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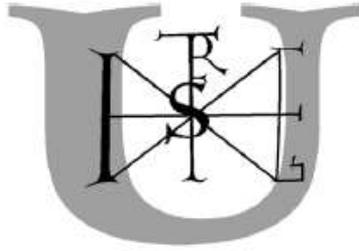
PhD SCHOOL OF MANAGEMENT AND BUSINESS
ADMINISTRATION

THESES OF THE DOCTORAL (PhD) DISSERTATION

**APPLICATION OF RISK MANAGEMENT TOOLS IN
AGRICULTURE IN THE EUROPEAN UNION**

Written by:
Péter Pálinkás

**Gödöllő
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1. INTRODUCTION

The natural and world economic phenomena of the past decades collectively emphasize the increasing importance of risk factors affecting agricultural production directly or indirectly. Agricultural producers should not limit their risk management strategies only to lessening and offsetting the problems caused by weather and natural events. Their effective responses to the diverse professional, economic, and political challenges are also increasingly crucial to successful farming.

Besides, it is also equally important to answer the question how farmers perceive the importance of risk factors influencing their activities and the adequacy of the tools and methods of treating such risks. These factors bear great influence on the risk management strategies applied by producers.

The European Union has already recognized the importance of risk management in agriculture and has made great efforts to investigate the possibilities of an EU level risk management system. Among others this was one of the main objectives of the “Design and economic impact of risk management tools for European agriculture” research project which was carried out in the framework of the EU 6th Framework Programme and which also serves as the background of my present thesis.

My primary research goal was to examine the risks and risk management tools in agriculture based on the answers and subjective judgements of farmers provided in the questionnaire designed for the research.

In my dissertation I also explain the concepts of risk, uncertainty, and risk management and I also describe the practice of agricultural risk management in the European Union and Hungary based on scientific literature.

In later chapters of my thesis I also explain the institutional background of the research, the applied methods and tests carried out, and then the results of my research.

Furthermore, I analyze the opinions of farmers regarding each risk factor and the reasons and consequences of crises where such incident occurred. I compare the risk management instruments and information sources currently applied in farming and those that the farmers plan to use in the future.

I explore the farmers’ point of view and experience in terms of the major types of risk, namely the production, market, financial, human resources, and institutional risks, and the methods suitable for managing them.

Based on the foregoing the main objectives of the dissertation are summarized in the followings:

1. Explaining the concepts of risk and risk management, and risks and risk management methods in agriculture based on international and Hungarian scientific literature.
2. Surveying the opinion of agricultural producers on risk and risk management instruments in agriculture among the producers of the countries involved in the research.
3. Examining crisis situations and their possible causes based on producers' experience.
4. Surveying the risk management instruments and information sources currently applied in farming and also those that producers plan to apply in the future.
5. Analyzing and comparing production, market, financial, institutional, and human resources risks based on the producers' answers in the surveyed countries.

Hypotheses:

1. According to producers natural factors and market conditions influence the results of their farming activities at the largest extent.
2. In countries with more extreme weather, like for example in Hungary and Spain participating in this research, crises occur more frequently and have greater impact than in countries with more consistent weather.
3. In Western European countries with developed infrastructure, such as Germany and the Netherlands, the use of the internet for farming and participation in professional trainings are more prevalent among farmers than in the other countries involved in the research.
4. Unlike in Western European countries with developed credit markets in new, ex-communist countries farmers' access to credit is more difficult which increases their risks.

2. APPLIED RESEARCH METHODS

2.1. Framework of the research

The background of the dissertation has been provided by an international study, “Design and economic impact of risk management tools for European agriculture”, carried out within the EU 6th Framework Programme. The primary objective of the study was to provide basis for debate by surveying scientific literature and analyzing risk related data and make suggestions for the decision makers of the European Union for discussing a possible future European risk management strategy in agriculture.

2.2. The questionnaire used for the survey

The design of the questionnaire and arranging the survey were the tasks of the Hungarian project partner, namely the Institute of Business Economics and Organization at the Szent István University. I assembled the questionnaire as a member of the Institute and as a participant of the project under the professional supervision of Csaba Székely, and by considering international scientific literature and consulting other colleagues working on the project.

The questionnaire was completed in the countries involved in the research project (Germany, Poland, Hungary, Spain, and the Netherlands). This also met the requirement of having both new (joined in 2004) and older EU member states (joined before 2004) represented in the survey. According to the agreement between the project participants the questionnaire had to be completed by 200 producers in each country based on the sampling plan and completion instructions I prepared. Eventually, the minimum 200 questionnaires per country or even more were successfully completed (Hungary: 204; Poland: 206; the Netherlands: 236; Spain: 200; Germany: 201).

Because of the different languages in the studied countries the original, English questionnaire was translated into the native languages of the participating countries.

The project participants trusted with arranging the survey in their respective countries selected local professional organizations and by closely cooperating with these the required number of questionnaires, as defined in the sampling plan, were completed in 2006-2007. In Hungary and Poland the survey was carried out by the organizations operating the local Farm Accountancy Data Network (FADN). The survey was carried out by a market research company in Spain, the agricultural consultancy

network in Germany, and an agricultural insurance company in the Netherlands.

