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# Methods of Risk Protection Used by Polish Farmers

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## Abstract

To answer the research question: what methods of protection against risk do Polish farmers use depending on the farm type, the sample was divided into clusters depending on farm characteristics. The results show that small farms use completely different risk management tools than medium and large farms, no matter what their main product is. There is also a significant difference between farms that have relatively large share of off-farm income and the remaining ones. Summing up, policy makers should prepare a diversified offer of risk-management tools for farmers, depending on their needs.

## Key words:

risk in agriculture, risk management, family farms

### 1. Introduction

Agricultural production is a business that is exposed to relatively high level of risk. Apart from risks common for any other type of business activities, such as financial risk or market risk, agricultural producers have to deal with risks specific to their branch. These are usually connected with natural environment, beyond human control. According to Miller et al. [2004], there are four categories of risk in agriculture, namely: production risk (resulting from weather conditions, insects, diseases of crops and animals), price risk (as a consequence of price fluctuations, in many cases resulting from changes in product supply due to weather and other natural hazards as well as political factors), casualty risk (resulting from such hazards as fire, floods, windstorms, etc), and technological risk (as a consequence of constant development and adoption of new methods and techniques of production).

A slightly different classification of risks is offered by Hardaker et al. [2004] who have divided risk into two basic groups: business risk (including production, price, personal, and institutional risk) and financial risk, referring to the ways of financing the farm. Even though risk is a common phenomenon in agriculture, it is far less common to undertake systematic actions aimed at solving problems resulting from it. As a consequence, risk remains one of the essential problems of agricultural business. As a rule, one of the basic problems with risk-coping is proper defining the essence of risk as well as its level [Hardaker 2000, Lund 2005].

Poor knowledge of risk assessment methods and instruments allowing to minimise its impact result in growth of risk aversion, including its most advanced form: risk evasion, manifesting itself in refusal to accept risks and in consequence leading to farmers' withdrawal from types of activities exposed to risk. There is a widespread opinion that most of the farmers are characterised with high risk aversion [Lien et al. 2005]. However, risk is unavoidable in agriculture, thus in practice much softer form of risk aversion can be observed, that is partial risk evasion, leading to limiting the scope of production [Klimkowski 2002].

In modern world, characterised by various interdependencies between many economic factors, risk is an inevitable part of success in business. In consequence, the only solution for a farmer exposed to various risks is a proper management of the farm, understood not as avoiding risk, but as limiting its negative consequences. According to Saganowski [1998] apart from risk evasion there are the following methods of coping with risk:

- keeping the risk (which means that the farm is fully responsible for covering possible losses)
- risk control (these are actions aiming at lowering frequency of losses as well as their height – this method is said to be out of reach of an individual farm holder)
- risk transfer (this method is based on transferring the risk to another actor through certain legal actions)
- risk distribution (understood as sharing financial consequences of a certain risk by a group; this method can be used by organisations consisting of a large number of farms).

In the agricultural practice there are many tools based on combination of various methods allowing to reduce different types of risk however, according to current knowledge, these tools are not used by wider public. Among the most popular methods of risk management in farming one can find on-farm strategies such as diversification of production programs, stabilization or self-insurance funds as well as risk-sharing strategies like marketing contracts, production contracts, hedging on futures markets, or the participation in insurance or regional mutual schemes [Bielza et al. 2007]. In Europe, the most popular risk management tools dealing with risk-sharing are calamities funds, regional mutual schemes and insurance.

Insurances are the most popular tool of risk management also in Poland, however their usage is not widespread. According to the estimates [Gazeta Ubezpieczeniowa 5.04.2005], in 2005 only 8% of arable land in

Poland was insured. Klimkowski [2002] suggests that the main reasons for low popularity of assets insurance in Poland are: lack of knowledge among farmers, as well as too high (according to farmers) insurance premiums. According to him, lack of knowledge is a consequence of poor understanding of the rules of the market economy. Before 1990, crop insurance and livestock insurance were obligatory and large share of the insurance premium was financed by the government. Then government cancelled the insurance obligation in the early 1990s, by accident at the moment of the lowering of farmers' incomes. As a consequence, rapid downswing of interest in this form of risk reduction was observed. Lower demand for insurance on the other hand resulted in rapid growth of the insurance premiums (currently, depending on the type of risk, it can be as high as 10-12% of the insurance sum).

