase of total costs. These findings are consistent with the findings of (Schnitkey, 2001). It is observed that there is an increase in the clearance between cylinders which leads to a decrease in the total costs and the results are 6.085, 4.846 and 3.980 \$/ton respectively by a decrease 25.6% and 21.8% respectively. The reason for this is increasing in the productivity and decreasing breakage percentage which leads to a decrease total costs when increasing clearance between cylinders, this is consistent with the results obtained by (Altahan *et al.*, 2011). The overlap between the machine type and grain moisture content is significant because the overlap between the type machine Satake and the grain moisture content 10-12% provided the lowest value of 3.793 \$/ton as comparing with the machine type Yanmar to the grain moisture content 14-16% which provides the highest value of total costs 6.108 \$/ton. The overlap between the grain moisture content and clearance is significant because of the overlap between the grain moisture content 10 – 12% and the clearance 0.8 mm provides the lowest value of total costs 3.325 \$/ton as comparing with the grain moisture content 14 – 16 % to the clearance 0.4 mm which provides the highest value of total costs 6.896 \$/ton. The overlap between the machine type and clearance is significant, because the overlap between the machine type Satake and the clearance 0.8 mm provides the lowest value of total costs 3.802 \$/ton as comparing with the machine type Yanmar to the clearance 0.4mm which provides the highest value of total costs 2.716 \$/ton. The best results 3.199 \$/ton have come from the triple overlap among machine type (Satake), grain moisture (10-12%), and clearance 0.8 mm.

