



RESEARCH ARTICLE

Analysis of Factors Affecting Farmers' Decisions to Get Agricultural Insurance: The Case of Oltu District of Erzurum Province

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ABSTRACT

This study aims to examine the socio-economic factors influencing the decision to purchase agricultural insurance among farmers in the Oltu district of Erzurum Province. Primary data obtained from a total of 150 surveys applied in Oltu district were used in the research. The analysis, based on the probit model, identifies key variables affecting the likelihood of purchasing insurance and explores their relationships. The findings are consistent with previous literature. The results show that an increase in household size raises the likelihood of purchasing insurance, as risk-sharing within families may enhance the need for insurance. Non-agricultural activities reduce the need for insurance, as income from these activities allows farmers to manage risks more easily. The increase in land ownership slightly reduces the demand for insurance, although the effect is weaker. Farmers with larger landholdings tend to have more resources and better risk management, thus reducing their insurance needs. An increase in livestock count significantly raises the likelihood of purchasing insurance. Farmers engaged in livestock farming are more inclined to insure their assets, as livestock represent high-risk assets. Tractor ownership also increases the likelihood of purchasing insurance, although the effect is borderline. Tractor owners generally operate larger farms, thus increasing their insurance needs. The model's validity was confirmed through a Chi-Square test, which rejected the independence hypothesis, showing that the probit model is reliable. The study suggested strategies to increase insurance use, such as supporting small businesses, applying insurance incentives to small farmers, developing livestock insurance policies, and improving access to agricultural machinery.

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1. Introduction

The agricultural sector has an important place in the world economy and is a vital sector for many countries. However, agriculture is a sector that carries great risks, especially due to external factors. These risks include climate change, natural disasters, pests, diseases and market fluctuations. These factors threaten farmers' production processes and income. Therefore, agricultural insurance is a financial security tool that protects farmers against these risks. Agricultural insurance helps farmers maintain production continuity by providing coverage

against losses caused by natural disasters or other external factors. However, there are a number of factors that affect the spread of agricultural insurance. Factors such as trust in the insurance sector, economic conditions, government support, farmers' knowledge levels and the quality of service provided by insurance companies can directly affect the decision to purchase insurance.

Agricultural insurance plays a major role in enabling farmers to cope with the adverse situations they encounter. With the development of technology and the diversification of insurance products, agricultural insurance has now become

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accessible to more farmers. However, insurance rates in developing countries such as Türkiye are still low. The reasons for this situation are many. The difficulties farmers experience in covering the costs of insurance policies, insufficient information about the insurance system and lack of trust prevent agricultural insurance from spreading to a wider segment. Agricultural insurance not only covers the losses of the producer, but is also of great importance in terms of ensuring stability in the agricultural sector, supporting rural development and increasing economic security. However, more incentives and awareness-raising efforts are needed for agricultural insurance to become widespread.

The support provided by the state for agricultural insurance plays a major role in making these insurances more widespread. In Türkiye, state-supported insurance systems such as the Agricultural Insurance Pool (TARSİM) encourage farmers to take out insurance. In order to secure the risks threatening the agricultural sector in Türkiye, it was considered to put an insurance mechanism into effect and for this purpose, the "Agricultural Insurance Law" numbered 5363 was enacted on 14/06/2005 and the Agricultural Insurance Pool (TARSİM) was established. Agricultural insurance is a mechanism that provides confidence that the damages will be covered in the event of damage to animals and products within the scope of agriculture (Altınözü, 2007). Crop insurance and animal life insurance applications were initiated as of June 1, 2006. As of 2022, the amount of insurance created through insurance practices in Türkiye will be 296.1 billion liras, approximately 49% of this amount is plant product insurance, 26% is cattle life insurance, 14% is greenhouse insurance, 8% is small cattle life insurance, 2% is poultry life insurance, 1% is beekeeping insurance and 0.27% is aquaculture life insurance. According to the results of the same year, 86% of the 3 million policies made in Türkiye are plant product insurance, 9% is cattle life insurance, 3% is small cattle life insurance, 1% is greenhouse insurance, 0.40% is beekeeping insurance, 0.10% is poultry life insurance and 0.01% is aquaculture life insurance (Tarsim, 2023).

