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STUDY ON THE MECHANIZATION OF BEAN (*Phaseolus vulgaris*) CROP UNDER EGYPTIAN CONDITIONS

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ABSTRACT

This study aimed to select the proper system of bean crop mechanization to achieve high yield, low grain losses with high field efficiency. The experiments were carried out using pneumatic planter and seed drill in planting operations in addition to the manual method, and tractor mounted mower was used in harvesting operation under different forward speeds and moisture contents compared to the manual method. Also, a Turkish threshing machine was used for threshing the crop at different drum speeds and seed moisture contents. From the obtained data it was concluded that; the pneumatic planter followed by tractor mounted mower and threshing by Turkish machine was considered the proper system for producing dry bean under Egyptian conditions, where as required minimum cost compared to the others. The seed moisture content of 14.86% and forward speed of 2.9 km/h were the proper conditions for harvesting dry bean crop. The threshing drum speed of 10.47m/s and seed moisture content of 11.33 % considered the proper values for threshing bean.

Keywords: Bean, planting, harvesting, threshing, moisture content, operation speed, losses, energy, cost.

INTRODUCTION

Bean is considered one of the important legume crops all over the world. it is currently used in human feeding more over, bean residues are used as a filling material for animal feed. The total planted area in Egypt devoted for dry seeds at 2010 was 47000 feddan with production of about 53000 tons with (an average yield of 1.13 tons/feddan). Also the production was 63000 feddan for green pods with total production of about 271000 tons (an average yield of 4.3 ton/ feddan) according to Agricultural Economics Bulletin (2010).

The dry bean procedures face many problems such as labor shortage as well as high wages in new lands.

Sabreen *et al.* (2002) used pneumatic and mechanical planter for planting soybean at four forward speeds (3.6, 4.7, 5.6 and 6.9 km/h) at three levels of soil moisture contents (34.22, 28.60 and 22.30%). The field experiments showed that the proper planting method producing the highest germination ratio, uniformity of seed distribution, adequate depth planting and the highest productivity was pneumatic planter. They stated that the optimum soil moisture content and forward speed that gave the highest germination ratio, uniformity of seed distribution and total yield were 34.60% and 3.6 km/h, respectively.

Neagu *et al.* (2002) determined that the degree of kidney bean [*Phaseolus vulgaris*] plant dislocation and grain losses at the running speed of 5.3 km/h using three equipments with different active parts: special unilateral action knives, toothed swivel disc and double knife mower. The best results were recorded in the case of using the special unilateral action knives while the least was observed on the toothed swivel disc.

Gomaa (2003) compared the performance of two types of planters (pneumatic and mechanical) in cowpea planting. The best seed germination, seed scattering, planting depth and total yield were obtained under planting forward speed of 3.16 Km/h. he found also the best results of planting uniformity and total yield

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were obtained using pneumatic planter compared to mechanical planter.

Herbek and Bitzer (2004) reported that the acceptable range for harvesting soybeans was between 11 and 20 % of moisture content,. A good rule is to start as soon as the moisture content reaches 14 to 16 % and continue until the field is harvested. They suggested harvesting promptly when moisture content reaches 13 % and to finish before moisture content drops to 11 %. Below that level, shatter losses and seed damage losses increase substantially. As to the effect of some operating parameters on cowpea threshing losses.On the other hand, The cylinder speeds ranging from 400 to 800 rpm were normally adequate and that higher cylinder speeds of 700 to 800 rpm. caused greater seed damages than slower speeds, and use a cylinder speed lower than 500 rpm recorded seed damage

(Yehia *et al*, 2005) reported that the highest grain emergence percentage of cowpea was recorded in the case of using pneumatic planter comparing with manual planting, seed drill and mechanical planter in flat and furrow soil. They added that the maximum grain emergence of 99.1% was obtained by using pneumatic planter in furrow whil the minimum of 62.44 % was obtained by using manual planting in flat soil. They reported also, the highest seed productivity of (1313 kg/fed) was obtained by using pneumatic planter in furrow soil in comparison to the others.

Morad *et al.* (2007) showed that the average values of yield of cowpea production were 408.7, 567.3 and 472.5kg/fed under manual planting, pneumatic planter and seed drill, respectively.

As mentioned before, dry bean production still depends mainly on manual methods especially in small holdings with consuming more time and cost. For this reasonThe objective of this study concerned as follow:

1. Selecting the proper system for planting and harvesting bean crop to reach to high yield, low grain losses with high field efficiency.
2. Selecting the optimum seed moisture content and operating speed to minimize the harvesting and threshing losses.
3. Reducing the total cost and energy requirements through selecting the proper system for bean mechanization.

