

Study of using sewing machines on costs and quality in Air-cured Tobacco

Mohsenzadeh R., Seraji M. R., Ahmadi M. and Yaghoobi Y.

Researchrs of Tirtash Research and Education Center, Iranian Tobacco Company

Corresponding author: Mohsenzadeh R

ABSTRACT: This survey was done for localization and determination of sewing machine performance on air-cured tobacco and also determination the percent of labor saving in comparison with traditional stringing method. This test was with factorial experiment in a completely randomized design in 3 replication and 13 treatments. This study was done with air-cured tobacco cultivation in a 2000 m² plot and all of the planting to harvesting steps was done according to tradition. After harvesting in different picks tobacco leaves was stringing with two methods: machine and traditional stringing. Number of Labor, stringing time, total costs, leaves loss ratio, strings number in day and price were calculated. Sewing machine treatment with 70–75 leaves, sewing the center of stem and stringing one day after harvesting was the best treatment. Using of sewing machine reduced number of labor (88% in hectare) and increased number of tobacco containing strings (78% per day).

Keywords: Tobacco, Stem, Sewing Machine, Stringing, Harvest.

INTRODUCTION

Tobacco is a commercial crop in many countries like China, India, Brazil, United States, European Union, Zimbabwe, Indonesia, and etc. because of its high economic value. Farmers will do grading based on the quality of the flue-cured tobacco leaves before taking them into a market. Quality inspection of the flue-cured tobacco leaves plays a crucial role in quality assurance, since the quality of the flue-cured tobacco leaves determines the quality of tobacco products (Guru et al., 2011). Tobacco is one of the most valuable agricultural and industrial crops which is cultivated in more than 100 countries all over the world with different climate and has a major role in of some of economy them (zamani,2010). Although Tobacco is counted as an important industrial plant in the world, it has not been paid much attention by researchers because of its negative aspect in cigarette production. Nevertheless, tobacco has different other usage. For instance, nicotine extraction is carried out from this plant in a large scale and tobacco is also used as a model plant in biotechnology (Chawla, 2003). To get high quality and reduce the production costs, mechanization facilities are used to the cultivation process and many types of tools are currently available (chen et al., 2009). IRAN has favorable soil and climatic conditions and tradition for growing leaf tobacco The harvested leaves are all stringing with hand (5/00/000 and 5/000/000 leaves in hac). Tobacco cultivation area in Iran has declined from about 20,000 ha in 1998 to 6,000 ha in 2107. Higher production costs and skilled labor unavailability in traditional cultivation system are mainly blamed for the loss of its cultivation area in Iran. The production of this industrial crop not only ensures the subsistence of tobacco growers but also is a source of income for thousands of people involved in processing, distribution, and marketing of final products (Samizadeh and Firouzi, 2017). The production of this crop not only ensures the subsistence of tobacco growers but also is a source of income for thousands of people involved in processing, distribution, and marketing of final products. The use of tobacco transplanters cuts labor costs, reduces seedling losses, and improves the accuracy and speed of transplanting. It is necessary for Iranian Tobacco Company to supply tobacco-growers with appropriate tobacco trans planters in accordance with local require-ments (Namvar Rezaei, 2008). The manual topping and harvesting of tobacco leaves and shoots are very costly. The movement towards mechanized cultivation of tobacco is unavoidable if its production is intended to be sustainable and competitive with foreign products. To make a reliable plan to develop the agriculture of a region, it is important to gain a precise knowledge of the existing situation and the problems facing the

development of agriculture. Otherwise, any long-, middle-and short-term plans will be ineffective and finally problematic and they will lead to a waste of capital and time.

As a result, some curing specialists must be present to tutor the control process. That increases the workload and the labor cost for tobacco curing and the quality of the cured tobacco is subject to the specialists' experiences (Larry, 2008). As the labor cost increasing, it is essential to reduce the labor and the workload required in the curing process, reduce the fuel consumption and increase the benefits of the tobacco production. To improve the automation level in tobacco curing process, many researchers have been done on the chemical process of the tobacco leaves in the curing process and the intelligent control and fuzzy control technologies are developed for automatically control the curing process (Ihosvany et al., 2005; Zhao et al., 2006; Ma et al., 2007; Liu et al., 2009; Kang, 2009, Jian-Hui et al., 2014). Olaoye and Rotimi 2010 affirmed that the agricultural mechanization level of a country is technically expressed in terms of hp/ha standard being 1.5/2hp/ha, kW/ha, ha/tractor, number of tractors/1000 ha, equipment weight/tractor and mechanical power/total power practicable, beneficial and sustainable in an area. Starkey (1998) defined farm mechanization as the development and introduction of mechanized assistance of all forms and at any level of sophistication in agricultural production to improve efficiency of human time and labor. Increased levels of farm power and mechanization is therefore one of the major factors required to increase production.