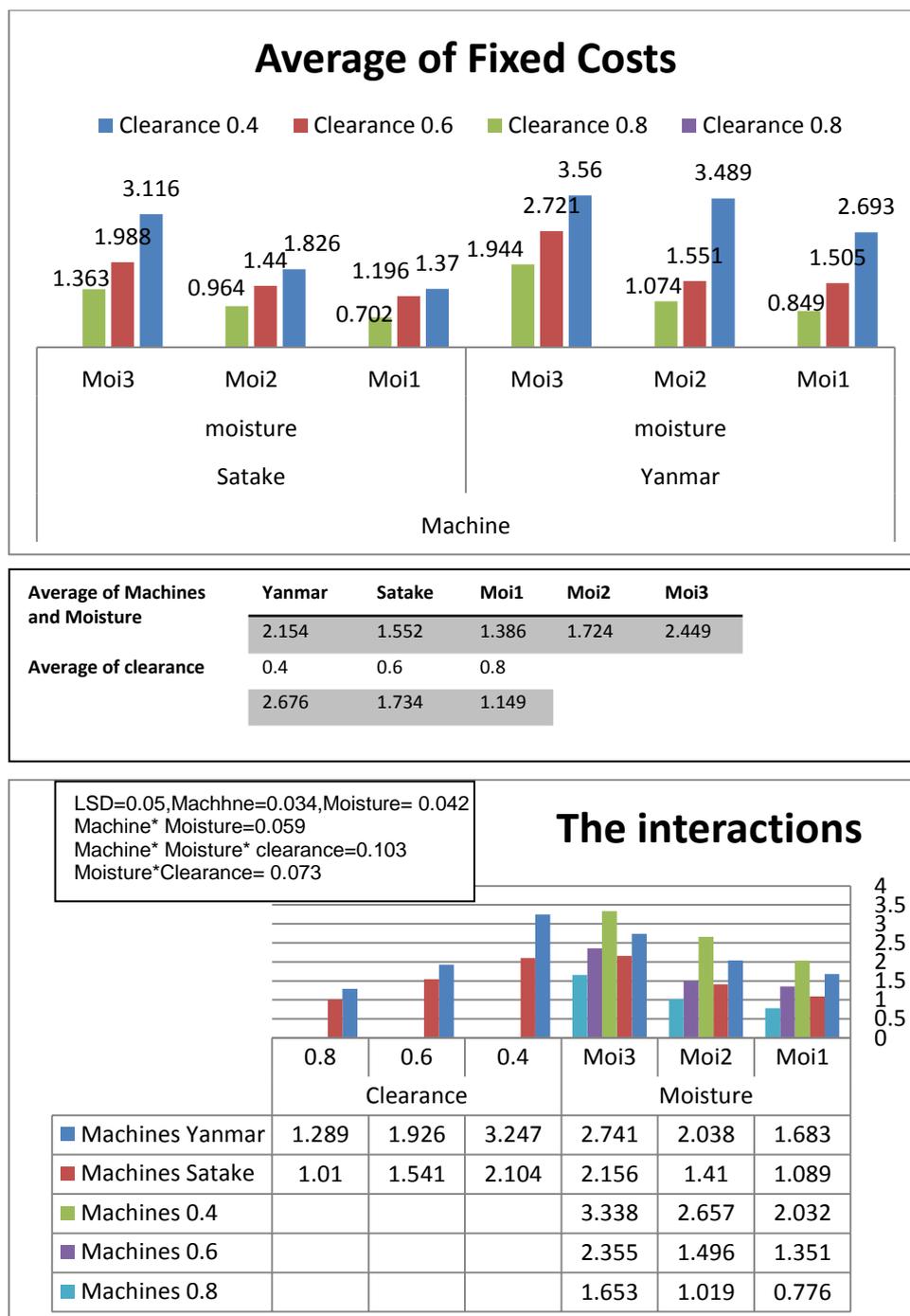


Fig (4) IIIustartes Effect of Machines types , Clearance and Grain Moisture in the Average of Fixed Costs \$/Ton.

Figure 4 shows the influence of the type of machine, clearance, and grain moisture in the fixed costs average. The results indicated that the machine type Satake is significantly better than the machine type Yanmar. The results that gained from this process are 2.154, 1.552 \$/ton respectively. By an increase of 38.7% .causes a decrease in fixed costs of the machine type Satake as comparing with the machine type Yanmar which provides the increase fixed costs value leads to increase average fixed costs. These findings are consistent with the findings of (dehez *et al.*, 2003). Increasing the grain moisture content leads to increase the fixed costs

average 1.386, 1.724 and 2.449 \$/ton respectively by an increase 24.3 % and 42.0 %. This is due to the increasing of grain moisture content leads to increase fixed costs because of increasing breakage percentage and decreasing the productivity process of the machine. These results are consistent with results that gained by (Siebenmorgen *et al.*, 2008). However increasing the clearance between cylinders leads to decrease the fixed costs average 2.676, 1.734 and 1.149 \$/ton respectively with low percentage 54.3% and 50.9% respectively. This is due to increasing of clearance between cylinders leads to increase the productivity process of the machine and decrease the fixed costs average. These results are consistent with the results that gained by (Ghoneim 1981). The overlap between the machine type and grain moisture is significantly because the overlap between the type machine (Satake) and the grain moisture 10-12% provides the lowest value of fixed costs average 1.089 \$/ton as comparing with the machine type Yanmar to the grain moisture content 12-14% which provides the highest value of fixed costs average 2.741 \$/ton. In addition, the overlap between the machine type and clearance is significant too because the overlap between the machine type Satake and the clearance 0.8 mm provides the lowest value of fixed costs average 1.010 \$/ton as comparing with the machine type Yanmar to the clearance 0.4 mm which provides the highest value of fixed costs average 3.247 \$/ton. Also, the overlap between the grain moisture and clearance is significant because of the overlap between the grain moisture content 10 – 12% and the clearance 0.8 mm provides the lowest value of fixed costs average 0.776 \$/ton as comparing with the grain moisture content 14 – 16 % to the clearance 0.4 mm which provides the highest value of fixed costs average 3.338 \$/ton. The best results 0.702 \$/ton have come from the triple overlap among machine type Satake, grain moisture 10-12%, and clearance 0.8 mm.

