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# Risk analysis and management practices of Bulgarian fruit-growers

**Rosen Ivanov**

Agricultural University – Plovdiv, Bulgaria
**Corresponding author: rosenivanov10@yahoo.com**

## Abstract

The current study presented empirical results from a survey among eighty-six fruit-growers in the region of Plovdiv, Bulgaria. Respondents participated in an online survey conducted in 2024. The aim of the study was to evaluate the existing risks in the fruit-growing sector and to identify relevant directions for future improvement that support sustainable development. The analysis identified twenty relevant risks which were assessed based on their likelihood and negative impact. The findings demonstrated the significance of most of the studied risks, with biological and market risks playing a dominant role. Fruit growers also recognized the importance of risk management for sustainable development, given their current vulnerability to certain risks. Moreover, there was a clear readiness to dedicate more resources and efforts to risk management. The analysis revealed the implementation of numerous risk management practices by fruit-growers; however, the focus overly concentrated on specific areas. Consequently, the evidence suggested several potential directions for improving risk management in the future.

***Key words***: risk management, risk assessment, fruit-growing, climate change, Bulgaria

## INTRODUCTION

The area of risk management has been of growing importance for farmers (Novickytė, 2019), and as a rule, biological risks have dominated risk management goals and practices (Theuvsen, 2013). However, the increasingly complex and turbulent external environment has led to the emergence of different types of relevant risks for farmers (Bashev, 2012). Näther & Theuvsen (2012) have identified 26 different risks, organised into seven thematic groups (Fig. 1). The occurence of numerous risks requires a pro-active risk management process since the lack of awareness may inhibit the sustainable development of each farm (Huirne, 2003; Komarek et al., 2020).

To mitigate the adverse impacts of various risks, farmers have to evaluate the risks based on two key aspects – their likelihood and the negative impact (Guo, 2015). Once assessed, risks can be managed by applying a variety of strategies, including partial or full avoidance, transfer to another party, reduction or acceptance (Wolke, 2007) (Fig. 2).

These clarifications suggest that the risk management process primarily consists of three key stages: identification, assessment and management (Wolke, 2007). An additional and final stage – risk control – is beyond the scope of the current research and is, therefore, not discussed further. The current study explores the risk management process in the specific context of fruit-growing. Empirical findings from the survey of fruit-growers were used to evaluate a set of 20 relevant risks. The data was also utilized to conduct a risk assessment procedure, which evaluated the frequency and severity of each risk for fruit-growers in Bulgaria. The popularity of different risk management strategies is presented in detail, along with an exploration of possible differences across various groups of farmers.


**Figure 1.** Overview of main risks in agriculture
*Source: Adapted from Näther & Theuvsen (2012)*

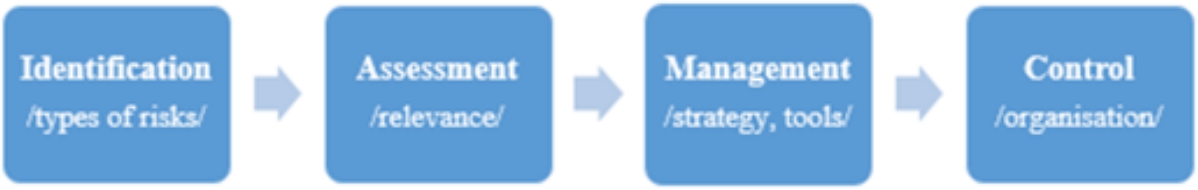


**Figure 2.** Overview of risk management process
*Source: Adapted from Wolke (2007)*

The analysis also identified the most important factors influencing the engagement of fruit-growers in risk management. Research findings provide valuable insights, as the topic of risk management has not been extensively studied in the context of fruit-growers. Moreover, the results can identify relevant risk management gaps that need to be addressed as part of future improvements in the process. Given the dynamic nature of the external environment and agricultural sector, the study may also offer practitioners an overview of the most relevant risks based on the latest available data.

## MATERIALS AND METHODS

This study presents the results from a survey of 86 fruit-growers, located predominantly in the region of Plovdiv, Bulgaria. The ability to collect sufficient number of responses is the reason behind the approach (Bryman, 2016). Such approach is suitable for reducing the risk of biased results and allow the access to reliable primary data which indicate the main trends in risk management. Quantitative primary data also facilitates statistical analysis which further support more objective analytical approach

(Saunders et al., 2019). The online survey was conducted between March and September 2024 via Google Forms platform. The approach contributed to a cost- and time-efficient data collection process by achieving a reasonable geographic and demographic diversification. The applied snowball sample design also contributed to recruiting initially unknown fruit-growers – a key determinant to achieve a larger sample size. The sample of 86 respondents included diverse participants in terms of demographic characteristics. Although dominated by men, the sample includes respondents with different experience, age and education.

As evident, the sample included fruit-growers with diverse profiles and specialisation in fruit-growing which is a key factor for reliable and representative findings. The following charts indicate the main characteristics of orchards (Fig. 3 and Fig. 4).

The sample included respondents who cultivated not only diverse orchard types but also different kinds of plants (Fig. 4).

There are several additional characteristics of orchards worth mentioning. Given the topography characteristics of Thrace, it is expected that most orchards are in plain and hilly areas (Table 2). Moreover, more than half of the orchards cover an area less than 4 ha, thereby highlighting the dominant role of small-size orchards (Table 2).