MATERIALS AND METHODS

The main experiments were carried out during the agricultural season of 2009/2010 at Dearb Negm, Sharkia Governorate to investigate some different mechanization systems for producing Bean (Giza 6 variety) under Egyptian conditions. The experimental area was about 1.5 fed divided into 27 equal plots with dimensions of (3x 78 m) for each. The mechanical analysis of the experimental soil was classified as clay soil as indicated in Table 1.

Materials

The following equipment were used in the research:

- Roman "Universal 650-M" of 55.93 kW
- Nasr " M34/T diesel water cooled" of 44.1 kW
- Pneumatic planter four rows, model GAMMA 90 with working width of 240 cm.
- Seed drill 21 rows, model COLORADO and working width of 240 cm.
- Tractor mounted mower model B.M.1102 with cutting width of 150 cm.
- Self-propelled harvester model 4G-120A with cutting width of 120cm and 12 hp engine power.
- Turkish threshing machine, consists of two components; threshing and winnowing units. The threshing drum of 120 cm length, 73 cm diameter and number of fingers is 40. The winnowing unit having a fan, vibrating screen and air elevator.

Table 1. Soil mechanical analysis

Clay %	Silt %	Sand %	Textural class
52.9	24.55	22.55	clay

Methods

Planting operation

The rows spacing and hills in the same row were almost adjusted to be 60 cm and 15 cm in both manual and mechanical methods respectively. The manual planting requires about 45 kg/fed of seeds and the mechanical planting (planter and seed drill) requires about 15 and 26 kg/fed respectively. The average number of seeds was 3-5 seed per hill under manual planting. Meanwhile, this was only done in the mechanical planting. Plots in different planting operations were thinned to one plant per hill after three weeks from planting. The planting depth was adjusted to be 4 cm at average forward speed of 3.75 km/h. Fertilizing, irrigation and weed control were the same in all treatments according to the technical recommendations.

Harvesting operation

The harvesting operation was carried out through three different levels of seed moisture contents of 10.87, 14.86 and 20.43% (db). at different operating speeds of 2.9, 3.8 and 5.1 km/h.

Threshing operation

The threshing operation was conducted on plants which obtained from the proper planting and harvesting treatments under three different drum speeds of 400, 500 and 600 rpm [8.37, 10.47 and 12.56 m/s] at four moisture contents of [8.61, 11.33 and 17.82 %(db)] at a constant feed rate of 185 kg/h

Treatments

Nine treatments, namely A, B, C, D, E, F, G, H and I were carried out and replicated three times in a completely randomized block design. Treatments C, F and I ignored because primary experiment was carried out by self propelled harvester and found that the harvesting losses was more than 50% so this method not used during the basic experiment

A.: Manual planting + manual harvesting + threshing by threshing machine.

B.: Manual planting + mechanical harvesting by tractor mounted mower + threshing by threshing machine.

D.: Manual planting + mechanical harvesting by self - propelled harvester + threshing by threshing machine.

E.: Mechanical planting by pneumatic planter + manual harvesting + threshing by threshing machine.

G.: Mechanical planting by pneumatic planter + mechanical harvesting by tractor mounted mower + threshing by threshing machine.

H.: Mechanical planting by pneumatic planter + mechanical harvesting by self-propelled harvester + threshing by threshing machine.

Measurements

Plant measurements

Germination ratio: A sample of (1000 seed) was germinated and replicated three times before and after planting to investigate seed germination.

Coefficient of variation: The coefficient of variation was measured using the following method. Deviation in row from recommended distance [%] that considered indicator to distribution uniformity. The deviation of hills on row from average distance *(CV)* was estimated according to the following equation;

$$C.V. = \frac{\sigma_{n-1}}{\bar{x}} \times 100 \quad \text{(Snedecore and Cochran, 1967)}$$

$$\sigma_{n-1} = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

Where:

σ_{n-1}: Standard deviation

x : Distance between hills on row.

$\bar{x}$: The recomended distance.

n : number of readings.

Crop yield: Random samples of plant with 1 m^2 of area for each one were taken from different places in each treatment and seeds mass of plants was measured then, average weight seeds of plants per m^2 were calculated from next equation.

$$\text{Average weight seeds of plants} = \frac{\text{weight of seeds in all samples}}{\text{Number of samples}}$$

Machine measurements

Theoretical Field capacity *(TEC)*; was determined by the following formula:

$$TEC = \frac{SxW}{4200} \quad [fed/h]$$

Where:

S = Travel speed m/h.

W = Rate width m.

The actual field capacity *(EFC)*; determined from the following formula:

$$EEC = \frac{60}{Tu + Ti} \qquad [fed./h.]$$

Where:

Tu = The utilized time per feddan in minutes.

Ti =The summation of lost time per feddan in minutes.

Field efficiency (η_f); was calculated by using the following formula:

$$\eta_f = \frac{EFC}{TFC} x\,100$$

Where:

EFC = The effective field capacity of the machine (fed/h).