A newly enacted legal act concerning co-financing by the state of agricultural insurances and livestock insurances can cause a breakthrough on the insurance market, because as much as half of the insurance premiums will be financed by the state. According to this act, since July 2008 all the farmers will be obliged to insure not less than half of their crops against certain natural disasters (flood, drought, hailstorms, improper overwintering, and spring frosts). Each farmer who will apply for public aid basing on high losses resulting from natural disaster will be obliged to present previously signed insurance policy, covering at least 50% of the farmers arable land [Wiadomości Rolnicze]. The above-mentioned regulation was prepared in accordance with the directive of European Commission, which forces each farmer in EU to sign by 2010 a contract insuring his/her crops and livestock. Otherwise the farmer would not be entitled to public aid in covering losses resulting from weather anomalies. It is expected that the new regulations will significantly raise the farmers' interest in insurances. It has to be emphasised that conventional insurance policy does not cover price risks and in consequence – income risks. This type of risk can be reduced by marketing contracts, futures, and options. However, the latter require rather developed forms of agricultural markets, which is still unsatisfactory in Poland. On the other hand, it is expected that during next few years the need for insurance against price risk will be constantly growing, as a result of progressive liberalisation of the world trade.

Growing freedom of trade combined with limitations in taking advantage of various instruments aimed at stabilising prices and incomes result in rise of price and income risk. As a consequence, one can expect a growth of farmers' interest in tools limiting various types of risk. Taking the above into consideration, it seems interesting to analyse methods of risk management used currently by Polish farmers, as well as their plans concerning coping with risk in the future.

## 2. Research methods and the goal of the paper

In this paper the authors were using data collected with the use of standardised questionnaire. The sample consisted of 206 farmers taking part in Polish FADN. The interviews were carried out in 2006 and the questions concerned behaviours and facts that took place in 2005<sup>1</sup>. The basic aim of the questionnaire was to learn about the opinions and thoughts of the farmers concerning risk and risk management. Apart from analysing the farmers' views, the questionnaire also contained questions concerning potential, type and scale of production. This allowed the authors to find the answer for the key research question, that is distinguishing various approach towards risk depending on the type of farm. Finding the answer for question stated in such a way seems interesting not only as a scientific description of certain phenomenon, but also gives chance to offer practical advice for future selection of tools of agricultural policy, thus developing methods of risk management in various types of farms depending on their characteristics (size, scale and type of production, etc).

The authors stated the hypothesis that both farmers' opinions as well as methods of risk management used currently or planned for the future differ according to the farms production characteristics. If the above hypothesis is confirmed, it implicates that different types of farms should be provided with different offer of risk management tools. In order to verify the hypothesis descriptive statistics was used. Later on cluster analysis was used. The inter-group differences were tested with the use of chi-squared method.

## 3. Sample characteristics

The interviews were carried out in family farms; the average size of the farms was slightly above 34 ha of utilised agricultural area (UAA), which means that they were few times larger than the average farm in Poland (which is 8 ha of UAA) (see table 1). However, the majority of farms in the sample was smaller than 20 ha, farms larger than 50 ha formed 12% of the sample, which explains the high average size. As for the type of production, the distribution was more even; only poultry farms formed as little as 2% of the sample which represents their share in the whole population. The type of production was specified basing on the dominating type of production as well as the farmer's declaration.

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<sup>1</sup> The interviews were part of an international research project „Design and economic impact of risk management tools for European agriculture”.

Table 1. General sample characteristics.

Average agricultural area [ha]	Average number of milking cows [heads]	Average number of sows [heads]	Average number of fatteners [heads]	
34,60	16,41	12,33	46,91	
Farm structure according to size [% of farms]				
<10ha	10 - 20 ha	20 - 50 ha	50 - 100 ha	>100 ha
23	33	32	6	6
Type of production [% of farms]				
plant	mixed	milk	pigs	poultry
22%	34%	25%	17%	2%

Source: own calculation

In order to form groups of farms that differ according to certain characteristics, the authors used the following criteria:

- farm size
- basic activity of the farm
- off-farm income
- the way of selling agricultural products
- participation in processing
- preparing business plan

The farm size criterion was based on three variables, such as amount of agricultural land in ha owned by the farmer and scale of animal production measured by number of milking cows and number of fattening pigs. In this case cluster analysis was carried out with the use of k-means method. The clusters that were formed are presented in the table 2.