The results of the completed questionnaires were sent to me to Gödöllő for further processing which I carried out with the SPSS software suite.

2.3. Contents of the questionnaire

Based on the scientific literature I divided the questionnaire into the below sections and each question was categorized into one of these according to its content.

General information

With these questions I collected information about the ownership of the farm, the production structure, and the size of the farm (area size, number of animals, income).

Knowledge of risk and risk management

The questions listed here aimed at finding out what the producers think about the different risk factors in agriculture and what type of risk reducing methods they use currently and plan to use in the future. Furthermore, I also looked at from what sources the producers gather information used for farming, and whether they ever experienced crisis situations through their farming activities.

Production and asset risk

With these questions I tried to collect detailed information on the opinion of producers about risks threatening crop production, the magnitude and causes of already occurred crop losses, and the methods reducing the risks of those. I also listed those questions here which investigate different aspects of land rent and farming from the operational side. Although these questions do not belong to this section specifically, they fit this part of the questionnaire best.

Market (price) risk

The questions in this section collect information about the price evolution of the main products, the marketing practices of the producer, and the problems experienced when selling the products. I also investigated here whether the producer is member of any cooperative or producers' collaboration and whether the producer has written business plan, and if not, what the reason is for that.

Financial risk

These questions aim at finding out from what sources the producer is financing the farming activity. Hereby I also investigated how the producers see the ways of accessing credit.

Institutional risk

This chapter looks at the opinion of producers about the national and EU level institutions and legislations, and the application of quality assurance systems, and the practice of signing contracts.

Human resources or personal risk

Many of the questions displayed here concern the producer's or the manager's demographic characteristics, such as age, highest completed education, and the participation of family members in farming. I also considered it important to find out whether the producer participated in any kind of farming related professional training at the time of completing the questionnaire. I also investigated some questions related to employees, and what sort of personal insurance the producer has.

2.4. Sampling plan used for the questionnaire survey

In order to ensure the credibility of the questionnaire parallel to the questionnaire design I also worked out a sampling plan based on which the producers completing the questionnaire were selected.

In case of all participating countries I applied stratified sampling with proportional allocation to choose the respondents. The point of this method is to divide the heterogenous population into homogenous subgroups, so called strata. Strata are mutually exclusive, so every element in the population must be assigned to only one stratum. The elements of the sample are randomly selected from each stratum.

The main characteristic of the proportional allocation is that it uses a sampling fraction in each of the strata that is proportional to that of the total population. Because the proportions in the sample equal to the ones found in the population the sample can be considered representative which makes it possible to examine the features of the population on a relatively small sample.

Proportional allocation is widely used by the European Commission in agricultural data collection. In such cases the Commission uses three stratifying criteria: (a) geographical region, (b) economic size of the farm (expressed in ESU, which stands for European Size Unit), and (c) the type of the farming activity.

I also used these stratifying criteria for the questionnaire survey except for that instead of the FADN regions I used countries as one of the stratifying

criteria because the main focus of the survey was to collect the desired information for all the countries involved in the research project and thus know the characteristics of each country, and to compare the surveyed countries.

In case of all surveyed countries I defined the sample based on the data of the 2003 Farm Structure Survey and the interactive database of EUROSTAT. I used the data from the 2003 Farm Structure Survey because at the time of working out the sampling plan this was the only data source that was equally available for all the countries involved in the research as the data of the 2005 Farm Structure Survey was made publicly available only later. Based on the applied sampling method and the official data I managed to define a representative sample for each country involved in the survey.

The sample for each country was defined also according to two additional criteria, the economic size calculated based on Standard Gross Margin (SGM), and the type of farming activity.

In case of the economic size categorization farms were classified into three groups according to their Standard Gross Margin expressed in ESU:

- **Small:** under 8 ESU;
- **Medium:** between 8 and 40 ESU;
- **Large:** above 40 ESU.

I took the 2004 thresholds as the basis because they were the most up-to-date at the time of preparing the sampling plan. During my research I analyzed questions in a country level comparison and in case of some questions I also prepared comparison based on economic size and activity type but because of limitations of size comparisons according to ownership and other aspects were not conducted.

The third stratifying criterion I used in the sampling plan was the farming activity type for which I also used the EU typology. According to the objectives of the research I defined the following categories based on the official types of farming activity:

1. **Crop production;**
2. **Horticulture and permanent crops;**
3. **Livestock production I.:** specialist grazing livestock and mixed livestock, mainly grazing livestock;
4. **Livestock production II.:** specialist granivores and mixed livestock, mainly granivores;
5. **Mixed cropping;**
6. **Mixed crop-livestock.**

After finalizing the sampling plan the group of respondents was defined by parties carrying out the survey by taking the above criteria into consideration and by random selection.

2.5. Tests applied to analyze results

The main objective of the questionnaire survey was to explore the differences between the surveyed countries on the level of each question. In the framework of the statistical tests I examined whether I can observe any statistically significant difference between the studied countries on each question's level. Additional to that, if a significant difference occurred I also wanted to know from where that difference is originating from, between which countries it occurs.

In those cases where I investigated the difference between the proportion of "yes" answers given to questions between the selected countries I applied z-tests with 5% significance level. Identification of the possible differences between the tested countries was done by organizing the countries into pairs and by comparing the countries in each pair. The analysis took place between all possible pairs of countries and by also applying the Bonferroni correction which reduces the possibility of identifying false, practically non-existing differences.

