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Farmers' Attitudes Toward Crop Planning in Turkey

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Abstract: Agriculture is still one of the most important sectors in the Turkish economy. However, the sector has many problems. Farmers make production decisions in uncertain circumstances. It is accepted that crop planning is a tool to use farm resources effectively, but in Turkey farmers decide on crop selection and combination according to their past experiences and their intuitions. In this study farmers' attitudes toward the guidance of experts on selection and combination of crop enterprises were analysed. One hundred and twenty farmers producing at least two crops were interviewed and the logit model was used in order to determine variables affecting acceptance of guidance on crop planning. The results indicate that farmers' age, number of plots and regarding only price of crop in enterprise selection were negatively related to adoption of crop planning while education level of farmers, membership of agricultural cooperatives, difficulties experienced in crop selection, playing games of chance and land tenure other than ownership were positively related.

Key words: Crop selection, crop combination, logit models, farmers' attitudes, crop planning

INTRODUCTION

Crop management involves the purchase of factors of production and their allocation among crops in the furtherance of objectives. This is a process involving decision making, putting decisions into practice and evaluating results. The main objective for a farm manager is to organize scarce resources in the best way and to get maximum profit. Successful farm management is based on optimal use of scarce resources.

The most fundamental and important of the functions of management is farm planning[1], also called crop planning. Farm planning is optimal using of the scarce resources such as land, labour, capital and management[2]. Planning by the farmers is plausible[3] and farmers can make plans based on their observations and experiences without using advanced planning techniques[4].

Two important decisions made by farm managers are the enterprises selected and how they are combined in the farm business[5]. Physical, biological, socio-personal and economic factors determine the most profitable crop and animal enterprise selection and combination[5,6]. The enterprise selection problem faced by farmers is complex due to changing economic conditions, producers' preferences (some of which are not clearly articulated) and the fact that many enterprises may be technically possible for production on a given farm[7]. It is argued that because individuals have various wants which they seek to satisfy and the means are in scarce supply and can be put to many different uses, there is a need to plan production[8] and increased uncertainty calls for more planning rather than less[9].

Crop planning is related to many factors such as the types of lands, yield rates, weather conditions, availability of the agricultural inputs, food demand, capital availability and the cost of production. Some of these factors are measurable and can be quantified but some of them are difficult to predict[10]. The most important point at this stage is correctness of predictions for the future. In order to achieve successful results, it is necessary to get assistance from experts. This assistance may not include the results of complex planning techniques. Experts in crop planning (extension services and universities) may suggest cropping plans with regard to farm resources and farmers' preferences using simple or complex planning techniques. However, first, farmers should request these recommendations and the second stage is their acceptance and adoption of the recommendations. In developing countries, this is influenced by a wide range of economic and social factors, as well as physical and technical aspects of farms and the attitudes of farmers to risk and farmers may have a conservative attitude toward recommendations by outsiders. Therefore, it is very important to understand the role of factors affecting farmers' attitudes toward the guidance of experts on selection and combination of crop enterprises.

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The agricultural sector is still one of the most important sectors in the Turkish economy. The sector accounts for 12.2% of the GNP and employment in agriculture is 35.9% of total employment in the country in 2001[11]. However, the sector has many problems of structure, organization, etc. According to data from the general agricultural census in 1991, there are about 4 million agricultural holdings and their average size is only 5.9 ha[12]. In addition to this, there are large differencies among the agricultural regions in terms of farm size. Besides their size is being small, the holdings have a large number of plots; the average plot number in Turkey is 5.45. This situation impedes the adoption of new technologies. Another important problem in the Turkish agricultural sector is the insufficiency of cooperation. Being small farmers and having no access to market information and having poor farmers' unions and cooperative organisations, farmers are weak at marketing and their bargaining power is limited. Since production decisions are made without knowledge of input-output prices and market conditions, farmers face uncertainties and production becomes very risky. It is considered that, in the production decision making process, farmers need estimates of input-output prices and recommendations of what to produce and how much. Although very much academical research has been carried out on crop planning in Turkey, the adoption of their findings by farmers has been limited. Besides this, it is not known whether farmers want crop planning or not. This study examines the impact of socio-economic factors on farmers' attitudes toward crop planning by experts in Turkey. The study will meet the need of the data necessary for extension services taking crop planning extension to farmers. Thus, for a successful crop planning extension the characteristics of farmers will be clarified. In the later sections of the study, farmers' attitudes toward the guidance of experts on selection and combination of crop enterprises will be briefly referred to as the adoption of crop planning.

