

Aggressiveness of market risk events and their management in intensive chicken breeding farms in Kosovo

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ABSTRACT

Market risk management has an important role in the development of agricultural businesses (farms and agribusiness enterprises). Researchers have a variety of methods available to assess and manage market risk events. Although many studies have been conducted on risk management, there is still a research gap, not only in specific sectors of agriculture, but also for specific categories of risk. This is due to the fact that the agricultural sector is diverse and in addition to the market risk, it is threatened by production risk, financing risk, legal risk and human resources risk. The purpose of the study is to highlight the aggressiveness of market risk events and their management. In this study, the qualitative and quantitative method was applied to assess the market risk in intensive poultry breeding and production farms, for the marketing of eggs and meat. The study was conducted in the Republic of Kosovo. The results of the study familiarize farmers with the levels and aggressiveness of market risk events. Finally, responses to market risk (market risk management strategies) are recommended.

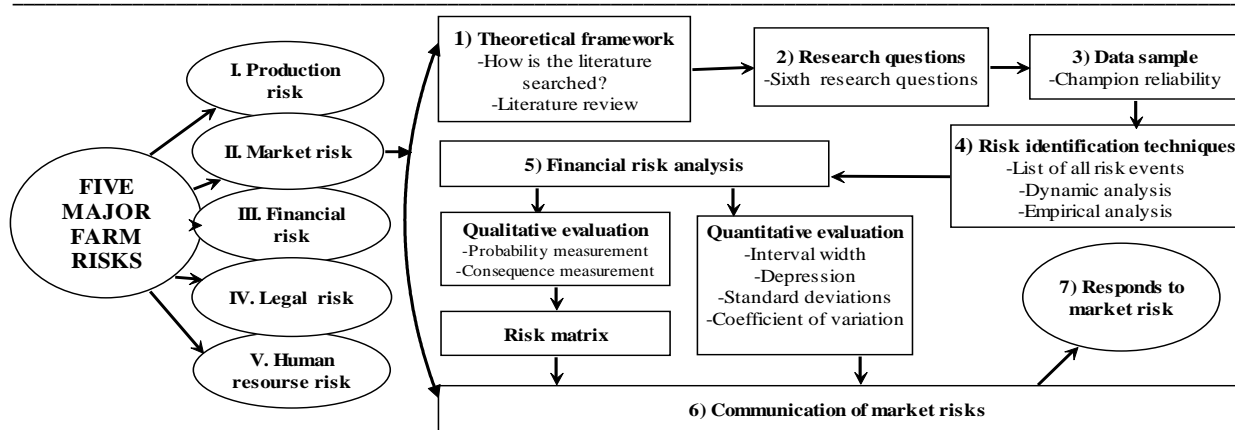
Keywords: Risk, market, propability, consequence, kualitative assessment, quantitative assessment, matrix, aggressiveness.

1. INTRODUCTION

Researchers of the risk management of agricultural businesses classify risks into five main categories: (1) production risk, (2) market risk, (3) financial risk, (4) legal/institutional risk, and (5) human resources risk (Harwood et al., 1999; OECD, 2008; Drollette, 2009; Schaffnit-Chatterje, 2010; Kahan, 2013; Carne et al., 2013; Turay, 2015; Thomas, 2018; Murrja et al., 2019; Komarek et al., 2020; USDA-ERS, 2020; Jankelova et al., 2020; Murrja, Maloku and Meço, 2021, Murrja&Braha 2021, Ranjbar et al., 2021). Sciabarrasi (2021) identifies them as the five major farm risks.

Komarek et al. (2020) identifies that the largest number of studies are related to production risk and afterwards those related to market risk, legal risk, financial risk and human resource risk. The current study aims to provide understanding on how farmers perception and attitude towards risk can influence their decisions, about management (Ullah et. al., 2015) and risk management. In this paper we will analyze the market risk. This study is based on the conceptual framework presented in Figure 1.

Figure 1. Conceptual framework of the study



Source: Adopted to our study from [Murrja et al., 2022](#).

Republic of Kosovo has an area of 10,908 km². It is located in the center of the Balkan Peninsula ([KAS, 2001](#)), in the part of Southeastern Europe, bordered by Albania, Montenegro, Serbia and Northern Macedonia ([KAS, 2016](#)). The population is 1,798,188 inhabitants ([KAS, 2021](#)). Kosovo is divided into 7 regions and 38 municipalities ([KAS, 2016](#)) and its capital is Prishtina.