TFC = Theoretical field capacity of the machine (fed/h).

Harvesting and threshing losses

Harvesting losses percentage; was measured as follows:

$$\text{Harvesting losses}\% = \frac{\text{Harvesting losses / fed}}{\text{Total yield / fed}} \times 100$$

Cracking and damaged seeds; The sample of 1 kg of seeds was collected from the threshed seeds to determine the seed damage cracked percent, and the cleaning efficiency was considered.

Efficiencies

Threshing efficiency (η_{th}); can be calculated by using the following equation:

$$\eta_{th} = \frac{W - W_1}{W} \times 100$$

Where:

W = The total weight of the seeds (gm).

W1 = Mass of unthreshed from the seeds (gm).

Cleaning efficiency (η_{cl}); can be determined using the following equation:

$$\eta_{cl} = \frac{W_1}{W_o} x\,100$$

Where:

W_1 = Weight of the seeds from the main output opening after cleaning (gm).

W_O = Weight of the seeds small chaff from the main output opening (gm).

Power requirements

Fuel consumption (*Fc*); was determined by measuring the volume of fuel required to refill the tank after operation time per each treatment, using a graduated glass cylinder 1000 cm^3. It was calculated using the following equation:

$$Fc = \frac{V_f}{T} \text{ X } 100 \qquad (L\,/\,h)$$

Where:

V_f: Volume of fuel consumption, cm^3.

T: Time of operations.

Engine power; for operating each machine was estimated by accurately measuring the decrease in fuel level in the fuel tank immediately after executing each operation.

The required power calculated using the following formula:

$$P(kW) = Wf \times c.v. \times \eta_{th} \times \frac{427}{75} \times \frac{1}{1.36} \quad \text{(Barger } et\ al., \text{ 1963)}$$

Where:

Wf = Rate of fuel consumption (kg/sec)

$c.v.$ = Calorific value of fuel in Kcal/kg of fuel.

427 = Thermo-mechanical equivalent, Kg.m/ Kcal.

η_{th} = Thermal efficiency of the engine

Specific Energy Requirements (kw.h/fed) can be calculated by the following equation:

$$specific\ energy\ requiremen\ ts = \frac{Power\ required\ (kw)}{Effective\ field\ capacity\ (fed\,/\,h)}$$

Costs

The cost of mechanized process was based on the initial cost of machine, interest on capital, cost of fuel and oil consumed, cost of maintenance, and wage of operator according to the following formula:

$$C = \frac{p}{h}\left(\frac{1}{a} + \frac{i}{2} + t + r\right) + (0.9W \times s \times f) + \frac{m}{144} \qquad \text{(Awady 1978)}$$

Where:

C= Hourly cost, L.E/h.

P=price of machine, L.E

h= Yearly working hours, h/year.

a= Life expectancy of the machine, year.

i= Annual Interest rate, %.

t= Annual Taxes, over heads rate, %.

r= Annual Repairs and maintenance rate,%.

f= fuel price, L.E.

0.9= A factor including reasonable estimation of the oil consumption in addition to fuel.

W= Engine power, hp.

S= Specific fuel consumption, L/hp. h.

m= Monthly average wage, L.E

144= Reasonable estimation of monthly working hours.

The operational cost can be determined using the following formula:

$$\text{Operatingcost /fed} = \frac{\text{Machinecost/h.}}{\textit{Effective field capacity(fed/h)}}$$

RESULTS AND DISCUSSION

Effect of Different Planting Methods on Some Plant Characteristics

Germination ratio

Results in Table 2 showed that the highest germination ratio of 96 % was remarked under the manual method. It decreased to 94 and 91.5 % under pneumatic planter and seed drill respectively. This is may be due to no effects on the seeds under manual planting while, The friction and compact forces between seeds and feeding system may be cause adamage on the same seeds and that leads to reduce the germination ratio in case of using seed drill and pneumatic planter.

Coefficient of variation

Results in Table 2 showed that the values of distribution uniformity were 11.32, 17.01 and 23.9 % using pneumatic planter, seed drill and manual planting, respectively. That is due to the distance between seeds can controlled in the case of using pneumatic planter better than the others.

Crop yield

It is cleared from Table 2 that the average values of yield obtained were 1206.24, 1440.81, and 1337.99 kg/fed. under manual planting, pneumatic planter, and seed drill, respectively. High total yield with the use of pneumatic planter was attributed to the more number and weight of seed per plant. So, mechanical planting using pneumatic planter is the advisable method for planting bean because of its high resulting yield.

Field Capacity and Efficiency of Different Harvesting Methods

Data in Fig. 3 showed that the effect of average of forward speed on both field capacity and efficiency of manual and mechanical methods of harvesting. Obtained results for mechanical methods showed a drop in field efficiency with a consequent sharp rise in the field capacity as the forward speed increased.