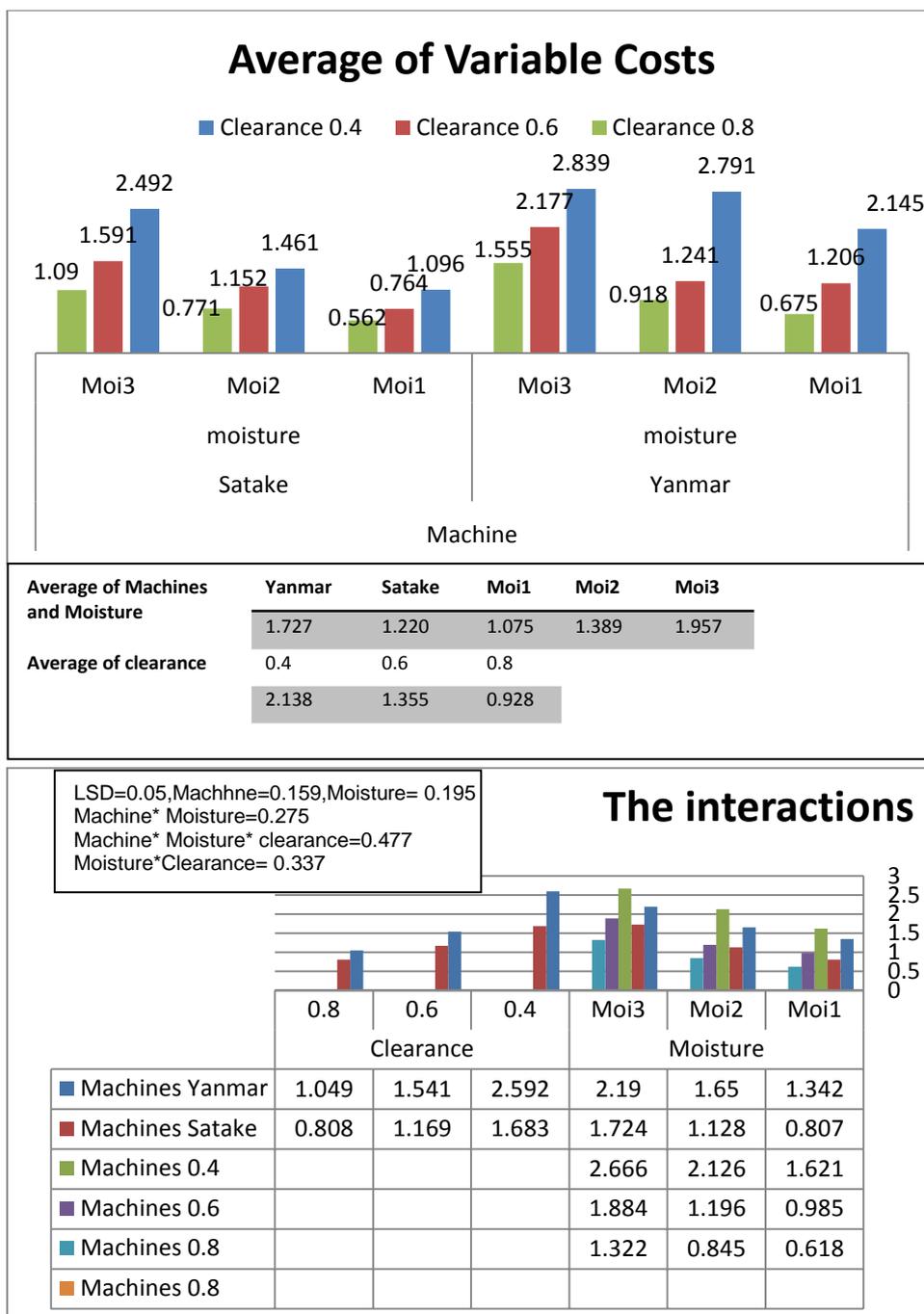


Fig (5) IIIustartes effect of machines types , Clearance and Grain moisture in the Average of Variable Costs \$Ton.

Figure 5 shows the influence of the type of machine, clearance, and grain moisture in the variable costs average. The results indicate that the machine type Satake is significantly better than the machine type Yanmar. The results that gained from this process are 1.727, 1.220 \$/ton respectively. by an increase of 41.5 % .This is due to the efficiency and productivity of the type of the machine Satake and decrease fixed and variable costs value as comparing with the machine type Yanmar which increased the costs values leads to increase average variable costs . These findings are consistent with the findings of (Ghoneim, 1981). Increasing the grain moisture content leads to increase the variable costs average 1.075, 1.389 and 1.957 \$/ton