Mohsenzadeh et al.(2014) and Mohsenzadeh (2016) reported the use of intelligent systems has positive effect on improving the quality and management of resources. This system is optimal for reduce production costs (cost and number of hours worked). The best way is to use of semi-automatic. Mohsenzadeh and Yaghoobi (2016) defined that using of sewing machine reduced number of labor and labor cost about 75% in hectare for technology process in oriental tobacco. The most needling time was related to hand needling by 792 hr/ha and the least needling time was related to electric needling by 190 hr/ha. Treatment of electric sewing machine had the most net income. Mohsenzadeh (2015) reported that Using of modern barn system and rack in technology steps of oriental tobacco, reduced number of labor, energy and costs, save of time and increased quality of tobacco (20-30%), efficiency and income, green weight of leaves (Kg) in cubic meters per barn. This system can be used to control the production parameters in the technology processes for oriental and flue-cured tobacco leaves. The objective of the study was to identify and effect of sewing machine on quality and productions costs in air-cured tobacco cultivation process in IRAN.

Material and Methods:

This study was done with factorial experiment in a randomized completely design in 3 replications with 3 treatments number leaves (70-75, 80-85, 90-95) and 2 treatments sewing place (end of stem and center of stem) and two sewing time (sewing in same day of harvesting or one day after harvesting) and control treatment (stringing with hand) (Fig. 3) in Tirtash research and education center in 2012year. In this study, we designed and created a sewing machine for air-cured tobacco with the following specifications (Fig. 4): The machine has Dimensions of 90cm (Width) x 450 cm (length) with one electromotor (230volt and 1 Hp), start key, conveyor strip (4 numbers), 4belts, stylus (1 number), electric reciprocating, Regulators lever, one tray, Wheel carrier (4 numbers) and Roller conveyors (6number). After the construction of sewing machine, air-cured tobacco seedlings were transplanted in mid-April. General practices (pest and diseases, weeds) and priming operation were done at the right time. The leaves were sewn with machine and stringing by hand. Then all the leaves were cured in storehouse in 3 Pickup. After the leaves were cured then were separated according to color, size and quality and then were evaluated. Number of Labor, stringing time, total costs, leaves loss ratio, strings number in day and price were calculated. Data analysis was performed to compare them using the Mstatc program.

Results and Discussion:

Analysis of variance treatments (Table 1) showed that the treatments evaluated in terms of time of stringing, labor number, total cost, the quality (price), labor number and string number in day had significant difference (Table1).

Table1. Analysis of variance (mean squares) the different treatments

Time of	String	Quality	Total	Leaves loss rate	Labor number	df	Factors
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stringing	number	(price)	cost				
427**	85**	9621482**	1084400**	70**	91**	12	Treatments(A)
84106**	225**	339050**	189420910	319**	4033	2	Pick up(B)
385**	75**	151343	954621*	71**	85*	24	AxB
20	4	1569547	744352	4	39	78	Error
12	10	11	2	13	3/15		CV

**=significant at 5% and 1% level of probability

A) Time of stringing:

The results showed that the control treatment (leaves stringing by hand) had the highest time of stringing for per string about 359 second and use of sewing machine reduced of time (10-11 second) (Table 2). Number of leaves air-cured tobacco in hectare are 500/000-600/000 with size 50x70 cm. Use of mechanization facilities will decrease work hard and time of work for cultivation processes (chen et al., 2009).

B) Number labor and total costs:

Treatments in the number of workers and labor and total costs had significant differences at the one percent level (Table 1). Control treatment(1) had the most number of workers, and costs with 70 number per hectare and cost about 15 million rials/ hac (Fig. 1 and 2). Sewing machine had the lowest number of labor, and total costs with 15 numbers per hectare and cost about 2 million rials/hac. Number labor and total costs are impressed time of stringing and sewing by hand or machine. Since the machine increased work speed, so Number labor and total costs to reduce.