MATERIALS AND METHODS

Study area: The study was conducted in two provinces of the Aegean Region in Turkey. Manisa and Izmir provinces were selected because they are important centers for agricultural production in the region and in Turkey. Climate and soil characteristics of Izmir and Manisa provinces are well-suited for the production of several crops. According to data of 1998, the contribution of the Aegean Region to Turkish crop production value is 22.5%. Manisa and Izmir provinces have the highest share of crop production value in the Aegean Region and their contribution to the crop production value of the region is 18.8 and 17.0%, respectively[13].

Survey: The survey was conducted in 1998-1999 and 120 farmers producing at least two crops in the previous production season were interviewed in order to identify the factors influencing the adoption of crop planning. Data were gathered on various socio-economic characteristics of farmers including age, education, family size, agricultural experience, membership of agricultural cooperatives, visits to extension services, farm size, number of plots, form of land tenure, number of crops produced, total production value and total variable costs. Data were also collected on difficulties experienced while deciding on crop patterns, acceptance and adoption of recommendations on choosing enterprises and combination by experts and on whether farmers played games of chance.

Model: The decision to accept and adopt crop planning or not is a binary decision. This variable is qualitative and it can only take two values in a model representation. Some of the farmers answered No (0) and others Yes (1). When the dependent variable is binary, the Linear Probability Model (LPM), logit and probit can be used[14-16]. The LPM is the simplest of the three models to use but has several limitations such as nonnormality of the error term, heteroscedasticity and the possibility of the estimated probability lying outside the 0-1 bounds. The logit and probit models guarantee that the estimated probabilities lie in the 0-1 range and that they are nonlinearly related to the explanatory variables. These models are quite comparable, however the logistic has slightly flatter tails. Therefore, the choice between the two is one of (mathematical) convenience and ready availability of computer programs. On this score, the logit model is generally used in preference to the probit[15]. Logit model has been widely used in order to define factors affecting farmers' attitudes in adoption studies[17-21].

The logistic distribution function can be specified as[15]:

$$P_i = E(Y = 1|X_i) = \frac{1}{1 + e^{-z_i}} \quad (1)$$

$$(Z_i = \beta_1 + \beta_2 X_i \text{ and } -\infty < Z_i < +\infty)$$

If P_i, the probability of adopting a decision (such as crop planning) is given by Eq. 1, then $(1-P_i)$ the probability of a nonadoption decision, is:

$$1 - P_i = \frac{1}{1 + e^{z_i}} \quad (2)$$

We can also write,

$$\frac{P_i}{1-P_i} = \frac{1+e^{z_i}}{1+e^{-z_i}} = e^{z_i} \quad (3)$$

$P_i/(1-P_i)$ is simply the odds ratio in favor of an adoption decision, that is a ratio of the probability that a farmer will adopt crop planning to the probability that he will not adopt it. If we take the natural log of Eq. 3, we obtain logit model specification,

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i$$

$$= \beta_1 + \beta_2 X_i$$

The dependent variable, $Y_i = 1$ if the i th farmer adopts crop planning, $Y_i = 0$ if the i th farmer does not adopt. X_i is a vector of explanatory variables related to the adoption decision and β is the vector of estimated coefficients. Negative coefficients reduced the probability that a farmer would adopt crop planning, while positive coefficients increased that probability.

RESULTS AND DISCUSSION

Eighty seven out of the 120 farmers indicated that they would accept the guidance of experts on crop selection and combination (crop planning) and that they would apply the recommendations. Thirty three farmers indicated that they did not need a such guidance and that they prepared yearly cropping plans according to their past experiences. Acceptance of the expert guidance on crop planning can be expected to be affected by several factors. Before discussion of the effects of these factors on adoption of crop planning, some descriptive statistics by adopter and non-adopter farmers were given in Table 1.

Table 1: Some characteristics of selected farmers

	Adopters (87) (mean)	Non-adopters (33) (mean)
Age (*)	41.59	47.79
Farming experience (*)	20.61	26.97
Education (*)	6.46	5.45
Household size	4.43	4.21
Farm size (ha)	11.09	10.60
No. of plots	7.35	7.36
No. of crops	3.53	3.94

*significant at 0.10 level

It is seen that farmers accept guidance of experts on crop planning are younger, more educated and less experienced in farming than the others. From the stand point of these characteristics, farmer groups are statistically different by the Mann Whitney U test[22].

Explanatory variables related to the decision to adopt crop planning are also given in Table 2. These variables include farm and farmers' characteristics and their expected effects on the adoption of crop planning are discussed below.

