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AGRICULTURAL RISK AND ITS PERCEPTION AMONG PROTEIN PLANT FARMERS

Key words: risk, risk perception, farms

ABSTRACT**.** As farmers are exposed to risk and uncertainty, they are unable to make optimal choices. The main purpose of this paper was to present how farmers perceive risk in agriculture.To meet the objective defined above, this paper relied on the results of a 2018 survey conducted with a sample of 137 legume farms across the country. The information was analyzed and described with the use of descriptive statistics methods. Also, the correlation between selected characteristics was assessed with the Pearson's contingency coefficient (C) based on the chi-square test of independence. Most interviewees (71%) perceive the effects of risk as the possible emergence of losses or profits, while 29% associate risks with losses only. None of the interviewees declared the perception of risks purely as an opportunity to reap benefits. The respondents believe that agricultural businesses should be most wary of production risk (an average rating of 11.6) and market risk (8.1 to 9.0).

INTRODUCTION

Risks are an inherent part of economic activity, in particular agriculture, and are associated with all actions taken by the operator. Farmers must make decisions and prepare forecasts but are unable to tell precisely whether their decisions will prove to be right or wrong. According to Piotr Sulewski [2014], risk can be regarded as having a hindering effect on optimum decision-making and, thus, on the optimum use of farm resources.

Also, risks can be perceived as a combination of the probability of something unpredictable happening and random impacts or adverse consequences [Winsen et al. 2014]. In agriculture, risks are related to the producers' uncertainty of whether expected production and economic results are met [Hardaker 2000]. When the probability, extent and impacts of a phenomenon increase, so does risk. Agriculture is, by nature, a risky enterprise. However, currently, the changing climate and price instability have a direct or an indirect impact on the social and economic stability of farming conditions, and contribute to production and income losses [Jerzak et al. 2015].

Usually, the following classification of risks is used with respect to agriculture: production risk, market risk, financial risk, institutional risk and personal risk [Hardaker et al. 1997, Harwood et al. 1999, EC 2001, Miller et al. 2004]. Income risk, a combination of production and price risks, is also referred to in the literature [Pawłowska-Tyszko 2009, Majewski et al. 2008].

According to Elke Weber and Richard Milliman [1997], risk-taking itself is a personality trait. They believe that people, when faced with different decision-making situations, assume a similar level of risk. As theorized by David Jonanssen and Barbara Grabowski, taking or avoiding risk is a dimension of personality which refers to individual preferences for selecting an option with a high, yet improbable reward or one with a low, but highly probable reward [Sołtysiak 2014]. Note that people behave in accordance with how they perceive risks rather than what the risks actually are [Asnar, Zannone 2008]. Economists have been placing focus on the role of psychological aspects in risk-taking for many years, not only in the context of crisis. For instance, Krzysztof and Teresa Jajuga [2007, p. 193] state: "First, psychological aspects are inextricably linked to risk (...)". Psychological aspects of risk-taking are also of extreme importance to business or farm managers. This is because their perception of risk affects the decisions they make, change, defer or avoid. Therefore, the perception of risk results in a modification of decisions made by managers. For the managers, the perception of risk also involves an estimation of potential losses they may incur due to various decisions they make.

Two concepts of risk perception prevail in the relevant literature: the defensive concept (which forms the basis of the theory of insurance) and offensive concept. In the defensive approach, risk is regarded as the likelihood of damage or loss, i.e. an adverse development [Philip 1967, Szymański 1961, Bruhwiler 1980, Gup 1992, Sjöberg 2000]. Conversely, according to the offensive risk concept, risk is considered to be an inherent part of economic activity, and is regarded not only as a source of losses but also as a source of potential profits [Drucker 1976, Osiatyński 1963, Grzybowski 1976]. Some scientific papers refer to yet another concept of risk perception: the psychological analysis of risk, an approach focusing directly on the decision maker. The decision maker subjectively specifies the likelihood of a specific risk situation and takes specific steps, having considered the amount of risk and his/her preferences in this area [Kozielecki, Kotarbiński 1965, Kozielecki, Kietliński 1972].

