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Timeliness affect the Net Farm Profit

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ABSTRACT

Timeliness is very important in large agricultural projects, which are characterized by large areas requiring different numbers and sizes of agricultural equipment. In order to choose the best equipment, and give the right management decisions. The intelligent manager must be aware of the optimum planting time, because the varying in the time of planting on sawing date leads to loss of productivity called (Timeliness) may reach about half of the crop.Determining the optimum time for planting is important to reduce the costs of declining yield due to timeliness and to obtain the highest yield from the farm.This research aims to cover these point machine sizes and operational available time affected the crop net return. Timeliness coefficients' equation was adjusted for famous Egyptian crops, for maximum crop yield to avoid the early or late establishment crop yield losses.

Keywords: Timeliness cost (Y_l).

INTRODUCTION

Timelinessis one of the most important parts in any farm, because of its affect the net farm profit. Efficient machinery management means having the optimum size and type of equipment available to do the job at the optimum time for the least cost, to avoid the timeliness cost.The lack of readiness of agricultural machines to plant a particular crop on the most appropriate day of sawing leads to loss of yield (yield losses from untimely establishment planting sowing date), so the agricultural machinery must be ready to work always to maintain the ability to work for along working hours.

Audsely and Wheeler (1978);Oskoui (1983);Witeny and Elbanna (1985); Hunt (1985); and Elbanna (1986) tested up to fifth order polynomial which was fitted to the yield loss data for both early and late establishment for one crop gave good agreement with experimental values. This solution was rejected however, because the complex waveform of the resultant curve is difficult to justify in terms of known crop responses with time. A second order polynomial was more vigorously examined. Asymmetry of the combine cure for both early and late establishment is dependent on the slope of the first order term so that negative penalties can occur. Independent second order polynomial, one for early and another for late establishments, introduce a discontinuity at zero, as do independent linear yield losses passing through zero. On the basis of both statistical evidence and practical considerations in which the penalties of the late establishment are more important than those for early establishment, Elbanna (1986) stated that, it was decided to adopt two independent equation of general forms:

$$Y_{le} = \frac{K_e}{3}(T_0 - T_e)^2 \quad \text{……….Early;}$$

$$Y_{ll} = \frac{K_l}{3}(T_l - T_o)^2 \quad \text{……….Late;}$$

$$Y_l = \frac{K}{6}(T_0 - T\ \ )^2 \quad \text{……….General} \quad \text{……..1}$$

Where:

Y_l= crop yield loss, %;
k = timeliness crop coefficient.

Integrating the yield loss (1) with the relevant timeliness coefficients k_e and k_l for early and late establishment, respectively over the time span (T_l-T_e) which spans to the optimum establishment data, gives the mean yield loss percent in the form:

$$Y_l = \frac{1}{2}\left\{\frac{K_e}{3}(T_0 - T_e)^2 + \frac{K_l}{3}(T_l - T_0)^2\right\} \quad \text{………. 2}$$

Where:

Y_l= mean yield losses, %; **T_0 = optimum sowing date, day;**
T_e = early sowing date, day; **T_l = late sowing date, day;**
k_e and k_l = early and late timeliness coefficients.

Willimam (2001) found that in many cases, crop yields and quality are affected by the dates of planting and harvesting. This represents a hidden cost associated with farm machinery, but an important one nevertheless. The value of these yield losses is commonly referred to as timeliness costs.De Toro & Hansson (2004) and Wilkinson(2005) reported that when farmers have to invest in new machinery, they have the choice of buying in-house machines or using contractors or machine cooperatives. Timeliness costs are important in this decision. One common perception about contractor work or machine cooperatives is that the operation may not start on the optimal day, leading to increased timeliness losses, especially during seasons with difficult weather conditions. On the other hand, machine capacity may be higher due to larger machines being viable for contractors and cooperatives.Srivastava *et al.* (2006) mention increasing machine capacity as one way to decrease timeliness costs, as larger machines with greater capacity can accomplish more timely work. In addition, optimal work organization and machinery utilization are important in achieving cost reductions (Soerensen, 2003). Another way to decrease timeliness losses is to plant different crops or varieties with different dates of maturation(Nilsson,1987).Yousif (2011) developed a computer system to be used as a tool for crops - machinery system management to select the number and size of machinery required to perform a timely seedbed preparation, seeding and weeds control operations. This system uses six implements, for four crops grown singly or in combination and three farming systems. That helps to estimate machineries and whole farm costs and net return for crops grown under different cultivation systems.