The increase of forward speed from 2.9 to 5.1 Km/h. was followed with an incease in field capacity values from 0.870 to 1.210 fed./ h. for rear-mounted mower. And a decrease in field efficiency values from 84.04 to 66.42 % under the same previous condition. The major reason for the reduction in field efficiency is due to the less theoretical time consumed in comparison with the other items of time losses.

An average of forward speed of 2.9 Km/h. is recommended because increasing it more than 2.9 to 5.1Km/h.,decreased field efficiency, while decreasing it less 2.9 Km/h., decreased field capacity and increase field efficiency.

Effect of Different Operating Parameters on Harvesting Losses

Fig. 4 showed that the manual harvesting at forward speed of 0.19 Km/h., and seed moisture content 14.86%, seed losses were 0.76, 1.00, and 0.65%, under manual planting, pneumatic planter, and seed drill, respectively.

In the mechanical harvesting using tractor-mounted mower, increasing forward speed from 2.9 to 5.1 Km/h., moisture content of 14.86% increased seed losses from 6.44 to 10.45%, from 5.45 to 8.36%, and from 6.18 to 9.26% under manual planting, pneumatic planter and seed drill, respectively.

The increase of grain losses by increasing forward speed was attributed to excessive load of plants on the cutter bar and in the same time, increasing the impact times of cutter bar with plants per unit of time. On the other hand, it noticed

Table 2. Effect of planting methods some plant characteristics

Planting methods	Coefficient of variation %	Germination ratio, %	Crop yield, kg/fed
Manual planting	23.9	96	1206.24
Pneumatic planter	11.32	94	1440.81
seed drill	17.01	91.5	1337.99

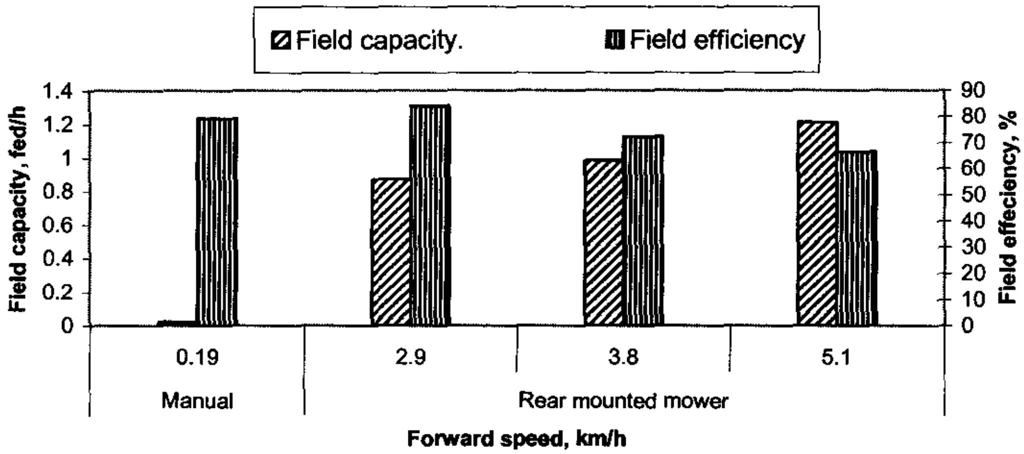

Fig. 3. The effect of forward speed on field capacity and field efficiencyat moisture content of 14.86 %

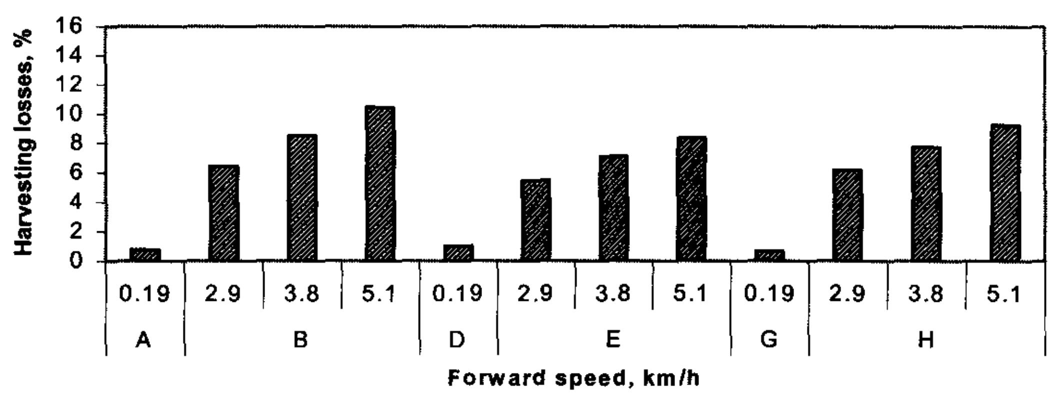

Fig. 4. Effect of harvesting methods on harvesting losses under different planting methods and forward speeds at moisture content 14.86%

that the less harvesting losses were occurred with manual.