Table 2. Type of farms in the sample according to their size and scale of animal production.

Clusters	Number of farms	Average number of fattening pigs	Average number of milking cows	Average amount of agricultural land (ha)
Small farms	150	5 [8,3]*	5 [8,9]	16,19 [10,03]
Medium farms with many fattening pigs	5	220 [42,58]	0 [0,45]	37,69 [19,9]
Medium farms with medium number of fattening pigs	24	73 [27,65]	1 [3,09]	30,28 [13,02]
Medium mixed farms	16	11 [20,76]	10 [16,47]	74,83 [23,45]
Large farms	5	22 [30,33]	6 [14,31]	183,26 [36,33]

\*In square brackets there are standard deviations within clusters.

Source: own calculation

The next differentiation was based on the main activity criterion. Basic activity of the farm could be animal breeding, crop production, or animal breeding and crop production at the same time. In the sample analysed there were 95 farms declaring that their main activity is crop production and animal breeding, 61 farms focusing on animal breeding and 50 farms with mainly crop production. That makes 46%, 30%, and 24% of the sample, respectively.

Features indicating farmer's engagement in market processes, such as the way of selling agricultural products, participation in processing, and preparing business plan were analysed together. As for the way of selling, there were 4 answers used: individual sales, marketing contracts, production contracts, and selling through

cooperatives. Most of the farmers did not participate in the processing, so this variable did not differentiate the sample. After using the hierarchical method, there were five clusters formed; they are presented in the table 3.

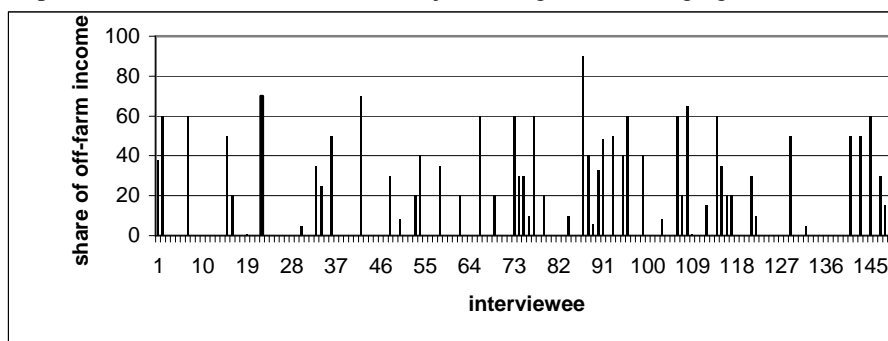
Table 3. Type of farms in the sample according to the way of selling and preparing business plan.

Clusters	Number of farms	Cluster description
1	95	Individual sales, no business plan
2	38	Individual sales, prepares business plan
3	40	Sales through marketing contracts, business plan prepared or not
4	19	Sales through cooperative, usually no business plan
5	14	Sales through production contracts, usually no business plan

Source: own calculation

The last criterion of farms differentiation used in this analysis was share of off-farm income in total income of the family as declared by the respondents. As many as 148 farmers (77%) estimated it on the level lower than 10% of the income. The distribution of the answers of remaining 48 farmers was rather balanced. As a result, the researchers decided to use in the further analysis dichotomised answers, namely: up to 10% of off-farm income and over 10% of off-farm income. Apparently, many of the farmers that form the cluster of the small farms declare having an off-farm job (graph 1).

Graph 1. Share of income from off-farm job among farms belonging to the cluster of small farms (in %).

