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PIOTR SULEWSKI
Warsaw University of Life Sciences
Warsaw

RISK AVERSION AND PROFITABILITY OF PRODUCTION FACTORS IN AGRICULTURAL HOLDINGS – THEORETICAL AND EMPIRICAL APPROACH*

Abstract

In the paper, an attempt to investigation the relation between farmers' attitude towards risk and profitability of production' factors has been undertaken. A resource-based theory of the firm underlines that the competitive advantage of the firm comes from owned resources. According to neoclassical economic theory, rational use of resources is associated with maximizing economic results, however under risk and uncertainty achieving such objective seems to be a difficult task (in terms of practical economic life). The main problem is risk aversion which comes from imperfect information. The risk aversion makes the decision – makers de-vote some inputs (part of resources) for risk reduction, what hypothetically leads to worse eco-nomic performance. Such point of view is coherent with a so-called state-contingent approach and theory of expected utility. The research revealed that in the case of crop and mix farms higher risk aversion is related with lower level of resources' profitability. The opposite situation was observed in specialized livestock farms.

Keywords: risk aversion, profitability, production factors, farm types, competitive advantage, uncertainty.

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Introduction

Each economic activity is connected with processing of certain resources (inputs) in production processes (provision of services) into products (services) satisfying a variety of needs of the public. In the light of limited availability of resources (rarity) enterprises are forced to make choices related to allocation of resources in an optimum way, i.e. to choose the best option with existing limitations and adopted criterion of objective (Kunasz M. 2006). Such approach emphasises the paradigm of rational management, which is the basic condition for achieving economic effectiveness, the imperative of functioning and development of enterprises (Jaki A. 2011).

The issue of inputs (understood as enterprise's resources) and their rational use in manufacturing processes has been the topic of considerations of economists since the beginning of existence of economics as a science. The pioneer of the classic doctrine of economics W. Petty pointed to four production factors, such as labour, land, vocational qualifications and other resources, which made work more effective (Stankiewicz W. 1998). Economists of the classic period – Smith, Ricardo or Say – considered the significance of three primary production factors (land, labour, capital), assigning to them different significance in value creation (Kunasz M. 2006). The classic take on production factors was extended by the founder of neoclassical economics A. Marshall, adding the factor of organisation of production and entrepreneurship. In the neoclassical theory, an entrepreneur became the indispensable component ensuring effective and rational use of the remaining inputs. The assumption of rationality of actions of decision makers is an important component of this theory, determining the perception of the role of an entrepreneur. Fulfilment of this assumption in practice requires that the condition of access to full information is met, as only a decision maker with excellent knowledge is able to take fully rational decisions. It is particularly important in the context of the problem of risk – fulfilment of the assumption of perfect information would eliminate uncertainty, however, such situation does not reflect the reality. Thus, entrepreneurs operate in conditions of risk and uncertainty[1], which results in a situation where they are unable to take optimum decisions, as envisaged in the neoclassical model. This point of view, stemming from the guidance of the behavioural approach, leads to the conclusion that in conditions of incomplete information (resulting in risk and uncertainty) company's resources could be used in a suboptimal way. As could be concluded from the assumptions of the theory of expected utility elaborated by Morgestern and von Neuman (1953) and its future developments (Arrow J.K. 1989; Pratt J.W. 1964), the factor causing the dissonance between the classic assumption of rationality and the reality is risk aversion.

[1] The classic differentiation introduced to the language of economics by F. Knight (1921): the notion of risk refers to a situation, where possible variants of a situation could be described through a likelihood, while the notion of uncertainty to conditions, where even a likelihood is not known.

This is particularly relevant in case of sectors of economy, in which the number of risk factors is particularly high (like agriculture).

Production factors (resources) in agriculture and farms and the resource theory of an enterprise

Most of definitions of an agricultural holding say that it is "an association of three primary production factors", additionally having certain specific features, particularly in case of a family farm model (dominating in many countries). For example, Gasson and Erington (1993) state that a farm "*is an agricultural unit owned and operated by a family, which may have one or more generations. Most of land and capital is provided by the family, but also additional land may be leased (...) and capital may be borrowed (...). Most of the labour is provided by the members of the family living on a farm, but additional labour may be hired*". Also other definitions state that an agricultural holding is a set of three production factors (Tomczak F. 2005).