respectively by an increase of 29.4 % and 40.8 %. The increase in moisture content of grain leads to the obstruction of the milling process and the reason for this low productivity operation of the machine and increase machine costs. These results are consistent with results that gained by (Alsharifi, 2007). However increasing the clearance between cylinders leads to decrease the fixed costs average 2.138, 1.355 and 0.928 \$/ton respectively with low percentage 57.7% and 46.0% respectively. This is due to increasing of clearance between cylinders leads to increase the productivity process of the machine and decrease the variable costs average. These results are consistent with the results that gained by (Jasim *et al.*, 2014). The overlap between the machine type and grain moisture is significantly significant because the overlap between the type machine Satake and the grain moisture 10-12% provides the lowest value of variable costs average 0.807 \$/ton as comparing with the machine type Yanmar to the grain moisture content 14-16% which provides the highest value of variable costs average 2.190 \$/ton by a decrease of 171.3%. In addition, the overlap between the machine type and clearance was significant too because the overlap between the machine type Satake and the clearance 0.8 mm provides the lowest value of variable costs average 0.808 \$/ton as comparing with the machine type Yanmar to the clearance 0.4 mm which provides the highest value of variable costs average 2.592 \$/ton. By a decrease of 220.8%. Also, the overlap between the grain moisture and clearance was significant cause of the overlap between the grain moisture content 10 - 12% and the clearance 0.8 mm provides the lowest value of variable costs average 0.618 \$/ton as comparing with the grain moisture content 14 - 16 % to the clearance 0.4 mm which provides the highest value of variable costs average 2.666 \$/ton by a decrease of 331.3%. The best results 0.562 \$/ton have come from the triple overlap among machine type Satake, grain moisture 10-12%, and clearance 0.8 mm.

