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Full Length Research Paper

The impact of socio-economic characteristics and sources of information on using conservative agricultural methods

Ferhan Savran[1], I. Coskun Ceylan[2]* and Ozdal Koksal[2]

[1]Agricultural Economics Department, Faculty of Agriculture, Canakkale Onsekiz Mart University, Canakkale, Turkey.
[2]Agricultural Economics Department, Faculty of Agriculture, Ankara University, Ankara, Turkey.

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In this research, socio-economic characteristics and information sources of the farmers performing sowing with combined sowing machine which is one of the conservative tillage methods and the farmers performing sowing with conventional methods in wheat production activities are studied. The research was conducted in Tekirdag province. The main population of the study is composed of 95 farm holdings having lands of at least 120 ha. 30 of these farm holdings perform conservative agricultural practices by using combined sowing machine. In the remaining 65 farm holdings, on the other hand, wheat production activity is carried out with conventional methods. While all the information sources of the farmers performing production with combined sowing machine are formal information sources, 43% the information sources of the farmers performing production with conventional methods are informal information sources. The farmers within the second group are individuals with lower levels of education and the share of agricultural income within their total income is also relatively low.

Key words: Conservative agriculture, wheat sowing, farmer behavior.

INTRODUCTION

The first step in plant production is tillage. The main aim in tillage is to prepare a suitable medium for the seed. The relationship between the soil, seed and water is important with respect to the germination of the seed. At this stage, the methods applied and the tools used for the purpose of conducting tillage show a great variety. In plant production, there are many methods from zero-tillage method in which no tillage is performed until sowing to conventional-tillage method in which tillage is performed for many times with different intervals in periods before and after sowing. In conservation tillage method, on the other hand, plowing is carried out before sowing while the remains of the previous product are on the soil. Conservative sowing has emerged as an alternative to the conventional sowing method due to losses in soil fertility emerging as a result of deterioration of the soil structure (FAO, 2009). With the use of conservative soil tillage methods, water and humidity in soil is conserved, useful organisms can maintain their existence, plant nutrients are not removed from soil and cultivation costs are reduced. With respect to the sustainable use of natural resources, on the other hand, erosion and drought can be prevented with the use of this method. In areas subject to erosion, yields are also low due to low soil fertility and water insufficiency. It is calculated that product costs increase by 25% every year due to erosion (Anonymous, 2007).

The economic advantages obtained with the application of conservative tillage methods, on the other hand, are the less manpower use, less fuel consumption, time saving, and protection of efficiency in the long run. In zero-tillage olive production, the amount of fuel saved compared to the production activity in which conventional tillage methods are used is 60 - 80 l/ha and the saving made manpower is 3 - 5 h/ha. In other words, energy efficiency (yield/energy used) increases with the use of conservative tillage methods. On the other hand, the amount of carbon emission occurred during tillage also decreases to a significant extent.

*Corresponding author. E-mail: iceylan@agri.ankara.edu.tr. Tel: (90-312) 596 1498. Fax: + (90-312) 318 5360.

It was determined that in South European countries when direct sowing method among the conservative agricultural methods is used in the production of annual plants, a decrease of 40 - 60 Euro/ha is annually achieved in production costs (Anonymous, 2007). In Paraguay, in region where conventional tillage methods are applied, a yield decrease of 5 - 15% was observed within a 10 - years period examined, whereas in regions where conservative tillage methods are not used (zero-tillage) the value of yield increased by 5 - 20% within the same period (Sorrenson et al., 1997, 1998). Globally speaking, in 50 countries, conservative tillage methods are applied on a total land of approximately 106.8 million ha (Derpsch and Friedrich, 2009). In Turkey, conservative agricultural practices are not widespread yet. However, a limited number of re-search studies conducted about the use of conservative tillage methods show that conser-vative tillage methods can be applied successfully. In a study carried out in Izmir (Çakir et al., 2005), the influence of different tillage methods on yields was examined.

According to the research findings, the yield is 27 - 43% higher in cases where conservative tillage methods are used when com-pared to the yield obtained in cases where conventional tillage methods are not applied. This study was conducted in Tekirdag province having a pro-ductive soil and climate conditions. The wheat production area in Tekirdag province is 164 - 754 ha, while value of yield is 4650 kg/ha (TURKSTAT, 2008).

The number of farm holdings practicing conservative tillage methods in wheat production is rather few. The method preferred by these limited number of farm holdings is preparation of soil before sowing and use of combined sowing machine giving the opportunity to per-form the sowing process together.