Perception of a farm through the lens of production factors, justifies looking at its functioning in the context of resource theory of an enterprise, which sees the source of competitive advantage of enterprises in resources held (Wernerfelt B. 1984). At this point, it should be noted that the competitive advantage in case of agriculture is not measured by the market share, as it is pointed out in strategic management, but rather through the above average results evidencing better use of resources at farm's disposal. Ziętara and Adamski (2014) conclude that competitiveness of farms should be understood as their ability to develop in conditions of a given country. They claim that "farms that are able to develop are those which generate income from governance, i.e. income from the farm, covering the so-called alternative costs, i.e. the costs of using own factors of production". Thus, one of the conditions of competitiveness of farms should be achieving an income at the parity level.

This approach is in line with the opinion of Czakon (2010), who believes that within the resources theory of an enterprise, for the purpose of research competitive advantage is operationalised in the form of the above average profitability (as an enterprise with an advantage must have this advantage reflected in financial results, which are better than average). It results from the fact that in case of fulfilment of micro-economic assumption of market perfection, all companies should achieve identical profitability, while the fact that this is not the case, indicates that companies draw additional rent (Czakon W. 2010, as in: Peteraf M.A. 1993). In case of agriculture, due to substantial dispersion and closeness to the model of perfect competition (Niezgoda D. 2009, as in: Molle 2000), most of rents discussed in the theory of economics[2] are impossible to be

[2] Only several types of this rent are pointed to here. The first type is the monopoly rent, which provides the monopolist with the influence over prices through limitation of the supply of a resource, or through limitation of access of other enterprises to such resource. The second type is the Ricardian rent, resulting

achieved by operators of the sector, which points to the relevance of trying to identify sources of better results in external conditions.

As Ujwary-Gil (2009) writes, in the resource-based approach a competitive advantage comes from "resources, which are rare, or more effectively used than in case of competition". According to this author, resources are used more effectively if the lead to more economical (cost-effective production. Kumasz (op. cit.) believes that the resource theory presents an enterprise as a unique bundle of tangible and intangible resources and skills that set it apart from other operators (competitors). The author, referring to numerous publications of other researchers, also states that profitability of enterprises is determined by attributes of resources (type, size, nature), as well as by imperfection of the market for factors, in which these resources are purchased. In case of agriculture this imperfection is also related to certain attributes of agricultural activity, making it impossible to achieve economic effectiveness according to Pareto criterion. According to Czyżewski (2007) in market economy there is "inadequate simultaneous functioning of three basic production factors (land, labour, capital), which makes it impossible to achieve balance in the agri-food sector, thus preventing generation and allocation of economic surplus, depreciating the position of this sector in relation to further and closer environment". The primary problem here, according to Czyżewski and Henisz (2002), is the absence of mobility of land, leading to "impairment of production processes in agriculture"[3] (allocation of production factors is suboptimal in Pareto sense). The land factor is crucial in case of agriculture. Due to the lack of mobility it cannot be (in principle) used more effectively in other sectors (in another location). This situation can be considered the original source of a worse position of agriculture in relation to other sectors of economy. It also translates into a number of attributes determining agricultural activity, such as seasonality of production to start with or the scale of risk and uncertainty resulting from weather conditions (Czyżewski A., Matuszczak

from using resources better than competition, with the Schumpetarian rent related to innovation as its variety. The fourth type of rent referred to by Czakon is the relational rent, making it possible for its disposer to distort the market and draw benefits from it (e.g. better access to information, limitation of transaction costs, etc.). The types of rents listed group sources of competitive advantages into several sets.

[3] It should be noted that mobility of the land factor (its absence) may be understood in a variety of ways. In the physical sense, the absence of mobility of land means that it cannot be moved to another location, which determines conditions for agricultural activity. This is primarily about climatic factors, which make a given location more or less "friendly" to agricultural production, thus setting the level of production risk. Mobility of the land factor can also be viewed in terms of ownership and it is then related to flows of this resource between farms. Thus understood mobility of land is one of the distinguishing features of structural transformations in agriculture, with the changes in areas of farms in the country as its synthetic expression. The simplest way to increase the mobility of the land factor understood in this way, thus increasing area of farms, is through land lease (Ziętara W. 2009). In relation to Polish agriculture one should also emphasis poor mobility of the labour factor, which results in a high level of employment and low labour productivity in this sector of the economy.