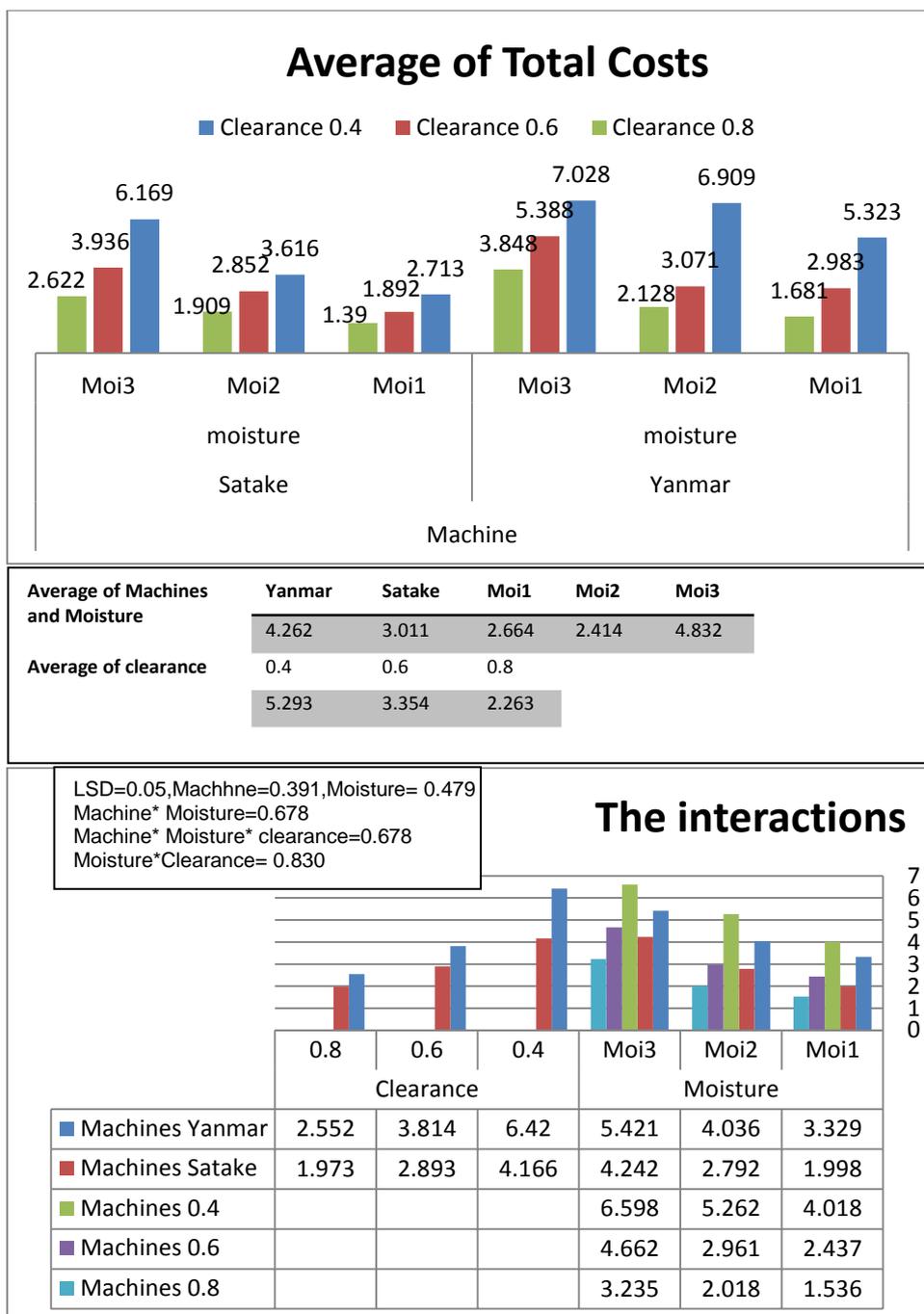


Fig (6) Illustrates Effect of Machines types , Clearance and Grain Moisture on the Average of Total Costs \$/Ton.

Figure (6) observe the influence of the type of the machines , clearance and grain moisture content in the total costs average \$ /ton .The results indicated that an increase the clearance between cylinders which leads to decrease the total costs average and the results are 5.293,3.354 and 2.263 \$/ton respectively, by a decrease 57.8% and 48.2% respectively. This is due to the exploitation of the machine within the clearance required to obtain a higher rate of perfect performance .This is consistent with the results obtained (Altahan *et al.*, 2011) .Also that increasing grain moisture conten leads to an increase in the total costs average,and the results are

2.664, 2.414 and 4.832 \$/ton respectively by an increase of 10.3 % and 100.1% respectively . This is due to the increase grain moisture leads to obstruct the work of the machine due to adhesion of grain on the sides of the machine and lowering the productivity of the machine and increase total costs average. These results are consistent with the results the gained by (Alshrifi, 2007). And it is also observed that the machine type satake is significantly better than the machine type Yanmar the results that gained are 3.011,4.262 \$/ton , respectively by an increase 41.5%. The reason for this is decrease productivity of the machine of type Yanmar which leads to increase of total costs average. These findings consistent with the findings of (Altahan, *et al.*, 1990). The overlap between the machine type and grain moisture content is significant because of the overlap between the type machine Satake and the grain moisture content 10-12% provides the lowest value of 1.998 \$/ton as comparing with the machine type Yanmar to the grain moisture content 14-16% which provides the highest value of total costs average 5.421 \$/ ton by a decrease of 171.3%. While the overlap between the grain moisture content and clearance is significant because of the overlap between the grain moisture content 10-12% and the clearance 0.8 mm provides the lowest value of total costs average 1.536 \$/ton as comparing with the grain moisture content 14 -16 % to the clearance 0.4 mm which provides the highest value of total costs average 6.598 \$/ton by a decrease of 329.6 .As for the overlap between the machine type and clearance is significant ,because of the overlap between the machine type Satake and the clearance 0.8 mm provides the lowest value of total costs average 1.973 \$/ton as comparing with the machine type Yanmar to the clearance 0.4mm which provides the highest value of total costs average 6.420 \$/ton by a decrease of 225.4. The best results 1.390 \$/ton have come from the triple overlap among machine type Satake, grain moisture 10-12%, and clearance 0.8 mm.

Conclusions

- 1- The machine type Satake is significantly better on the machine type Yanmar in all studied traits.
- 2- The grain moisture content 10-12% superior significantly on two levels 12-14% ,14-16% in all studied properties .
- 3- The clearance between cylinders 0.8 mm superior significantly on others two clearance 0.4 ,0.6 in all studied properties. The overlap between the machine type Satake and grain moisture content 10-12% superior significantly and also overlap between the machine type Satsake to clearance 0.8. in all studied traits as compared with the overlap of the machine type Yanmar with moisture content of grain 12-14%,14-16% and two clearance 0.4 ,0.6 mm in all studied properties. The overlap between the machine type Satake with grain moisture content 10-12% and clearance 0.8mm significantly better as compared overlap to the machine type Yanmar with moisture content of grain 12-14%,14-16% and two clearance 0.4 ,0.6 mm in all studied traits.
- 4-

Recommendations

- 1- The present recommends to carry out future studies using other of machinery types and other varieties of rice

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