In practice, farmers differ in how they perceive and are exposed to risks. The risk management strategies in place do not depend solely on an objectively defined risk exposure but also on how the risks are subjectively perceived by a farmer. The way the farmer perceives risks changes depending on his/her own experience and risk aversion [Jerzak 2013]. In Poland, problems involved in risk perception by farmers have rarely been addressed in research [Sulewski, Kłoczko-Gajewska 2014, Laska, Wicki 2012, Sulewski, Pogodzińska 2018,]. However, this topic is tackled in many international publications [Wilson et al. 1988, Meuwissen et al. 1999, Flaten et al. 2005, Foguesatto, Machado 2017, Rianne et. al. 2015]. The main purpose of this study was to present how farmers perceive risk in agriculture. Note that these are the very ones who make multiple decisions on a daily basis, and that their decisions have a direct effect on the functioning of their farms. Because farmers are exposed to risk and uncertainty, they are unable to make optimal choices, as assumed in the neoclassical model[1].

[1] The model assumes that decision makers have a complete picture of the situation; are fully aware of the possible scenarios; can act effectively in a context of uncertainty; and are able to reasonably and logically assess all aspects of the relevant situation.

MATERIAL AND METHODS OF STUDIES

To meet the objective defined above, this paper relied on the results of a 2018 survey conducted with a sample of 137 farms located across the country. Also, this paper relied on research carried out under the multi-annual programme of the Ministry of Agriculture and Rural Development for 2016-2020 ("Enhancing the use of domestic feed proteins in the production of high-quality animal products in a sustainable development perspective"). A purposive sampling technique was used. The sample selected consisted of farms engaging in legume production which had received a crop-specific payment for legumes in previous years, and whose farmers agreed to take part in the study. The study was based on personal interviews with the use of a survey questionnaire. The questions were also asked with the use of the rank and Likert scale. Once collected, the information was analyzed and described with the use of descriptive statistics methods. Also, the correlation between selected characteristics was assessed with Pearson's contingency coefficient (C) based on the chi-square test of independence.

CHARACTERISTICS OF THE SURVEYED FARMS

The survey covered 137 farmers with an average farming experience of 23 years. The largest and smallest group was composed of persons aged 30-39 (34%) and up to 29 (10%), respectively. In the group surveyed, 45 persons (33%) had a tertiary agricultural education, 26 persons (19%) had a vocational agricultural education, 24 persons (18%) had a tertiary education, 7 persons (5%) had a secondary agricultural education and 7 persons had a primary education. The average farm area was 305 ha (with the minimum and maximum area being 40 ha and 4200 ha, respectively). The dominant activity was crop production for 74 farms (54%), mixed production for 39 farms (28%) and livestock production for 24 farms (18%). Legumes were cultivated by all farmers. Yellow lupine was cultivated in 14 farms (on an average area of 24 ha); narrow-leaved lupine was cultivated in 39 farms (on an average area of 19 ha); pea was cultivated in 18 farms (on an average area of 45 ha); fodder pea was cultivated in 21 farms (44.4 ha); and soybean was cultivated in 23 farms (6 ha). 82% of interviewees declared farming income to be the main source of income for their household budget. Income was assessed based on the amounts of income earned in the year prior to the survey (2017), as declared by the farmers. There were large differences in income across the population surveyed. Farms with an annual income of PLN 250,000 or more made up as much as 55% of the interviewees, whereas 33% of the population surveyed had an annual income of PLN 30,000 to PLN 50,000. There was one farm with an income of PLN 15,000 to PLN 30,000 and another farm with an income of PLN 100,000 to PLN 200,000.