The poultry sector (broilers, laying hens, birds, chickens and other turkeys, goslings, ducks and geese, other birds: African chickens, pigeons, etc.) in Kosovo is mainly oriented towards egg production, but recently started to develop Chicken meat production ([MAFRD Kosovo, 2016](#)). In 2020, the total number of poultry in Kosovo has increased by 4.4% compared to the previous year ([MAFRD, Kosovo 2021](#)). The average per capita consumption is estimated to be 206 eggs/year and we can say that Kosovo meets about 99% of needs for egg consumption, while with current production Kosovo manages to cover only 7.1% of consumption needs ([MAFRD, Kosovo 2021](#)).

2. LITERATURE REVIEW

2.1. Market risk on agricultural and livestock farms

Marketing risk is closely linked with production risk ([Green, 2003; Drollette 2009](#)). Marketing risk is linked with the possibility of loss in the production market or reaching lower prices to what were expected ([Green 2003; Sciabarrasi, 2021](#)). Price uncertainty poses a serious threat to farmers, especially in developing countries ([Assouto et al., 2020](#)). Market risk refers to uncertainty about the prices that producers will receive for goods or the prices they have to pay for inputs ([USDA-ERS, 2020](#)). Farm marketing transforms production activity into financial success ([Carne et al., 2013; Reynolds-Allie et al., 2013](#)). Sources of agricultural product price fluctuations include climate change/their impact on yields, ([Chen CC, 1999; Hamdan, Othman and Kari, 2015](#)) sudden changes in energy prices, and asymmetry in access to information ([Lazzaroni & Wagner, 2016](#)).

Farmers have little control over the market forces that drive commodity prices. Meanwhile price movements occur after seasonal or cyclical changes, which lead to overproduction and underproduction. Even these will suddenly change supply and demand and as a result, this will affect the market price. When farmers plant crops or spend resources on raising livestock and poultry, they do not know for sure what prices they will get for their produce. Other factors are changes in consumer income, the strength of the economy, government trade policies and exchange rates that affect demand for goods.

All of the above factors make the price volatile. Since input prices translate into costs for farmers and production prices translate into incomes for farmers, unfavorable prices on both sides can be devastating. It is therefore imperative that farmers manage marketing risk both in input and in output in order to obtain the projected profits.

2.2. Aplikimi i metodave cilësore dhe sasiore

The qualitative method is practical and oriented mainly towards detection practices and logical reasoning (Patton, 1987), requires experience, knowledge and creativity (Emblemsvag and Kjølstad, 2006) and is based on empirical analysis (Theodorou et al., 2021). Qualitative risk assessment aims to provide knowledge about sources and their potential impacts (Astles et al., 2006). While the quantitative method is predictive of specific levels of risk (Ramachandran & Charters, 2011) and applies mathematical models (Astles et al., 2006). These methods are important in the risk analysis of the farm enterprise level (Rasid et al., 2017).

3. MATERIALE DHE METODA

The study is based on the conceptual framework presented in **Figure 1**. To build this framework we are based on several authors and standards of international risk institutions (Bernstein, 1998; Emblemsvag Jan and Kjølstad, 2002; Fletcher, 2005; Pullan & Murray-Webster, 2011; Theuvsen, 2013; Fletcher, 2015; Murrja, Maluku and Meço, 2021; Murrja and Braha, 2021; BS 31100-2011; ISO 31000-2018; IRM-2002/2010), which are adapted to the context of qualitative and quantitative analysis of market risk on poultry farms in Kosovo.

3.1 Theoretical framework

Theoretical framework of this study is based: 1) in providing a considerable number of items within which our study is part; 2) in existing theories of literature; 3) in tests and certifications of other researchers; 4) in the form of an essay; 5) in creating an opinion to approach unknown research; 6) in a theory related to the proposals of other researchers; 7) in the use of theory, to predict and control situations within the context of the study (Murrja and Braha, 2021).

Research literature research is conducted in order to respond to the requirements of the theoretical framework (Tan Pham et al., 2019) with these phrases: "Risk management of farm / in agriculture"; "Qualitative market risk assessment in the farm/agriculture"; "Quantitative market risk assessment in the farm/agriculture"; "Quantitative and qualitative market risk assessment in farm/agriculture"; "Qualitative assessment methods"; "Quantitative assessment methods"; "Qualitative and quantitative assessment method". "Risk assessment of farm/agriculture".