MATERIALS AND METHODS

It is known that each agricultural crop has a certain period of life (vegetative growth period and maturity period), with certain lighting and darkness. Cultivation of the crop at an inappropriate time may affect both growth and maturity periods, which reduces the yield of the crop to more than half. Studies and research on the effect of the appropriate time for each crop on the productivity of the sharpness, in the sections of crops field studies have determined that each crop on the appropriate day to cultivate to give the maximum productivity, and if the start of the date of agriculture or delayed planting time on this day is appropriate to grow it less productive than marginal productivity.

Data were collected on the loss of crop yields due to the lack of agriculture in time for the most famous Egyptian crops (wheat - rice - cotton) in Dakahlia and Gharbia governorates for ten years. The crop loss data were collected from the scientific departments such as the crop departments as well as the agricultural research institute. The equation of loss of crops was developed and found under the current Egyptian conditions usingElbanna (1986)as in the form.

$$Y_l = \frac{1}{2}\left\{\frac{K_e}{3}(T_0 - T_e)^2 + \frac{K_l}{3}(T_l - T_0)^2\right\} \quad ......3$$

Where:

Y_l = mean yield losses, %; **T_0 = optimum sowing date, day;**
T_e = early sowing date, day; **T_l = late sowing date, day;**
k_e and k_l= early and late timeliness coefficients.

In this study, was developed the Timeliness coefficients' equation to planting crops at the optimum time because of the lack readiness of agricultural equipment to cover the all area required to sowing at the time specified by the Ministry of Agriculture (where it is suitable for planting) for different crops. These losses are called timeliness cost. Therefore, crops must be grown at the optimum time, which yields the highest yield profit crops.

RESULTS AND DISCUSSION

The majority of timeliness costs were caused by early or late in the start of sowing or harvesting, with only a smaller proportion arising during sowing or harvesting in the optimum date, compared with early or late date.

1. Wheat crop timeliness cost

Table (1) explains wheat crop time losses coefficient, their standard errors and percent of explanation.From Fig (1) it can noticed that the yield losses from untimely establishment planting sowing date (early), have an exponential trend line for wheat crop. Fig (2) indicated that the yield losses from untimely establishment planting sowing date (late), their exponential trend line for wheat crop. From Fig (3) it can noticed that the yield losses from untimely establishment planting sowing date for wheat crop

Table 1. Crop types, time losses coefficients, their standard errors and the percentage of explanation "R^2".

Crop		Coefficients $*10^{-2}$ k_e	Coefficients $*10^{-2}$ k_l	Standard errors$*10^{-3}$ k_e	Standard errors$*10^{-3}$ k_l	Expl. R^2	DF
Wheat	Early loss	2.70671		2.31114		69.22%	61
	Late loss		2.15219		2.07479	67.42%	52
	Combined	2.70671	2.15219	2.36966	2.01787	68.37%	114
Rice	Early loss	7.8357		4.03198		88.10%	51
	Late loss		6.69239		2.77598	90.50%	61
	Combined	7.8357	6.69239	3.40583	3.40583	89.10%	113
Cotton	Early loss	8.28991		4.35199		84.41%	67
	Late loss		7.89342		4.01945	87.12%	57
	Combined	8.28983	7.89342	4.20083	4.20083	85.69%	125

Fig (1) shows that when wheat crop dates are early, the yield losses increase about delay.In Fig (3) the sensitivity of the wheat crop to early and late sowing date can be observed from the optimum sowing day. It is therefore recommended to extend the period of cultivation of wheat crop from mid-November until the end of the month with no early in agriculture and the date is determined by the Ministry of Agriculture.

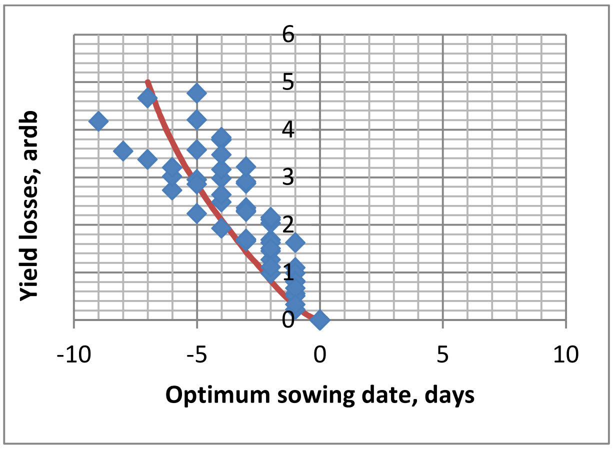

Fig. 1. The wheat yield losses of sowing date (early).

