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RISK MANAGEMENT IN AGRICULTURE

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Abstract

This paper is a result of the theoretical and methodological part of a PhD research on risk management in agriculture, done at the department of economics, Agricultural University – Plovdiv.

All businesses are exposed to risk. Uncertainty and volatility are growing in the changing world. Usually the risk is associated with the probability of different negative influences on the business process, which can reduce or destroy expected outcomes. Risks cannot be fully avoided in any business, especially in agriculture, but they can be managed in order to minimize their impact. Agricultural producers tend to be exposed to more risks with greater magnitudes compared to other economic sectors, and still the availability of specialized risk management tools is lagging (EC, 2017).

The aim of this research is to explore the possible risks in agriculture and the related theoretical concepts for their assessment, as well as to outline some of the most advanced management methods and instruments applied in practice for prevention and control.

Keywords: agriculture, risk identification, risk assessment, risk management

INTRODUCTION

According to OECD (2009), a single risk management strategy cannot be analysed in isolation. Instead, the issue of risk management must be explored holistically by taking into consideration numerous types of risks, their inter-relations, as well as the impact on different stakeholder groups.

Exploring risk management in agriculture is a modern trend in recent years. A review for the period 2008 – 2018 indicates a significant rise of the interest in the field. In Web of Science, the number of articles, focused on risk management in agriculture, has increased from just 17 in 2008 to 66 in 2018 (Novickyte, 2019). In addition, the number of citations on risk in agriculture has exponentially grown from just 5 to 742 for the same period (Novickyte, 2019). These facts clearly indicate the growing scientific interest and the practical need for improved risk management methods and tools.

Traditionally, risk management in agriculture has focused on coping with a variety of biological- and weather-related risks (Theuvsen, 2013). From a management point of view, agriculture has become an increasingly complex process. Farmers no longer operate in isolation given the requirements to cooperate, respond and address the actions of various types of stakeholders with different influence and interests, such as employees, policy makers, partnering financial institutions, suppliers, business partners and many others. Such complexity increases the exposure and vulnerability to risks. It also motivates the exploration of the topic in a greater depth.

MATERIALS AND METHODS

This section of the study discusses the main theoretical models related to the topic of risk management by emphasising on the agricultural area.

To begin with, Näther and Theuvsen (2012) present a detailed overview of the main

risks in agriculture. They are categorised in seven distinct groups depending on their nature: production, human resource, financial, production facility, market and price, political and others. The model also shows that each of the respective risk groups includes several key items; thereby, further enriching the risk identification process. In total, there are 26 individual types of risks in agriculture presented by the model Näther and Theuvsen (2012).

Naturally, the relevance of each of the presented risks may fluctuate depending on the specific context of a farm. Regardless of such specifics, the model’s propositions are clear – modern agriculture faces increased risk management requirements. The risk management strategy should include the whole spectrum of risks – market risks, political and financial risks, biological and weather-related risks.

