

EXPLORING FARMERS' DECISION FOR CROP INSURANCE

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Abstract. The existence of adverse weather conditions increases the production risks of farms through crop yields in the crop sector. One of the measures to mitigate the risks from the weather in agriculture is to insure crops. In the Estonian insurance market, crop insurance is available to farmers. Government-based crop insurance subsidies apply to crop insurance premium, but so far, there is little demand for it among farmers. The aim of the paper is to identify the terms of crop insurance that play a role in deciding in favour of crop insurance. A survey examines the factors related to the insurance decisions of agricultural producers about their preferences regarding the terms of crop insurance. The data, collected from Estonian agricultural companies through an online questionnaire, is used to show farmers' preferences with regards to crop insurance. The results show that interest to using crop insurance was relatively low among farmers despite the agricultural insurance premium subsidies provided by the Agricultural Registers and Information Board in Estonia. Regarding crop insurance, it would be rather used by farmers who consider insurable production risks and insurance premium subsidies more important. Of the terms, insurance indemnity, covered risks, and insurance premium were considered the most important in making a decision in favour of using crop insurance. Interest in crop insurance products would increase if specific insurance conditions were understandable and acceptable to producers.

Keywords: EU agricultural risk management, crop yield insurance, risk mitigation, Baltic States.

JEL codes: H42, G22, M48, Q10

Introduction

EU agricultural policy and government decisions play an important role in supporting agricultural risk management. Government intervention in risk management through budgetary means is common practice in most countries, where farmers' incomes are at risk due to severe losses. Government intervention is only justified in the absence of market-based measures or where they are not feasible. One of the most widely used government measures to support agricultural insurance is to subsidize insurance premiums to the policyholder (Dick, W.J.A. and Wang, W., 2010). The insurance support measure partially compensates farmers for crop insurance premium payments. This measure was added to the Estonian Rural Development Plan in 2019. Thus, there is a state-implemented agricultural insurance premium support in Estonia to compensate farmers for crop insurance premium costs.

The functioning of the market for insurance services requires sufficiently interested insurers as well as policyholders. So far, the supply of crop insurance in the Estonian insurance market is low and so is the demand. However, a survey by the Estonian Chamber of Agriculture and Commerce revealed in 2017 that over 80% of agricultural producers specializing in crop production would be willing to use crop insurance if it was subsidized by the government (Sormus, R., 2018). The results of previous surveys about crop insurance in Estonia are somewhat contradictory (Nurmet, M., et al. 2016; Ratass, M. et al., 2017; Sormus, R., 2018). However, these studied agricultural insurance as a risk management measure (Ratass, M. et al., 2017), farmers' attitudes towards crop insurance (Nurmet, M. et al., 2016) and the need to use crop insurance on farms specializing in crop production (Sormus, R., 2018), but none of them included questions about specific crop insurance terms. In view of the above, it is hypothesized that the existence of a crop insurance premium support measure and clear insurance terms and conditions will encourage farmers to become more interested in using crop insurance as a yield risk mitigation tool.

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The **aim of this paper** is to identify the terms of insurance that play a role in deciding in favour of crop insurance. The study focuses on demand-side analysis based on farmer preferences. A survey examines the factors related to the insurance decision of agricultural producers and their preferences regarding the terms of crop insurance. In order to reach the aim, the aspects related to agricultural insurance are explained, the factors influencing the decision of crop insurance are described and an overview of the situation of crop insurance in Estonia as a risk management measure is given. Then, factors involved in farmers' insurance decisions and preferences for crop insurance are examined.

Primary data collected through a farm survey are used. The statistical program SPSS Statistics and the spreadsheet program MS Excel were used to analyse the data collected by the questionnaire survey. Data were analysed quantitatively using descriptive statistics and Student's t-test for statistical analysis. The impact of various factors on farmers' crop insurance decisions was assessed. The T-test enabled to compare the difference between the responses of the two samples (respondents would use crop insurance or not) using average estimates and statistical significance (Bhattacharjee, A., 2012). This characteristic was based on the distribution of the answers (yes, no) to the question "would you use crop insurance?". Data analysis was performed at a 95% confidence level ($p < 0.05$).