RESULTS OF THE STUDY

As shown by this study, 94% of interviewees have faced a situation threatening the continued existence of their undertaking within the last 5 years. In most cases (53%), the risk factors cited by the farmers were disadvantageous climate conditions, as well as animal or plant diseases resulting in production losses. 33% of farmers suffered losses due to price instability of agricultural produce available in the market.

The risk involved in each activity, including agriculture, needs to be perceived in two ways. On the one hand, it means the possible failure to attain the expected outcome; but on the other hand, it provides an opportunity to deliver an outcome other than expected. In view of the above, the farmers surveyed were asked to associate the potential risk impacts with one of the following answers: "only a potential loss," "only a potential profit," or "a loss or a profit" (Figure 1).

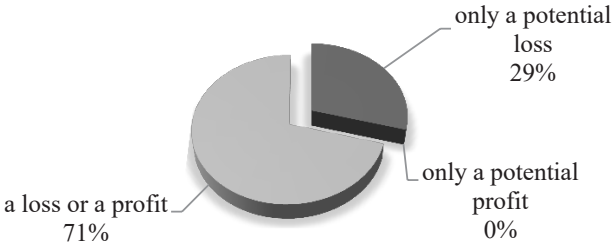

Figure 1. The farmers' perception of potential risk impacts

Source: own study based on the questionnaire survey

Most respondents (71%) adhere to the neutral risk concept, i.e. equate the possible risk impacts with a loss or a profit. 29% of farmers associate the potential effects of risk only with a loss (the negative concept). None of the interviewees declared to perceive risks only as an opportunity to reap benefits. If the risk is considered to be a threat, measures can be taken to reduce it. Conversely, by taking the positive role of risks into account, higher benefits may be generated by engaging in a risk-bearing activity. In turn, the neutral concept of risk allows farmers to increase benefits as a risk premium.

The study also covered the relationship between the perception of potential risk impacts by the farmers surveyed and their age, gender and education. The Pearson's contingency coefficient indicated weak or moderate links between the characteristics in question, reaching 0.44, 0.51 and 0.24 for the correlation between the perception of risk impacts and the respondents' gender, age and education, respectively (which signifies weak correlation levels).

In this study, the farmers classified various risks, ranking them correspondingly from 1 (negligible) to 12 (crucial) (Table 1).

The respondents believe that agricultural businesses should be most wary of the production risk caused by climate and weather changes (an average rating of 11.6). This is supported by earlier research by Anna Kłoczko-Gajewska, P. Sulewski [2009] and Magdalena Śmiglak-Krajewska [2014]. The risk of a contractor's insolvency (9.8) was ranked second by farmers, followed by the risk of changes in prices of productive inputs (4.0) and changes in prices of agricultural crops (9.0). The farmers were least afraid of

Table 1. Average rating of the farmers' perception of agricultural risks

Risks	Mean	Std.
Production risk (weather factors)	11.6	0.77
Contractor's (buyer's) insolvency risk	9.8	1.98
Risk of change in prices of labour inputs	9	1.79
Risk of change in prices of agricultural crops	8.1	1.72
Risk related to the demand for agricultural crops	7.7	2.21
Risk of becoming insolvable	7.3	2.35
Production risk (technological factors)	6.5	2.56
Risk related to a political shift	5.4	2.5
Risk related to legislative amendments	5.2	2.46
Interest rate risk	3.7	2.35
Human factor risk (illnesses, work accidents)	3.7	2.07
Solvency risk	1.9	1.27

Source: own study based on the questionnaire survey

personal risk (3.7) resulting from threats such as disease, work accidents or death, and the risk of their own insolvency (1.9). Note that the farmers surveyed were consistent in their assessment of major agricultural risks: the standard deviation varied in the range of 0.77 (production risk) to 2.56 (technological risk).

The survey also included a question on the respondents' perception of the likelihood of certain events affecting their farms. The farmers could choose between 12 types of natural, economic and personal threats and between 5 different responses. On average, the interviewees found extreme drought (68%) and frost (65%) to be the most likely threats. In turn, they believed pest infestation (23%) and fortuitous events such as fire or flood (26%) to be the least likely (Figure 2).