C) The quality (Price):

Treatments were different for the average price (quality) tobacco. Treatments of 2 and 6 had the best quality with about 38200 rials and the leaves stringing by hand was 34960 rials (Table 2). Sewing machine system can lead toward a better and more quality of tobacco leaves with the lowest of wastes. Because it can be due to control of uniformity in sew the leaves and reduce be tired workers. (Lopez et al., 2005) reported a good quality tobacco leaf used in intelligent and mechanization systems.

Table 2. Mean compare the different treatments

Time of stringing(S)	Quality (price/Rials)	Leaves loss (Number)	rate	Treatments	Number
359 ^a	34960 ^{abc}	17 ^c		Stringing by hand (control)	1
10/4 ^b	38210 ^a	22 ^b		Sweing machine+70-75 leaves+end of stem+same day of harvesting	2
10/2 ^b	35970 ^{abc}	10 ^f		Sweing machine+70-75 leaves+end of stem+ one day after harvest	3
10 ^b	36730 ^{ab}	13 ^e		Sweing machine+70-75 leaves+center of stem+same day of harvesting	4
10/13 ^b	37000 ^{ab}	6 ^g		Sweing machine+70-75 leaves+center of stem+ one day after harvest	5
10/4 ^b	38190 ^a	16 ^{cd}		Sweing machine+80-85 leaves+end of stem+same day of harvesting	6
10/61 ^b	35160 ^{abc}	13 ^e		Sweing machine+80-85 leaves+end of stem+ one day after harvest	7
10/27 ^b	37550 ^{ab}	22 ^b		Sweing machine+80-85 leaves+center of stem+same day of harvesting	8
10/35 ^b	33740 ^{bc}	9 ^f		Sweing machine+80-85 leaves+center of stem+ one day after harvest	9
10/4 ^b	35190 ^{abc}	22 ^b		Sweing machine+90-95 leaves+end of stem+same day of harvesting	10
10/36 ^b	33460 ^{bc}	14 ^{de}		Sweing machine+90-95 leaves+end of stem+ one day after harvest	11
10/55 ^b	33310 ^{bc}	25 ^a		Sweing machine+90-95 leaves+center of stem+same day of harvesting	12
11 ^b	32370 ^c	12 ^e		Sweing machine+90-95 leaves+center of stem+ one day after harvest	13