Research results and discussion

1. Factors influencing the decision of crop insurance

The literature that examines determinants of crop insurance and insurance schemes where government backed schemes are included is abundant. The development of the crop insurance market has necessitated the examination of a number of factors which may influence the decision for crop insurance. A high variability in yield increases a company's production risk (Crane, L. et al., 2013). The implementation of risk transfer strategy in the risk management process means that the potential loss from an adverse outcome faced by a farmer is shifted to professional risk-taking institutions. (Schaper, C. et al., 2009). Agricultural insurance is a financial instrument for risk management, which is used to finance the harmful consequences of the realization of production risks. By using the insurance, the farmer incurs additional fixed costs in the form of insurance premiums and receives insurance for unforeseen and major losses (Njegomir, V. et al., 2016). Simpler instruments that hedge a single risk dominate agricultural insurance. Multi-risk insurances are more complex instruments and less common on farms (Schaper, C. et al., 2009). From farmers' point of view, crop insurance is beneficial because it enables to stabilize producers' incomes, encourage investment, and increase cash flow (Karthick, V. et al., 2017). A similar view is that use of crop insurance enables farmers to hold lower financial reserves and make more investments; reduce debt and buy land or other capital (Raulston, J.M. et al. 2010). Crop insurance can sometimes be a prerequisite for receiving credit and support (Girdziute, L. and Slavickiene, A. 2012).

Premium subsidies may increase the interest of farmers in insurance (Liesivaara, P., Myyra, S. 2017). Policies or insurance schemes that offer lower insurance premiums can be useful to facilitate adaptation and improve farm resilience. This would provide farmers with financial security against extreme weather damage, while motivating them to invest in farm resilience and adaptation (Beckie, H.J. et al. 2019). By subsidizing crop insurance and thereby reducing farms' business risk exposure, farms may accumulate more debt to maintain their operation's overall level of risk. When insured farms suffer a loss, crop insurance indemnities can help finance their short-term operating needs without leading to additional financial risk (DeLay, N. et al. 2022). Crop insurance indemnities mitigate fluctuations in revenue and lower a farm's risk by reducing business risk. Crop insurance premium subsidies have become a large expenditure

for governments. Insurance subsidies must be designed in such a way that they are cost-effective in achieving their main objective and do not become a growing financial burden on government. Poor subsidy structures can lead to costly government budgets and significant economic costs and inefficiencies, and in some cases to a deterioration in the environment (Hazell, P. and Varangis, P. 2020).

Asymmetric information, which causes adverse selection, moral hazard and systemic risk issues in insurance provision, is inherent to insurance (Enjolras, G. et al., 2012), being one of the main problems of crop insurance markets. Adverse selection and moral hazard must be minimized to ensure that the specific risk is insured. According to adverse selection, the policyholder has more information than the insurer, and those with higher risks are more willing to buy the insurance. Moral hazard refers to a change in the policyholder's behaviour after buying an insurance contract, which results in an increase in the probability or extent of the occurrence of a loss. The application of deductibles on insurance premiums are used to minimize moral hazard. Both adverse selection and moral hazard result from information asymmetries between the insurer and the farmer. Correcting this asymmetry (i.e. obtaining more information for the insurer) is usually a costly and difficult endeavour (Ramsey, A. F. and Santeramo, F. G. 2017).

Agricultural insurance can be compulsory or optional. Compulsory insurance would have a higher potential market volume and lower insurance premiums for farmers. Farmers' insurance decisions may be influenced by previous experience with insurance products (Santeramo, F.G. 2018) and crop losses. There is also a mutual relationship between crop insurance, land productivity and the environment (Kurdys-Kujawska, A. et al. 2021). In general, arable farmers and farmers with low soil quality who have experienced crop losses in the past are more likely to purchase conditional insurance. Farmers with good quality soils, who perceive that they have already adapted their practices to climatic risks and who have not experienced losses due to adverse climatic events in the past are less willing to purchase insurance (Jorgensen, S.L. et al. 2020). Increasing yield variability increases farmers' insurance demand (Khuu, A. and Weber, E.J., 2013; Liesivaara, P. and Myyra, S., 2017).