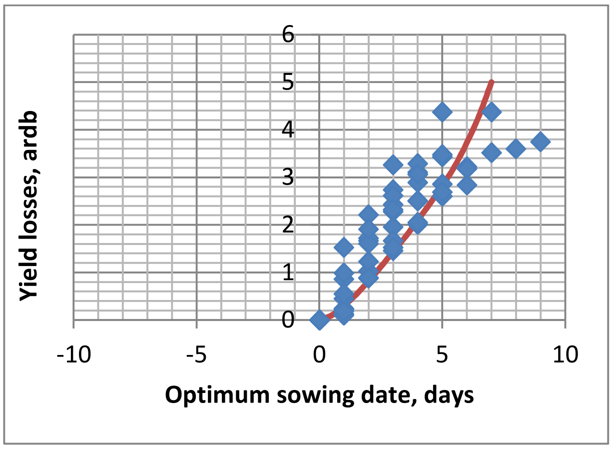

Fig. 2. The wheat yield losses of sowing date (Late).

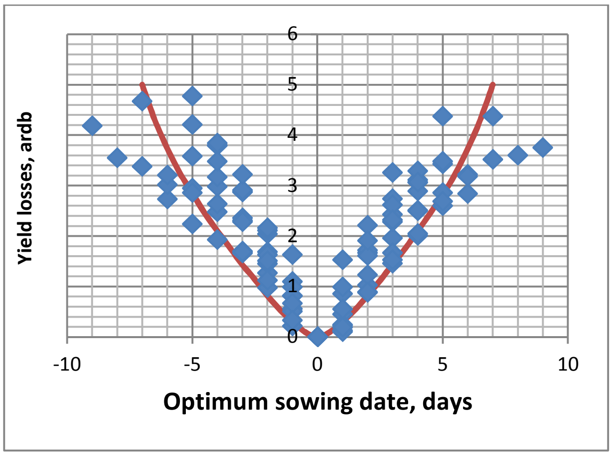

Fig. 3. The yield losses from untimely establishment planting sowing date, their exponential trend line of wheat crop.

The percentage of yield loss equations with the relevant timeliness coefficients for early and late establishment, k_e and k_l respectively, over the time period (T_e –T_l) which spans the optimum organization date gives the mean percentage of yield loss "Y_l". The "Y_l" losses are illustrated in Figs. (1), (2) and (3) for the collected data over 10 years from (2008 to 2018). The mathematical equation for the data curve introduces same bias in the data analysis. The date of optimum agriculture, which achieves the highest yield of wheat between mid and end of November, The coefficient of the late sowing date was 0.0215 compared to 0.0270 for the early time.

2. Rice crop timeliness cost

Table (1) explains rice crop time losses coefficient, their standard errors and percent of explanation. From Fig (4) it can noticed that the yield losses from untimely establishment planting sowing date (early), have an exponential trend line for rice crop. From Fig (5) it can noticed that the yield losses from untimely establishment planting sowing date (late), their exponential trend line for rice crop. Fig (6) indicated that the yield losses from untimely establishment planting sowing date for rice crop. The date of optimum agriculture, which achieves the highest yield of rice, is in mid-May. The coefficient of early start was 0.07835 and the late coefficient is 0.06692.Fig (4) shows that when wheat crop dates are early, the yield losses increase about delay. In Fig (6), the sensitivity of the rice crop to early and late sowing date can be observed from the optimum sowing day. It is therefore recommended to extend the period of cultivation of rice crop from mid-November until the end of the month with no early in agriculture and the date is determined by the Ministry of Agriculture.

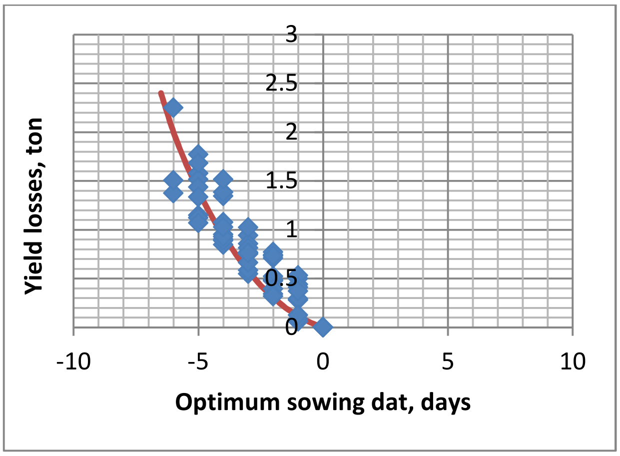

Fig. 4. The rice yield losses of sowing date (early).