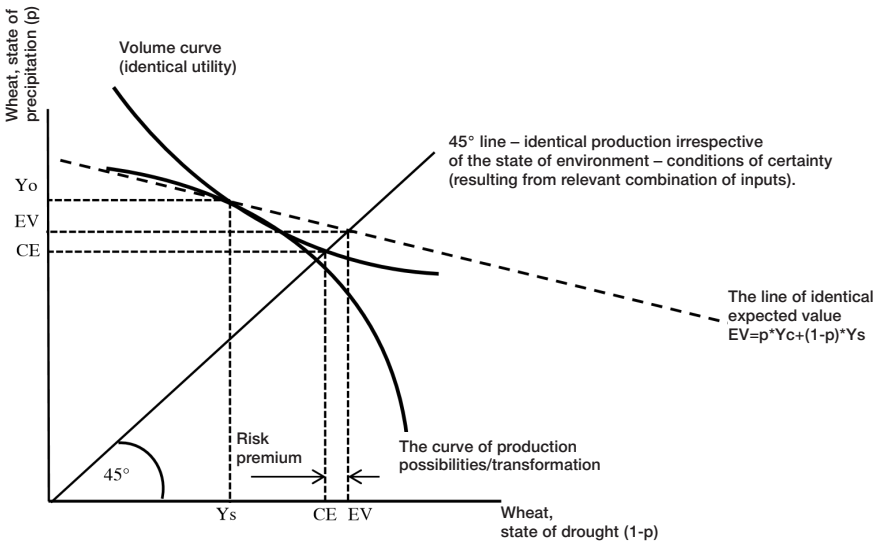
A. 2011). Destabilisation of agricultural incomes and profitability of agricultural trade is the consequence of these phenomena determined by the original flaw of the land factor (Czyżewski A., Henisz A. 2011, as in: Klawe A. 1981). A conclusion can be drawn from the above that in, a sense, the original cause of risk in agriculture is the "imperfection" of land as a production factor. The macroeconomic point of view, though emphasises the significance of attributes of production factors in systematic determination of the agricultural sector as a whole, does not determine the causes of differences in effectiveness of use of production factors at the level of individual decision instances or production activities (which is the area of considerations in the research based theory of an enterprise).

Theoretical foundations of risk in agriculture

As pointed out in the introduction, risk can be considered a factor hindering taking optimal decisions, thus hindering optimal use of resources at the disposal of a farm. Risk in agriculture is connected with uncertainty of achieving expected production and economic results by agricultural producers (Robinson L.J., Barry P.J. 1987; Hardaker J.B. 2000). Specificity of agricultural activity makes the scale of risk in agriculture much larger than in other sectors of the economy (2006). The following types of risk are listed in agriculture (Hardaker J.B. et al. 1997): production risk, price risk, financial risk, institutional risk and personal risk. Each of the types of risks can be caused by a number of factors, while the most general source of risks is uncertainty of the way various parameters of the production process (technical and organisational) will be shaped in the future. The production process if partly beyond control of the decision maker – farmer. In this case the primary problem is reduced to the following statement: a farmer, when making a decision on allocation of available resources, cannot be sure about potential production results. It is connected with the fact that the production process itself is of biological nature and depends (directly in plant production and indirectly in animal production) on the course of weather conditions. In most of agricultural activities the situation is additionally complicated by a long production process. When taking decisions on allocation of available resources to individual activities (incurring certain expenditures), agricultural producer is driven solely by specific expectations on the course of events in the future. In models of farms formulated on the basis of the neoclassical approach it is typically assumed that farmers pursue maximisation of income (Hazell, Norton 1986). This approach is consistent with the neoclassical theory of an enterprise, which assumes perfect information of a decision maker and monodisciplinary analysis, excluding from the field of study non-economic variables (Gorynia M. et al. 2005, as in: Hayek 1945), such as: the process of resource processing, organisational problems, internal decision making processes, search for information, manner of handling situations of absence of information and uncertainty (Gorynia M. et al. 2005, as in: Blaug 1995).

The observed dissonance between theoretical assumptions of mainstream economics and observed reality resulted in a situation where some of economists began developing theories, which were an alternative perspective on the issue of microeconomic determinants of production processes and use of resources in enterprises. It seems that in relation to agriculture, the "state-contingent approach", promoted by Quiggin and Chambers (2000, 2004), explains the complexity of production processes in risk conditions particularly well. This approach – without denying rationality of decision makers – points to dependence of production and economic results on the manner of allocation of resources vis-a-vis possible states of environment. This approach builds on the theory of expected utility and is based on the assumption that in conditions of risk and uncertainty decision makers (farmers in this case) shall allocate resources in a manner maximising expected utility rather than the expected profit (income, revenue). In case of a decision maker indifferent to risk, these two decision criteria would be identical, which is not the case in the conditions of absence of certainty. Risk aversion leads to a situation, where persons averse to risk are willing to give up part of expected income (revenue, profit) in return for reduction of uncertainty related to its obtaining. When making the decision on allocation of farm resources, the farmer takes into account the risk connected with individual activities carried out on a farm. Thus, each product is of a "state-contingent" nature, which means that making individual inputs (making decisions on allocation of resources), a decision maker chooses not only "a physical product", but also the associated risk.