AGE, indicating the age of farmer, was categorized into four binary groups as AGE1, AGE2, AGE3 and AGE4 in order to define the effects of different age levels on crop planning adoption. It is known that young farmers have a greater tendency to adopt new technologies. Crop planning also can be thought of as a new technology for conservative farmers. On the other hand, young farmers may need more information about crop selection and combination than older farmers. In both situations, it was hypothesized that age is negatively related to adoption of crop planning.

Farmer education indicates the years of education of the farmer. It is thought that educated farmers have a greater tendency to adopt crop planning in order to use their farm resources effectively. It was hypothesized that education level of farmers is positively related to adoption of crop planning.

Table 2: Description of variables used in the logit model

Variable	Type	Description
FS_1	Binary	Omitted category for farms less than or equal to 5 ha.
FS_2	Binary	1 if farm size is greater than 5 or equal to 10 ha, 0 otherwise
FS_3	Binary	1 if farm size is greater than 10 or equal to 15 ha, 0 otherwise
FS_4	Binary	1 if farm size is greater than 15 or equal to 20 ha, 0 otherwise
FS_5	Binary	1 if farm size is above 20 ha, 0 otherwise
$FEXP_1$	Binary	Omitted category for farming experience less than 10 years
$FEXP_2$	Binary	1 if farming experience is between 10 and 25 years, 0 otherwise
$FEXP_3$	Binary	1 if farming experience is above 25 years, 0 otherwise
EDUC	Continuous	Farmer's education (years)
PLCHAN	Binary	Playing games of chance (1 Yes, 0 No)
EXT	Binary	Visiting extension services (1 Yes, 0 No)
ACM	Binary	Membership of agricultural cooperatives (1 Yes, 0 No)
AGE1	Binary	Omitted category for farmers less than or equal to 30 years old
AGE2	Binary	1 if farmer is greater than 30 or equal to 40 years, 0 otherwise
Age3	Binary	1 if farmer is greater than 40 or equal to 50 years, 0 otherwise
AGE4	Binary	1 if farmer is above 50 years, 0 otherwise
TGMND	Continuous	Total gross margin index per ha, at least = 100

Table 2: Continue

Variable	Type	Description
TVCND	Continuous	Total variable cost index per ha, at least = 100
HHS	Continuous	Household size
NP_1	Binary	Omitted category for number of plots less than or equal to 5
NP_2	Binary	1 if number of plots is between 6 and 9, 0 otherwise
NP_3	Binary	1 if number of plots is above 9, 0 otherwise
OLAND	Binary	Omitted category for farmers operating only own land
ORLAND	Binary	1 if farms operating both own and rented land, 0 otherwise
OTLAND	Binary	1 if farms operating land in other types of tenure, 0 otherwise
NC	Continuous	Number of crops produced in previous season
MARCON	Binary	Omitted category for farmers regarding only marketing conditions of a crop in enterprise selection
COSTS	Binary	1 if farmers regarding only costs of a crop in enterprise selection, 0 otherwise
PRICE	Binary	1 if farmers regarding only price of a crop in enterprise selection, 0 otherwise
OTHER	Binary	1 if farmers regarding other characteristics of a crop in enterprise selection, 0 otherwise
EXPDIF	Binary	Experiencing difficulties on crop selection (1 Yes, 0 No)

The years of farming experience was categorized into three binary groups. It was hypothesized that farming experience is negatively related to adoption of crop planning because more experienced farmers may decide easily what to produce and how to combine enterprises.

EXT and ACM indicate visiting extension services and membership of agricultural cooperatives, respectively. It was hypothesized that both of them are positively related to adoption of crop planning because it was thought that these characteristics give evidence of progressive behaviour in farmers. Moreover, relationships to extension services and cooperatives may cause farmers to feel confidence in outsiders regarding production decisions.

Playing games of chance (Lottery etc.) shows the risk attitudes of farmers. It was hypothesized that playing games of chance is positively related to adoption of crop planning. Farmers are always in uncertain conditions when making production decisions. However, in Turkey, farmers confidently believe in their own decisions and this belief causes them to see the recommendations of experts on crop planning as more risky.

It was hypothesized that size of the household is positively related to adoption of crop planning because larger families have a greater labor supply for producing several crops.

EXPDIF indicates difficulties experienced by farmers on selection and combination of enterprises because of uncertainties and it was hypothesized that it is positively related to adoption of crop planning.

Farm size was categorized into five binary groups. It was thought that farm size is positively related to adoption of crop planning because farmers with large farms may have a greater tendency for working more profitable. Besides, they may have a chance to produce several crops in larger areas.