It is a novelty for the farmers of the region to make use of conservative tillage methods via using combined sowing machine. The studies already conducted shows that adoption of agricultural innovations is a process displaying variety from farmer to farmer. For this reason, researchers have examined in their studies conducted in this region, certain characteristics of the farmers (age, education level, farm size etc.) for the purpose of explaining such varieties (Ryan and Gross, 1943; Rogers, 1983; Vanclay and Lawrence, 1994). On the other hand, in the studies con-ducted on adoption and diffusion of novelties, it has been expressed that information is the basic element and that there is a linear relationship between attaining information and the adoption behavior (De Herrera and Sain, 1999; Mabuza at al., 2008). The basic aim of this research is to examine the socio-economic characteristics and infor-mation sources of the farmers using combined sowing machine.

MATERIALS AND METHOD

In Tekirdag province, wheat production is performed in 30 of the farm holdings with land size of at least 120 ha via the conservative sowing method and in 65 of them via conventional sowing method. In the research, the reason behind the selection of farm holdings having at least 120 ha of land is the fact that in economic sense the optimum use of combined sowing machines which are expensive compared to conventional sowing machines use in the region, is possible in these farm holdings. The data used in the study were gathered via survey method from all the farm holdings with land size of at least 120 ha in Tekirdag province (95 farm holdings). At the stage of statistical analysis of the data gathered, chi square test was used for the purpose of determining the relationship between the variables determined. In the research Multiple Correspondence Analysis technique was used which aims the analysis in a more detailed manner than other techniques and in a less dimensional space of r*c table which was obtained categorically or crosstabs transformed into r*c*k table and the graphical display of the results obtained and which gives more detailed results.

The variables addressed in the study are the following: the share of agricultural income within the farmers' total incomes (SAITI %) (four categories : 0 - 25%. 26 -50%, 51 - 75%, 76 -100%), education levels of the farmers (EL) (four categories – Illiterate / Literate / Primary school graduate/Secondary school graduate), quality of information sources (QIS) (two categories – Formal / Informal) and the significance degree of economic factors (price of the machines / reduction in tillage and sowing costs) on the decision of purchasing/not purchasing combined sowing machine (SDEF) (three categories – insignificant / medium level / significant). The share of agricultural income within the total income was assumed to be I = 4, education level of the farmer j = 4, quality of information sources of the farmer k = 2, significance degree of economic factors on the decision of purchasing/not purchasing combined sowing machine l = 3, and use of combined sowing machine m = 2. The data obtained were transformed into a table with dimensions i x j x k x l x m, and an indicator matrix was created in order that application of multiple correspondence analysis can be applied (Mendes, 2002). This matrix shown with L is expressed as follows:

$$L = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 0 & 1 & 1 \\ . & . & . & . & . & . & & \\ 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}_{95 x 15}$$

Here on the columns of L matrix were the total level number of the variables used (4 + 4 + 2 + 3 + 2 =15), and on the rows were the number of surveys (number of experiment unit) (95). In this case, the L matrix became a matrix of 95 x 15 dimensions. L matrix is created by giving 1 for the categories of the 5 variables found in the surveys and 0 for the others. Therefore, row totals of L matrix shall be equal to 1 in one variable category and to variable number (p) in all its categories. In the analysis of L matrix, the matrix called Burt table or matrix consisting of the inner products of this matrix was taken as basis (Gifi, 1990; Mendes, 2002; Aktürk, 2007).

RESULTS

In Tekirdag province which is the research area, the farm holdings grow wheat; different soil preparation methods are practiced for soil preparation and sowing. In the research area, combined sowing machine which is regarded as an indication of the adoption of conservative tillage methods is used in 30 of the 95 sampled farm holdings. The indicator matrix created for the analysis of the effects of the 5 categorical variables addressed in the

Table 1. Burt table.

Categories	variables	Combine sowing machine use		EL				SAITI (%)				SDEF			QIS	
		User	Non user	Illiterate	Literate	Primary school	Secondary school	0 - 25	26 - 50	51- 75	76 -100	Unimportant	Moderate	Important	Formal	Informal
Combine Sowing machine use	User	30	0	0	4	20	6	0	3	3	24	1	10	19	30	0
	Non user	0	65	15	4	18	28	2	4	8	51	16	4	45	37	28
EL	Illiterate	0	15	15	0	0	0	2	1	1	11	5	0	10	7	8
	Literate	4	4	0	8	0	0	0	1	1	6	2	0	6	8	0
	Primary school	20	18	0	0	38	0	0	4	2	32	5	11	22	30	8
	Secondary school	6	28	0	0	0	34	0	1	7	26	5	3	26	22	12
SAITI (%)	0 - 25	0	2	2	0	0	0	2	0	0	0	2	0	0	0	2
	26 - 50	3	4	1	1	4	1	0	7	0	0	2	0	5	6	1
	51 - 75	3	8	1	1	2	7	0	0	11	0	5	0	6	9	2
	76 - 100	24	51	11	6	32	26	0	0	0	75	8	14	53	52	23
SDEF	Unimportant	1	16	5	2	5	5	2	2	5	8	17	0	0	9	8
	Moderate	10	4	0	0	11	3	0	0	0	14	0	14	0	13	1
	Important	19	45	10	6	22	26	0	5	6	53	0	0	64	45	19
QIS	Formal	30	37	7	8	30	22	0	6	9	52	9	13	45	67	0
	Informal	0	28	8	0	8	12	2	1	2	23	8	1	19	0	28