Currently, farmers must invest to survive in the market. Investment projects implemented by farms provide benefits to farmers, save labour inputs, improve market competitiveness and result in organizational improvements but, at the same time, require capital expenditure, i.e. spending money. As regards investment activities, the farmers often make decisions to address problems they face for the first time, and are, therefore, exposed to risks. In the next question, the respondents were presented with 5 statements, and were asked to rate them at their own discretion depending on how much they agree with each statement (from "definitely agree," "rather agree," "no opinion," "rather disagree" to "definitely disagree"). 87% of respondents claim they cannot afford to take a risk in their farms, while 13% disagree with that statement. As noted by the farmers, the investments are often expensive and require the use of borrowed capital in addition to own funds. For the investors, it is extremely important and difficult to choose an investment which will generate income in the future. 16% of the respondents are afraid to borrow investment funds even if it could improve their farm's profitability, 39% have no opinion, and 45%

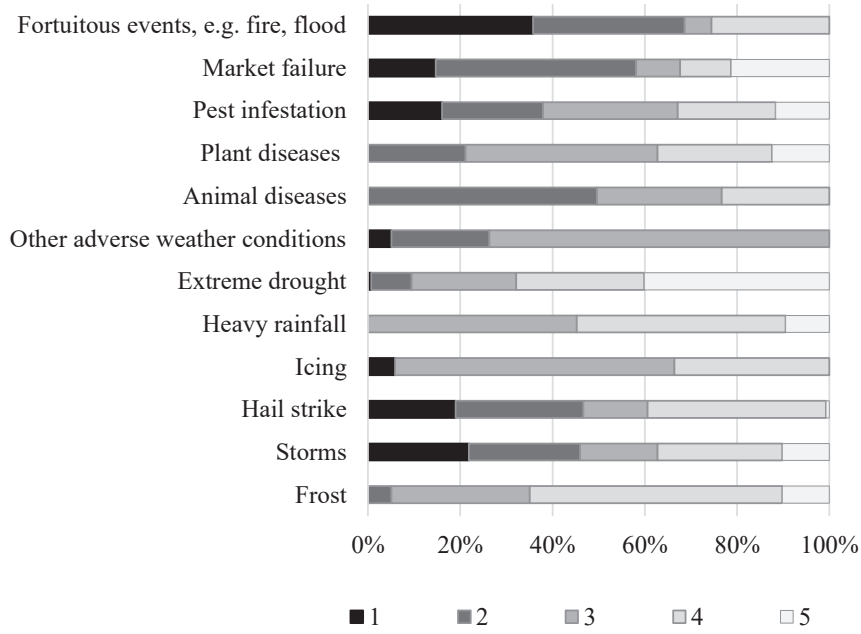

Figure 2. Likelihood of certain events affecting the farms surveyed (1 – highly unlikely, 2 – unlikely, 3 – no opinion, 4 – likely, 5 – highly likely)

Source: own study based on the questionnaire survey

are not afraid to do so. Most respondents (26%) rather agree with the statement "I only make investments when they become strictly necessary"; 30% have no opinion while 10% strongly agree. As shown by this study, 26% of respondents are very cautious in their financial decisions (investments or loans); 15% disagree and 15% have no opinion. Most farmers surveyed (78%) are afraid they are unable to do enough to avert risk to the highest possible degree. The respondents were also asked to specify the investment financing method (using a loan or own funds) which requires a more detailed analysis (Figure 3).

The vast majority of farmers surveyed (68%) stated that investing their own funds requires a more in-depth analysis. This corroborates the conclusions made by Richard Thaler and Eric Johnson [1990] who discovered that people are less willing to risk their own hard-earned money.