Number of plots was categorized into three binary groups. Its expected sign was negative and because of this structural problem, farmers may tend toward producing only one crop and not adopt crop planning.

It is thought that different land tenure forms also affect farmers' attitudes toward crop planning. In Turkey land renting and sharing agreements are usually short term and for this reason it was thought that farmers who are working rented and shared land may feel a need for crop planning in order to achieve more income. It was hypothesized that ORLAND and OTLAND are positively related to adoption of crop planning while OLAND is negatively related.

NC is number of crops produced in the previous year and it reflects general tendency of cropping pattern. It was thought that the more production possibilities, the more need for crop planning and for this reason it was hypothesized that this variable is positively related to adoption of crop planning.

Farmers take into consideration different characteristics of crops when choosing and combining them. In this study farmers considered marketing conditions, prices, costs and other characteristics of crops. It was thought that regarding these characteristics also affected adoption of crop planning behaviour. It was hypothesized that MARCON (regarding only marketing conditions of a crop), price (regarding only price of a crop) and other (regarding other characteristics of a crop such as labor demand or any of the characteristics mentioned above) are negatively related to adoption of crop planning while costs (regarding only cost of a crop) is positively related. Farmers regarding marketing, price and other conditions of a crop may determine their production plans according to current situation. However, farmers regarding only cost of a crop may want to reduce total costs and they need guidance in the selection and combination of enterprises.

Table 3: Logit model results for crop planning attitudes

Independent variables	Estimated coefficient	SE	Z-statistic	p-value
Constant	0.470338	2.389772	0.196813	0.8440
FS_2	0.666978	0.978039	0.681954	0.4953
FS_3	1.947846	1.125389	1.730821	0.0835***
FS_4	5.349409	2.658589	2.012124	0.0442**
FS_5	–1.139943	1.241045	–0.918535	0.3583
Fexp2	0.213942	1.161141	0.184251	0.8538
Fexp3	1.583899	1.420607	1.114945	0.2649
EDUC	0.355203	0.188690	1.882472	0.0598***
PLCHAN	1.442838	0.875502	1.648013	0.0994***
EXT	–0.085501	0.740184	–0.115513	0.9080
ACM	2.255152	0.935697	2.410130	0.0159**
AGE2	–2.194149	1.633580	–1.343154	0.1414
AGE3	–3.038189	1.584309	–1.917674	0.0552***
AGE4	–4.013330	1.895022	–2.117827	0.0342**
TGMND	–0.000522	0.003928	–0.133008	0.8942
TVCND	–0.003223	0.003168	–1.017376	0.3090
HHS	0.194102	0.266190	0.729187	0.4659
NP_2	–3.852624	1.285598	–2.996756	0.0027*
NP_3	–2.974541	1.360651	–2.186117	0.0288**
ORLAND	1.445511	0.794386	1.819659	0.0688***
OTLAND	2.357418	1.145102	2.058697	0.0395**
NC	–0.158715	0.323922	–0.489980	0.6241
COSTS	–0.799008	1.090438	–0.732740	0.4637
PRICE	–2.200307	1.164501	–1.889485	0.0588***
OTHER	–1.569837	1.067462	–1.470626	0.1414
EXPDIF	3.703743	0.961689	3.851289	0.0001*

*significant at 0.01 level, ** significant at 0.05 level, *** significant at 0.10 level, Likelihood ratio test statistic (degrees of freedom= 25)=66.82924 ($p<0.01$), McFadden $R^2 = 0.473427$, Dependent variable (Y) = observed 1 = 87 (adopters of crop planning), observed 0 = 33 (nonadopters of crop planning)

It was hypothesized that TGMND (Total Gross Margin Index) is negatively related to adoption of crop planning while TVCND (Total Variable Cost Index) is positively related. It was thought that farmers who have high total gross margins do not need to adopt crop planning; however, in order to have low total variable costs they may need to adopt crop planning.

The McFadden R-square measure of the goodness-of-fit is reported in the Table 3 and it shows that the model correctly explains 47% of adopting crop planning. Besides, the likelihood ratio test statistic indicates that the model is statistically significant at $\alpha<0.01$. The significance of the coefficients for each variable is that the variable explains the probability that a farmer will or will not adopt crop planning. The majority of coefficients agree with prior expectations. However, the coefficients which are not statistically significant were not interpreted. The analyses show that farmers' age, number of plots and regarding only price of a crop were negatively related to adoption of crop planning while education level of farmers, membership of agricultural cooperatives, experiencing difficulties in crop selection, playing games of chance and land tenure forms other than operating only owned land were positively related.