Insurance premiums and premium subsidies are important for farmers in terms of crop insurance (Ginder, M.G. and Spaulding, A.D., 2006; Boyd, M. et al., 2011; Aditya, K.S. et al., 2018; Santeramo, F.G. et al., 2016). The premium that farmers would be willing to pay for a guaranteed coverage level is relatively small. Cost is the most important to farmers. Generally, maintaining insurance coverage level and affordable premiums for extreme weather events may become challenging if meaningful action on mitigation across all sectors of society is not undertaken (Doherty, E. et al. 2021).

2. The crop insurance system in Estonia as a yield risk management measure

In Estonia, crop insurance is offered by BTA Baltic Insurance Company AAS (BTA Baltic Insurance Company AAS, 2021). The insured object can be such crops as cereals, legumes, oilseeds. Perils include hail, rain, storm, winter damage, fire, lightning, theft of the harvest, the fall of the grain. The fall of the grain is covered only in the period of grain growing phase from the formation of the inflorescence to the early maturity of the dough. Damage to legumes and oilseeds caused by the fall of the grain is not reimbursed. The deductible is limited to 20%, and damages caused by diseases and pests, non-compliance with good agricultural practice, unfavourable weather conditions during harvest, accumulation of water in the drainage system are excluded.

The conditions for reimbursement differ in cases of winter and summer damages. Winter damage is that which occurs in winter before the sprouting phase. If good agricultural practice is followed and the number of live plants per square meter is less than stipulated in the insurance contract (for example, the number of winter wheat plants per square meter is less than 100), then it is possible for a policyholder to receive

insurance indemnity. In order to receive the insurance indemnity, the extent of the damage caused to the insured crops is determined as a percentage. The percentage obtained is multiplied by the sum insured, which is then multiplied by the limit of indemnity (either 15%, 20% or 25%) agreed in the insurance contract.

There are two types of summer damage. Firstly, damage caused by hail, rain, storms, crop theft, thunderstorms, and fire. To calculate the insurance indemnity, the part of the total area damaged is found, the deductible rate is deducted from it and the difference obtained is multiplied by the sum insured. Another type of summer damage is the fall of the grain of growing stages. If damage from the fall of the grain is higher than the deductible, the damage shall be indemnified in the amount of 15%.

Farmers, after obtaining a crop insurance contract, can apply for agricultural insurance premium subsidies in Estonia (Agricultural insurance support, 2019). Agricultural insurance premium subsidies are administered by the Agricultural Registers and Information Board (ARIB) within the framework of measure 17.1 "Crop, animal and plant insurance payments" of the Estonian Rural Development Plan 2014–2020 (Passa, 2020). Under this measure, up to 70% of insurance premiums are reimbursed. Agricultural insurance premium subsidies are granted only in respect of insurance contracts which have compensation for damage caused by adverse climatic events to animals or plant diseases, the spread of pests or economic loss caused by an environmental incident. Agricultural insurance premium subsidies can be received if the terms and conditions of the insurance contract stipulate that indemnification applies if at least 20% of crop has been damaged (deductible $\geq$ 20%).

In period 2019–2020, three agricultural companies in Estonia claimed compensation for insurance premiums covering 1 453 ha. Of the crops, winter wheat accounted for the largest share of the total insured area, about 36.0% of the total area. 16 ha of summer wheat were insured, which accounted for 1.1% of the total insured area. The total claim payment amount was 1 341 119 euros and the policyholders made a total of 25 363 euros of insurance premiums (i.e. an average of 22 euros per hectare) (Passa, 2020).

The budget of measure 17.1 was 2 000 000 euros in 2019–2020 and 6.9% of the budget (in total of 17 754 euros) was used for agricultural insurance support. Crop insurance premiums accounted for 0.8% of the budget. Animal insurance premiums are also reimbursed from the budget and form a major part of the budget paid out.