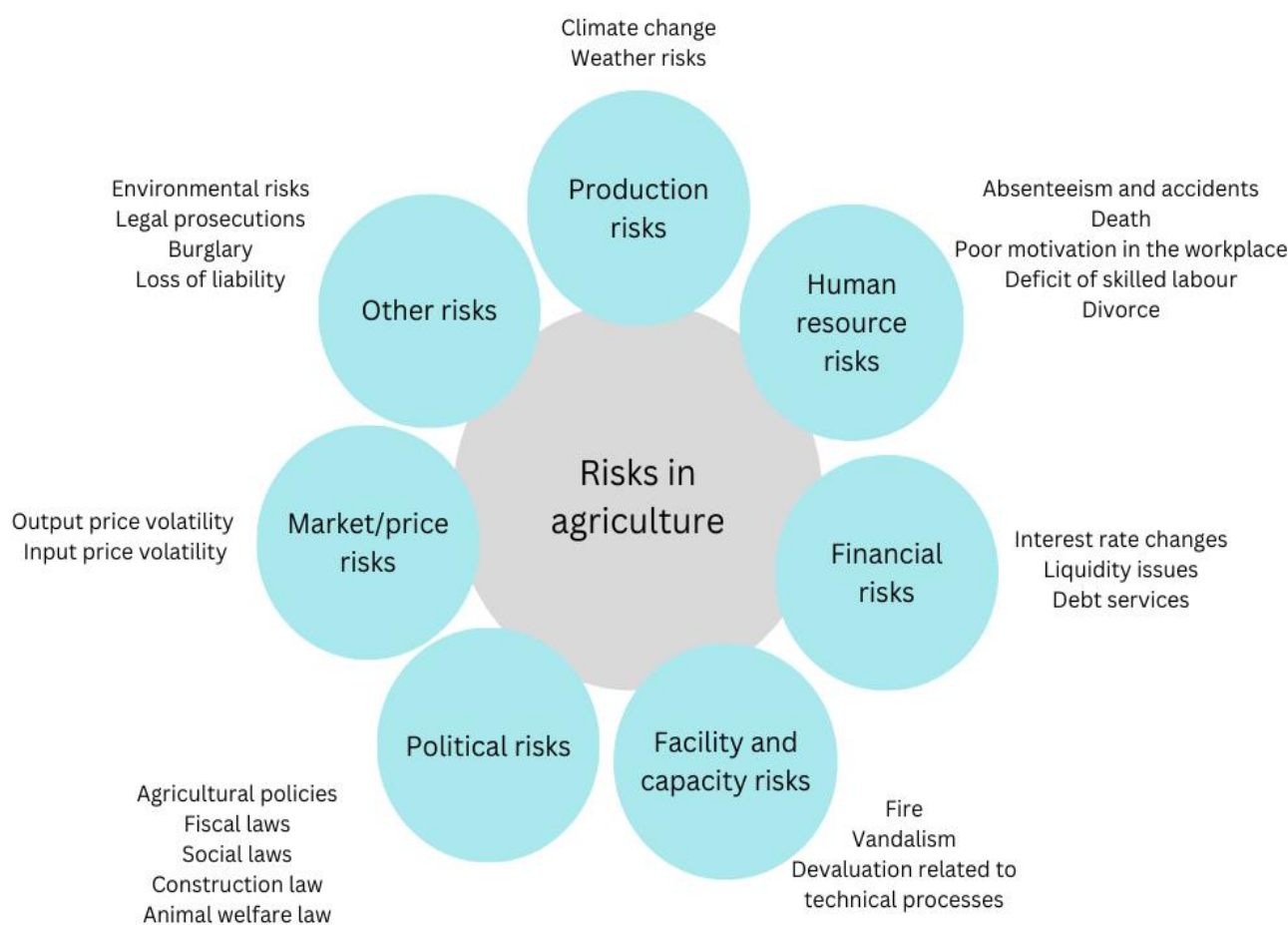


Figure 1. Main groups and types of risks in agriculture.
Source: Adapted from Näther and Theuvsen (2012)

The model is quite applicable for risk identification purposes. The actual risk management process, however, also requires the systematic implementation of several stages by including evaluation, response and control of risks (Wolke, 2007). Thus, risk management is

a step-by-step process which should not only be consistently performed, but also periodically considered in the context of the changing external and internal environments (Wolke, 2007).



Figure 2, Stages of risk management process
Source: Adapted from Wolke (2007)

Risk identification and assessment are the initial two stages of the model with a key role in understanding the types of risk and their relevance, respectively (Wolke, 2007). Given the theoretical profile of the article, the focus of the discussion hereafter is to present relevant models for risk identification and assessment. The other two stages of the model – risk management and control – tend to require more practically-oriented strategies and actions in order to mitigate and prevent potential and existing risks. As a result, these two stages of the risk management process are purposefully excluded from further analysis in this theoretical paper.

RISK IDENTIFICATION

Referring to the earlier-mentioned model of risk identification (Fig. 1), it can be noted that risks may originate from the overall external environment, from the specifics of the agricultural sector or from the personal and organisational developments (Näther and Theuvsen, 2012). Hence, it is relevant to propose theoretical models for risk identification at macro, meso and micro level.

External environment risks:

The macro environment is a source of many opportunities and risks for business organisations (Rastogi and Trivedi, 2016). The PESTEL model (an acronym of political, economic, social, technological, environmental and legal) scans the macro environment to identify relevant opportunities and risks (Kolios and Read, 2013). Each of the six groups of factors, which shape the external environment,

includes specific items to be considered in the risk identification process (Kolios and Read, 2013).