3.2 Study research questions

This study addresses the following research questions:

1. Which market risk events are risk factors with very low and low level or have mouse aggression?
2. Which market risk events are moderate risk factors (high and very high probability and small and very small impact) or have the rabbit aggressiveness?
3. Which market risk events are moderate risk factors (low and very low probability and large and very large impact) or have the shark aggressiveness?

4. Which market risk events are risk factors with a very high level or have the lion aggressiveness?
5. Does the risk perceived by farmers match the value of the caused damage?
6. What is the relative variation of the loss from market risk events (quantitative assessment to measure objective risk)?

3.3 Data sample

The study includes intensive poultry farms for egg and meat production. A sample of 33 farmers or farm managers or farm economists, who were randomly interviewed in 7 regions of Kosovo, was used to assess production risk factors. The following formula was used to measure the reliability of the sample size:

$$t = \frac{\bar{x} - \mu}{S / \sqrt{n}} \quad \text{where} \quad \mu = \bar{x} - t \frac{S}{\sqrt{n}}$$

μ - Average population data;

\bar{x} - Average choice (5.5); t - Confidence level $(1-\alpha) = 0.95$ and safety $\alpha = 0.05$, where value $Z_{\alpha} = 1.96$; S - The variance of choice (3,26); n - Sample size (33).

In order to calculate variance of choice were used the data in Table 1 and the formula

$$S^2 = \sum_{i=1}^m \frac{(x_i - \bar{x})^2}{n-1} \quad \text{where} \quad S = \sqrt{S^2}.$$

x_i - Number of farmers or managers interviewed for each region.

Table 1. Estimation of the sample confidence level

No.	Region	x_i	\bar{x}	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
1	Ferizaj	2	5.5	(3.5)	12.3
2	Gjakova	8	5.5	2.5	6.3
3	Gjilan	5	5.5	(0.5)	0.3
4	Mitrovica	2	5.5	(3.5)	12.3
5	Peja	3	5.5	(2.5)	6.3
6	Prishtina	10	5.5	4.5	20.3
7	Prizren	3	5.5	(2.5)	6.3
The number of regions		n=33	$\bar{x} = 33/6$		$\sum(x_i - \bar{x})^2 = 63,8$

Source: Adopted to our study from [Murrja, Meço and Tomorri, 2019](#).

Therefore, $S^2 = 63,8/6 = 10,63$ and $S = \sqrt{10,63} = 3,26$. By choosing the confidence level $(1-\alpha) = 0,95$ we obtain: $0,95 = \Pr(\bar{x} - t * S / \sqrt{n}) \leq \mu \leq (\bar{x} + t * S / \sqrt{n})$, in which variance with distribution farmer t with $(n-1)$ degree of freedom, is such that the value $t_{(n-1;0,05)}$ fulfills the condition that integral $if(t; n-1)$ between $-t_{(n-1;0,05)}$ and $t_{(n-1;0,05)}$ is 0,95. In our study we have $0,95 = \text{Propabiliteti}[5,5 - 0,95(3,26/5,74)] \leq \mu \leq [5,5 + 0,95(3,26/5,74)]$. Thus, we obtain $4,96 \leq \mu \leq 6,04$.

3.4 Market risk identification techniques

In order to make an appropriate risk management decision, it is important to evaluate the risks according to an integrated approach, for example all possible threats are calculated. There are many types of risk, and when looking to control and manage, it is important to understand and identify sources of risk (Hardaker et al., 2007). In order to identify market risks here is adopted an integrated combination of several quality assessment techniques (Emblemsvag and Kjølstad, 2006; Girdžiute, 2012; Jordaan et al., 2013; Hopkin, 2018; Srinivas, 2019). Initially a list of all market risks was made, based on event dynamics (Chen, 2020) and empirical analysis (reliance on practice and experience). After surveying 11 sources, we analyzed 7 of them (see Table 3), because for 5 other sources, such as: “Loss of market access”, “Selling in new markets (not recognizing them)”, “Cancellation of contracts by buyers”, and “Inability to communicate with buyers due to language”, farmers expressed that their probability and consequence were zero.

3.5. Market risk analysis

Probability and consequence are risk measures (IRM; IIA; Orange Book) and produce the risk factor (Cooper et al., 2005; Jankelova et al., 2017). Riwthong et al. (2017) employed the 5-point Likert scale to measure farmers' perception of production risk. Qualitative risk assessment provides an overview of how likely something is to go wrong (likely) and what the consequence will be (Wang & Roush, 2000). The ranking of risks based on the product of probability (P) and consequence (C) provides a risk factor (RF) (Cooper et al., 2005). Farmers or managers were asked to rate the incidence and severity of each source of production risk, according to the Likert scale, from 1 (very low) to 5 (very high) in order to express how important they consider each source of risk, considering its potential impact on the farm (Ullah et al., 2015; Rizwan et al., 2019; Theodorou et al., 2021). These results are combined in the risk matrices in Figure 3 and Figure 4. Table 2 and Table 3 present the generic descriptions and the qualitative probability and consequence assessment for market risk events.