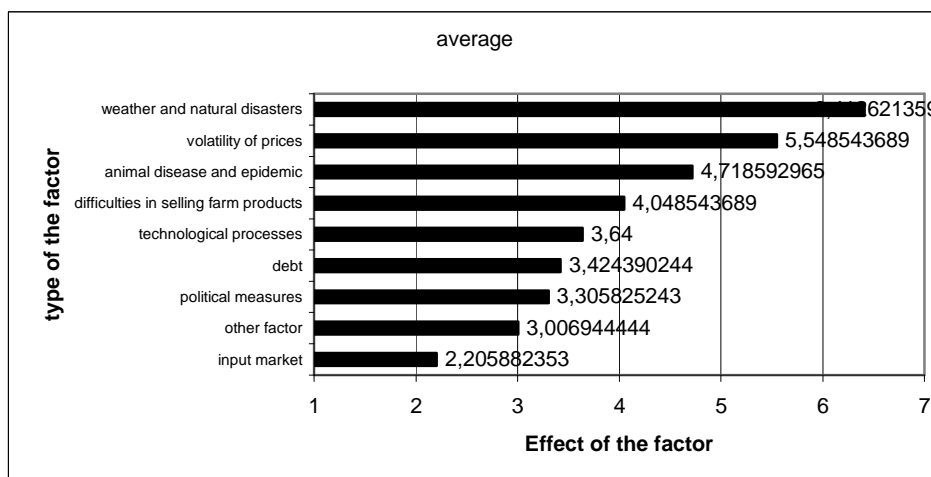


Source: own calculation

#### 4. Opinions of the farmers concerning risk and risk management

According to the theory (see the introduction) there are at least several types of risks that farmers face, and they can be grouped depending on their causes. In the interviewed farmers' opinion the most influential risk factors in agricultural production were weather and natural disasters (see graph 2).

Graph 2. Average effect of selected factors on farming activities (1 - no effect, 7- large effect) in the opinion of the interviewed farmers.



Source: own calculation

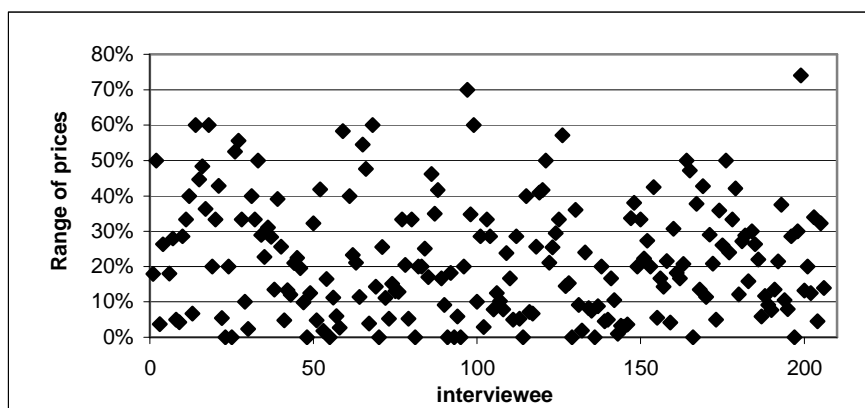
The second place was taken by volatility of prices, and the third by animal disease and epidemic. As the least influential risk factor from the choice list the interviewees mentioned input market understood as problems with buying means of production. It is worth emphasizing that the respondents gave relatively similar answers concerning the strength of influence of certain risk factors (standard deviation varied, depending on the factor, between 1.1 and 2.2). It seems important that as many as 17% declared that their farms had been close to bankruptcy due to the above mentioned risk factors. The most frequently mentioned risk factor causing such a dramatic situation was the climate (mentioned by 51% of farms that had been close to bankruptcy), followed by farmer's health problems and market factors (31% each). The remaining causes of problems were mentioned rather seldom.

The research revealed that, apart from 17% of the respondents who were on the verge of bankruptcy, the remaining farmers also faced in the past various situations causing significant losses, even though not serious enough to endanger the farm's existence. It was revealed that one of the main factors influencing the farms' situation was the production risk in most cases represented by yield instability. The minimum and maximum yield level of the main crop in the last five years varied significantly. Difference between the highest and the lowest yield ranged between 0% and 87% of the highest yield. The average was 45% with standard deviation as high as 16%. Similarly large differences in the output could be observed in the animal production: the range of minimum and maximum production of the main product was between 0 and as much as 97% of the highest production. The average was 42% and standard deviation 22%.