Agricultural insurance is an important tool that protects farmers against the risks they face. However, accessibility of policies alone is not enough for agricultural insurance to become more widespread. Factors such as economic conditions, government incentives, services provided by insurance companies, farmers' trust in the insurance system and their level of knowledge are among the elements that directly affect the decision to purchase insurance. Strengthening these elements will enable agricultural insurance to become more effective and widespread. Agricultural insurance is of critical importance not only for farmers but also for the sustainability of the agricultural sector in general.

In this study, the effects and levels of the factors that are effective in the decision of farmers to have agricultural

insurance in Oltu district were tried to be revealed in line with the data obtained from the surveys conducted with the producers in Oltu district of Erzurum province. Political suggestions were made based on the findings obtained.

2. Materials and Methods

The study protocol was approved by the Atatürk University, Faculty of Agriculture Ethical Committee with the decision number 2025/1 in session 2025/12.

2.1. Materials

The main material of the research consists of primary data obtained from face-to-face interviews with farmers who have agricultural insurance and those who do not have agricultural insurance in the neighborhoods of Oltu district of Erzurum province. In addition, secondary data obtained from published articles, reports, postgraduate theses, national and international publications such as the Ministry of Agriculture and Forestry, TARSİM and statistics were also used.

Since the number of businesses that have insurance in Oltu district is 75, all of them were included in the scope of the research. The total number of surveys applied was 150, 75 of which were from those who had agricultural insurance and 75 from those who did not have agricultural insurance, and Microsoft Excel and NLogit programs were used in the transcription and analysis of the survey data.

2.2. Methods

Oltu District in Erzurum Province, which has microclimate features and has higher plant and animal production diversity compared to other districts, was selected as the study area.

The main population of the research consists of all farmers who have and do not have agricultural insurance in the villages of Oltu district of Erzurum province. The number of enterprises to be surveyed was determined as 150 in total, including all enterprises that have agricultural insurance in Oltu district (75) and 75 enterprises that do not have agricultural insurance.

The data obtained in the study were transformed into supporting variables in reaching the points related to the purpose of the study. The socio-economic characteristics of the farmers were presented with means and percentages.

In the study, the chi-square test was used to test whether the difference between the observed frequencies and the expected frequencies was statistically significant in order to reveal the relationship between some socio-economic business characteristics and insurance (Aşkan & Dağdemir, 2015).

In the study, the probit model was used as an econometric model to determine the factors that affect farmers' agricultural insurance. Probit Model; is a model type in which the dependent variable has a qualitative character and the positive result takes the value 1 and the negative result takes the value

0, and the probability of the dependent variable being positive or negative is calculated. NLogit program was used in the implementation of the model.

3. Results and Discussion

3.1. Socio-Economic Characteristics of Enterprises

Demographic characteristics of the producers were examined in terms of marital status and it was determined that 98% of the producers were married. While 57.3% of the producers who had agricultural insurance were between the ages of 36-50, 44% of the producers who did not have agricultural insurance were between the ages of 36-50.

According to the education distribution of the producers, 25.3% of the producers who have agricultural insurance are middle school graduates and 41.3% are high school graduates. 30.7% of the producers who do not have agricultural insurance are middle school graduates and 29.3% are high school graduates. The study titled Investigation of the Perceptions of Cotton Producers Towards Climate Change and Agricultural Insurance: The Example of Aydın Province also stated that 50% are primary school graduates, 18% are middle school graduates, 22% are high school graduates, 5% have an associate degree, and 1% have a postgraduate degree. The researchers reported that there is a positive relationship between the adoption and implementation of innovations, including insurance in agriculture, and the level of education, that is, it is easier for people with a higher level of education to adopt and implement innovations and new technologies (Şengün & Özden, 2022). However, in the research titled Factors Affecting Farmers' Decisions to Have Agricultural Insurance: Adana Province Example, no relationship was found between having agricultural insurance, which can be considered an innovation in Turkish agriculture, and education level (Ünal, 2017).

