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Productivity in agricultural sector and need to improve living conditions in Northeast Anatolia Region

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Agricultural sector is one of the most sluggish and inefficient sectors in Turkey, the main reasons behind this are excessive rural population, small farm sizes and inefficient farm management. One of the most important tools to solve these issues is the extension service. This study aims to find out the factors that influence the people's incentives to receive extension services in Northeast Anatolia region of Turkey. For this end, a survey study on 600 farmers from 30 forest villages was conducted. Using this data, a limited dependent variable model with binomial probit estimation procedure was estimated. The study results imply that education level of farmers needs to be increased, young farmers must be encouraged to involve in farming and farmers should be supported to increase their farm sizes in order to have more effective extension services.

Key words: Extension services, attributes of farmers, forest villages, Northeast Anatolia.

INTRODUCTION

Today, development in technology creates such opportunities, benefits and efficiency gains for producers that adopting it is a must for them to survive in this competitive world market (Gurel, 1998). As in other sectors, technologic developments in agriculture increase the yield per unit of land and decrease labor letting production costs. Those who adopt technology faster can be more competitive in the world market, but the others who cannot keep up with the technology become the market of others.

Working conditions of farmers are much more difficult than those working in other sectors. Production activities in agriculture depend on environmental factors such as frost, flood, drought, precipitation, diseases, harmful insects and other factors such as changes in prices, family's living standards and technology. These factors are the sources of risk, uncertainty and instability in agricultural sector (Trieschmann and Gustavson, 1998). One of the best ways to alleviate these negative effects and increase productivity is to increase the knowledge of farmers about technical and economic aspects of farming practices.

Although productivity does very much depend on the structure of soil and availability of irrigation water, extension services have an important role in increasing agricultural productivity, as well. The major strategy of

agricultural extension is to offer knowledge in a way that they can utilize it effectively (Kidd et al., 1999).

Agricultural extension activities are mainly based on voluntary participation. Therefore, the wants and needs of farmers have to be taken into consideration (Yurttas and Atsan, 2006). In most cases, if the extension services are not adapted to the cases of farmers correctly, failure becomes inevitable. For that reason, extension people do need income generating, potential improving and financially effective activities to attract the farmers (Bernet et al., 2001). Due to insufficient financial sources, effective extension systems cannot be used in many cases.

Agricultural extension services are important policy tools in rural development. These services in Turkey have been provided to farmers free of charge as a public service. The extension activities have aimed to teach farmers informally the ways to improve their agricultural practices so that they can adopt new productivity and profit increasing technologies in their farming activities (Mula-yim, 1995). Extension people are those who use available tools effectively to help farmers adopt and apply the new technologies as fast as possible (Ceylan, 1988).

One of the most effective extension tools is television (TV) with the capability of spreading news very quickly and efficiently. Hence, farmers can be easily informed

about new technologies via TV.

Land size in a farm, production experience, tractor usage, land ownership, productivity, age, literacy, being a member of cooperatives and frequency of visiting the cities are the important farm and farmer attributes in adopting new technologies (Aktas, 1973). In dissemination and adopting new technologies, socio-economic attributes such as farm size, education level, age and communication behaviors, e.g. radio-TV listener, relationship with neighbor and relatives, are important factors (Rogers and Shoemaker, 1971).

Effectiveness in agricultural extension activities substantially depends on the attributes of farms and farmers (Akram et al., 2003; Ogunfiditimi, 1986). Therefore, it is very important to know what factors that affect farmers to receive extension services. Knowing them we helps these program services more effectively. For this end, this study attempts to analyze the attributes of farmers and farms that affect farmers to receive extension services in the Northeast Anatolia region. To achieve this goal, first a survey study was conducted for 600 farmers in 30 forest villages in Erzurum, Artvin and Bayburt provinces. Then, using this data set, a probit limited dependent variable econometric model was estimated to determine the important factors on receiving extension services.