EL: Education level, (SAITI %) Share of agricultural income within the total incomes, SDEF: Significance degree of economic factors, QIS: quality of information sources.

multiple correspondence analyses in the research and the Burt matrix obtained through the inner products of the matrix are given in Table 1. 80% of the 95 farmers with who interviews was conducted in the research area fall within the age group 31 - 60, which can be considered as middle age group. The fact that majority of the farmers are in the same age group increase the expectation that they show similar attitudes and behaviors as they have similar agricultural experiences. 40% of the farmers are primary school graduates. The basic income source of the farmers is agricultural activity and the share of agricultural income within the total incomes of 79% of the farmers varies between 75% - 100%. The ratio of the farmers who have non-agricultural income besides agricultural income is 8.5%.

The basic information sources of the farmers about combined sowing are the Provincial Directorate of Agriculture and Rural Affairs Ministry, fairs, neighbor and relatives and their own individual initiatives. 70% of the information sources of all the farmers on combined sowing machine are formal information sources. Diagonal elements of this matrix give the totals belonging to the sub-categorical totals of the five categorical variables examined. Two farm holdings having agricultural

Table 2. Weight of variable categories addressed in each dimension.

Variables/Categories		1. Dimension (component 1)	2. Dimension (component 2)
Combine sowing machine use	User	-1.119	0.300
	Non user	0.516	- 0.139
EL	Illiterate	1.295	0.898
	Literate	-0.438	- 0.496
	Primary school	-0.670	0.565
	Secondary school	0.281	- 0.912
SAITI(%)	0-25	3.228	3.875
	26-50	-0.262	0.421
	51-75	0.440	-1.086
	76-100	-0.126	0.017
SDEF	Unimportant	1.080	0.583
	Moderate	-1.294	0.988
	Important	-0.004	-0.371
QIS	Formal	-0.423	-0.072
	Informal	1.012	0.172

income share within their total incomes is 0 - 25%, 7 farm holdings with a share 26 - 50%, 11 farm holdings with a share 51 - 75% and 75 farm holdings with 76 - 100%. Among the distribution outside the diagonal, for instance in 24 farm holdings whose share of agricultural income is not used. Information sources of the farmers in all the farm holdings using combined sowing machine are formal, whereas the information sources for 56% of the farmers who do not use combined sowing machine are informal. It was deter-mined as a result of the analysis that the dimension with the highest explanation rate is the 1^{st} dimension (22.09%). When the articulate shares in explaining total change are taken into consideration, it was determined that the share of the first and the second dimension in explaining the total change is 36%. In other words, only 36% of the total change can be explained when it is reduced to 2-dimensional space from 10-diemnsional space between the levels of the variables examined. When Table 2 is examined, it can be seen that 1^{st} level of the combined sowing machine use is in the 2^{nd} dimension, and its 2^{nd} level is in the 1^{st} dimension. 2^{nd} and 3^{rd} levels of EL variable are in the 2^{nd} dimension and its 1^{st} and 4^{th} level is in the 1^{st} dimension. It was determined that 1^{st} level of QIS variable is in the 2^{nd} dimension, and its 2^{nd} level is in the 1^{st} dimension. When five variables are evaluated together, provided that the region variable in the 1^{st} dimension has equal effect, it can be said that information sources of the farmers who do not use combined sowing machine are informal, and that their education levels are literate. When the data is examined with respect to SDEF variable, it is seen that those who do not use combined sowing machine take economic factors into consideration more.

Conclusions

The examination of the relationships between the categorical variables with multiple correspondence analyses makes it possible to address and interpret the relationships between the variables addressed in this study from different angles. With this technique the results are also given in visual form. In this study, in which certain socio-economic characteristics and information sources of the farmers using combined sowing machine in Tekirdag province are examined, the results reached are as follows:

The farmers using combined sowing machine are determined to;

- Make use of formal information sources,
- Have high education levels,
- Have high shares of agricultural income within their total income,

The farmers who do not use combined sowing machine are determined to;

- Make use of informal information sources,
- Have low education levels,
- Find the price of combined sowing machine high.

These findings of the research show similarities and differences with many researches examining the characteristics of the farmers practicing conservative agricultural methods. The differences between the results obtained from studies on adoption of conservative agricultural practices are due to the differences in regions where the

research is conducted, farmers and their conditions.

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