This mechanism has been presented schematically in Figure 1. Assuming that a farm produces only one product and that only two states of the environment are possible ("optimal precipitation" and "drought"), one could assume that a farmer decides on allocation of resources between to "state-contingent" products, i.e. "wheat in state of precipitation" and "wheat in state of drought". If he shows substantial aversion to risk, he will allocate the resources to "wheat in state of drought", i.e. he will allocate inputs to reduce the risks related to farming in the conditions of shortage of water (e.g. he will try to improve water relations, he will carry out treatments increasing the capacity to retain water longer in a desiccant complex, choose more resistant varieties, etc.). A decision maker with greater disposition for risk would rather incur inputs related with intensification of production than undertake activities reducing the risk. As a consequence, results of the former shall be relatively good in condition of drought, but relatively poor in conditions of optimal precipitation (unnecessary investment in limitation of drought risk instead of in intensification of production). In the latter of hypothetical situations results would be opposite. The theory of "state-contingency" assumes certain substitutability in production of "state-contingent" products, resulting from the relation between the risk and likelihood of presence of individual environment condition, which in Figure 1 is reflected by the transformation curve (production possibilities).



Key:
p – likelihood of individual states,
EV – expected value,
CE – certainty equivalent,
Yo, Ys – outcome in state "precipitation", "drought".

Fig. 1. State-contingent approach in relation to agricultural production.
Source: (Berg E., Kramer J. 2008).

Proportions, in which a farm chooses to produce one or another "state-contingent" product (and related allocation of resources), result from decision maker's attitude to risk, which is expressed by the curve of identical utility (indifference). The optimal combination of two "state-contingent" products is designated by the point of tangency of the indifference curve with the transformation curve. If we added a line to the diagram, which would run from the beginning of the coordinate system at an angle of 45° than it would reflect allocation of resources (use of inputs), which would give identical results irrespective of the state of environment. The intersection of this line with the line of identical utility schematically reflects the value of the so-called equivalent of certainty, i.e. a result lower than expected, but ensuring a satisfactory level of expected utility for the decision maker. For a decision maker with aversion, the result which is lower, but burdened with lower uncertainty presents higher utility than the result equal to the expected value, but more uncertain. This phenomenon would not take place in case of a decision maker indifferent to risk. In the figure, the expected value has been illustrated by the intersection of the 45 line with the line of identical expected value (the line means such combinations of products of probability of individual states of environment and achieved results making the expected value, which is a sum of these products, identical).

The theoretical approach discussed, despite the fact that it is difficult to apply empirically – if only because of the large number of states of environment, which should be taken into account in farm models[4] – conceptually represents a rather interesting illustration of the problem of emergence of differences in production and economic results between similar farms. In conditions of risk and uncertainty, farmers, who in their majority are characterised by risk aversion (OECD 2004, 2009), pursue maximisation of expected utility (which with application of classic assessment criteria could suggest incomplete use of resources of farms). In connection with the above a question could be posed, whether farms of farmers showing higher risk aversion achieve poorer economic results (measured with parameters such as agricultural income or return on resources) than farms of farmers with higher disposition to accept risk. Answering this question was the main objective of the research.

Methodology

The point of view adopted in this paper is based on the assumption resulting from the resource theory of an enterprise, pointing to the crucial role of resources of an enterprise for its profitability. With observations resulting from the expected utility theory and the theory of "state-contingency" in mind, the considerations on profitability indicators have been carried out taking into account diversity of farmers' attitudes to risk. A hypothesis has been verified, which assumed that higher return (profitability) indicators of production factors (farm resources) are achieved in entities, where farmers demonstrate lower level of risk aversion. So far this correlation was not the subject of research in relation to agricultural holdings in Poland and it rarely was of interest to foreign authors[5].