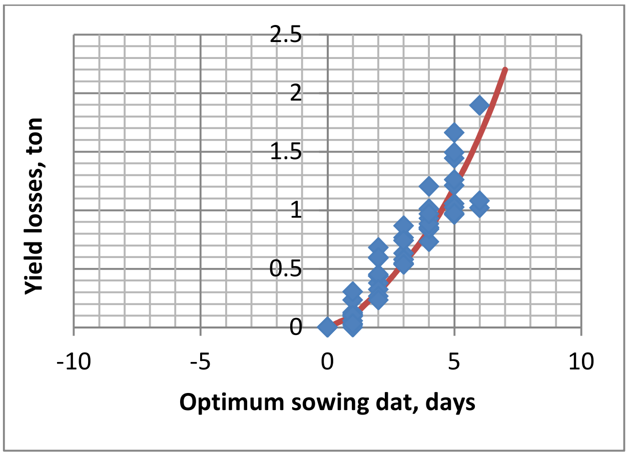

Fig. 5. The rice yield losses of sowing date (Late).

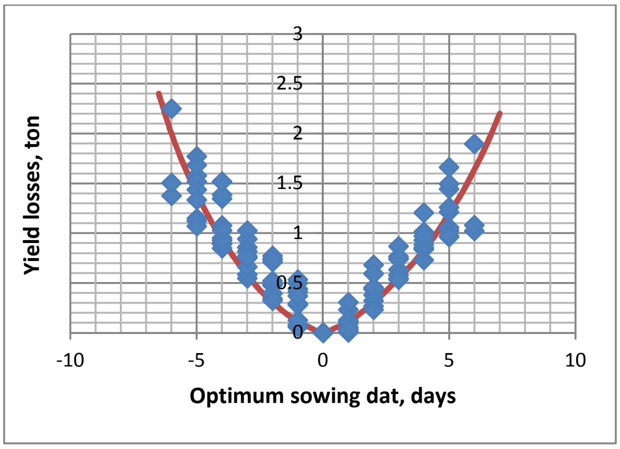

Fig. 6. The yield losses from untimely establishment planting sowing date their exponential trend line of rice crop.

3. Cotton crop timeliness cost

Table (1) explains cotton crop time losses coefficient, their standard errors and percent of explanation.From Fig (7) it can noticed that the yield losses from untimely establishment planting sowing date (early), have an exponential trend line for cotton crop. From Fig (8) it can noticed that the yield losses from untimely establishment planting sowing date (late), their exponential trend line for cotton crop. From Fig (9) indicated that the yield losses from untimely establishment planting sowing date for cotton crop.The date of optimum agriculture, which achieves the highest yield of cotton, is in mid-March. The early coefficient was 0.082899 and the late coefficient is 0.078934.

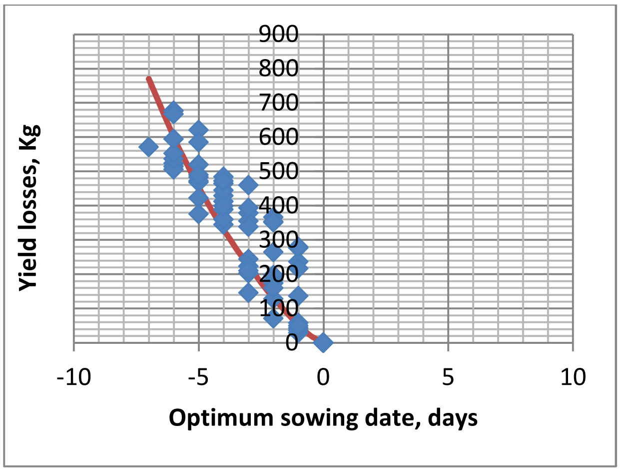

Fig. 7. The cotton yield losses of sowing date (early).

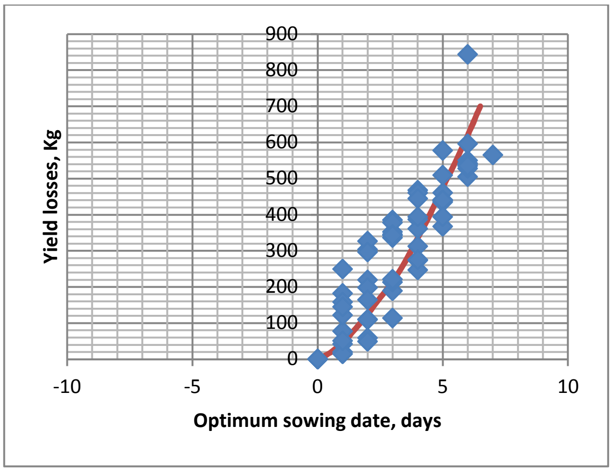

Fig. 8. The cotton yield losses of sowing date (Late).