I applied a similar approach in case of questions measured on interval scale as I examined the discrepancies in all country combinations. I applied the Kruskal-Wallis test with 5% significance level to see whether there was any overall difference between the countries. After that I looked for differences in each possible pair of countries as well. These post-hoc tests were conducted by using the Mann-Whitney test and the Bonferroni correction to avoid false conclusions.

3. FINDINGS

3.1. Risk and risk sensitivity

Success of agricultural production depends on the combined effect of several factors in case of which the subjective opinion of the farmers define how risky they consider each of these factors. Additionally, the decision of what resources and to what extent to use to offset these risks also depends on how farmers judge these factors. In the questionnaire used for my research respondents were asked to rate the listed factors according to their personal opinions.

Respondents had the possibility to rate each factor on a scale of 1-7 where 1 means that the given factor has no effect on farming while in case of 7 the factor has great effect on agricultural production (Table 1).

Table 1: Farmers' ratings of factors affecting farming

	Hungary	Poland	Netherlands	Spain	Germany
Weather and natural disasters	6.24 Large effect	6.41 Large effect	5.06 Large effect	5.74 Large effect	5.41 Large effect
Animal disease and epidemic	4.91 Moderate effect	5.19 Large effect	5.98 Large effect	3.36 Moderate effect	3.35 Moderate effect
Volatility of prices	5.68 Large effect	5.55 Large effect	5.24 Large effect	5.48 Large effect	5.35 Large effect
Difficulties in selling farm products	5.06 Large effect	4.05 Moderate effect	4.69 Moderate effect	4.39 Moderate effect	3.95 Moderate effect
Input market	3.98 Moderate effect	2.21 Negligible effect	3.27 Moderate effect	3.75 Moderate effect	3.47 Moderate effect
Debt	2.63 Negligible effect	3.42 Moderate effect	4.52 Moderate effect	2.97 Negligible effect	3.04 Moderate effect
Political measures	4.15 Moderate effect	3.31 Moderate effect	4.89 Moderate effect	4.07 Moderate effect	5.23 Large effect
Technological processes	4.22 Moderate effect	3.64 Moderate effect	4.31 Moderate effect	3.62 Moderate effect	4.02 Moderate effect

Overall averages show that farmers consider weather and natural disasters as the factor having the largest effect on farming followed by volatility of prices. Farmers of all the surveyed countries think that volatility of prices has a great effect on farming but it is traceable that according to Hungarian farmers its effect is more notable than in case of German and Dutch farmers.

Animal diseases and epidemics (where respondents are involved in livestock production) have great influence on their farming activities according to Polish and Dutch farmers while German producers attach greater significance to political measures and Hungarians emphasize the greater importance of difficulties in selling farm products.

These results of the questionnaire were further examined based on two additional aspects. According to the economic size of farms (based on the European Size Unit) similar conclusions can be drawn as for the country comparisons, namely that in case of both small, medium, and large size holdings weather and natural disasters and volatility of prices were rated by farmers as factors having the largest effect on their farming.

When comparing the answers based on activity type (crop production, livestock production, and mixed production, so crop and livestock together) the following results can be seen. To animal diseases and epidemics solely those farmers attribute the greatest importance who are involved only in livestock production. Weather and natural disasters and volatility of prices are considered by crop producers as having the greatest effect including both purely crop producers and those involved in mixed production.

Farmers involved only in crop production consider weather and natural disasters and price volatility as factors having the greatest influence on their farming. However, farmers involved in livestock production and mixed production consider also animal diseases and epidemics as factors with great effect. This leads to the conclusion that according to their opinions these farmers have to face on more important risk factor, so their situation might be seen as somewhat more difficult.

3.2. Farmers' experience of risks and crises

In the questionnaire survey I tried to find out whether the farmers have ever faced any crisis situation threatening the very existence of the farming activity.

Results show (Figure 1) that in this regard Spain is the most affected country among the surveyed EU member states because more than half (56.5%) of Spanish farmers have already been exposed to crisis. Spain is

followed by Hungary where 40.3% of farmers have experienced such a situation. In this regard Germany, Poland, and the Netherlands can be considered as safer (compared to Spain and Hungary) because in these countries merely 20% of farmers have already had to cope with crisis situation(s).