According to the residence preferences of the producers, the residence preference of the producers who have agricultural insurance is village/neighborhood at a rate of 80%, while this rate is 77.3% for those who do not have agricultural insurance.

Social security status of producers: 90.7% of producers who have agricultural insurance have social security and 55.8% are subject to a retirement fund. 96% of producers who do not have agricultural insurance have social security and 86.1% are subject to a retirement fund.

It was examined whether the producers had any job or source of income other than agricultural activities and accordingly, it was determined that 40% of the producers who had agricultural insurance were engaged in activities other than agriculture and that this activity was public labor with a rate of 53.3%. It was determined that 78.7% of the producers who did not have agricultural insurance were engaged in activities other than agriculture.

According to the equipment and machinery assets of the producers per farm, it was determined that 0.56 of the producers who had agricultural insurance had tractors, 0.50 had trailers, 0.50 had ploughs, 0.25 had baler machines, 18 had combine harvesters, 0.01 had spraying machines and 0.02 had other equipment and machinery assets. It was determined that 0.29 of the producers who did not have agricultural insurance had tractors, 0.2 had trailers, 0.13 had ploughs, 0.05 had baler machines, 0.01 had no combine harvesters or spraying machines and 0.02 had other equipment and machinery assets.

According to the land assets per farm of the producers, the total property land assets of those who have insurance are determined as 25.4 da, the total rental land assets are 6.7 da, and the total land assets processed by partners are 1.4 da, while the total property land assets of the producers who do not have agricultural insurance are determined as 24.2 da, the total rental land assets are 4.7 da, and the total land assets processed by partners are 0.16 da. While the number of land plots per farm of the producers who have agricultural insurance is 4.6 da, this number is 3.9 da for the producers who do not have agricultural insurance. In the research conducted on the silage corn producing enterprises in Pasinler district of Erzurum province, the average property land is determined as 116.64 da, the average amount of rented land is 4.44 da, and the average amount of land kept by partners is 0.76 da. The average number of parcels in the study is calculated as 9.10 (Tuvanç & Dağdemir, 2009).

The number of cattle per farm of producers with agricultural insurance is 49.9 and that of producers without agricultural insurance is 10.2.

When the workforce of the enterprises is examined in terms of male business unit, it is understood that the enterprises that have insurance have more workforce capacity. While the total workforce of the enterprises that have insurance is at the level of 4.43, it is 4.19 in the enterprises that do not have insurance.

One of the factors that has the greatest impact on the investment decisions of enterprises and their adoption of new technologies is undoubtedly the annual income level. In this study, the income level and composition of the enterprises examined were examined. The annual total income of the producers who have agricultural insurance from plant production was determined as 24080 TL, the income from animal production as 349560 TL and the income from non-agricultural activities as 58997.3 TL. In the income distribution of the producers who have agricultural insurance, 6.3% of the income from plant production, 80.1% of the income from animal production and 13.6% of the income from non-agricultural activities constituted.

The annual total income of producers who do not have agricultural insurance from plant production is determined as 41653.3 TL, income from animal production is determined as

50920 TL and income from non-agricultural activities is determined as 187227.1 TL. Income distribution of producers who do not have agricultural insurance consists of 14.9% income from plant production, 18.2% income from animal production and 66.9% income from non-agricultural activities.

3.2. Analysis of Factors Affecting Insurance

The chi-square test results used in the analysis of the factors affecting the agricultural insurance behavior of the enterprises examined are given in Tables 1 and 2.