Relating to the effect of seed moisture content on harvesting losses, Fig. 5 Show that increasing seed moisture content, decreased harvesting losses.

In the manual harvesting, increasing moisture content from 10.87 to 20.43 %, at forward speed 0.19km/h decreased harvesting losses from 1.31 to 0.53 %, from 1.64 to 0.71 %, and from 1.19 to 0.47% under manual planting, pneumatic planter, and seed drill, respectively.

In the mechanical harvesting using rear mounted mower, increasing moisture content from 10.87 to 14.86 % at forward speed of 2.9 Km/h., decreased harvesting losses from 8.59 to 6.44 %, from 7.36 to 5.45 %, and from 8.03 to 6.18% under manual planting, pneumatic planter, and seed drill, respectively. And increasing moisture content from 14.86 to 20.43% at the same speed increased harvesting losses from 6.44 to 7.3%, from 5.45 to 6.26% and from 6.18 to 6.91% under the same previous treatments.

So, the moisture content of 14.86% is recommended to the optimum seed moisture content for harvesting by using the tractor mounted mower.

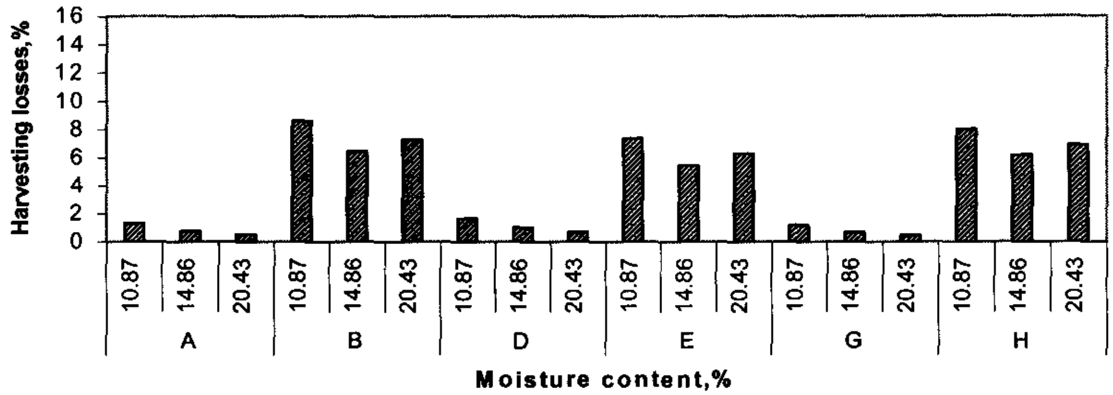

Fig. 5. Effect of harvesting methods on harvesting losses under different planting methods and moisture contents at forward speed 2.9km/h

Harvesting because of decreasing the harvesting speed to a minimum limit.

So the average of forward speed of 2.9 km/h recommended for harvesting by using the tractor mounted mower.

Effect of Different Operating Parameters on Threshing Losses

Unthreshed pods

Fig. 6 show the relationship between unthreshed pods and different drum speeds at seed moisture contents. The obtained results revealed that both drum speed and seed moisture content affect deeply on the percentage of unthreshed pods. The highest value of unthreshed pods of 6.25 %, was observed under the high level of average of seed moisture content of 17.82 %, and low drum speed of 8.37 m/s, while the lowest value of 0.64 %, was observed under low average of seed moisture content of 8.61% and high drum speed of 12.56 m/s.

Mechanical seed damage

Fig. 7 Show the relationship between seed damage and different drum speeds at different seed moisture contents. It is noticed that minimum values of mechanical seed damage were recorded at low drum speeds of 8.37 m/sec (400r.p.m.), and high seed moisture content of 17.82%.

Total threshing losses

Fig. 8 show the relationship between total losses (including unthreshed pods and damaged seeds together) and different drum speeds at different seed moisture content. It is noticed that minimizing threshing losses can be obtained at a drum speed of 10.47 m/sec (500r.p.m.) and moisture content of 11.33% where it was 7.06%.

Effect of Different Operating Parameters on Threshing Efficiency

Threshing efficiency was affected by many variables such as drum speed and seed moisture content. Fig. 9 indicated that threshing efficiency increased from 93.75 to 96.42%, 96.83 to 98.38%, and 98.33 to 99.36% by increasing drum speed from 8.37 to 12.56 m/s, at average of seed moisture content of 17.82, 11.33 and 8.61%, respectively. On the other hand, threshing efficiency decreased by increasing seed moisture content, where the seeds can not be separated easily as results, the percentage of unthreshed grains increased.