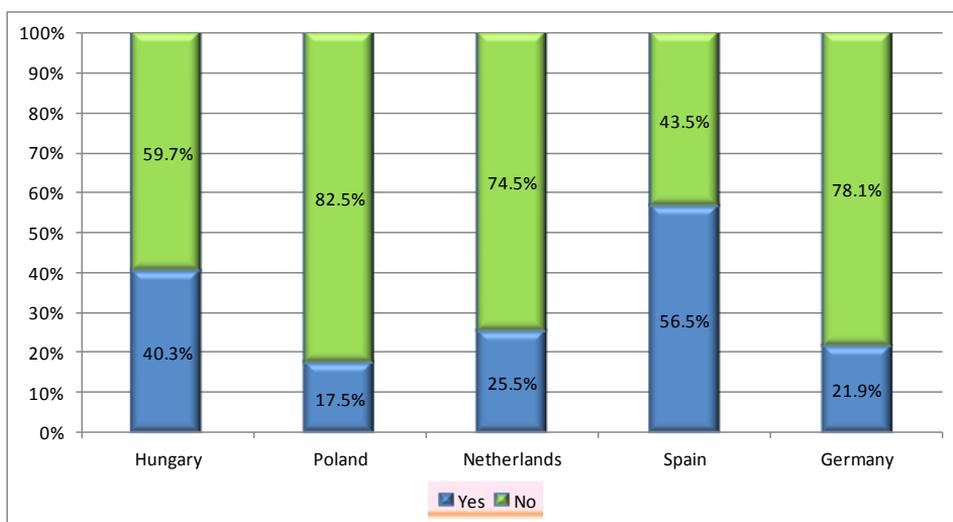


Figure 1: Occurrence of crisis situation among farmers

I also asked in the questionnaire that in the last ten years how many times did farmers experience crisis in which the loss due to the unexpected event exceeded the 10% of the planned yield in case of crop production and 5% in case of livestock production (these thresholds were set up based on discussions with other colleagues participating in the research). Beside the occurrence and frequency of crisis situations I also considered knowing the magnitude of loss important, namely what percentage of the cultivated area, livestock, and total farm revenue was affected by the crisis in the most severe situation. Such data makes estimating the gravity of such situations possible. I asked this question to both crop and livestock producers. Results concerning crop production are displayed in Table 2.

Answers show that crisis has occurred four times on average in the last ten years in Spain while in the other surveyed countries this is three times on average and the difference between them is statistically not significant.

Table 2: Main attributes of crisis situations experienced by crop producers

	Hungary	Poland	Netherlands	Spain	Germany
Average frequency of crisis situations in the last 10 years (number of occurrences)	2.99	3.03	2.88	4.21	2.90
Affected area as a percentage of the total land	47.08%	4.42%	27.39%	69.59%	40.02%
Affected revenue as a percentage of the total revenue	36.09%	25.70%	29.45%	65.59%	17.95%

As seen in the above table that most severe loss affected 69.58% of the cultivated area. Spain is followed by Hungary with 47.08%, followed by Germany with 40%, however the difference between these latter two is statistically not significant. The result for the Netherlands is 27.39% while it is only 4.41% in Poland.

When looking at what percent of the total revenue has been affected by the most severe crisis still Spain holds the number one position (65.59%) followed by Hungary (36.09%) also in this respect.

The measures described in this chapter were observed also in the case of livestock producers (Table 3). These results show that crisis situations, yield loss exceeding 5%, occurred two times on average in all surveyed countries in the last ten years. The most severe loss affected on average 49.6% of the livestock in Spain, followed by Hungary with 37.82%. The average magnitude of loss in Germany and Poland is between 16% and 18% but the difference between them is statistically insignificant. The largest yield loss affected, on average, 44.52% of the total farm revenue in Spain and 25.73% in Hungary.

Table 3: Main attributes of crisis situations experienced by livestock producers

	Hungary	Poland	Netherlands	Spain	Germany
Average frequency of crisis situations in the last 10 years (number of occurrences)	1.75	2.00	2.22	1.72	1.86
Affected livestock as a percentage of the total livestock	37.82%	18.41%	-	49.61%	16.86%
Affected revenue as a percentage of the total revenue	25.73%	20.25%	15.41%	44.52%	17.88%

The above table shows that based on the survey results the largest losses occurred in Spain in terms of both crop and livestock production.

In my research I also tried to find out what causes crisis situations in each country. Answers show that in case of Hungary, Poland, and Spain climatic events while in case of the Netherlands and Germany market conditions proved to be the primary reasons of crisis as Figure 2 displays.

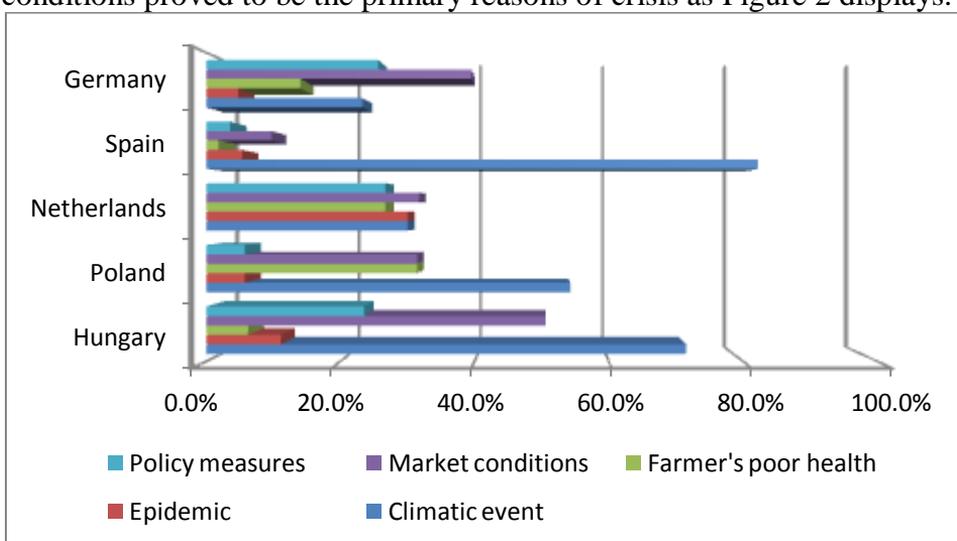


Figure 2: Causes of crisis situations according to producers

3.3. Risk management instruments applied currently by farmers and instruments planned to be applied in the future

In order to see the risk management practices of farmers it is essential to explore what instruments they use to cope with risks during their daily work.