The research covered a group of 593 farms from across the country, keeping farm accounts in FADN. The group under research reflected the structure of FADN research sample in terms of economic size, production type and geographic location, therefore, it may be deemed representative to the extent the

[4] One of few attempts at empirical use of the theory of "state contingency" has been presented by E. Berg (2012), while due to a small number of states of environment taken into account the study is rather an interesting illustration of mechanisms described in the theory than an example encompassing the entire complexity of the decision making situation of a real farmer.

[5] One of the first publications, which refers to this problem, is the study of Rosenzweig and Biswanger (1989) on farms in India, which assumed, however, that allocation of resources to individual activities is independent of risks; nevertheless, authors came to the conclusion that uninsured weather risk is a substantial cause of lower effectiveness and lower average income. They also concluded that a higher level of weather volatility was connected with greater inequality of distribution of wealth, which suggests that greater risks is conducive to income disparities. They also observed that among the richest farmers the increase if weather related risk did not result in decreased profitability. Part of available studies do not refer directly to the issue of return on resources or effectiveness, but rather to general results of farms (e.g. Majewski E. et al. 2008). However, typically the majority of studies related to risk focus on one of the aspects related to the issue of risk (e.g. the issue of aversion, risk reduction strategies applied, etc.).

entire FADN sample is. On these farms advisers from extension service centres (collecting data for the FADN system) carried out guided in-depth interviews, which facilitated supplementing the data available in FADN database with components characteristic to farmers' attitudes towards risk and other information unavailable in the FADN database. Interviews with farmers were carried out in 2012. Attitudes of farmers were established through the direct methods, consisting in asking farmers questions on perception of risk and marking the answers received on the Likiert scale. This approach is one of the three basic manners of establishing risk aversion, alongside hypothetical lotteries and observation of investment decisions (Damodaran A. 2009). An overview of advantages and disadvantages of individual solutions in the area of aversion assessment suggested by various authors is available in another publication (Sulewski P. 2014). Combination of data available in FADN database with data collected in interviews facilitated connection of information of economics of farms with parameters in the area of socio-psychological characteristics of farmers.

The paper analysis resource profitability indicators such as:

– return on land (income from farm in PLN/ha – the measure of return on the land factor);
– return on assets (income from farm/assets – the measure of return on the capital factor);
– return on equity (income from farm in PLN/value of equity in PLN);
– return on own labour (income from farm/FWU).

Additionally, analyses were supplemented with the comparison of parity income. The analysis was carried out on the basis of data from 2012.

Due to the fact that individual types of farms are characterised by a diversified demand for individual production factors (Felczak T. 2011), which in a systematic way may translate into differences in levels of analysed parameters, all analyses were carried out within production types. Furthermore, due to a relatively small number of farms in some of the types, the original number of levels applied in assessment of disposition for risk was reduced to three ranges, i.e. low, medium and high aversion.

Results

The structure of researched farms by production types[6] is presented in Figure 2. It can be assumed that it roughly reflects the structure of commercial farms in Poland. It is dominated by "mixed farms", which constitute nearly half of the researched population. The most numerous groups are farms of type "permanent crops", "horticultural crops" and "other grazing animals".

[6] Detailed explanation of classification of farms in FADN may be found in a study: Analiza skutków zmian we Wspólnotowej Typologii Gospodarstw Rolnych. IERiGŻ-PIB, Warszawa 2010.

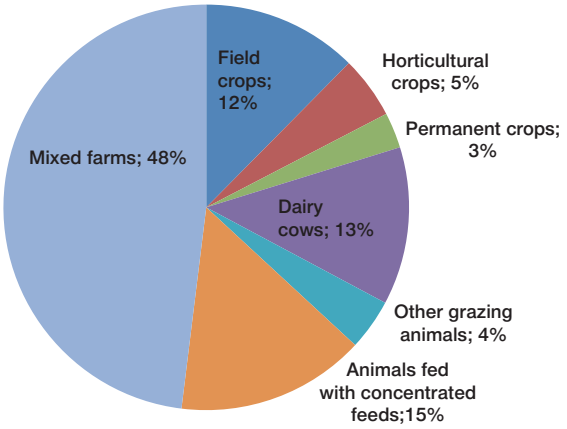


Fig. 2. The structure of researched farms by production types (TF8).
Source: own study.