Effect of Different Operating Parameters on Cleaning Efficiency

Fig. 10 show the relation between cleaning efficiency and different drum speeds at different seeds moisture contents. The cleaning efficiency increased from 90.68 to 94.33, 93.45 to 96.2, and 95.36 to 98.39 %, at seed moisture content of 17.82, 11.33, and 8.61 %, respectively by increasing drum speed from 8.37 to 12.56 m/s.

From the previous data of the threshing process, it can be concluded that: the moisture content ranged from 8.61 to 11.33 % and drum speed of 10.47 m/s, are considered the optimum treatment through which losses percentage is minimum.

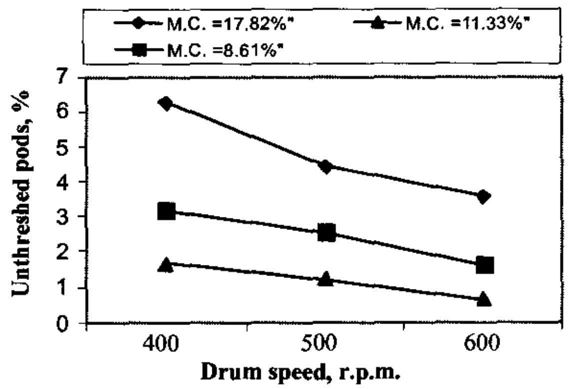

Fig. 6. Effect of drum speed under different seed moisture content on unthreshed pod

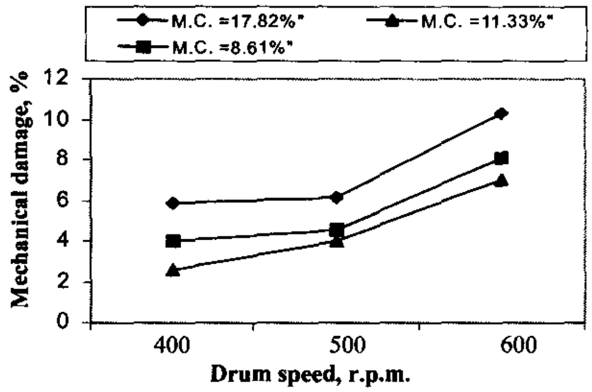

Fig. 7. Effect of drum speed under different seed moisture content on mechanical seed damage

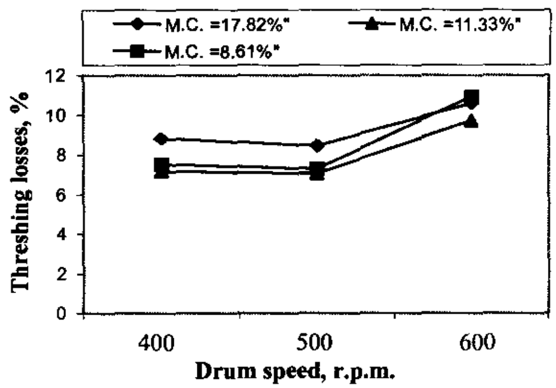

Fig. 8. Effect of drum speed on threshing losses under different seed moisture content

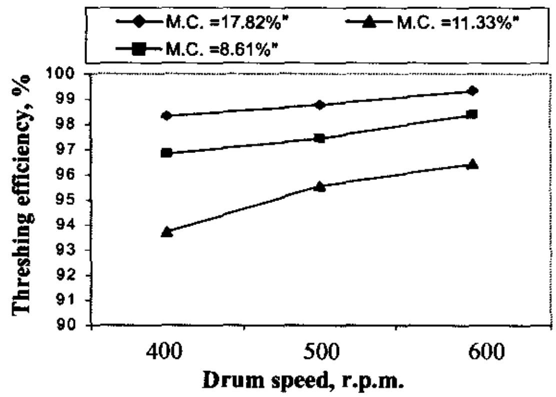

Fig. 9. Effect of drum speed on threshing effeciency under different seed moisture content

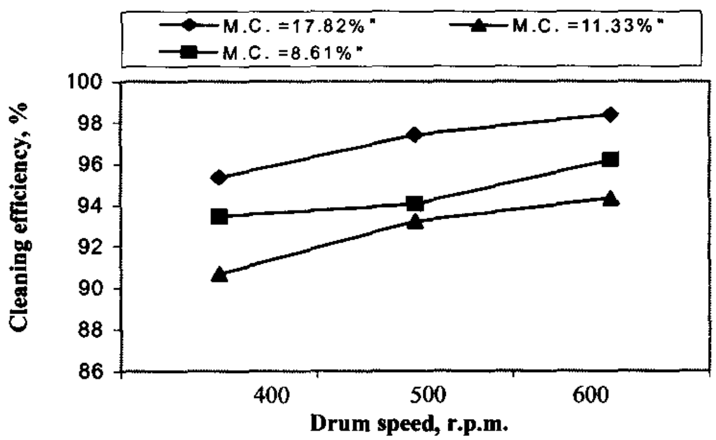

Fig. 10. Effect of drum speed on cleaning effeciency under different seed moisture content

Energy Requirements for Different Bean Mechanization Systems

Fig. 11 shows that the total energy requirements to produce one ton of dry bean can be arranged in descending order as follows: H, B, E, G, D, and A. It is clear that the treatment (H) (mechanical planting by seed drill + mechanical harvesting by tractor mounted-mower + threshing by threshing machine) required the highest value of energy (47.90 kW.h/ton), while treatment (A) (manual planting + manual harvesting + threshing by threshing machine) required the lowest value of energy (22.906 Kw.h/ton).