In the questionnaire used for the research I listed several widely used risk management instruments from which the farmers had to select the ones they currently use (Table 4) and in a later question the ones they would like to use in the future.

Table 4: Risk management instruments currently used by farmers

	Hungary	Poland	Netherlands	Spain	Germany
Crop insurance	21.5%	14.1%	30.5%	59.2%	68.7%
Livestock insurance	4.1%	6.8%	37.2%	36.6%	42.8%
Diversification	23.1%	33.5%	11.5%	18.8%	28.4%
Marketing contracts	38.5%	35.4%	18.6%	12.6%	49.3%
Production contracts	15.9%	16.0%	20.8%	5.8%	16.4%
Off-farm investment	4.1%	1.9%	6.2%	5.8%	49.8%
Off-farm employment	19.0%	20.4%	17.7%	4.7%	36.8%
Property insurance	41.5%	67.5%	66.8%	29.8%	75.1%
Vertical integration	3.6%	5.8%	4.4%	12.6%	7.0%
Avoiding use of credit	37.9%	40.3%	38.1%	36.6%	31.3%
Hedging	1.5%	2.9%	1.3%	1.0%	5.0%
Holding financial reserves	40.5%	51.5%	22.6%	22.5%	61.2%

In terms of the currently applied risk management tools I found that crop insurance is a very popular instrument among German and Spanish farmers as 60%-70% of them are using it to manage risks. The prevalency of crop insurance is more moderate in the other three surveyed countries. It is worth to point out that livestock insurance is more widely used

among the farmers of old EU member states then in new member states, so in Poland and in Hungary.

The case of property insurance shows a more diverse picture because such insurances are popular mainly in Germany where 75.1% of farmers use any type of property insurance. Germany is followed by Polish farmers with 67.5% and Dutch farmers with 66.8% of them using property insurance.

On the other hand, marketing contracts proved to be popular among the farmers of new member states and Germany. Regarding German farmers it can be seen that they are much more active in terms off-farm investment (49.8% of them have it) and off-farm employment (36.8% of them are involved in such activities) than their colleagues in the other examined countries.

Avoiding the use of credit is also a kind of risk management tool with which farmers try to keep their level of debt on a low level thus reducing their exposure to creditors and financial difficulties imposed by unexpected events. This method is equally important in all examined countries as about 40% of farmers use it in case of each of the surveyed countries.

Beside the currently applied risk management instruments the ones planned to be used in the future are similarly important. This information helps to find out whether changes can be expected in the use of risk management tools. Results also enable us to infer in which tools farmers have considerable interest regarding future usage.

Based on the answers of farmers participating in the questionnaire survey it can be noted that the majority of farmers in all surveyed countries intend to use the currently applied risk management instruments also in the future. In this regard the highest rates can be observed in Germany and Spain as 80% of German farmers and 75.1% of Spanish producers plan to maintain the use of already applied risk management methods. However, the case of Polish farmers is a good counter example to this because considerably higher proportion of them are interested in new previously not used methods than the farmers in other countries.

3.4. Information sources used in farming and participation in training related to farming

In agriculture, like in any other segments of the economy, the success of market players greatly depend on the information they use for making decisions. The lack of meaningful information, in terms of decision making, constitutes a risk for agricultural producers because without the

necessary information it is very difficult to make decisions that give adequate response to risks in agriculture.

According to this assumption I asked the respondents in the questionnaire to mark which information sources they rely on in their farming work. Answers show (Table 5) which sources of information farmers of each country mostly apply when making professional decisions.

Table 5: Information sources used by farmers in farming

	Hungary	Poland	Netherlands	Spain	Germany
Internet	28.4%	34.0%	73.7%	20.8%	93.0%
Printed press	65.7%	90.8%	96.6%	40.6%	68.2%
Consultant	37.3%	88.8%	80.2%	35.0%	40.8%
Educational courses	9.5%	54.4%	48.3%	16.2%	36.3%
Other farmers	69.7%	57.3%	59.5%	79.2%	65.7%
Personal data collection	53.7%	71.4%	29.7%	49.7%	93.5%
Suppliers	11.4%	50.5%	65.1%	22.8%	45.3%
Buyers	17.9%	18.4%	41.4%	20.3%	23.9%
Farmers' union	10.9%	9.2%	-	20.3%	74.1%
TV programs	51.7%	78.2%	45.3%	29.4%	24.9%
Radio programs	49.8%	36.4%	-	15.7%	0%
Technical books	41.3%	39.8%	-	17.3%	63.2%

If overall averages are calculated from the values observed for each tool in each country it can be concluded that printed press is the most widely used source of information among farmers because 72.4% of farmers use it in farming. Unlike in the other examined countries only 40% of Spanish farmers use printed press as they rely more on the information obtained from fellow farmers.