As a result of the chi-square analysis conducted on the relationship between farmers' agricultural insurance and their age, the X^2 value was determined as 13.37438 and the p-value as 0.00389. This low p-value indicates that there is a significant relationship between age groups and insurance. While the rate of those who have insurance is low in the young age group, the middle age group (36-50 years) is the group with the highest rate of those who have insurance. The rate of insurance decreases in the age groups of 51 and above. A significant relationship was found between age and insurance. While young farmers are more reluctant to have insurance, the rate of farmers in the middle age group is higher. Velandia et al. (2009) stated that young farmers are less inclined to have insurance. Young farmers tend to see insurance costs as high and perceive risk as lower. Adjabui et al. (2019) stated that age is an important factor affecting the demand for insurance and that farmers in the middle age group are generally more likely to have insurance. Akintunde (2015) stated that the age factor is an important factor affecting insurance decisions and that farmers, especially those between the ages of 35-50, have higher rates of insurance. However, there are also studies stating that insurance and age have a negative correlation with increasing age. This result is probably due to increasing financial liabilities with increasing age (Adjabui et al., 2019; Budhathoki et al., 2019).

According to the chi-square analysis results between agricultural insurance and the education level of the producers, the X^2 Value is 8.00575 and the p-value is 0.15592. This high p-value shows that there is no significant relationship between education level and insurance. However, while the rate of insurance is higher among high school graduates, the rate of insurance is lower among university graduates. This may indicate that the level of education does not have a direct effect, but there are differences in some groups. Aina et al. (2018) state that as the level of education increases, the rate of insurance increases. Educated farmers can better understand the benefits of insurance products and risk management. Akintunde (2015) states that as the level of education increases, the probability of farmers to have insurance increases and educated farmers have more information about insurance products. On the other hand, there are also studies stating that an increase in education decreases the tendency to have insurance (Arshad et al., 2016; Kwadzo et al., 2013).

An examination was made between the producers' residence in the district center or neighborhood (village) and their insurance behaviors and as a result of the chi-square analysis, the X^2 Value was found as 0.15890 and the p-value as 0.92362. Since the calculated p-value is very high, there is no significant relationship between the place of residence and insurance. Fahad and Jing (2018) emphasize that the insurance rates of farmers in rural areas are low and that farmers in rural areas are less willing to get insurance and that insurance awareness should be increased. Since a clear definition of the exact boundaries of the rural-urban distinction in Türkiye cannot be revealed statistically and in real terms, it is necessary to take into account the fact that producers determined to reside in the district center will not fully reveal their urban behavior patterns when evaluating this parameter.

In the chi-square analysis between the producer's social security and agricultural insurance behavior, the X^2 Value was determined as 1.71429 and the p-value as 0.19043. The p-value does not show a significant relationship. However, the rate of insurance among those with social security appears to be higher.

The relationship between whether farmers have non-agricultural income activities and whether they have insurance was also questioned and as a result of chi-square analysis, X^2 Value: 23.23632 and p-value was found as 0.00000. P-value is very small and statistically significant. This result shows that non-agricultural activities are an important factor affecting the decision to have insurance. The insurance rate of enterprises with non-agricultural activities is much lower. The fact that the producer has a non-agricultural income-generating activity causes them not to see agriculture as their main occupation and stands as an obstacle to professionalization in agriculture. Abebe and Bogale (2014) stated that non-agricultural activities can affect the insurance needs of farmers because these activities can diversify farmers' incomes and reduce the need for insurance. Ali (2013) stated that the demand for agricultural insurance of farmers with non-agricultural activities generally decreases. Singh (2017) stated that non-agricultural activities diversify farmers' incomes and therefore reduce the demand for agricultural insurance. Some studies have stated that non-agricultural activities do not reduce the demand for insurance, on the contrary, these activities support farmers' decision to buy insurance (Adjabui et al., 2019; Arshad et al., 2016; Gulseven, 2020).

The presence of a tractor in a business is important in terms of showing that agricultural production is adopted as a basic profession. As a result of the chi-square analysis between this significant variable and insurance behavior, the X^2 Value was determined as 10.90116 and the p-value as 0.00096. The p value found as a result of the analysis is statistically significant, meaning it can be said that owning a tractor is a factor affecting the decision to have insurance. The insurance rate of businesses

owning tractors is much higher. Ali (2013) stated that farmers owning tractors have more modern agricultural techniques and therefore are more likely to have insurance.