In the diffusion and adoption literature, many different attributes of individuals may influence them to act in different ways. Rogers (1995) suggests that socioeconomic characteristics, personality values and communication behavior of individuals influence their way of adopting innovations. Depending on the generalizations made for each of these 3 categories, some individuals adopt innovations earlier than the others. For example, a socioeconomic characteristic states that early adopters have larger farms than later adopters, a personality value states that early adopters are less dogmatic than later adopters and finally a communication behavior states that early adopters have more contacts with agricultural extension service than late adopters. Although some of these factors which influenced the diffusion and adoption of agricultural innovations were studied in Turkey, that is Tatlidil (1989)'s actors influencing diffusion and adoption of sprinkler irrigation, (Boz, 1993) factors influencing diffusion and adoption of crop insurance and Boz and Akbay (2005) factors influencing adoption of maize, there have been no specific study, especially in the northeast-tern Anatolian region to investigate what factors influence farmers to receive agricultural extension service. The current study was intended to fill this gap.

Since agricultural sector in Turkey provides employment to approximately 32% of the total population, makes a 12% contribution to national income and 8% contribution to total exports (TSA, 2008), it is worthwhile to provide farmers with the last technological improvements and agricultural innovations. The only public institution which works for this purpose is the ministry of agriculture and rural affairs (MARA). It is organized in every province and district employing hundreds of extension agents who struggle to take agricultural innovations to farmers, espe-

cially the hard to reach. MARA's division of farmers' education and extension develops many local, regional and national programs for agriculture and home economics. The main purposes of these programs are to increase productivity in agricultural sector and to improve living conditions in rural areas (MARA, 2009). Because private extension services in the research area are at minimal level farmers need to utilize public extension services. So this study was focused on the factors influencing farmers to receive extension services from public institutions.

MATERIALS AND METHODS

Materials

The Coruh river watershed largely coincides with the administrative boundaries of 17 districts of 3 provinces, Artvin, Erzurum and Bayburt (Of these 17 districts, six districts, that is, Artvin, Ardanuc, Borcka, Murgul, Savsat and Yusufeli, belong to Artvin province; eight districts, that is, Ispir, Narman, Oltu, Olur, Pazaryolu, Senkaya, Tortum and Uzundere, belong to Erzurum province; and three districts, that is, Bayburt, Aydintepe and Demirozu, belong to Bayburt province). The area of the watershed accounts for approximately 55% of the total area of these 3 provinces (JICA, 2003).

The study area in Coruh river watershed includes 30 forest villages from 3 cities, Bayburt, Erzurum and Artvin (Of these 30 forest villages, 5 are from Bayburt; 15 are from Uzundere, Ispir and Oltu districts in Erzurum; and 10 are from Yusufeli and Savsat districts) (Figure 1). These villages are determined by using the criteria of forest cover, potential for rehabilitation and susceptibility to degradation (Kimijima, 2003). The material of the study is collected through survey with 600 households in these 30 forest villages that is, 20 surveys in each village.

Methods

The case of receiving extension services was presented by the variable that was created by the question of "what information sources do you use to increase your knowledge regarding the agricultural practices? If the answer was one of the first 4 choices (TV-radio, book-booklet, extension specialist and others) then the villager was considered as receiving extension services. Otherwise, the villager was considered as not receiving any extension services. The dependent variable is a binomial limited variable and coded as 1 and 0, where 1 refers to the farmers who receive extension services, and 0, otherwise. Independent variables that influence the farmers to receive extension services are related to the attributes of the villagers and farms. Limited dependent variable econometric model was estimated using probit estimation procedure in Limdep econometric computer program (Green, 2000; Yavuz, 2001). The model used in this study can be written as follows

$$RES = F(R, AHH, EL, L, NC, PRV, VM, MCV, SS)$$

Where

RES: Receiving Extension Services: 1; Otherwise: 0, **R**

R: Regions: Savsat and Yusufeli: 1; Uzundere, Bayburt, Ispir and Oltu: 0

AHH: Age of the Head of Household

EL: Education Level Ranging 1 to 7

L: Amount of Land Cultivated (ha)

NC: Number of Cattle the Farmers have (head)