Tabela 2. Generic description and qualitative assessment (in numbers, words and colors) of the event probability

Possibility of event occurrence	Frequency in 5 years	Scale	Probability in words	Color rating
Event occurrence almost impossible (1%)	1 time	1	Very low	Green
Rare event occurrence (2%)	2-10 times	2	Low	Light green
Possible event occurrence (3-9%)	11-30 times	3	Average	Yellow
Frequent event occurrence (10-39%)	31-40 times	4	High	Orange
Almost certain event occurrence (mbi 40%)	Over 41 times	5	Very high	Red

Tabela 3. Generic description and qualitative assessment (in numbers, words and colors) of the event consequences

Consequence description	Value of damage	Scale	Consequences in words	Color rating
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Very low consequence	Up to 1,150€	(1-3)	Very low	Green
Low consequence	1,151€ - 2,300 €	(4-6)	Low	Light green
Average consequence	2,301€ - 10,150 €	(7-9)	Average	Yellow
High consequence	10,151€- 44,000 €	(10- 12)	High	Orange
Very high consequence	Over 44,000€	(13- 15)	Very high	Red

Source: Adopted to our study from Fletcher, 2005; Wieland et al., 2011; Fletcher, 2015; Olivera et al., 2019; Newman et al., 2018; SK Shaheenur, 2020, Murrja et al., 2022 (Table 2 dhe Table 3).

Questionnaire design: The questionnaire is structured in 7 open-ended questions. For each risk event is required a Likert rating of probability and consequence, from 1 (very low) to 5 (very high), and the average monetary value of the damage for the last five years 2017-2021 (Column 6, Table 5).

3.5.1 Qualitative market risk assessment

In order to facilitate their presentation in the risk matrix, the coding of each risk source was done (Aemando et al., 2009; Wilkinson et al., 2013; Herbst et. al., 2020).

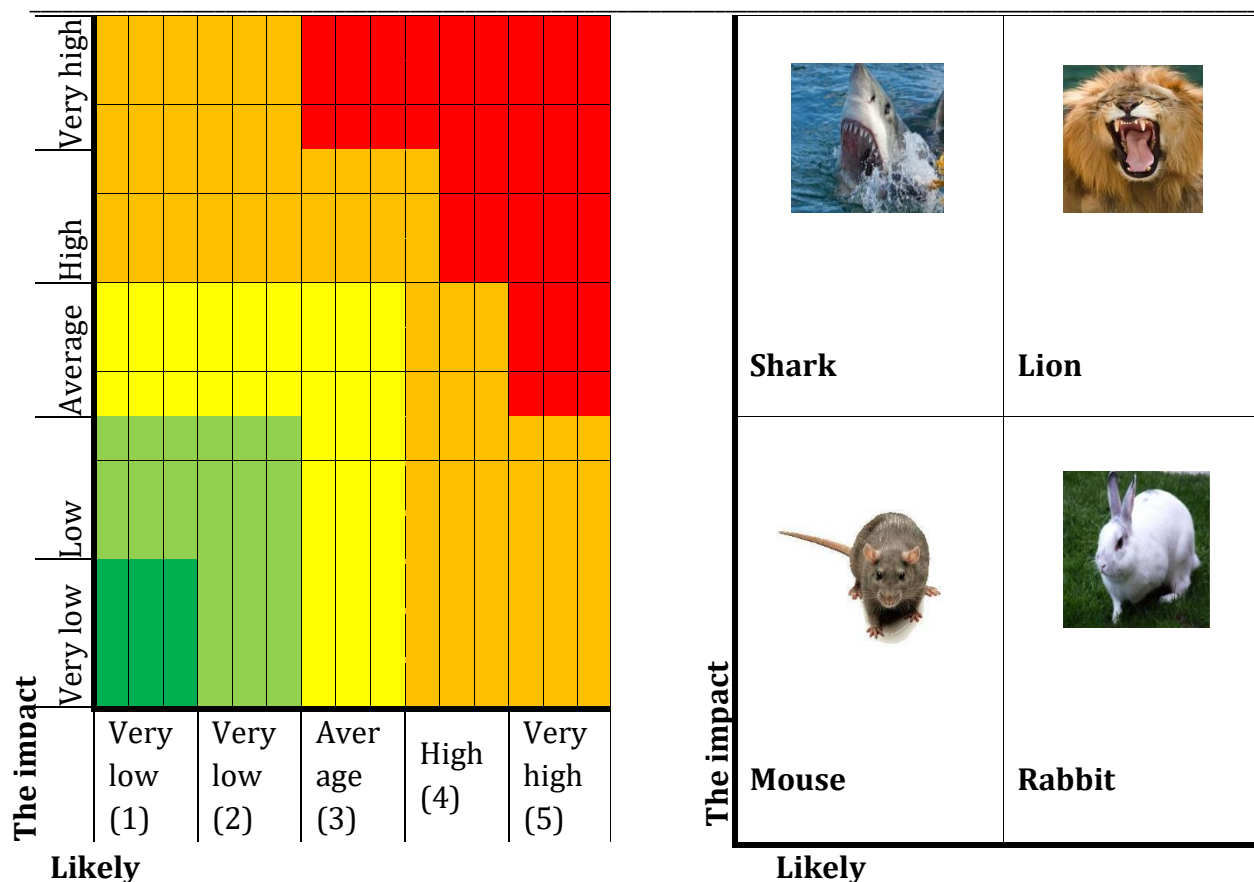
Table 4. Nominal assessment of market risk events (placement of codes or symbols)