Cost Analysis for Bean Production

The cost of the field machinery is dependent on many factors due to the machine conditions and the mechanization system.

Fig. 12 represent the cost per unit of production for the different treatment. The cos of production per ton of yield can be arranged in descending order of treatments as follows: A (305.386 L.E. /ton), G (206.257 L.E. /ton), D (188.013 L.E/ton), B (171.653 L.E/ton), H (80.551 L.E/ton), and E (70.647 L.E./ton), respectively. Treatments B, D, E, G, and H reduced the cost of operation by 43.792, 38.434, 76.866, 32.460, and 73.623 %, respectively comparing to the conventional treatment A (305.386 L.E. /ton). From this results, it is evident that treatment E (mechanical planting by pneumatic planter + mechanical harvesting by tractor mounted mower + mechanical threshing by threshing machine) recorded the lowest value of cost per unit production (70.647 L.E./ton).

Conclusion

The field experiments aimed to evaluate some different mechanization systems for producing bean crop. Results showed that:

1. Treatment mechanical planting by pneumatic planter + mechanical harvesting by mounted mower + mechanical threshing by threshing machine is recommended for production dry bean crop under Egyptian conditions as it requires minimum cost (70.647 L.E./ton) and recording high percent of return (profit 76.866 %) comparing with the other treatments.
2. Seed moisture content of 14.86 % and forward speed of 2.9 km/h are recommended for harvesting dry bean crop as it recorded minimum seed losses.
3. Drum speed of 10.47 m/s (500 r.p.m.) and seed moisture content of 11.33 % are recommended for threshing dry been crop as it recorded both minimum losses and energy (7.06 % and 23.13 Kw.h./fed.), respectively.

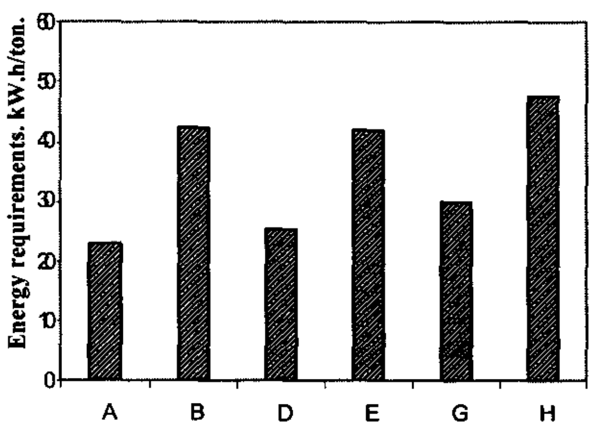

Fig. 11. Energy requirements to produce one ton of bean under different treatments

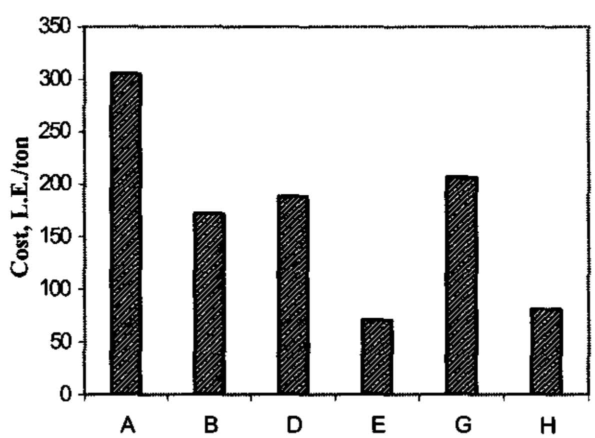

Fig. 12. Cost requirements to produce one ton of bean under different treatment

REFERENCES

Agricultural economics bulletin (2010). Ministry of Agriculture, Cairo, Egypt.

Awady, M.N. (1978). Engineering of tractors and Agricultural machinery, (in arabic), Textbook-Col. Agric., Ain Shams univ.,: pp:289.

Barger, E.L., J.B. Lejdohl, W.M. Carleton and E.G. Mokibben (1963). Tractor and their power units. 2nd ed., Wiley Sons. Inc., New York. U.S.A.

Gomaa, S.M. (2003). Performance evaluation of pneumatic and mechanical planters for cowpea planting. Misr J. Ag. Eng., 20 (4): 965 - 979.