PRV: Permanent Resident in the Village: 1, Otherwise: 0

WM: Willingness to Migrate: 1, Otherwise: 0

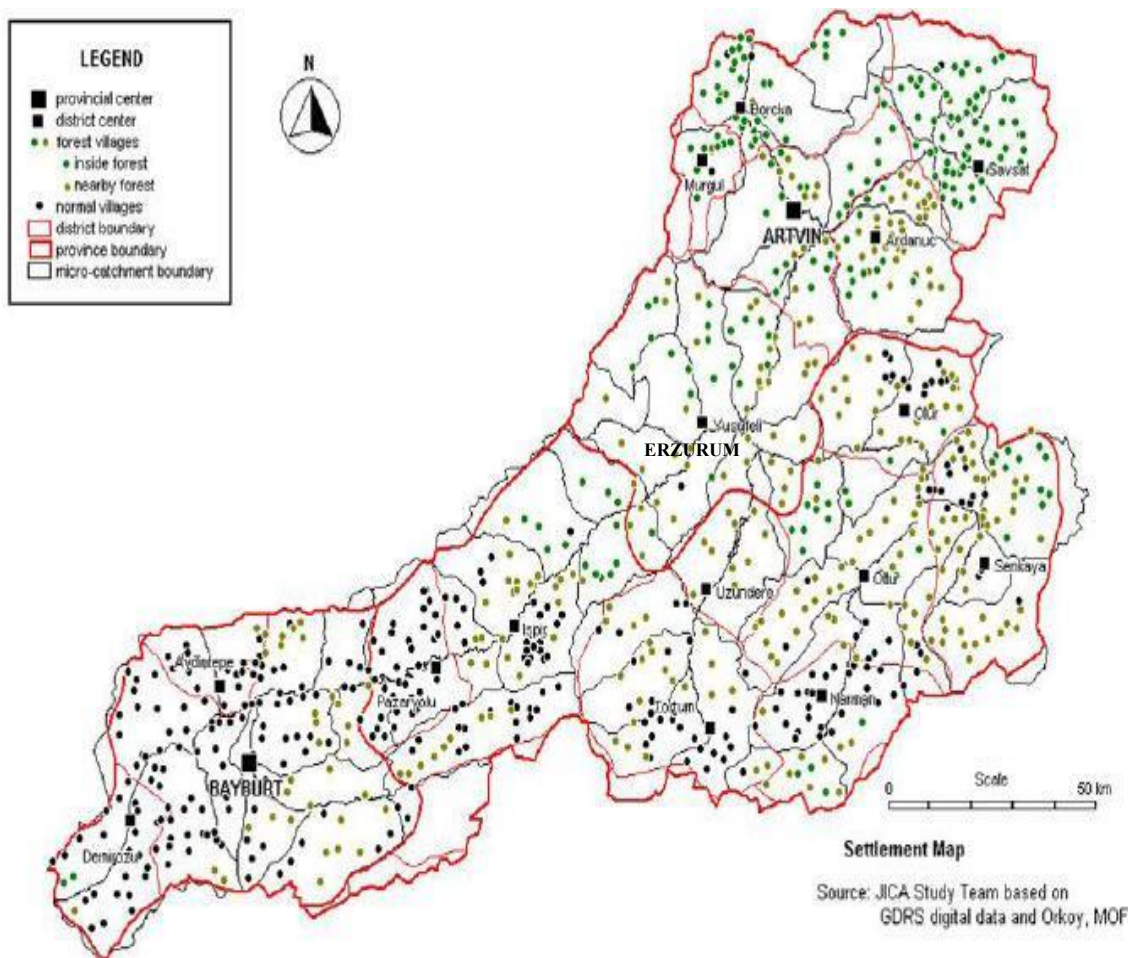


Figure 1. Map of the northeast Anatolia region.

RESULTS

Attributes of the villagers

In Coruh catchment, attributes of villagers such as primary profession, education level, types of extension services the villagers utilize, type of fuel, the villagers use for heating and cooking change a lot from one district to another. The attributes taken into consideration in this study are mainly related to the villager's dependency on forest resources.

The distribution of primary profession of the villagers by district is shown in Table 1. Being retired is the highest % of primary profession among the villagers in Coruh catchment. Yusufeli leads in this profession with 54% followed by Savsat and Ispir with 44 and 41%, respectively. Second highest primary profession is cattle farming in which Bayburt leads with 65% followed by Oltu and Ispir with 31 and 25%, respectively. Crop farming comes in third place as a primary profession at which Uzundere leads with 27%. All these results indicate that Coruh catchment has limited amount of land and thus, most of the villagers are retired from an off-farm job, or deal with cattle farming.

Education levels of villagers are shown in Table 2. Most of the villagers have elementary school diploma ranging from 49% in Savsat to 74% in Oltu districts. Savsat is the leading district in education level with 11% college degree, while Bayburt has the lowest education level with 14% illiteracy rate. These results are in line with common low education level in rural areas nationwide.