Farmers' land assets and insurance behavior were questioned and as a result of the analysis, X^2 Value was determined as 48.42003 and p-value as 0.99719. According to the analysis results, there is no statistically significant relationship between land assets and insurance. In other words, there is no significant difference between land assets and insurance. In the literature, there are studies stating that the amount of enterprise land decreases the tendency to buy agricultural insurance (Madaki et al., 2023; Musonda, 2012; Nyaaba et al., 2019), while there are studies stating that it increases it (Başer et al., 2023; Budhathoki et al., 2019; Chand et al., 2016; Dahal et al., 2022; Danso-Abbeam et al., 2014). It was emphasized that large land holdings are a factor that increases the possibility of farmers to make insurance, that the risks farmers face increase with large land holdings, that insurance is common in large land holdings because large land holdings generally carry more risks and that farmers try to manage these risks with insurance. In this study, the absence of a significant relationship between land holdings and making insurance is generally inconsistent with the literature findings. This result shows that the average land size in the examined enterprises is due to the fact that they are in the status of small enterprises. Because, the average land size in the examined enterprises is 33.5 acres in the enterprises that make insurance and 29.06 acres in the enterprises that do not make insurance.

It is observed that the number of land plots is not a factor affecting the decision to buy insurance among the businesses that do and do not buy insurance. There are mixed findings in the literature on whether the number of land plots affects the insurance decision. It is suggested that farms with a large number of plots are more inclined to buy insurance because they need more risk management. However, the fact that such farms have more dispersed and diversified production may also balance the need for insurance (Sadati et al., 2010). On the other hand, farms with large single plots of land may have a higher need for insurance because it is thought that such businesses are more vulnerable to risks, especially natural disasters. However, the fact that there is no significant difference between insurance and the number of land plots in the study indicates that this factor does not play a decisive role in the insurance decision.

One of the factors that will encourage a farm to have agricultural insurance is the livestock presence in the farm. In order to determine this relationship, the relationship between the farm's livestock presence and insurance behavior was examined. As a result of the chi-square analysis, it was determined that the livestock presence of the farms that had insurance was higher than those that did not have insurance and this difference was significant ($X^2 = 143.58$, $p = 0.00010^*$). The livestock presence is an important factor in agricultural

insurance. Animal production is a high-cost sector for farmers and livestock insurance is an effective way to manage these risks. Livestock insurance helps farmers reduce the financial risks associated with livestock losses due to various reasons such as illness, accident or natural disaster. This protection allows farmers to have a more stable income. Insurance payments cover economic losses in the event of livestock losses and ensure that the financial stability of the household is maintained. This stability allows for better planning and investment on the farm. Farmers aim to ease the financial burden arising from any loss by insuring their livestock, especially their cattle, and many studies have determined that there is a positive correlation between livestock ownership and the tendency to purchase insurance (Dong et al., 2020; Ghazanfar et al., 2015; Madaki et al., 2023; Mehmood et al., 2022; Nugrahaini et al., 2021; Subedi & Kattel, 2022). However, insuring cattle may be a barrier for some farmers due to high insurance premiums and management difficulties (Abebe & Bogale, 2014; Akintunde, 2015). The research confirms that cattle ownership is an important factor in insurance participation.

The chi-square test result between the labor force of the enterprise and insurance behavior shows that there is no significant difference ($\chi^2 = 8.17654$, $p = 0.31728$). This reveals that the total labor force (total of female and male labor force) does not have a significant effect on the decision to buy insurance. Labor force has been examined as a factor affecting insurance decisions, especially in the agricultural sector. The literature generally associates the effect of labor force on insurance decisions with the economic power and agricultural production capacity of farmers. Studies have addressed the aspects of the labor force potential in enterprises that can positively or negatively affect insurance decisions. It has been stated that farms with more labor force tend to buy insurance. However, this tendency is generally seen in large enterprises and high-income farmers (Liu et al., 2021; Madaki et al., 2023; Mehmood et al., 2022; Shang & Xiong, 2021). In small-scale farms, the workforce may often be insufficient to generate income levels that can pay insurance premiums. The impact of total workforce availability on insurance decisions largely depends on farmers' economic situation and agricultural production capacity. A large workforce may lead to an increase in the decision to purchase insurance in large farms, but in small farms, the workforce has no significant impact on insurance (Mensah et al., 2023; Nugrahaini et al., 2021; Nyaaba et al., 2019).