(1) Political factors include the degree of political stability, institutional effectiveness, corruption level, existing foreign trade policies, tax rates and regimes, funding grants and subsidies (Johnson et al., 2017). Therefore, political factors shape the overall characteristics of the business environment. Political factors have a direct and implicit impact on agricultural businesses. While political stability and corruption level may be considered as general sources of risks, tax policies and subsidy changes tend to have a direct impact on agricultural firms. Overall, political risk depends on the exposure of a given firm to government’s actions (Johnson et al., 2017).

(2) Economic variables focus on key macroeconomic indicators, including income level, as measured by the GDP, economic growth, interest rates, inflation, unemployment, disposable income and others (Worthington and Britton, 2015). The above-mentioned key economic variables explain the size and the drivers of demand in an economy which in turn affects market prices and sales volumes (Krugman and Wells, 2017). They may also influence the nature of business development costs – fuel, labour and other inputs. In this relation, economic factors may be a key source of risks for agricultural entities given the importance of the market, financial costs and production, as suggested by Näther and Theuvsen (2012).

Table 1. Key elements of PESTEL model

Factors	Elements
Political	Government policy, corruption, institutional effectiveness, trade regimes, tax policies, grants and subsidies
Economic	GDP level, economic growth, inflation, unemployment, interest rates, exchange rates, disposable income
Social	Population size and growth, age distribution, changes in consumer preferences, workforce trends, cultural specifics
Technological	Technological state, level of innovation, intellectual property, research and development activity
Environmental	Climate change, environmental regulations, environmental preservation, corporate social responsibility
Legal	Regulatory changes, employment legislation, consumer protection laws, anti-trust measures, health and safety laws

(3) Social factors also influence demand but with a predominantly long-term impact. This is explained by the fact that social variables include demographic trends, age distribution and workforce trends and changes in consumer preferences (Johnson et al., 2017). Cultural specifics are also included as a social factor. Nevertheless, culture-related factors appear to be relevant from a risk management perspective for cross-border companies only. Such agricultural conglomerates may experience various culture-related management, communication and behavioural issues related to operating with foreign workforce and customers (Hofstede, 2001).

(4) Technological factors recognise the role of technological progress by taking into consideration emerging technologies, intellectual property, research and development and others (Worthington and Britton, 2015). In general, technologies tend to enhance new business development opportunities, rather than being a source of risks; however, agricultural firms should be aware about the dynamic technological changes and should invest in new technologies accordingly in order to maintain competitiveness.

(5) Environmental factors mainly focus on climate change, environmental issues,

preservation, as well as corporate social responsibility policies (Johnson et al., 2017). The role of environmental factors has increased due to the growing public awareness and policy changes in the field of environmental protection (Kolios and Read, 2013). Business organisations, including the ones in agriculture, need to adjust their operations and change in order to comply with the changing environmental regulations. This may be quite costly in the short-term and thereby impose new risks.

(6) Legal factors. Finally, the PESTEL model reflects the existence of legal risks related to regulatory changes, employment legislation, consumer protection laws, anti-trust measures and others (Johnson et al., 2017). Changes in legal factors may be a source of risks for the business due to the higher compliance costs and non-compliance issues. Cross-border agro businesses face an even more challenging legal framework. This is explained by the fact that laws and regulations may diverge across countries; hence, requiring legal adaptation of business practices in each market (Morrison, 2020).

Industry level risks

The meso environment emphasises on the existence of industry-wide sources of risk for agriculture. Porter’s Five Forces model is a popular model for assessing the level of profitability and attractiveness in any given economic sector (Porter, 1979). The framework combines five distinctive groups of factors: bargaining power of suppliers, bargaining power of buyers, threats of new entrants, threat of substitutes and existing rivalry (Isabelle et al., 2020). The combined impact of these factors determines the relative level of industry attractiveness; however, the specific exploration

of each factor tends to identify specific risks for industry participants, as well (Porter, 1979).

Agricultural firms typically rely on suppliers in order to produce finished products. Suppliers deliver various inputs affecting the production, such as fuel, seeds, fertilisers, labour and others. Thus, the bargaining power of suppliers may be a source of risks for firms (Hole et al., 2019). Theoretically, suppliers, who are few in number, large in size and difficult-to-replace, may experience a considerable market power; thereby, causing extra costs and even insufficient supply for agricultural firms (Isabelle et al., 2020).