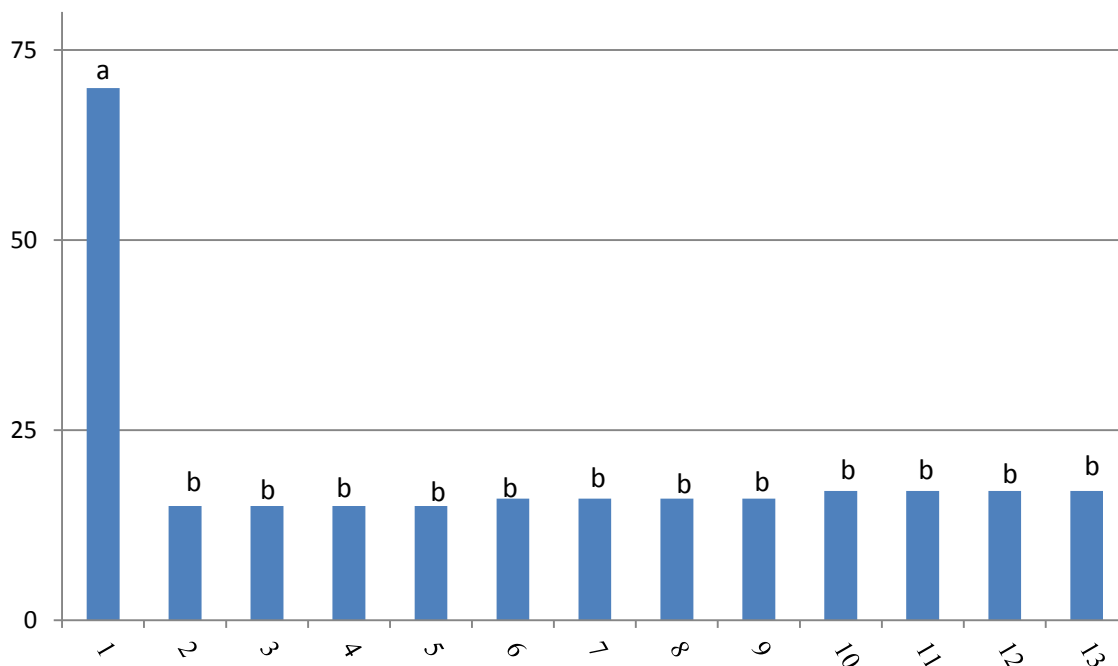


Figure 1. Labor number in design treatments

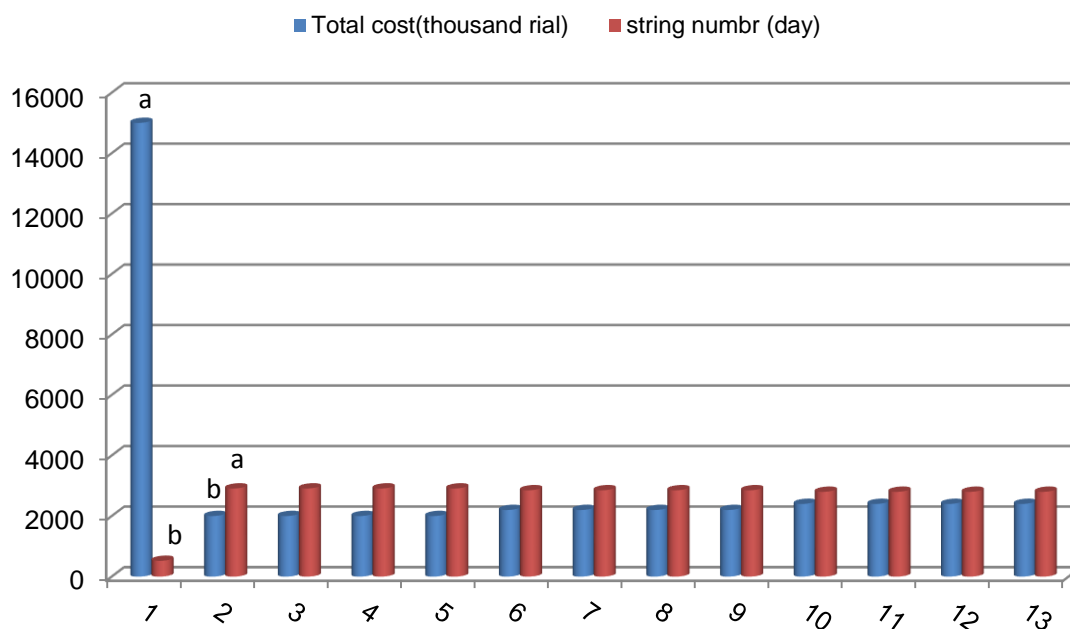


Figure 2. Total cost and String number in design treatments

D) Leaves loss rate:

Leaves loss rate was significantly different in treatments. Treatments 2, 8, 10, 12 had the most Leaves loss rate (22-25 leaves) and Control treatment had 17 Leaves loss rate (Table 2). It seems that factor is important, time of sewing in same day of harvesting or one day after harvesting. Number leaves, type of sewing and place of sewing hadn't impact on Leaves loss rate. Leaves loss rate reduced for one day after harvesting, Due to leaf wilting and reduce break of stem.

E) String number in day:

Strings number in day had significantly different. Use of swing machine increased String number in day about 2800- 2910. But control treatment had 520 strings in day (Fig. 2). This different is due to use of mechanization and machine. The movement towards mechanized cultivation of tobacco is unavoidable if its production is intended to be sustainable and competitive with foreign products.

Conclusion:

The use of sewing machine has positive effect on improving the quality and management of resources. This system is optimal for reduce production costs (cost and number of hours worked and etc.). This system can be used for the production of this industrial crop not only ensures the subsistence of tobacco growers but also is a source of income for thousands of people involved in processing, distribution, and marketing of final products. Sewing machine treatment with 70–75 leaves, sewing the middle of perdition and stringing one day after harvesting was the best treatment. Using of sewing machine reduced number of labor (88/5%in hectare) and increased number of tobacco containing strings (78% per day).



Figure 4. sewing machine



Figure 3. Leaves Stringing by hand

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