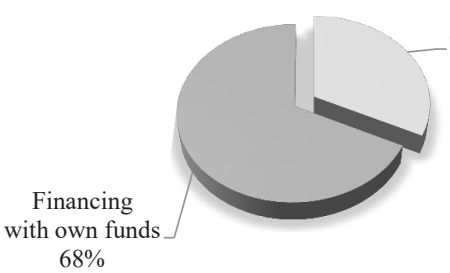

Figure 3. Sources of investment which require a more detailed analysis

Source: own study based on the questionnaire survey

Agriculture is affected by a considerable instability of and variation in production conditions and prices of agricultural produce. Therefore, agricultural producers seek solutions to minimize that risk. The survey asked the farmers about their opinion on methods (among 16 propositions) that would allow them to effectively reduce the risks potentially affecting their farms (Figure 4).

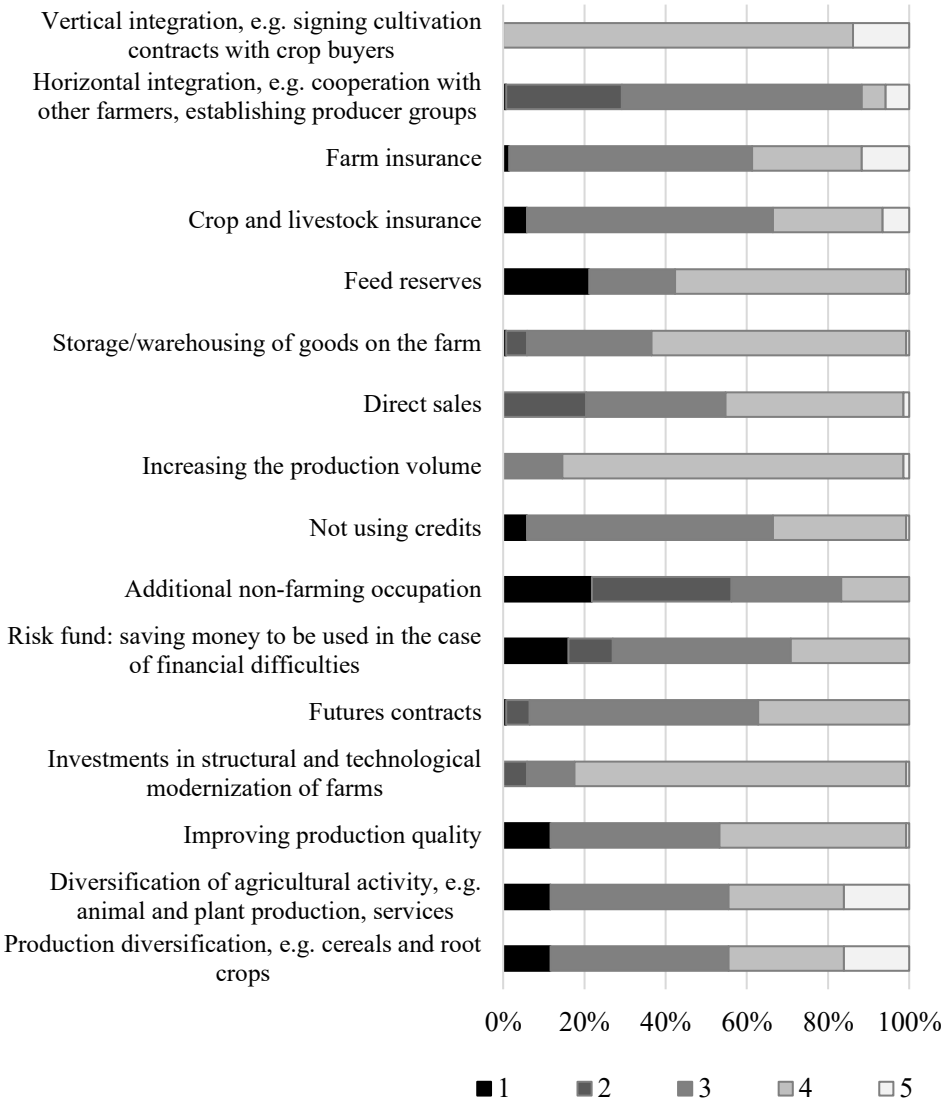

Figure 4. Assessment of methods used to offset the effects of agricultural risks 1 – highly unlikely, 2 – unlikely, 3 – no opinion, 4 – likely, 5 – highly likely)