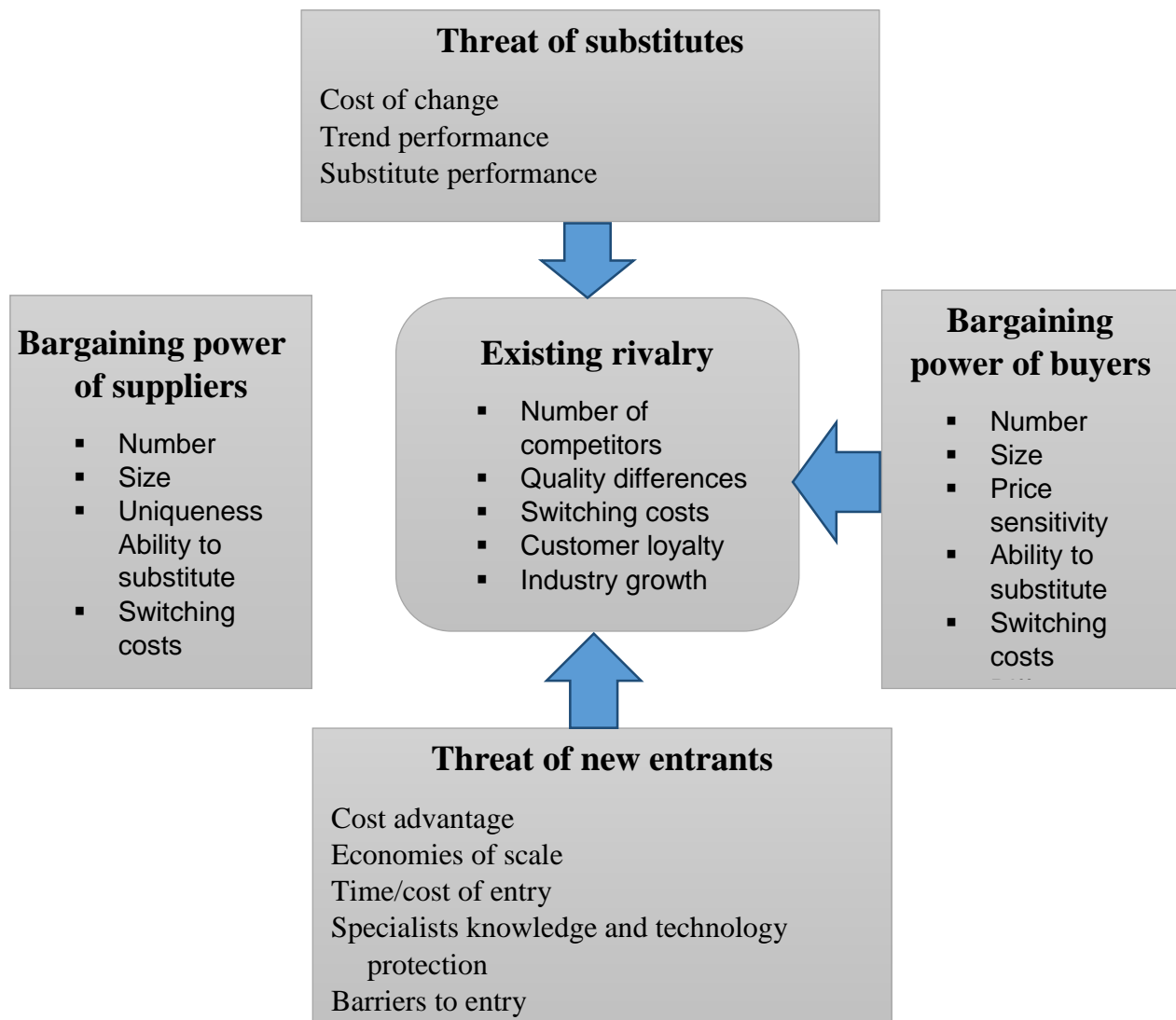


Figure 3. A detailed overview of the Porter’s Five Forces model
 Source: Adapted from Isabelle et al. (2020)

Buyers also share some characteristics, such as size, number, price sensitivity, ability to find substitutes and others, which strongly influence the demand patterns and the profit margins of the industry participants (Porter, 1979). In general, the existence of few and large buyers with access to substitute products delivers market power. In addition, price sensitive buyers have an elastic demand curve reducing the opportunity of producers to achieve attractive profit margins (Krugman and Wells, 2017). In this instance, agricultural firms tend to experience specific risks imposed by the high bargaining power of buyers.