3. Methodology and study sample

The data on farmers' opinions about the terms of insurance that play a role in deciding in favour of crop insurance have been collected through a farm survey. Questions were asked about insurance indemnity, insurance risks, insurance premium, insurance coverage, insurance support, deductible. Respondents assessed the importance of different insurance terms and conditions in deciding in favour of crop insurance. The respondents were offered options on the insurance terms and conditions provided. Insurance indemnity, measured by euros per hectare, is claim payment amount paid by the insurer in case of damage to the policyholder. Covered risks or insurable risks are perils or potential cause of a loss (e.g. drought, hail etc). Insurance premium, measured by euros per hectare, is the amount paid by the policyholder to the insurer for the insurance. Insurance coverage, measured in percentages, is the share of loss that is indemnified by the insurer. Insurance support in percentages is government support for paid insurance premiums. Deductible is the percentage of damage that is borne by a producer (the insurer will pay for the loss in excess of the deductible).

It should be emphasized that the respondents gave assessments of conditions whose specific values have not been defined in this question. Significance ratings were given on a 5-point scale (5-very important, 4-rather important, 3-neutral, 2-rather not important, 1-not at all important).

The impact of factors related to insurance conditions on farmers' crop insurance decisions was assessed using a t-test. It was compared whether the assessments of the significance of crop insurance conditions influence farmers' insurance decisions. The difference in the average assessments of the significance of the crop insurance conditions was compared between the respondents who would or would not use crop insurance, respectively. As a result, differences in respondents' average ratings and probabilities of significance are highlighted.

The population of the survey is Estonian agricultural holdings. The sample consisted of farms that received agricultural subsidies according to the database of the ARIB in 2018 and 2019. The sample was selected on a random basis, with all farms having an equal opportunity to be included in the sample. 685 companies were selected from the ARIB database in combination with the Creditinfo Eesti AS database. The survey was sent by e-mail to 685 farms in the 1st quarter of 2020. A total of 101 farmers responded to the survey, with a response rate of 14.7%. Table 1 presents the descriptive statistics from the sample based on farm characteristics and the demographic profile of farmers. The majority of respondents (84%) were from private limited companies. The number of self-employed persons among the respondents was 15% and that of public limited companies was 1%. According to Statistics Estonia (2019), 45% of agricultural enterprises (11 561 in total) were private limited companies, 53% were self-employed and 0.7% were public limited companies in 2019 (ER029). The sample is somewhat different from the distribution of the survey population: the share of private limited companies was higher and the share of self-employed persons was lower in the sample of the survey.

Table 1

Farm structures in the sample

No	Description	Characteristic	Share of respondents, %
1.	Form of business	private limited company	84
		self-employed person	15
		public limited company	1
2.	Farm type	crop	70
		mixed	29
		cattle	1
3.	Farm size (ha)	below 100	17
		101 – 500	48
		501 – 1 000	15
		above 1 001	21
4.	Farm age (years)	below 10	21
		11 - 20	22
		21 -30	51
		above 30	6

Source: author's calculations based on survey

By field of activity, the majority (70%) of the farms were crop farms, 29% mixed farms, and 1% animal cattle farms. In terms of the farm's age, more than half (51%) of the respondents had been in business of agriculture for 21-30 years, 22% 11-20 years, 21% up to 10 years and 6% 31 years and more. Thus, according to data, the majority of the farms were in crop production, having a long-term agricultural experience.

4. Farmers' preferences regarding crop insurance terms

In order to find out farmers' preferences for crop insurance, respondents were asked whether they would use crop insurance. Regarding this question, the respondents were informed that within the framework of the insurance support that entered into force in Estonia in 2019, the state compensates up to 70% of the insurance premiums paid by a farmer. This additional information was provided to the respondents to find out the willingness to use state-subsidized crop insurance. The respondents' assessments of the willingness to use crop insurance showed that 27% of respondents would use crop insurance and 26% would not. 46% of respondents do not have a clear opinion on the need to use crop insurance. Despite the insurance premium support, the interest of farmers is rather low and most of them did not have a definite preference.

From the point of view of the farmer considering buying insurance, crop insurance principle (compulsory or optional) is making a difference. Compulsory insurance would have a higher potential market volume and lower insurance premiums for farmers. Respondents were asked about their preferences regarding compulsory or optional crop insurance. The difference between compulsory and optional insurance was explained to the respondents. The majority of farmers (79% of respondents) preferred optional crop insurance and 21% compulsory crop insurance. Of respondents who would buy crop insurance, a quarter (25%) preferred compulsory insurance. In contrast, a large proportion (89%) of those who would not buy crop insurance preferred optional insurance.