According to the answers given by the interviewed farmers, unexpected loss exceeding 10% of the anticipated crop production was faced on average 2.8 times during the last 10 years, and was not faced even once only by 13% of the respondents. Unexpected yield loss lowered the income on average by 26%. In more than 90% of the cases the loss was caused by the drought; consequently, one can conclude that this is the main factor of production risk in Poland. As for the animal production, unexpected loss exceeding 5% of the planned production was faced by the respondents on average 2 times during the last 10 years, causing the reduction of the herd by 18% and of the anticipated income by as much as one fifth. In more than 70% of the cases the loss was a result of animal disease.

The second factor, apart from production problems, significantly influencing stability of agricultural production is price risk (marketing risk). It is observed that its significance is growing with the liberalisation of the economy. According to the respondents' declarations, the prices for their main products were changing significantly during the last 5 years (see graph 3). The range of prices varied from 0% to 74% of the maximum price. On average, the changes reached 22% of maximum price (standard deviation 16%). The changes were so rapid, even though as many as 56% of farmers knew where they were going to sell their products before the beginning of production, and 37% knew it partly. It is worth mentioning that knowledge of the place where the output would be sold prior to the harvest resulted in most of the farmers (76%) having no problems with marketing their products during the last 5 years; only 23% of the respondents declared having such difficulties.

Graph 3. Range of prices for the main product in years 2001-2005 calculated as share of the maximum price obtained.



Source: own calculation

Apart from the above described risk factors, there is one more important element influencing the farming, namely financial risk referring to indebtedness and other issues connected with financing the farm activities. In the analysed sample, almost 65% of the farms had credits, on average higher than 100 thousand PLN. From the point of view of financial risk it is important to have an easy and fast access to crediting. Most of

the respondents stated that they had access to credits, however the conditions offered by banks and the procedures were unfavourable. Only 1/3 of the farmers declared that they could obtain credit quickly, easily, and on favourable conditions. Such situation has to be commented as a factor enlarging level of financial risk on the farm.

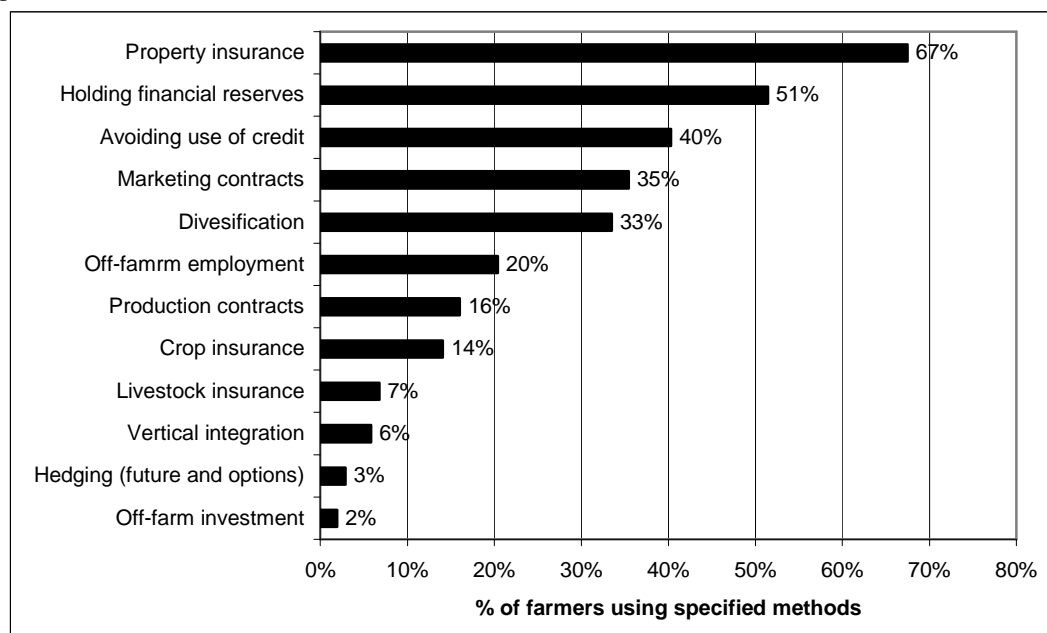
## 5. Methods of protection against risk used by Polish farmers

As for methods of protection against risk, the farmers were asked to mark the methods currently used by them. They could choose from a list of the following methods: crop insurance, animal insurance, diversification, marketing contracts, production contracts, off-farm investments, off-farm employment, assets insurance, vertical integration, avoiding use of credit, hedging (options and futures), holding financial reserves.