There are also two types of threats with a diverging impact in the agricultural sector. The threat of new entrants tends to depend on a variety of entry barriers, including licensing regulations, economies of scale, capital requirements for the development of large production and distribution capacity and others (Hole et al., 2019). The absence of effective entry barriers exposes existing agricultural firms to a higher level of competition, especially in high-growing and attractive segments of the sector. Thus, the threat of new entrants erodes the competitive position of existing firms which is a major risk (Isabelle et al., 2020).

In contrast, the threat of substitutes is less relevant for the majority of agricultural firms due to the essential necessity of agricultural products and inability to replace them with alternatives. Hence, the threat of substitutes is rarely a source of risks in agriculture.

The model also considers the existing rivalry as a major determinant of profitability in the sector (Hole et al., 2019). Existing rivalry is also linked to the market structure, as it is focused on the number of competitors (Krugman and Wells, 2017; Isabelle et al., 2020). The levels of customer loyalty, switching costs and quality differences together with the pace of industry growth are key factors to be

considered, as suggested by the model (Isabelle et al., 2020). In the context of agriculture, risks may emerge from the lack of considerable growth given the mature stage of development, as well as the production of undifferentiated products by many farmers. The latter prevents the creation of a popular brand value and customer loyalty; thereby, exposing firms to a more considerable competition in the marketplace.

Organisational level

The micro firm-based level is also a source of specific risks. While the presence of personal, production facility and other risks is recognised by Näther and Theuvsen (2012), there are additional considerations and models for the evaluation of micro-level risks.

The Balanced Scorecard is a model for a timely monitoring and controlling of four areas of organisational performance, so that sustainable development is fostered (Kaplan and Norton, 1996). The model considers the existence of financial, customer-centred, internal and capacity-related areas of performance. Business organisations have the freedom of selecting the most relevant items in each of the four areas; hence, the model can be tailored on the basis of the specific organisational context (Dudic et al., 2020).

The financial perspective typically includes revenue, profitability, cash flow, costs and other quantitative metrics of the market performance (Kaplan and Norton, 1992). Internal area focuses on efficiency metrics, levels of inventory and other process-oriented performance indicators. Customer perspective explores indicators of market share, brand value, customer loyalty and satisfaction. Finally, capacity-related area, which also refers to learning and growth, measures the level of employee retention, satisfaction, training and development needs and others (Kaplan and Norton, 1992).