According to the chi-square analysis between the annual income level of the enterprise and insurance, annual income is higher in enterprises that have insurance, and this difference is significant ($X^2 = 35.10$, $p = 0.00003^*$). Income level is one of the primary factors affecting participation in agricultural insurance. High-income farms are more likely to have insurance because they have greater risks. Studies show that

high-income farmers are more comfortable paying insurance premiums and therefore more likely to have insurance (Budhathoki et al., 2019; İkkat Tümer et al., 2019; Kurniaty et al., 2021; Mensah et al., 2023; Nugrahaini et al., 2021). In addition, it is observed that lower-income farmers have higher rates of not having insurance due to their sensitivity to insurance costs (Ellis, 2016; Mehmood et al., 2022). The findings of this study are consistent with the literature as they show that high-income businesses are more likely to purchase insurance.

The effect of factors related to agricultural insurance is not limited to economic factors; socio-cultural, structural and political factors also shape this decision. The results obtained are parallel to the findings of many studies in the literature. Factors such as age, non-agricultural activities, and tractors show a significant relationship with insurance. Especially non-agricultural activities and tractor ownership are important factors affecting the rate of insurance. Characteristics such as marital status, educational status, place of residence and social security do not have a significant effect on the decision to insure.

Table 1. Analysis of the distribution of some socio-economic characteristics of enterprises.

Business Features		Insurance		Non-Insurance		Chi-square Test	
		Frequency	Percentage	Frequency	Percentage	X ²	P
Age	25-35	5	6.7	0	0	13.37438	0.00389*
	36-50	43	57.3	33	44.0		
	51-65	24	32.0	32	42.7		
	>65	3	4.0	10	13.3		
Education	Literate	1	1.3	0	0	8.00575	0.15592
	Primary School	18	24.0	14	18.7		
	Secondary School	19	25.3	23	30.7		
	High school	31	41.3	22	29.3		
	University	6	8.1	16	21.3		
Residence	Town	15	20.0	17	22.7	0.15890	0.92362
	Neighborhood (Village)	60	80.0	58	77.3		
Social Security	Yes	68	90.7	72	96.0	1.71429	0.19043
	No	7	9.3	3	4.0		
Non-Agricultural Activity	Yes	30	40.0	59	78.7	23.23632	0.00000*
	No	45	60.0	16	21.3		
Tractor ownership	Yes	42	56.0	21	28.0	10.90116	0.00096*
	No	33	44.0	54	72.0		

Table 2. Analysis of some technical indicators of enterprises.

Business Features		Insurance	Non-Insurance	Chi-square Test	
				X ²	P
Land ownership (da)	Possession	25.4	24.2	48.42003	0.99719
	Rent	6.7	4.7		
	Partnership	1.4	0.16		
Number of Land Pieces	Number	4.6	3.9	19.84085	0.92062
Total Cattle Assets	Number	49.9	10.2	143.58478	0.00010*
Labor Force (EİB)	Female	1.05	1.10	8.17654	0.31728
	Male	3.38	3.09		
Total Annual Income	TL	432 637.3	279 800.4	35.09770	0.00003*

3.3. Econometric Model Results

The most appropriate model was chosen by trying different model combinations from the existing data set. Table 3 provides

the definitions and statistical indicators of the variables used in the econometric model. The variables used in the model, such as the number of family members, total land assets and number of cattle, are continuous variables, while the variables for non-

agricultural activities and the presence of tractors in the enterprise are binary variables. The mean of the variable for the number of family members used in the econometric model is 4.77, the mean for total land assets is 31.05 and the mean for

cattle assets is 30.1. In the enterprises examined, 40% of the entrepreneurs have non-agricultural activities and 42% have tractors.

Table 3. Statistical summary and description of variables.