### 5.1 Currently used methods of risk protection

The use of certain methods of risk-coping among interviewed farmers is presented on graph 4. The respondents most frequently declared using assets insurance (almost 70% of the farmers), which results from the fact that currently in Poland insuring some of the assets (such as buildings used for farming) is obligatory. When considering risk-coping methods that are not obligatory, the most popular ones were keeping financial reserves (51%) and avoiding credits (40%). One third of interviewed farmers diversify their production, that is plant different species of crops or breed various animals, and 1/5 of the respondents have off-farm jobs. Insurances are not too popular; crop insurance is used only by 14% of the respondents, and animal insurance by even less, that is by 7%, while as many as 67% farmers insure their assets. Although 35% of respondents used marketing contracts, only 16% sign production contracts. The least popular are off-farm investments, hedging, and vertical integration.

Graph 4. Methods of risk protection used by interviewed farmers in 2005 (% of farmers declaring using particular method).



Source: own calculation

When analysing currently used methods of protection against risk, there are no statistically significant differences between farmers, depending on their production profile. However, the differences appear when we differentiate farmers according to the share of off-farm income. Farmers whose off-farm income is higher than 10% of the total income are less likely to sign production contracts and to use assets insurance in comparison with the remaining farmers. On the other hand, they are more likely to protect themselves against risk through off-farm employment and avoiding credits. The remaining variables, that is: crop insurance, animal insurance, diversification, marketing contracts, off-farm investments, vertical integration, hedging, and holding financial reserves were not significantly different depending on the share of off-farm income.

The differences also appear when we look at farms depending on their size and scale of animal production (Table 4).

Table 4. Methods of risk protection used by the interviewed farmers in 2005 depending on the scale of production (% of farmers using specified method)

Method of risk protection	Cluster				
	Small farms	Medium farms with many fattening pigs	Medium farms with medium number of fattening pigs	Medium mixed farms	Large farms
Crop insurance	6	40	42	31	40
Livestock insurance	5	0	13	0	0
Diversification	39	0	17	25	20
Marketing contracts	29	60	50	50	80
Production contracts	15	40	0	38	0
Off-farm investment	2	0	0	6	0
Off-farm employment	27	0	0	0	0
Property insurance	62	100	83	75	80
Vertical integration	7	0	0	6	20
Avoiding use of credit	44	0	33	38	20
Hedging (future and options)	2	0	0	6	20
Holding financial reserves	49	40	67	63	60

Source: own calculation

Small farms in general do not use crop insurance, while all the remaining types (medium and large farms) gave positive answer to this question more often. The situation looks similar when considering marketing contracts. Small farmers tend to use off-farm employment, while this method is generally not used by medium mixed farms and medium farms with medium number of fattening pigs. The remaining two groups, that is large farms and medium farms with many fattening pigs, gave mixed answers.

Let us now look at the sample from the following perspective - the way of selling products and preparing business plan. Farms that sell their products on their own and do not prepare business plan do not use marketing contracts, production contracts or asset insurance and they tend to avoid taking credits. On the other hand, farms that sell on their own but prepare business plan are also reluctant to use production contracts, but they insure their assets and do not avoid taking credits. Generally speaking, farmers that sell through marketing contracts are not afraid to take credits, and the remaining methods of protection against risk are used by some of them. To compare, farms that sell through production contracts do not use asset insurance, and the remaining methods are used by some of them. Farmers selling their products through cooperatives are not homogenous in their decisions, so there were no significant tendencies in this group.

## 5.2 Methods of risk protection planned to be used in the future

The respondents were asked to mark methods of protection against risk which they would like to use in the future. Contrary to the currently used methods, methods that are planned for the future differ depending on the production profile (Table 5).

Table 5. Methods of risk protection planned to be used in the future depending on production profile.