Risk event	Symbol
1 Price fluctuation (price declining).	R _{m1}
2 Non-compliance with market standards (packing, packaging).	R _{m2}
3 Competition.	R _{m3}
4 Variations in consumer preferences.	R _{m4}
5 Reduction of consumer revenue.	R _{m5}
6 Embargo on Serbian and Bosnian goods	R _{m6}
7 Inaccuracy in registering incomes and expenses.	R _{m7}

Source: Authors own elaboration

Risk matrix: Using the matrix to illustrate the likelihood and magnitude of the risk impact (risk factor) is a very important risk management tool (Hopkin, 2018). Figure 3 presents the matrix according to the production risk levels from 1 (very low) to 5 (very high) and Figure 4, presents the production risk aggressiveness matrix.

Figure 3. Matrix of qualitative risk levels **Figure 4.** Risk aggressiveness matrix



Source (Figure 3): Adapted for our study by [Rosenburg et al., 1999](#); [Cooper et al., 2005](#); [Astles et al., 2006](#); [Wilkinson et al., 2013](#); [Flechter, 2015](#); [Ullah et al., 2015](#); [Murrja et al., 2022](#).

Source(Figure 3): Adapted from [Farag \(2015\)](#); [Murrja et al., 2022](#).

3.5.2 Quantitative estimation of market risk

In order to evaluate quantitative market risk this study has employed followig statistical estimates: 1) Interval width: $I_{width} = X_{max} - X_{min}$; 2) Depression: $D^2 = \frac{\sum(x_i - \bar{x})^2}{n-1}$; 3) Standard deviation: $D = \sqrt{D^2}$; and 4) Coefficient of Variation $C_v = (D/\bar{x}) * 100$.

3.6 Communication of market risks

The purpose of risk communication between researchers, managers, stakeholders and the public should provide information for better decision making ([Peterman 2004](#), [Garcia 2005](#)). The research focuses on communicating market rick events to farmers.

4. ANALYSIS, RESULTS AND DISCUSSION

4.1. Qualitative analysis of market risk

Table 5 Reflects the average probability and consequence results for market risk events and their combination (risk factor), as well as the average value of the financial dwm in euros for the last five years (2017-2021).

Table 5. Combined assessment of peobability with consequence (risk factor) and the value of damage in euro for each event

Risk code	Risk event	Probability	Consequence	Risk factor	Damage value
(1)	(2)	(3)	(4)	(5)=3*4	(6)
R _{m1}	Price fluctuation (price declining).	3	14	42	48,500
R _{m2}	Non-compliance with market standards (packing, packaging).	1	1	1	500
R _{m3}	Competition.	3	8	24	5,700
R _{m4}	Variations in consumer preferences.	2	3	6	1,200
R _{m5}	Reduction of consumer revenue.	4	6	24	3,000
R _{m6}	Embargo on Serbian and Bosnia-Hercergovina goods (application of 100%tax to them).	5	14	60	42,000
R _{m7}	Inaccuracy in registering incomes and expenses.	1	1	1	100



Source: Authors own elaboration

For all market risk events the risk factor perceived by farmers matches the financial damage caused.