The study of attitudes of farmers towards risk indicates that in general the majority of farmers are characterised by rather average risk aversion – this observation pertains to almost all production types (the exceptions are "other grazing animals" and "horticultural crops" in case of which the share of farmers with high and average risk aversion was identical) (Fig. 3). It should be emphasised that very few farmers (only 10% in total in the researched population) presented attitudes of very low risk aversion. To a certain extent it confirms opinions of other authors quoted earlier, which in majority of cases point to the domination of aversion attitudes. At the same time, it is worth to emphasise that only part of the researched persons identified themselves with the high level of risk aversion (this issue was discussed more broadly in a study by Sulewski, 2014).

Profitability of farms was one of the most often considered issues in agricultural economics for many years. The research in this area has been so far undertaken by numerous researchers, who pointed to a number of factors determining economic results of farms. For example, Wiatrak (1998) pointed to the area of a farm and technical equipment. Bórawski and Grygoryev (2009) pointed to the area and direction of production in farms carrying out alternative activities. Gołębiewska and Klepacki (2000) emphasised the relevance of connections between a farm and a market. According to Ziętara (2009) achieving an income at the parity level requires adequate scale of production, which is connected with an increase in economic productivity of labour. Detailed analysis of the problem of profitability were also carried out by J. Zegar (2004, 2008).

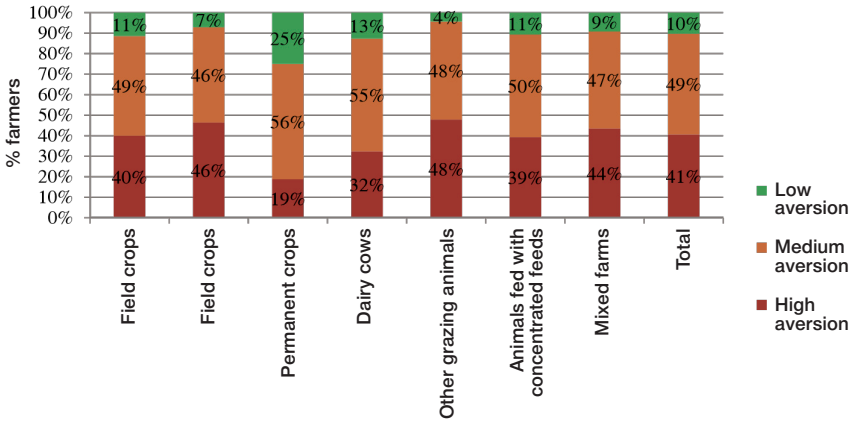


Fig. 3. The level of risk aversion (three levels) and farm production types.
Source: own study.

The studies undertaken, because of their objective, omitted the absolute value of income in their analyses, focusing on profitability indicators (equated with indicators of return on production factors). Table 1 includes average values of indicators of return on land, labour, total assets and equity, depending on the level of risk aversion. The comparison carried out indicates that in most production types lower level of risk aversion is connected with on average higher return on individual resources (though not in all situations). In case of "filed crops" one can observe clearly higher returns on total assets and equity in groups with lower risk aversion. However, in this production type there are slightly smaller differences when it comes to average returns on land and labour – one could only conclude that farms, where farmers are characterised by high level of aversion, show the lowest value of parameters in question. The differences are relatively low between the group with medium and low level of aversion. Rather clear differences in the level of parameters in question can be observed in the remaining production types, specialised in plant production, i.e. "horticultural crops" and "other permanent crops". Almost all types achieve the highest level in groups with the lowest risk aversion in the analysis of profitability indicators (return on equity in the "horticultural crops" is a certain exception, where there were no differences between the group with low and medium level of risk aversion).

The regularities observed in farms from plant types were not confirmed in case of dairy farms, with reference to which the opposite dependence could be claimed. In case of returns on assets, capital and labour clearly the highest values were achieved in groups with high risk aversion (in case of return on land in the group with medium level of aversion). The lowest level of all

listed indicators has been recorded in the group with the lowest risk aversion. The observations made with reference to the first three production types were not confirmed either with reference to the second specialised group of animal farms, i.e. in type "animals fed with concentrated feeds", although in this case differences in the average level of the indicators were less explicit that in type "dairy cows". The highest return on land characterised the group with high risk aversion, however, on farms with low risk aversion the value of this parameter was on average only a little lower (PLN 6.68 thousand per ha against 7.2 thousand); and they clearly stood apart in this respect from farmers with medium risk aversion level. This group was also characterised by the lowest on average return on assets and equity, while unlike in case of return on land – slightly higher values accompanies lower level of risk aversion. On mixed farms a regularity was observed similar to the dependence present on farms with plant types, consisting in lower average value of profitability indicators in groups with higher risk aversion.