Additionally, it is important to note, also because of its general economic significance, that the internet is used widely by farmers only in Germany and the Netherlands as a source of information used in farming. The case

of Germany has to be further pointed out because there the internet is already the second most used information source among agricultural producers. In my opinion this refers to that if the internet provides usable content and farmers consider that content credible then it can be a particularly useful way of collecting information.

In terms of up-to-date professional knowledge farming related trainings and educational programs are very important tools of acquiring usable expertise. This is why I also examined what percentage of farmers completing the questionnaire participated in any farming related training at the time of completing the questionnaire. Figure 3 depicts the results for each country.

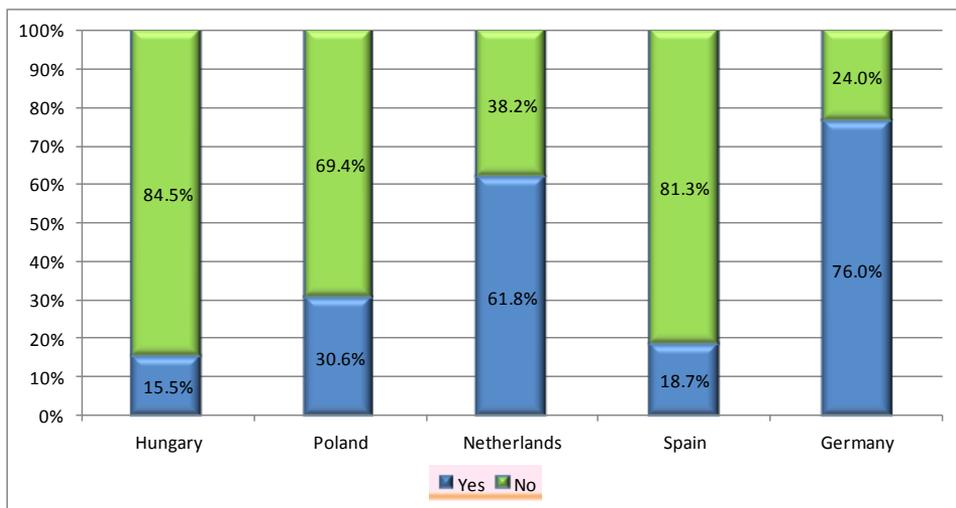


Figure 3: Participation of farmers in vocational training related to farming

The vast majority, 76%, of German farmers participated in any form of farming related vocational training when answering the questionnaire followed by the Netherlands with 61.8%. Unlike these two countries, Spain, Poland, and Hungary forms the other group as in these countries less than 30% of producers participated in any vocational training at the time of completing the questionnaire.

3.5. Farmers' opinion on methods capable of reducing risks

I also asked the farmers in the questionnaire to evaluate different risk reducing methods in terms of both crop and livestock production according to their personal experiences and opinions. The respondents could rate the different methods according to the already described system, namely rating each method on a scale ranging from 1 to 7 where

1 means that the given method is unsuitable to reduce risk and 7 refers to the contrary, the high efficiency of the method. The results are displayed in Table 6.

Table 6: Farmers' opinion on methods capable of reducing risk in crop production

	Hungary	Poland	Netherlands	Spain	Germany
Crop rotation / Relay planting	4.65 Moderately effective	4.62 Moderately effective	5.10 Very effective	3.70 Moderately effective	5.64 Very effective
Irrigation	4.26 Moderately effective	5.53 Very effective	4.48 Moderately effective	5.64 Very effective	3.62 Moderately effective
Drainage	4.06 Moderately effective	3.04 Moderately effective	5.12 Very effective	4.74 Moderately effective	3.66 Moderately effective
Preventive plant protection	5.53 Very effective	5.45 Very effective	5.80 Very effective	4.77 Moderately effective	5.93 Very effective
Technological improvement	4.78 Moderately effective	4.92 Moderately effective	4.97 Moderately effective	5.01 Very effective	5.08 Very effective

Regarding crop production overall averages show that farmers rate preventive plant protection as the most effective risk reducing method (5.5) followed by technological improvement (5) and crop rotation/relay planting. Results demonstrate that according to farmers' opinion preventive plant protection and technological improvement are very effective tools in reducing risks while crop rotation/relay planting, although scored relatively high, was rated only moderately effective.

I used a similar scale for evaluating the risk reducing methods in livestock production (Table 7). Overall averages show that farmers consider preventive medical treatment the most effective instrument (5.2). It is followed by ex-post medical treatment (5.1) and young animals from own breeding (5). In all of these three cases farmers rated these methods as very effective in reducing production loss. However, it is worth mentioning that the ratings of these three instruments fall very close to each other, so they might be perceived by farmers as equally effective.