A brief history of Kosovo government decisions on 100% tax on Serbian and Bosnia-Herzegovina goods

Application of a protection measure by the Government of Kosovo of 100% according to decision no. 01/74 dated 06.11.2018, for products imported from Serbia and Bosnia and Herzegovina, had a great echo and attacked only trademarks from Serbia and Bosnia and Herzegovina. The international community seems to have tacitly accepted the imposition of this tax. On 21.11.2018, the Government of Kosovo increased the tax from 10% to 100% also for the international brands produced in these two countries, excluding only some of them. On 28.12.2018, the Government took the decision to ban all trademarks without exception, which were produced in Serbia and Bosnia and Herzegovina, and entered into force on 01.01.2019. Therefore, was approved decision for supplementing and amending the decision no. 01/76 dated 21.11.2018, from which paragraph 2 of the basic decision is removed (Havolli&Uka, 2019). The reasons pushing the Government of Kosovo to impose a 100% tax was Serbia's aggressive campaign to withdraw recognitions and the campaign against Kosovo's membership in UNESCO and Interpol, which was successful (Gashi&Berisha, 2019; Havolli&Uka, 2019). Although the pressure of international community towards Government of Kosovo was enormous, this embargo lasted more than two years.

Figure 6. Matrix of risk assessment

Consequence	Very higt (13-15)							
	Higt(10-12)							

1. Market risk factors, perceived by farmers follow the trend of the damage, which means that the perception is in line with the value of the damage. Farmers are alert to market risk events.


Based on the quantitative analysis of market risk, we draw the following conclusions:




1. Market risk events have a large interval width (€48,700). This value is above the segment with high financial consequences [€10,151 - €44,000] (see Table 3). But the width of the interval is not a good measure of risk, especially for the value of the damage. The breadth of the range leads farmers to mainly buy the factors of production and sell their final products.
2. Relatively high dispersion of 71.4%, which means that the probability of occurrence is above 70%.
3. Standard deviation (21,302), which is included in the segment of high financial consequences [€10,151-€44,000] (see Table 3).
4. Very high coefficient of variation (147%).
5. Based on the prediction of the relative variation of the losses from the average of €14,471 a mismanagement of the market risk event, the losses can go up to €35,773. Based on the general descriptions of financial losses in Table 3, these losses are of a high level. This shows that farm market risk requires serious commitment from farmers to minimize financial consequences.

6. RECOMMENDATIONS

The audit aims to ensure that risks are not taken beyond the extent to which the firm can absorb the losses of a potential worst result (Aleknėvičienė et al., 2019). Communication and answers to research questions, and recommendations for using tools or strategies to address market risk events are presented in Table 8.

Table 8. Communication of production risk events according to quality assessment and recommendations

Riski events	Risk factor	Aggression of risk events	Impact of risk factor	Risk response (strategies of treatment)
R_{m2} - Non-compliance with market standards (packing, packaging).	Very low		Inconsiderable	1) Self-financing. Does not affect farm objectives.
R_{m7} - Inaccuracy in registering incomes and expenses.	Low		Insignificant	

R_{m3} -Competition. R _{m5} - Reduction of consumer revenues.	Medium		Medium Existence of fear.	1) Drafting a marketing plan related to the farm objectives.
R _{m6} - Embargo on Serbian and Bosnia-Hercergovina goods (application of 100% tax to them).	High		High Their impact causes serious damage. It is a political risk.	2) Market studies and analysis.
R _{m1} - Price fluctuation (price declining).	Very high		Very high Impact is catastrophic.	3) Production quality. 4) Expanding market by motivating customers. 5) Direct sales.

Source: Authors own elaboration

Risk factors perceived by farmers follow the damage trend, which means the perception is consistent with the value of the damages. It is worth clarifying the high level of the event R_{m6}-“Embargo on Serbian and Bosnian goods”, which brought increased costs for farmers, because they took all the raw materials from Serbia. Because of the embargo they were forced to take raw materials from Bulgaria, Croatia, Slovenia and Turkey. After the lifting of the embargo, mutual trade continued normally.

Market risk events have very large interval amplitude (48,700), high dispersion (71.4%), very high standard deviation (21,302) and very high variation coefficient (147 %). The forecast of the relative variation of losses from the average of 14,471 € results in 21,302 €. This value is part of the segment of damages with high consequences (10,151€-44,000€). Therefore, farmers are advised to follow the above recommendations.

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