In terms of crop insurance, insurance premiums and premium subsidies are found to be important for farmers in deciding whether to buy the insurance or not (Ginder, M.G. and Spaulding, A.D. 2006; Boyd, M. et al., 2011; Aditya K.S. et al., 2018; Santeramo F.G. et al., 2016). The respondents were asked how important they consider the following conditions for crop insurance: insurance coverage, deductible, insurance premium, insurance indemnity, premium subsidies, covered risks (Table 2). The most important terms and conditions that play a role in deciding in favour of crop insurance were insurance indemnity (average 4.50), covered risks (average 4.40) and insurance premium (average 4.30). Insurance indemnity was considered very important by 58% and rather important by 31% of respondents. Covered risks were considered very important by more than half (53%) of respondents, which shows that adverse weather conditions that are covered by insurance are important for farmers. As in previous surveys, respondents considered the level of insurance premiums to be important (49% rated it as very important and 35% as rather important). Insurance premium support and deductibles were considered to be less important.

The importance of different insurance terms and conditions in deciding in favour of crop insurance are presented in Table 2. Covered risks and insurance premium subsidies were considered to be more important by the respondents who would buy crop insurance. Based on the T-test, the difference between the average assessments for covered risks ($t = 2.68$, $p = 0.010$) and insurance premium support ($t = 2.81$, $p = 0.008$) was statistically significant, meaning that assessments of the significance of insurable risks and insurance premium support have a significant impact on the insurance decision. In other words: crop insurance would be used by farmers who consider insurable risks and insurance premium subsidies to be relevant for the use of crop insurance. This is consistent with the results by Aditya, K.S. et al. (2018) that insurance

premium subsidies have a positive effect on the insurance decision. Also, these respondents who would buy crop insurance consider risks arising from the adverse weather conditions as more important compared to those who would not buy a crop insurance. Both covered risks and insurance premium support have a significant impact on farmers' crop insurance decisions.

Table 2

Differences in average estimates of the significance of crop insurance terms and conditions based on the willingness to purchase crop insurance

No	Factors	Assessments of the importance of crop insurance	Willingness to purchase crop insurance		
			yes	no	p
1.	Insurance indemnity (EUR/ha)	4.50	4.50	4.63	e
2.	Covered risks	4.40	4.68	4.22	**
3.	Insurance premium (EUR/ha)	4.30	4.21	4.50	e
4.	Insurance coverage (%)	4.30	4.29	4.12	e
5.	Insurance premium support (%)	4.10	4.50	3.77	**
6.	Deductible (%)	4.00	4.11	4.00	e

Source: author's calculations based on a survey

These results suggest that crop insurance decisions in particular are primarily driven by factors such as covered risks and insurance premium subsidies. Insurable risks, which have a low probability of occurrence and very adverse consequences, may be understood differently and depend on the producers' perceptions of the probability and extent of the damage. From a policy perspective, the terms and conditions parameters such as insurance scheme design and information about the policy of insurance premium support are the subject of particular attention.

Conclusions, proposals, recommendations

In this paper farmers' insurance preferences based on factors related to insurance conditions were examined. The existence of a crop insurance premium subsidy measure and clear insurance terms and conditions could encourage farmers to become more interested in using crop insurance as a yield risk mitigation tool. This paper identified the factors that play a role in deciding in favour of crop insurance.

- 1) The survey revealed that despite of the existence of insurance premium subsidies, interest in crop insurance is relatively low (27% would use, 26% would not use, almost 46% do not have a certain opinion).
- 2) The majority (79%) of farmers believe that crop insurance should be optional in Estonia.
- 3) Terms and conditions parameters such as indemnity, risks covered, insurance premium and deductible proved to be important in the decision to purchase insurance.
- 4) Farmers' decision to insure crops was significantly influenced by insurance risks and insurance premium subsidy.
- 5) Crop insurance would be used by farmers who consider insurance risks and insurance premium subsidies to be more important conditions for the use of crop insurance.
- 6) From a policy perspective, these results suggest that crop insurances' premium subsidy measure remains important when farmers are uncertain about the risks and crop insurances' terms and conditions.

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