On the basis of observations made, it should be concluded that while the dependence in case of mixed and animal farms is in line with expectations (high level of risk aversion is conducive to lower profitability of production factors), the observations pertaining to dairy farms come as a certain surprise. Hypothetically this fact could be connected with a greater number of risk factors, particularly in dairy farms, where production results depend both on specific components typical for this activity (e.g. diseases, nutrition problems, etc.) and factors related to the course of weather (plant production is a source of roughage). At the same time, practical possibilities of limitation of the risk, e.g. through production insurance (risk transfer) are much smaller than in plant farms. It means that in this case preventive measures are of greater importance (e.g. care about animal hygiene), which on the one hand, has a positive impact on results of farms[7], on the other, results in a situation where "better" and "more aware" farmers perceive themselves as less inclined to take risks. In case of farmers using insurance (primarily "field crops") the phenomenon of "moral hazard", broadly described in literature, may be of certain significance. It consists in greater inclination to risk among those insured, which could translate into them achieving better results (they take more risky actions, meaning e.g. dropping certain components of proper agricultural practice, expecting that they shall be indemnified in case of failure). This assumption is to a certain extent made more credible by the data on production insurance (Table 2) indicating that in the period preceding the study (2005-2011) insurance of animals was practically not used, while insurance of crops (at least once in 2005-2011) was purchased by nearly half of farms in "field crops" type and half of farms in the "mixed farms"

[7] The significance of impact of proper agricultural practices on production and economic results of farms was described in the study edited by E. Majewski (2001): Jakość zarządzania w gospodarstwach rolniczych w Polsce w świetle badań.

type. In these production types a higher share of farms using insurance was present on average in groups with lower risk aversion (which could suggest that the fact of having insurance has an impact on higher inclination for risk – this is the phenomenon referred to as "moral hazard"). The opposite situation was the case in dairy farms and in type "grainfed animals" – more farms with crops insurance were recorded in groups with the higher risk aversion level. It should be emphasised, though, that in this case insurance was not related to the primary area of activity (keeping animals) and the collected research material does not provide the possibility to assess the dependence between the level of risk aversion and the frequency of use of animal insurance (the number of farms is too low to make a division).

Analysing the hypothesis proposed in this study on possible impact of the risk component on profitability of production factors, the analysis was extended to include comparison of the indicator of parity income between farms diversified by farmers' attitude towards risk in individual production types. This indicator was calculated as the ratio of income from a family farm per 1 FWU (Family Work Unit – 2200 hours of work of family workforce), to average remuneration of workers in the national economy in 2012[8]. This issue seems important to the extent that achieving income at the least at the level of parity could be considered as one of the conditions of viability of farms, being the consequence of profitability of resources used in farm's activities. The overview presented indicates that a majority of groups identified achieved the parity level of income (while it should be remembered that the selection of farms from among the FADN population eliminated economically the weakest entities). High indicator of income parity in "field crops" farms draws attention, which should be connected with low level of demand for labour in this group. From the point of view of this study it is important that apart from type "dairy cows" and "animals fed with concentrated feeds" lower level of risk aversion was accompanied by higher level of parity income.

[8] PLN 42 260 gross / year (PLN 30 238 net) according to http://www.wskazniki.gofin.pl/8,126,1,przecietne-wynagrodzenie-pracownikow-za-lata-od-1950-r.html.

Table 1

Indicators of return on land, labour and equity, depending on the level of risk aversion

Farm production type	Risk aversion (in relation to issues related to agricultural holding)	Return on land (income from farm/agricultural land)	Return on total assets (income from farm/value of total assets)	Return on equity (income from farm/value of equity)	Return on labour (income from farm/AWU[a]).
		medium			
Field crops	high	2.46	0.35	0.35	103.3
	medium	2.62	0.60	0.61	128.1
	low	2.83	1.67	1.72	127.6
	total	2.65	0.59	0.60	117.4
Horticultural crops	high	6.73	0.05	0.06	17.3
	medium	19.34	0.06	0.06	18.3
	low	29.16	0.15	0.15	38.7
	total	15.48	0.07	0.07	20.6
Other permanent crops	high	-0.68	0.09	0.09	-17.9
	medium	5.25	0.14	0.14	18.1
	low	7.55	0.16	0.16	29.9
	total	5.55	0.14	0.14	18.6
Dairy cows	high	2.81	0.21	0.22	44.4
	medium	2.72	0.11	0.12	39.9
	low	1.97	0.10	0.10	28.1
	total	2.68	0.14	0.15	39.7
Other grazing animals	high	0.99	0.02	0.02	5.4
	medium	1.67	0.02	0.02	13.0
	low	2.68	0.09	0.09	48.4
	total	1.44	0.03	0.03	13.0
Animals fed with concentrated feeds	high	7.20	0.18	0.18	59.5
	medium	2.69	0.14	0.14	49.6
	low	6.68	0.21	0.21	42.5
	total	4.68	0.16	0.16	51.5
Mixed farms	high	1.91	0.09	0.09	24.5
	medium	2.27	0.12	0.12	30.3
	low	2.15	0.18	0.20	50.3
	total	2.10	0.11	0.11	29.2