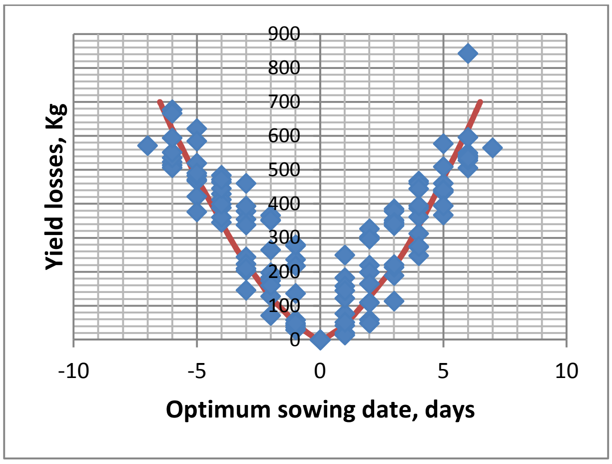

Fig. 9. The yield losses from untimely establishment planting sowing date, their exponential trend line of cotton crop.

CONCLUSION

The economic consequences of under-optimal field operation performance are called timeliness cost. It is the result of a decline in the value of crops due to the lack of readiness of equipment to achieve the area required for agriculture in the best time, it can be reduced by increasing the capacity of the machine. To improve the basis for optimal selection of field machines in agriculture, methods have been developed and applied to calculate timeliness cost in terms of crop quality and quantity loss in non-optimal run times.

The timing coefficients of "k_e and k_l" have been developed, and the values of the results obtained have been determined in the table shown (1). The sensitivity of the three crops (wheat, rice, cotton) can be observed to be affected by planting time from the best sowing day in the early or late days.It was concluded that the optimal planting date that achieves the highest yield of wheat ranges from mid to late November. The coefficient of the late sowing period was 0.0215 compared to 0.0270 for the early period.The best farming history of the highest yield of rice is in mid-May. The coefficient of early start was 0.07835 and the late coefficient is 0.06692. The history of optimum agriculture, which achieves the highest cotton yield, is in mid-March. The early coefficient was 0.082899 and the late coefficient is 0.078934.These planting dates can be changed according to the weather conditions and according to the appropriate planting dates proposed by the Ministry of Agriculture.

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تأثير فاقد الوقت علي العائد من المزرعة

الشحات بركات البنا ، محمد ابراهيم غازي وهاني محمد عبيد

قسم الهندسة الزراعية – كلية الزراعة – جامعة المنصورة

إدارة المعدات الزراعية مهمة جدا في المشاريع الزراعية الحديثة ، والتي تتميز بمساحات كبيرة تحتاج إلى أعداد وأحجام مختلفة من المعدات الزراعية ، من أجل اتخاذ أفضل قرارات إدارة المعدات، يجب أن يكون المدير الذكي على دراية بمعرفة أفضل وقت لزراعة المحاصيل ، لأن الاختلاف في تاريخ الزراعة عن الوقت المناسب يؤدي إلى خسائر في الإنتاجية تسمى (تكلفة الوقت) قد تصل الى حوالي نصف المحصول. وتكمن اهمية هذا البحث في بيان تأثير أحجام المعدات والوقت التشغيلي المتاح على صافي عائد المحاصيل. تم تعديل معاملات الوقت المناسب للمحاصيل المصرية الشهيرة ، للحصول على أقصى إنتاجية للمحاصيل لتجنب خسائر المحاصيل في وقت التبكير أو التأخير. تم جمع بيانات عن فاقد المحاصيل الراجع لعدم الزراعة في الوقت المناسب لاشهر المحاصيل المصرية(القمح – الارز – القطن) في محافظتي الدقهلية والغربية لمدة عشر سنوات. تم تجميع بيانات تاريخ زراعة واقصي انتاجية ومتوسط الانتاج المحاصيل المختلفة من الاقسام العلمية كاقسام المحاصيل وكذلك مركز البحوث الزراعية وتم تنمية معادلة فاقد المحاصيل وايجاد ثوابتها تحت الظروف المصرية الحالية باستخدام معادلة البنا(1986).بعد التحليل الرياضي والاحصائي للمعادلات السابقة والخروج بالنتائج التي تم عرضها نوصي باستخدام المعاملات المتحصل عليها من تلك التحليل حيث انها تتناسب مع الظروف المصرية المحلية واكثر واقعية في حساب قيمة فاقد المحاصيل الراجع للزراعة في الوقت المناسب. حتي نتمكن من تحقيق أقصى عائد لأعمال المزرعة