Variables	Definition	Average	Standard Error
X1	Number of family members, continuously variable	4.77	1.353
X2	Non-agricultural activity, binary variable, yes:1; no: 0	0.40	0.492
X3	Land ownership, continuously variable	31.05	49.835
X4	Number of cattle	30.1	30.498
X5	Tractor ownership, yes:1; no:0	0.42	0.496

The probit model results and marginal effects, which attempt to determine the factors affecting farmers' insurance, are presented in Tables 4 and 5. The probit model created was found to be significant at the 1% level. When the probit model results and marginal effects are evaluated together, several important factors that affect farmers' insurance probabilities stand out. The constant term, non-agricultural activity and the number of cattle variables from the model coefficients were found to be significant at the 1% level, while the number of

family members, total land assets and the presence of a tractor in the farm were found to be significant at the 10% level.

According to the probit model results, the probability of making agricultural insurance increases as the number of family members increases, the producer's cattle stock increases and the producer's tractor is found. The farmer's non-agricultural activity and the increase in land stock decrease the probability of making agricultural insurance.

Table 4. Probit model results.

Variables	Coefficients	Standard Error	P-value
Sabit	-2.60291***	0.58182	0.0000
X1	0.20501*	0.10709	0.0556
X2	-1.06151***	0.31729	0.0008
X3	-0.00466*	0.00245	0.0567
X4	0.04391***	0.00657	0.0000
X5	0.55201*	0.33279	0.0972
Logarithmic Likelihood Function	-51.52202		
Restricted Logarithmic Likelihood Function	-103.97208		
Chi-Square (5 d.f.)	104.90011		
Significance Level	0.0000		

*10% significance level, ** 5% significance level, *** 1% significance level.

According to the results of the marginal effects of the variables related to the probit model on taking out agricultural insurance; the marginal effects of the variables of non-agricultural activities and the number of cattle are significant at the 1% level, the marginal effect of the variable of the number of family members is significant at the 5% level, and the total land assets are significant at the 10% level. If the number of family members increases by one unit among the variables in the model, the probability of the producer taking out agricultural insurance increases by 4.02%. It can be said that risk sharing among family members supports insurance decisions. The effect of family structure on insurance has generally been reported with a positive relationship in previous studies. It has been stated that the family structures of farmers have an important place in the decision-making processes

(Oduniyi et al., 2020). Solidarity and risk sharing, especially among family members, can increase the demand for insurance.

According to the model results, the existence of a producer's non-agricultural activity reduces the probability of making agricultural insurance by 24.3%. It is frequently emphasized in the literature that non-agricultural activities have a negative effect on farmers' insurance decisions. It is observed that farmers feel less need for insurance with the income they earn from non-agricultural activities (Abebe & Bogale, 2014; Singh, 2017). This finding shows that farmers' risk management and income diversification can reduce insurance demand.

The increase in the farmer's land holdings decreases the probability of insurance by a very low level of 0.1%. Since the p-value is slightly above 5%, this effect is at the statistically

significant limit. Each decare increase in land holdings decreases the probability of insurance by 0.091%. This situation shows that large-scale enterprises have lower insurance requirements because they have more resources. The effect of land size on insurance demand is summarized in the literature as farmers can better manage their own internal risks and their insurance needs decrease when they have larger land holdings.

Increasing the producer's cattle stock by one unit increases the probability of making agricultural insurance by 0.9%. This effect is quite strong and statistically significant. Each additional cattle increases the probability of making insurance by 0.86%. This is consistent with the literature that farmers engaged in animal husbandry have higher insurance rates. Farmers engaged in animal husbandry generally have higher insurance demands. Because cattle are high-risk assets, this may lead farmers to make insurance (Madaki et al., 2023; Mehmood et al., 2022; Nugrahaini et al., 2021). These findings indicate that farmers engaged in animal husbandry are more inclined to manage their risks through insurance.

Having a tractor increases the probability of having insurance, but the p-value is at the limit of significance. Having a tractor in an agricultural enterprise increases the probability of having insurance by 11.7%. The effect of tractor presence on insurance is related to farmers adopting modern agricultural practices. Having a tractor generally increases the insurance requirements of farmers and leads to larger farms.