Table 7: Farmers’ opinion on methods capable of reducing risk in livestock production

	Hungary	Poland	Netherlands	Spain	Germany
Preventive medical treatment	5.52 Very effective	5.95 Very effective	4.03 Moderately effective	5.82 Very effective	4.47 Moderately effective
Ex-post medical treatment	4.48 Moderately effective	5.34 Very effective	5.48 Very effective	5.55 Very effective	4.49 Moderately effective
Quarantines / Building rotation	3.76 Moderately effective	3.95 Moderately effective	2.79 Not effective	5.41 Very effective	4.13 Moderately effective
Young animals from own breeding	4.90 Moderately effective	4.51 Moderately effective	5.09 Very effective	5.04 Very effective	5.19 Very effective
Quality assurance	3.89 Moderately effective	4.74 Moderately effective	4.34 Moderately effective	5.47 Very effective	5.43 Very effective

3.6. Perception of access to credit among farmers

During the research I tried to find out how farmers perceive the process of getting credit as it greatly affects the prevalency of bank loans. Farmers’ opinion on access to credit is shown in Figure 4. Respondents could choose one answer which best reflects their opinion.

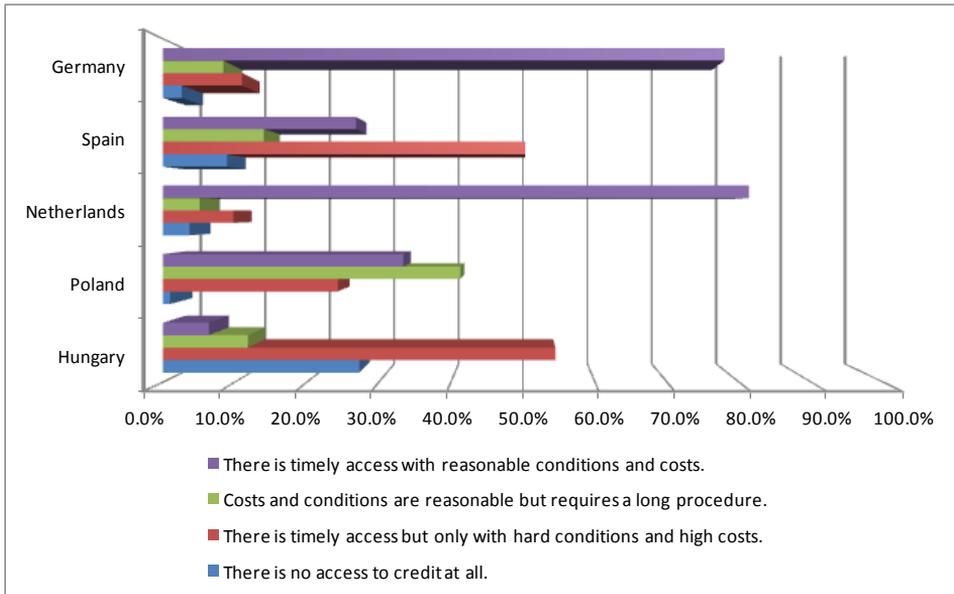


Figure 4: Perception of access to credit among farmers in each surveyed country

Results reveal that around half of Spanish and Hungarian farmers think that although they can get credit in time but the related conditions are difficult to meet and costs are high as well. Unlike them 41.3% of Polish farmers think that conditions and costs of credit are acceptable but the procedure is too long. On the other hand, around 80% of Dutch and German farmers believe that they can access credit in time with acceptable conditions and costs.

Finally, it is important to point out that 27.3% of Hungarian farmers stated that they are not able to get credit at all which is a salient result because in the other countries only between 1% and 3% of farmers expressed such opinion. This is a significant difference and furthermore it affects an area which is crucial in terms of the continuity of production because if the producer is unable to get credit in case of need then his situation becomes unsustainable and the very existence of the farm is in danger. Additional to that, only 6.4% of Hungarian farmers think that they can get credit in time and with acceptable conditions and costs which percentage is considerably lower compared to the other examined countries.

The above results lead to the conclusion that according to farmers' opinion getting credit is the most difficult in Hungary compared to the other surveyed countries.

3.7. New scientific results

1. By examining the subjective opinions of agricultural producers I have found that according to their judgment the phenomena of natural environment (weather and natural disasters, and animal diseases and epidemics) and price volatility have the largest effect on their farming activities.
2. In my investigation I have demonstrated that in terms of crisis situations threatening the existence of farms Spain in the first place and Hungary in the second place are the most endangered countries among the surveyed countries both in terms of crop and livestock production. The reason for this is that in these two countries crisis situations have occurred in considerably higher proportions in agricultural holdings and their effects have been the largest also in these two countries.
3. By analyzing the causes of crisis situations I have revealed that in Hungary, Poland, and Spain climatic factors while in the Netherlands and Germany market conditions proved to be the primary causes of crises. These together prove that where weather is more balanced crisis situations tend to be caused rather by market conditions while in case of more extreme climate weather is the main cause.
4. During my research I have surveyed the risk management instruments used currently and planned to be used in the future by producers. I have found that property insurances are prominently popular among farmers except for Spain where they are preceded by crop insurances. I have also demonstrated that avoiding use of credit is important in all the examined countries. In terms of risk management tools to be used in the future I have shown that the majority of producers in all surveyed countries would like to continue using currently applied instruments.
5. In my dissertation I have pointed out that farmers of Western-European countries with developed agriculture hold the first place in collecting professional information quickly and efficiently because the great majority of farmers use the internet in their work to gather such information and participate in farming related trainings.
6. As part of my research I explored the opinion of both crop and livestock farmers about several widespread risk management instruments. Based on the results I have concluded that crop producers consider preventive plant protection and technological

improvement as the most efficient risk management tools. Regarding livestock production I have found that such producers consider preventive and ex-post and medical treatments and young animals from own breeding as the most effective instruments in reducing risks.