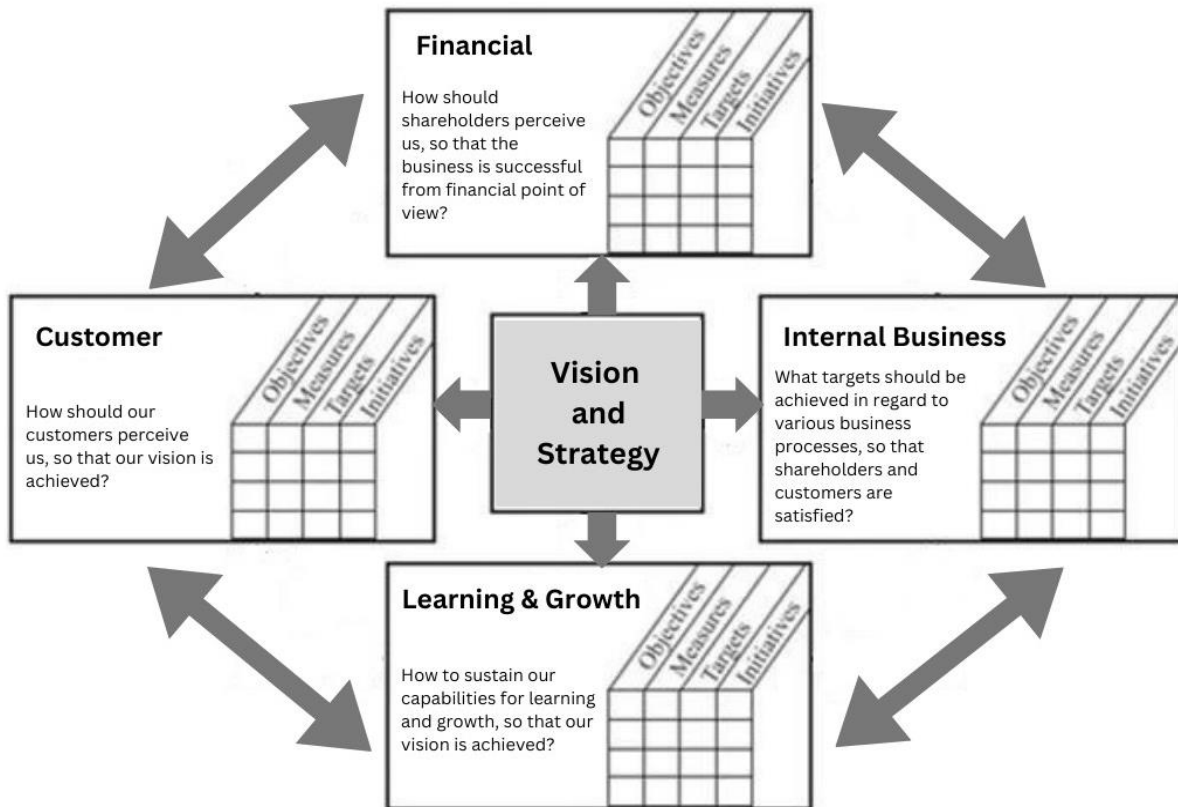


Figure 4. Balanced scorecard model
 Source: Adapted from Dudic et al. (2020)

The model suggests the recognition of relevant indicators in each of the four performance areas together with an objective and measurable way of evaluation (Kaplan and Norton, 1996). Organisations are expected to be pro-active and dedicated to performance measurement. By engaging in consistent and objective performance measurement, the balanced scorecard model is suitable in detecting discrepancies between actual and expected performance, as well as instances of deteriorating performance. Thus, firms are able to identify the emergence of new risks or deteriorating dynamics in a timely manner (Kaplan and Norton, 1996).

RISK ASSESSMENT

The discussion shows the relevance of applying “PESTEL”, “Porter’s Five Forces” and “Balanced scorecard” for the identification of

external, industry and specific risks. As suggested in Figure 2, once identified, risks have to be evaluated as part of the risk management process (Wolke, 2007). Assessment is important, as it determines the strategic actions and resource allocation in coping with risks according to their relevance for each respective organisation.

Quantitative measures of assessment are dominant due to the ability to achieve measurable, objective and specific results on the basis of numeric values (Saunders et al., 2009). Quantitative results are also easy to compare; thereby, enhancing the ability to rank risks according to their scores.

The risk evaluation matrix is a common tool in the field of project management and it is also quite applicable in the risk management process (Guo, 2015). Wolke (2007) identifies two dimensions in risk evaluation – loss potential and incident rate. The risk matrix

model applies identical dimensions where the overall relevance of a given risk is a function of its consequence and likelihood (Guo, 2015). The risk matrix model suggests that the respective values from both dimensions are multiplied in order to produce a final score. The

latter is used by risk managers to identify the overall relevance of a given risk (Table 2). Respectively, risks with the highest scores should be considered as the most important and vice versa (Guo, 2015).

Table 2. Risk matrix

Likelihood Impact	Remote (1)	Unlikely (2)	Possible (3)	Likely (4)	Almost certain (5)
Extreme (5)	5	10	15	20	25
Major (4)	4	8	12	16	20
Moderate (3)	3	6	9	12	15
Minor (2)	2	4	6	8	10
Insignificant (1)	1	2	3	4	5

Source: Adapted from Guo (2015)

In the current case, a 5-step scale is applied; however, many different quantitative scales are used in practice. The question of an assessment scale is less important than the ability to accurately quantify each risk, so that an objective evaluation is performed (Guo, 2015). It is also important to note the risks with high likelihood, which can have minor consequences for firms; thereby, suggesting an inverse relationship between severity and occurrence (Peace, 2017). Nevertheless, there are exceptions and practitioners have to be aware in the risk evaluation process.

theoretical models in the field. The combined use of and accumulated experience in performing in the macro, meso and micro environment should be seen as key pillars of the risk management process. Therefore, research findings can be applied as part of a methodology when assessing risks and risk management practices in the field of agriculture. Nevertheless, it is important to note that future empirical research is necessary in order to analyse the actual applicability and value of the theoretical concepts in different types of agricultural organisations and contexts.

CONCLUSION

Research findings demonstrated the complexity of the risk management process and its increasing relevance given the uncertain environment. Organisations in the agricultural sector face a widening range of potential risks. Respectively, the risk management process is of increasing relevance and impact on performance. The review of the theoretical concepts in this article demonstrates the need for a pro-active and effective management of potential and actual risks. This process may be considerably fostered by applying proven

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