The distribution of agricultural extension services by the villagers utilized are very much diversified among the districts (Table 3). Television broadcasts are used most commonly in Savsat with 86% and in Yusufeli with 48%. Uzundere is leading district in utilizing extension person with 31% followed by Oltu and Bayburt with 25 and 19%, respectively. Approximately 50% of the villagers did not utilize extension services at all.

The attributes of farms

The attributes of farms may have important impacts on the dependency of the forest sources. Some of the attributes of farms that are assumed to be related to dependency on forest resources are amount of land owned and

Table 1. Primary profession of the villages (%).

Districts	Crop farming	Agricultural employee	Cattle farming	Forestry	Officer employee	Retired	Others
Savsat	18	0	23	0	5	44	10
Yusufeli	17	1	7	0	8	54	13
Uzundere	27	2	13	1	5	36	16
Bayburt	5	1	65	0	5	15	9
Ispir	11	0	25	1	6	41	16
Oltu	14	1	31	2	3	38	11
Average	15	1	28	1	5	38	12

Table 2. Education level of the villagers (%).

Districts	Illiterate	Literate	Elementary	Middle	High	College
Savsat	3	0	49	19	18	11
Yusufeli	7	8	57	14	8	6
Uzundere	7	4	66	14	7	2
Bayburt	14	13	66	3	4	1
Ispir	6	21	68	1	2	2
Oltu	6	13	74	6	1	0
Average	7	10	63	9	7	4

Table 3. Type of agricultural extension activities the villagers utilize (%).

Districts	Television	Book and Brochure	Extension person	Others	None
Savsat	86	2	3	5	4
Yusufeli	48	2	4	0	46
Uzundere	11	1	31	5	52
Bayburt	8	1	19	2	70
Ispir	26	0	12	4	58
Oltu	28	6	25	1	40
Average	35	2	15	3	45

cultivated, number of fruit trees, amount of manure used as fertilizer, number of cattle, sheep and goat, amount of wood consumed and total income of farmers (Table 4). Bayburt has the largest average amount of land owned and cultivated per farm with 57 and 42 da, respectively. Uzundere has the highest number of trees (142) per farm compared to the other districts. Amount of manure used as fertilizer per farm varies from 305 kg in Savsat to 5410 kg in Ispir. The number of cattle varies between 3 heads in Uzundere and Yusufeli and 7 heads in Ispir per farm. The number of sheep and goats per farm is the highest in Savsat with 10 heads followed by Yusufeli with 6 heads. Wood consumption is the highest in Savsat with 4376 kg while the total amount of annual income is the most highest in Bayburt with 6603 TL (Turkish Lira).

Regression analysis

The factors that may affect to receive extension services were firstly selected based on the experts' opinions, inferences and intuitions (instead of using qualitative research techniques such as participatory appraisal to explore how local people themselves understand "extension services") among all variables in survey data. Then, regression analysis is used to determine the most important variables. The variables included in limited dependent regression model are shown in Table 5. Of the 9 variables entered in the model, 4 were statistically significant at 5% levels and all had expected signs.

Living in the districts of Savsat and Yusufeli (regional affect) positively affects the farmers to receive extension.

Table 4. Farm attributes related to forest dependency of villagers.

Farm attributes	Savsat	Yusufeli	Uzundere	Bayburt	Ispir	Oltu	Average
Land owned (da)	35.6	32.8	36.0	57.0	46.4	29.6	39.5
Land cultivated (da)	34.6	30.0	30.6	42.0	37.4	22.2	32.8
Fruit trees	27.5	28.9	141.7	2.8	26.8	8.6	39.4
Manure (kg)	305.0	3460.0	4383.0	3747.5	5409.5	1740.0	3174.0
Number of cattle	3.9	2.9	2.6	5.7	7.0	6.6	4.7
N. of sheep and goats	9.5	6.0	5.0	4.7	0.1	3.9	4.9
Wood consumed (kg)	4376.0	2878.4	1625.3	2856.0	2451.6	2226.3	2740.0
Income (NTL)	4745.1	5222.9	5788.4	6602.8	4394.8	4946.4	5283.4

Table 5. Regression results from limited dependent regression model.