Table 5. Marginal effects.

Variables	Marginal Effect	Standard Error	P-value
X1	0.04017**	0.02021	0.0469
X2	-0.24351***	0.07286	0.0008
X3	-0.00091*	0.00047	0.0501
X4	0.00860***	0.00076	0.0000
X5	0.11663	0.07334	0.1118

*10% significance level, ** 5% significance level, *** 1% significance level.

4. Conclusion

This study aimed to examine the factors affecting the decisions of farmers to have insurance in agricultural enterprises in Oltu District of Erzurum Province. The probit model analysis shed light on various socio-economic characteristics affecting the decisions of farmers to have insurance. The research findings are generally consistent with previous studies when compared with the literature.

The fact that the number of family members increases the probability of getting insurance shows that farmers attach more importance to family solidarity and risk sharing. This finding is parallel to studies in the literature indicating that family structure has a significant effect on farmers' insurance

preferences. Risk sharing among family members may increase farmers' need for insurance. Farmers tend to manage risks collectively, especially when there are more individuals in family businesses.

The negative impact of non-agricultural activities on insurance is consistent with the literature. The presence of non-agricultural income sources reduces the need for farmers to have insurance. Since farmers can manage their own risks more easily with the income they earn from non-agricultural activities, their need for agricultural insurance decreases. This finding is an important factor that shows how farmers' risk diversification affects their insurance needs. Considering that non-agricultural activities have a negative impact on insurance, agricultural insurance awareness campaigns should be expanded to include non-agricultural activities.

The fact that an increase in land holdings reduces the need for insurance is a finding consistent with the literature. It is emphasized in the literature that farmers with large land holdings generally tend to have less insurance because these farmers have more resources and risk management capacity. This shows that farmers can better manage their own internal risks with large land holdings and the demand for insurance decreases as a result. However, these findings also reveal that insurance incentives should be increased for small-scale farmers. Since small farmers may have difficulty managing their risks, special insurance policies and incentives should be developed for this group.

The increase in the number of cattle is an important factor that increases the probability of insurance. Farmers engaged in livestock want to secure their high-risk assets with insurance. This finding is consistent with previous studies. The high tendency of farmers to insure their cattle indicates their willingness to manage risks more effectively. In this context, the development of insurance policies specific to the livestock sector and the expansion of cattle insurance coverage may increase the tendency to purchase insurance.

The fact that the presence of a tractor increases the possibility of insurance can be interpreted as farmers increasing their insurance needs by having more modern and large-scale businesses. Tractor use is an important element that increases farmers' agricultural productivity and also indicates that farmers may face more risks.

In light of the research findings, the following recommendations can be made to increase the use of agricultural insurance:

1. Training programs should be organized to increase knowledge and awareness of different demographic and socio-economic farmer groups.

2. Taking Non-Agricultural Activities into Account: Considering that non-agricultural activities reduce insurance

demand, awareness campaigns should be organized for farmers about the effects of non-agricultural income on insurance.

3. Incentives for Small Farmers: The observation that insurance demands of farmers with small lands are low indicates that more affordable insurance policies and supports should be provided for farmers in this group. Additional insurance premium support can be provided especially for low-income farmers.

4. Developing Livestock Insurance: Developing special livestock insurance policies for farmers engaged in livestock farming will increase insurance usage. In addition, it should be supported with risk-reducing measures such as animal health insurance and vaccinations.

5. The presence of agricultural machinery such as tractors increases the demand for insurance. Therefore, increasing the level of agricultural mechanization of enterprises and facilitating the acquisition of agricultural machinery can further increase the use of insurance.

6. Developing insurance programs for farmer groups and implementing them with appropriate policies can increase the level of adoption due to responsibility sharing.

Compliance with Ethical Standards

The study protocol was approved by the Atatürk University, Faculty of Agriculture Ethical Committee with the decision number 2025/1 in session 2025/12.

Conflict of Interest

The authors declare no conflict of interest.

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