Source: own study based on the questionnaire survey

All respondents found cultivation contracts to be the most effective tool in reducing the risk of a disadvantageous change in prices and sales. Upon signing the contract, agricultural producers may distribute their production risk in line with the risk sharing pattern. Also, the farmers highly valued (63%) the ability to store (warehouse) agricultural produce on their farms, and hold feed reserves (58%). Interestingly, diversification of activity and insurance of crops and livestock are rated low by the interviewees. Only 44% indicated the diversification of activity to be a good solution allowing to offset the negative effects of risk. Only 34% of interviewees found insurance to be an effective method for minimizing adverse farming events, while as much as 60% had no opinion on this matter. In a 2011 survey conducted by P. Sulewski and A. Drożdż [2012], the usefulness of insurance was also rated low by the farmers surveyed. This may result from low levels of knowledge on insurance. The respondents also indicated that the price of insurance is too high and the benefits small.

SUMMARY

As shown by this study, the farmers surveyed have faced a situation threatening the continued existence of their farms over the last couple of years. Most respondents (71%) perceive the effects of risk as the possible emergence of losses or profits, while 29% associate risks with losses only. The respondents believe that agricultural businesses should be most wary of the production risk (an average rating of 11.6) and market risk (8.1 to 9.0). The results suggest there is little variation in the perception of risk by respondents; the standard deviation varied in the range of 0.77 to 2.56. This study did not enable the clear identification of characteristics that affect the different perception of risk among the farmers surveyed. Such variables as gender, education or age were not significant determinants of risk perception (the Pearson's contingency coefficient was 0.24 to 0.51). The respondents found cultivation contracts (100%) to be the most effective tool in reducing the risk of a disadvantageous change in prices and sales. 78% of farmers surveyed are afraid they would be unable to do enough to avert risk to the highest possible degree. A study on a larger group of farmers should be conducted in order to formulate detailed conclusions, considering the impact of behavioral effects that may affect decisions made by farmers.

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RYZYKO W DZIAŁALNOŚCI ROLNICZEJ ORAZ JEGO POSTRZEGANIE PRZEZ ROLNIKÓW UPRAWIAJĄCYCH ROŚLINY BIAŁKOWE

Słowa kluczowe: ryzyko, postrzeganie ryzyka, gospodarstwa rolne

ABSTRAKT

Rolnicy działają w warunkach ryzyka i niepewności, co sprawia, że nie są w stanie dokonywać wyborów w sposób optymalny. Głównym celem opracowania jest zaprezentowanie, w jaki sposób rolnicy postrzegają występujące w rolnictwie ryzyko. W realizacji postawionego celu posłużono się wynikami badań ankietowych przeprowadzonych w 2018 roku na próbie 137 gospodarstw rolnych, uprawiających rośliny białkowe, z terenu całego kraju. Zebrane informacje zostały poddane analizie, a następnie opisane przy zastosowaniu metod statystyki opisowej. Dodatkowo przeprowadzono ocenę związku korelacyjnego między wybranymi cechami przy wykorzystaniu współczynnik kontyngencji C Pearsona, opartym na teście niezależności chi-kwadrat. Większość ankietowanych (71%) postrzegała skutki ryzyka jako możliwość wystąpienia straty lub zysku, a 29% wyłącznie jako poniesienie straty. Nikt z ankietowanych nie wskazał, że postrzega ryzyko wyłącznie z możliwością osiągnięcia zysku. Według respondentów w prowadzonej działalności najbardziej należy obawiać się ryzyka produkcyjnego (średnia ocean 11,6) oraz ryzyka rynkowego (8,1-9,0).

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