Cluster	Crop insurance	Livestock insurance	Diversification	Marketing contracts	Production contracts	Off-farm employment	Vertical integration	Hedging	Keeping financial reserves
% of farmers planning to use specified methods									
Crop and animal production	65	52	40	35	22	32	3	1	61
Mainly crop production	72	6	48	48	16	20	6	6	56
Mainly animal production	46	54	25	33	13	15	8	0	56

Source: own calculation



Farmers who concentrate mainly on crop production plan to use crop insurance and not insure animals. Almost half of them also plan to take advantage of production diversification. The answers given by farmers who concentrate on animal production are a bit different: animal insurance, less frequently crop insurance as well as diversification. Additionally, they less frequently have plans to look for off-farm employment. Farmers who have both crop and animal production plan mainly to insure their crop and animals and to keep financial reserves.

There were also significant differences between farms depending on the share of off-farm income in total farm income. Farmers whose share of income from off-farm jobs is lower than 10% plan to use animal insurance and production diversification in the future and will not look for off farm jobs, they are also not afraid to take credits. Farmers with share higher than 10% gave the reverse answers.

When considering the size of farms and scale of production, small farmers more rarely plan to use animal insurance, but more often consider looking for off-farm employment in the future. They are less willing, in comparison with the other farmers, to take credits. Medium farms with large or medium number of fattening pigs in most of the cases plan to use animal and crop insurance. Farmers who have medium mixed farms without animal production know that they will not look for off-farm jobs. The answers for the remaining questions are diversified and do not depend on the farm size.

Table 6. Methods of risk protection planned to be used depending on the size and scale of production.

Planned methods	Cluster				
	Small farm	Medium farms with many fattening pigs	Medium farms with medium number of fattening pigs	Medium mixed farms	Large farms
	% of farmers planning to use specified methods				
Crop insurance	59	80	67	69	80
Livestock insurance	35	80	79	31	20
Diversification	37	20	42	50	40
Marketing contracts	35	60	42	44	60
Production contracts	20	20	8	19	0
Off-farm investment	9	0	4	0	20
Off-farm employment	31	0	13	0	0
Property insurance	37	60	42	31	40
Vertical integration	7	0	0	6	0
Avoiding use of credit	38	0	25	25	20
Hedging (future and options)	2	0	0	0	20
Holding financial reserves	57	60	50	69	60

Source: own calculation

Considering farm division based on criterion of participation in market processes, farmers who market their products through individual sales and do not prepare business plan declared that they were not willing to use animals insurance in the future, but they would look for off-farm employment and avoid taking credits. Those using marketing contracts would not try off-farm employment and were not willing to avoid credits. Farmers who sell through cooperatives plan to use animals insurance. The remaining answers did not depend on the way the farmers market their products.

## Conclusions

The research revealed that farmers from the analysed population face a number of risk caused by various factors. One of the basic problems for the farmers is a production risk resulting mainly from climate conditions, most often from frequent droughts. Another important issue is marketing risk connected strongly with instability of prices. The analysis showed that, despite experience of high losses, relatively few farmers use active methods of risk management such as crop insurance or hedging. In the analysed sample one could also observe some differentiation of risk-coping methods depending on certain farm characteristics. It seems that the most important differences in methods of protection against risk can be found between small farms (dominating in the sample) and larger farms. Differences between various types of medium farms and large farms are not so significant. As a rule, smaller farms prefer to protect against risk through limiting their production (described in the literature as partial risk evasion), avoiding credits and looking for off-farm employment. Larger farms choose

to develop their activities, do not avoid taking credits, and among methods of protection against risk used by them one can find insurances. It can be concluded that proper farm management and development of the agricultural business tend to increase the scope of insurance used by a farmer.

It seems that with time smaller farms will shift towards part-time farming, using off-farm income as a collateral in case of financial problems, while larger farms will become more business-like. As a consequence, there should be diversified (at least dichotomized) offer of risk protection tools depending on the viability of the farm and its level of development. One can assume that in the future larger farms will tend to seek for professional help and access to modern tools of risk reduction (such as marketing contracts or hedging). Smaller farms, on the other hand, will be more likely to secure the families' income through looking for additional income sources or avoiding risky situations such as taking credits. Taking the above into consideration, it seems that policy makers should prepare for farmers a diversified offer of risk-management tools, depending on their needs. Probably with time the agricultural markets will develop in a way allowing for the use of marketing contracts, futures, and options on a wider scale – of course, only by larger farms.

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