Herbek, J.H. and M.J. Bitzer (2004). Harvesting, drying, storage, and marketing. Lexington, Ky: cooperative Extension Service Bulletin AGR, 132.

Morad, M.M., A.S. El-Kot, M.M. Ali and H.M. Salem (2007). Study on the mechanization of cowpea crop production under Egyptian conditions. Misr. J. Ag., Eng., 24 (3) : 450-468.

Neagu, T., P. Cojocariu, V. Valcu and P. Pilat (2002). Investigations on the mechanical dislocation of kidney bean. Cercetari Agronomic in Moldova, 35(1/2): 9-12

Sabreen, K.A., S.M. Sharaf and G.H. El-Sayed (2002). Soybean response to mechanical planting methods in clay-loam soil. Misr J. Agr. Eng., 19(2): 327-338.

Snedecor, G.W. and W.G. Cochran (1967). Statistical Methods 6th. Ed., Ames: The Iowa State University U.S.A., Press, 593.

Yehia, I., S.E. Bader and A. Lotfy (2005). Effect of some planting systems on cowpea crop productivity. The 13th conference of the Misr Society of Agr., Eng., 14-15 December, : 670-678.

دراســـة عن ميكنــة محصــول الفـاصوليــا تحت الظروف المصريــة

علاء عوني أحمد عبد العاطي – محمود عبد العزيز حسن

محمود خطاب عفيفي خطاب – حنان محمد سعد الدين الشال

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أجريت التجربة لزراعة وحصاد ودراس محصول الفاصوليا تحت الظروف المصرية خلال موسم٢٠٠٩- ٢٠١٠ في مساحة ١ فدان في أرض طينية خفيفة (صفراء) بديرب نجم – محافظة الشرقية. كانت أهداف الدراسة: اختيار أنسب طريقة لزراعة وحصاد ودراس محصول الفاصوليا للحصول على أعلى إنتاجية و أعلى كفاءة حقلية ممكنة. دراسة تأثير كل من المحتوى الرطوبي للحبوب والسرعات الامامية المختلفة على الفواقد الحقلية عند الحصاد. دراسة تأثير كل من المحتوى الرطوبي للحبوب والسرعات المختلفة للدرفيل على الفواقد الحقلية عند الدراس. العمل على خفض كل من التكاليف والطاقة المستخدمة وذلك من خلال إختيار النظام الامثل لميكنة محصول الفاصوليا وقد أجريت التجربة با ستخدام المعاملات الآتية: (A) زراعة يدوي + حصاد يدوي + دراس بآلة الدراس الثابتة. (B) زراعة يدوي + حصاد بالمحشة الخلفية للجرار+ دراس بآلة الدراس الثابتة. (D) زراعة آلية في جور (البذارة الهوائية) + حصاد يدوي + دراس بآلة الدراس الثابتة. (E) زراعة آلية في جور (البذارة الهوائية) + حصاد بالمحشة الخلفية للجرار + دراس بآلة الدراس الثابتة. (G) تسطير آلي (السطارة) + حصاد يدوي+ دراس بآلة الدراس الثابتة. (H) تسطير آلي (السطارة) + حصاد بالمحشة الخلفية للجرار + دراس بآلة الدراس الثابتة. تم تقييم المعاملات من حيث. تأثير طرق الزراعة على بعض صفات النبات وكذلك على إنتاجية المحصول. تأثير طرق الحصاد والسرعات الامامية للالة ونسبة رطوبة البذور على على فواقد الحصاد. تأثير بعض العوامل على عملية الدراس (نسبة الرطوبة للبذور – سرعة الدرفيل). الطاقة المطلوبة لعمليات الميكنة المختلفة لمحصول الفاصوليا. التكاليف المطلوبة للعمليات الالية المختلفة لمحصول الفاصوليا. ومن خلال النتائج تم التوصل إلى التوصيات الآتية: يوصى باستخدام المعاملة التالية:(زراعة آلية في جور(البذارة الهوائية) + حصاد بالمحشة الخلفية للجرار + دراس بالة الدراس الثابتة) لإنتاج الفاصوليا تحت الظروف المصرية ، حيث أنها سجلت أقل قيمة للتكاليف مقارنة بباقي المعاملات المستخدمة. يوصى بحصاد محصول الفاصوليا عند نسبة رطوبة (١٤,٨٦ ٪) وسرعة أمامية لآلة الحصاد (٢,٧ كم/ساعة) حيث أنها سجلت أقل قيمة للفواقد الحقلية للبذور. يوصى بدراس محصول الفاصوليا عند نسبة رطوبة (١١,٣٣٪) وسرعة درفيل ٥٠٠ لفة/ دقيقة (١٠,٤٧م/ث) حسث أنها سجلت القيم المناسبة من القدرة وفواقد البذور.