[a] AWU – Annual Work Unit = 2200 h.

Source: own study.

Table 2

The share of farms with crops insurance in 2005-2011 (at least 1 year)

Farm production type	Risk aversion	% of farms with insured crops	% of farms with insured animals
Field crops	high	40	-
	medium	53	
	low	62	
	total	49	
Horticultural crops	high	8	-
	medium	21	
	low	0	
	total	13	
Other permanent crops	high	33	-
	medium	40	
	low	0	
	total	29	
Dairy cows	high	27	4.5
	medium	26	
	low	9	
	total	24	
Other grazing animals	high	7	-
	medium	18	
	low	0	
	total	11	
Animals fed with concentrated feeds	high	48	7.5
	medium	39	
	low	30	
	total	39	
Mixed farms	high	27	-
	medium	39	
	low	50	
	total	34	

Source: own study.

Table 3

Parity income indicator

Farm production type	Risk aversion	Parity income indicator (income from farm per 1 FWU/average net remuneration in the economy)
		medium
Field crops	high	4.09
	medium	5.63
	low	7.07
	total	5.16
Horticultural crops	high	0.75
	medium	1.09
	low	1.52
	total	1.01
Other permanent crops	high	-
	medium	1.37
	low	1.16
	total	1.04
Dairy cows	high	1.38
	medium	1.33
	low	0.93
	total	1.29
Other grazing animals	high	0.18
	medium	0.43
	low	1.45
	total	0.41
Animals fed with concentrated feeds	high	2.24
	medium	1.55
	low	3.05
	total	1.96
Mixed farms	high	0.96
	medium	1.10
	low	2.07
	total	1.12

Source: own study.

Summary and conclusions

The resource theory of enterprise indicates that the primary factor for building of competitive advantage by enterprises are resources. Due to the significant fragmentation of the agricultural sector, the issue of competitiveness and strategic advantage should be considered in terms of the above average results rather than the market share. Higher – in comparison to other entities – return on individual production factors could be considered a synthetic expression of better competitive position. However, the neoclassical way of perceiving an enterprise omits the significance of the component of risk and uncertainty in its assessment. The mainstream of economics assumes that a rational decision maker pursues maximisation of profit, while the real conditions of functioning, in which risk and uncertainty play an important role, result in a situation where decision makers with risk aversions pursue another function of objective. Theories complementary to the mainstream of economics, such as the theory of expected utility or "the state-contingency theory" emphasise the expected utility as the decision criterion in conditions of absence of certainty. From a practical perspective in could mean that allocation of resources, which by assumption does not serve maximisation of profit (income), but expected utility taking into account the attitude to risk, will be more useful to a decision maker. From a theoretical perspective this should be connected with lower profitability of production factors in comparison to the situation, in which it is the profit (income) that is maximised. With the dependencies resulting from the modern state of the theory of economics in mind, the hypothesis has been proposed in this study that the higher risk aversion is connected with lower returns on production factors, reflected in selected indicators of profitability of resources. Empirical analyses carried out have shown that in case of plant and mixed farms, typically lower profitability indicators have been observed in groups with higher risk aversion, which conforms to the proposed hypothesis, It could mean that farmers, who are more afraid of risk than others, achieve poorer economic results because of incomplete use of resources. The regularity observed in plant farms has not been confirmed in relation to specialised dairy farms and entities of "grainfed animals" type. In this case, the higher degree of risk aversion (higher disposition to risk) was connected with poorer profitability indicators. Hypothetically one could assume that the reasons for this difference result from different characteristics of both farms (their resources) themselves and different nature of risks in comparison to plant types. However, verification of these assumptions requires further and more detailed research.

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