The variable for the old farmers category (AGE3) is statistically significant implying that an increase in the age of farmers within this age category will have a negative effect on their adoption decisions of crop planning. For older farmers (AGE4) an increase in their age will have also negative effect on their adoption decisions. Therefore, it can be said that older farmers are less likely than younger ones to adopt crop planning.

The negative and significant signs on NP2 and NP3 indicated that number of plots have a negative effect on likelihood of adoption of crop planning. As mentioned earlier, this is a structural problem and it can be said that this situation impedes having several crops in a farm, therefore, the farmer has to produce only one or two crops and does not need crop planning.

The variable named PRICE has also negative and significant sign. This variable indicated that the probability of adoption of crop planning was lower for farmers regarding only price of crop in crop selection than for the farmers regarding other characteristics. This situation agrees with prior expectations.

The positive sign on EDUC suggests that educated farmers have greater likelihood of adoption of crop planning. Playing games of chance also has a positive and significant sign and it indicates that farmers playing games of chance have a greater likelihood of adoption of crop planning than do non-players. This is an expected result. It is thought that many farmers still consider the guidance of experts on crop selection and combination as more risky than their own intuitions.

Membership of Agricultural Cooperatives (ACM) and Experiencing Difficulties (EXPDIF) with crop selection are also positively related to adoption of crop planning and

have a significant sign. Membership of agricultural cooperatives can be interpreted as a criterion of extroversion of farmers and it is indicated that farmers who are members of agricultural cooperatives are much more likely than non-members to adopt crop planning. The positive and significant sign on EXPDIF suggests that the probability of adoption of crop planning was higher for farmers experiencing difficulties than for others. These farmers do not know how to make production decisions because of uncertainties and for this reason the guidance of experts on crop selection and combination is necessary.

The variables ORLAND and OTLAND have also positive and significant signs. ORLAND indicates that farmers operating with both their own and rented land are much more likely to adopt crop planning than those operating only their own land. OTLAND consists of a combination of different land tenure types (owned, rented and shared) and it indicates that farmers operating with other types of land tenure have also a greater likelihood of adoption of crop planning. It is thought that farmers in these categories will need crop planning because they want to get higher income in the short term.

The other variables with positive and significant signs are farm size categories FS3 and FS4. The expected sign of the farm size was positive and the positive and significant signs on FS3 and FS4 (middle farm size categories) indicated that farmers with middle size farms are more likely to adopt crop planning.

The results of this study show that farm resource endowments and farmers' characteristics are affecting farmers' adoption of crop planning positively or negatively. In many adoption studies on several topics it was concluded that social and economic factors were affecting farmers' adoption behaviour[17-21]. Studies related to farmer's choice and crop mix decision also point out that social and economic factors such as farm resource endowments, external constraints, farm land, land-labour ratio, subsidies and production regulation were important in these decisions[23-25].

CONCLUSIONS

The construction of a reasonable cropping pattern in farms is closely related to the efficient use of resources. The right way of decision for cropping pattern affects not only the individual farm but also the sector and national economy. Since the short term hinders the change in quality and quantity of the resources, the objective, the most profitable production, is possible only by best using the restricted resources available. However it should be noted that it is difficult to take decision for the construction of cropping pattern under uncertainties such as natural, technical, institutional and economic. The lack of farm data kept by the farmers in Turkey causes the decisions to be taken by chance, particularly experiences. Therefore it is straightforward that there is a need for developing farm plans and guiding the farmers regarding the use of the plans so that the uncertainties could be minimized by considering the available amount and the trend in crop and input prices. Undoubtedly, some conditions should be implemented to take this opinion into real life. The main issue is the experts who have planning skills. Furthermore, the farmers who will adopt the planning models are conservative and insecure to the surrounding environment.

This study shows that farmers' attitudes toward the guidance of experts on crop selection and combination are affected both by the characteristics of the farmers and the resources they own and includes interesting results. Of course, different samples probably will give different results. However, this study has made a first step toward understanding farmers' crop planning attitudes in Turkey.

It is thought that the guidance of experts on crop selection and combination is necessary in order to survive and adapt to changing economic conditions of farmers in Turkey. This may be true in the long term but in the short term extension services should create a data base including price fluctuations on both crops and inputs, develop strategies that are relevant to farmers' needs and later encourage them to adopt of crop planning.

As a first step, it is thought that even correct and realistic estimates on prices would help to increase the contribution of indivudial farmers and the agricultural sector to the whole Turkish economy.

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