7. I have demonstrated that based on producers' perceptions the possibilities of access credit are the worst in case of Hungarian farmers among the countries surveyed. I have shown that the proportion of farmers thinking that they are unable to access credit is the highest in Hungary. Additionally, the proportion of farmers thinking that they can access credit in time with acceptable conditions and costs is the smallest in Hungary. The majority of them think that they can access credit in time but only under difficult conditions and costs.

4. CONCLUSIONS AND SUGGESTIONS

The research on factors affecting agricultural production has revealed that in the surveyed EU member states and in the different economic size and activity type categories producers consider weather and natural disasters and price volatility as the factors affecting their farming activities at the largest extent. This strongly relates to the finding that farmers identified climatic and market conditions as the main causes of already experienced crises situations. Relevant results show that in case of crisis situations and in terms of both production yield and revenue Spain and Hungary are the most affected countries both in regards to crop and livestock production. Unlike these the other examined countries can be considered safe in this regard. Consequently, countries more exposed to crises have to pay more attention to designing and operating mechanisms aiming at avoiding or mitigating crisis situations caused by natural and market conditions.

Examination of risk management instruments applied by farmers showed that crop and livestock insurances are widespread mainly in the old EU member states while property insurances play an important role both in the old and new member states. Although old member states have developed credit markets in case of all the surveyed countries high proportion of farmers are trying to avoid taking on credit and thus financial liabilities. One of the most widely used ways of financing agricultural production is saving money, so farmers set aside funds in order to finance occurring costs. This is mainly inherent in Hungary, Poland, and Germany.

Analyzing the future use of risk management instruments revealed that the majority of both crop and livestock producers plan to continue using the currently applied risk management tools. Consequently, the majority of farmers already knows and uses the risk management tools considered to be suitable. This could alter considerably only due to a major change in the supply of such instruments, such as the appearance and spread of new revolutionary technological innovations.

I think that the internet should gain greater importance in the future in all countries in increasing the efficiency of risk management. My research results point out that in countries with developed agriculture, like the Netherlands and Germany, the majority of farmers already use the internet as the source of professional information but it is not the case in Hungary and Spain and the situation is only slightly better in Poland. In my opinion the most important criterion for the wide spread of the professional use of internet is that the internet has to deliver credible,

easy-to-use and up-to-date content. It is not enough, for example, to simply publish legal regulations, which is inherent in case of many Hungarian internet sources, but they should be accessible by farmers in an exoteric manner and by pointing out their practical implications. I find equally important the disclosure of the most recent market data and analyses on the internet which the farmers could use on a daily basis in making everyday farming decisions. Additionally, consultants should also play a key role in this by introducing the internet sources to farmers and demonstrating their use.

In conjunction with the foregoing I have to point out that both farmers and public institutions should put more emphasis on farming related professional trainings because these can provide the forum for farmers to obtain both technological and timely market information and also to learn the changes in legislation affecting their work, and all of this in one place and in a structured manner. My research revealed that farmers in the Netherlands and in Germany, where agriculture is highly developed, participate in such trainings at a much larger extent than for example in Hungary. Such high participation rates derive from the practical reasons explained earlier which greatly contribute to maintaining and improving production, marketing, and risk management efficiency.

Although because of the similarity in economic, social, and natural traits one could expect similarity also in the perception of agricultural risks and risk management tools between Germany and the Netherlands, and between Hungary and Poland but detailed analyses revealed that similarity or difference can be observed only on the level of specific questions. The main reason for this is that while in case of individual questions similarity between countries can be clearly observed, on an overall level, when looking at the entire "risk profile" of countries, the surveyed countries show considerable differences. This, of course, also depends on the scope of the research, to what extent it covers relevant questions. In case of this research the examined countries show great differences, although similarities can still be found on the level of specific questions. Spain is the most suitable example to demonstrate this because in some aspects it shows great similarity with other countries while being entirely different in others.

However, it is also important to point out that I examined only five EU member states in my research out of the current twenty-seven, so it can be easily seen that the number of combinations of possible similarities and differences between member states could be considerably large when analyzing all the member states. My research shows that countries with similar economic, social, and natural traits might show greater similarity

in case of some questions but in case of others they might greatly differ, like for example in the case of Hungary and Poland. This is why I think that if the EU wishes to regulate risk management in agriculture then it has to establish such a flexible regulatory framework which allows for the specific needs and characteristics of individual countries while also clearly reflects EU guidelines and expectations thus ensuring that member states can adapt their regulations to EU requirements based on well defined measures and criteria.

In my opinion, because of the increasingly extreme natural phenomena and the swift and often adverse changes of the global economic environment, the risk exposure of agricultural holdings will increase in the future which makes farmers face great losses more frequently if adequate risk management strategies and instruments are not applied.

The European Union urge the spread of market based risk management tools which do not or only partially require public funds and which operate more efficiently compared to those run by the state.

Based on the foregoings I think that on-farm (e.g. applying less risky technologies, diversification) and market based risk management instruments, such as agricultural insurances and hedging, will play an increasingly important role in the risk management practices of the farmers in the European Union.

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