Variables	Coefficient	Standard error	T- value	P value	Mean variable
Regional Effect	0.76	0.12	6.07	0.00	0.33
Age of the Farmer	-0.01	0.00	-5.30	0.00	54.54
Education Level	0.18	0.05	3.82	0.00	3.09
Land Cultivated	0.00	0.00	0.86	0.39	32.82
Number of Cattle	0.02	0.01	2.05	0.04	4.76
Permanent Resident	-0.13	0.13	-1.01	0.31	0.79
Willingness to Migrate	-0.13	0.12	-1.11	0.27	0.30
Cooperative Member	0.15	0.19	0.80	0.42	0.10
Having Social Security	0.13	0.13	1.04	0.30	0.79

services. This may be because these districts have more forest but less land sources than the other districts. This phenomenon can induce farmers to utilize their limited sources more effectively and efficiently through extension services.

It is found that the older the villagers the less extension services they receive. Older people do not usually want to change their way of life styles, that is, they are more conservative and not easy for them to learn, adopt and apply the new innovations in their farms. Therefore, they do not have much interest in new technologies and programs. However, younger farmers may want to improve their farming activities to increase their income level.

Education level of villagers positively affects the farmers to receive extension services, that is, the higher the education level of the farmer the more willingness to receive extension services. Education makes people to realize the importance and benefits of adopting new technologies. It is also easier for educated people to access and learn the new technologies and programs. Therefore, they can be more enthusiastic and willing to adopt and apply the new innovations in their farms.

Having more cattle induce the farmers to follow technological developments in those fields in order to increase productivity and efficiency by adopting the better ways of farming. Therefore, more land and cattle they have, the more extension services they demand.

The other variables, the amount of land cultivated, permanent residence, willingness to migrate, cooperative

membership and having social security were not significant. Therefore, the nature of these variables are that farmers' demand of extension services is not influenced by their farm sizes, their residency status, their willingness to migrate to another town, their cooperative membership and whether or not they have social security (Table 5).

Results of this study showed similarities with earlier studies. The variables age and education level are consistent with Rogers (1995)' generalizations which state that early adopters of innovations are younger and more educated. In the current study also demanders of extension services are younger and more educated. This finding may indicate that those farmers who seek extension service are more innovative, so they may look out new ways of increasing their profits and improving their quality of life.

Although the variable education was significant at Boz and Akbay (2005) study, it was not significant in Tatlidil (1989) and Boz (1993) studies. On the other hand, the variable age was significant at Tatlidil (1989) study but not in the other studies. Having more cattle influenced farmers to demand extension services. As far as this variable is related with income level it is consistent with Rogers generalization on income and with the findings of the above 3 studies which found that innovative farmers have higher income than the other farmers. Farm size also influences farmers' income level. However, it was not significant in the current study but in the earlier 3 studies.

This could be related to the research area where extensive farming is predominant and the majority of farm income is generated by animal raising. Therefore, more extension service may be needed for animal farming.

Most of the variables which didn't significantly influence farmers' demand of extension service were not covered by the earlier studies. So, there was no possibility of comparing these results.

Conclusion

In today's world, market oriented economies are becoming dominant and governments are constrained to limited supporting areas in agriculture. Therefore, agricultural extension has become an important structural policy tool to help farmers to be more competitive in the world market. To have efficient extension activities, it is important to know the attributes of farmers and what factors affect to demand these services.

The attributes of villagers and farms that affect forest dependency vary a lot among the districts of Coruh river catchments. For example, ratio of primary profession among villagers such as cattle farming varies from 7% in Yusufeli to 65% in Bayburt. This variation, that is true in other attributes as well, provides a good opportunity to determine the impact of the attributes on forest dependency.

According to the results of the study, age and education level of farmers and the number of cattle are statistically important to demand extension services. Younger farmers, more educated farmers and farmers having more cattle have more demand for extension services. On the other hand the cases of staying outside of village in some part of the year, not willing to migrate, being a member of cooperative and having a type of social security are not statistically significant, and these attributes of farmers have no influence on the demand of farmers for extension services.

Taking all these results into consideration, the following conclusions can be drawn to have more effective extension services.

- i.) Farmers must be encouraged and even supported to live in their villages. Their migration to urban areas should be prevented by adequate supporting policies.
- ii.) Younger farmers have to be encouraged to involve in farming.
- iii.) Education level of the farmers must be increased.
- iv.) Farmers need to be encouraged to increase their cattle numbers.

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