**Table 1.** Demographic characteristics of survey participants and their roles

| | | | | | |
|---|---|---|---|---|---|
| **Gender** | Male – 77.9% | Female – 22.1% | - | - | - |
| **Age** | 20-30 – 23.3% | 31-40 – 22.1% | 41-50 – 18.6% | 51-60 – 24.4% | 60+ 11.6% |
| **Education** | Basic – 4.7% | Secondary – 24.4% | Secondary vocational – 18.6% | Higher – 52.3% | - |
| **Experience (years)** | < 10 – 38.3% | 11-20 – 25.6% | 21-30 – 18.6% | 30+ 17.5% | - |
| **Role** | Owner – 66.3% | Renter – 19.8% | Manager – 9.3% | Other – 4.6% | - |

*Source: Own calculations*

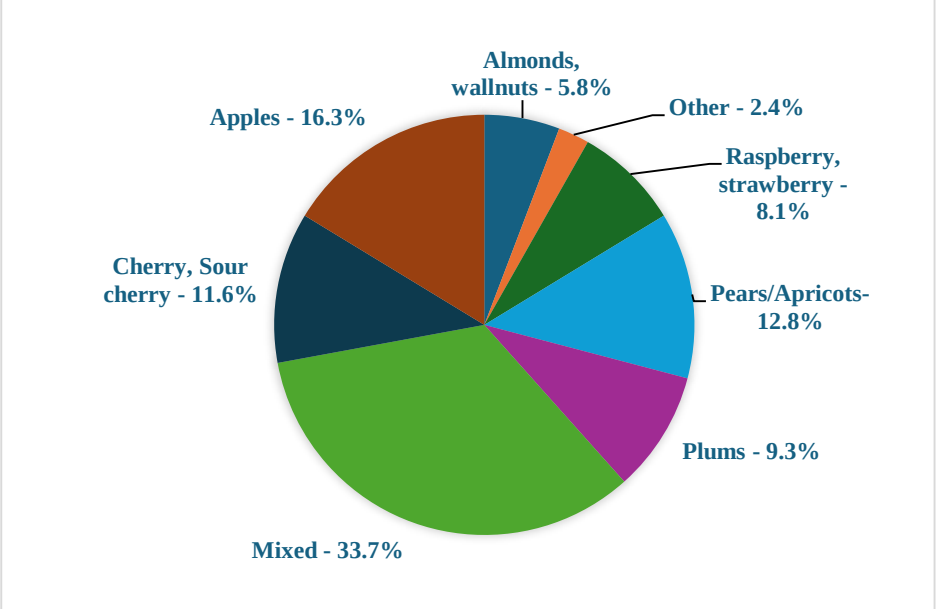


**Figure 3.** Distribution of orchard types in the survey (%)
*Source: Own calculations*

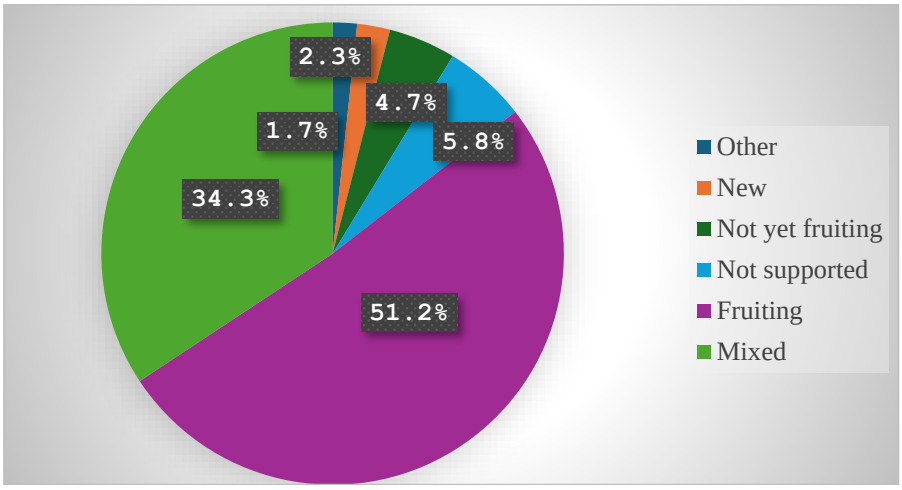


**Figure 4.** Distribution of plant kinds in the survey (%)
*Source: Own calculations*

**Table 2.** Other key characteristics of orchards (ha)

| **Area (ha)** | <2 – 38.4% | 2.1-4 – 16.3% | 4.1-6 – 10.5% | 6.1-8 – 9.3% | 8+ 25.5% |
|---|---|---|---|---|---|
| **Topography** | Flat – 74.4% | Hilly – 20.9% | Semi-mountainous - 3.5% | Mountainous – 1.2% | - |

The data shows the diverse demographic profile of participants and orchards with different characteristics. Hence, the sample largely reflects the existence of diverse fruit-growers and orchards in the Plovdiv region.

## RESULTS AND DISCUSSION

The discussion includes the risk assessment and management practices after all relevant risks were already identified in the introduction part of the study.

***Importance of risk management***

The analysis began with an exploration of the importance of risk management in the context of fruit-growing. More than two-thirds (67.4%) of the participants consider risk management an important process affecting the outcome of their efforts. In contrast, 22.1% of respondents are, to a certain extent, unaware of the role of risk management, whereas 10.5% expressed neutral opinions (Fig. 5).

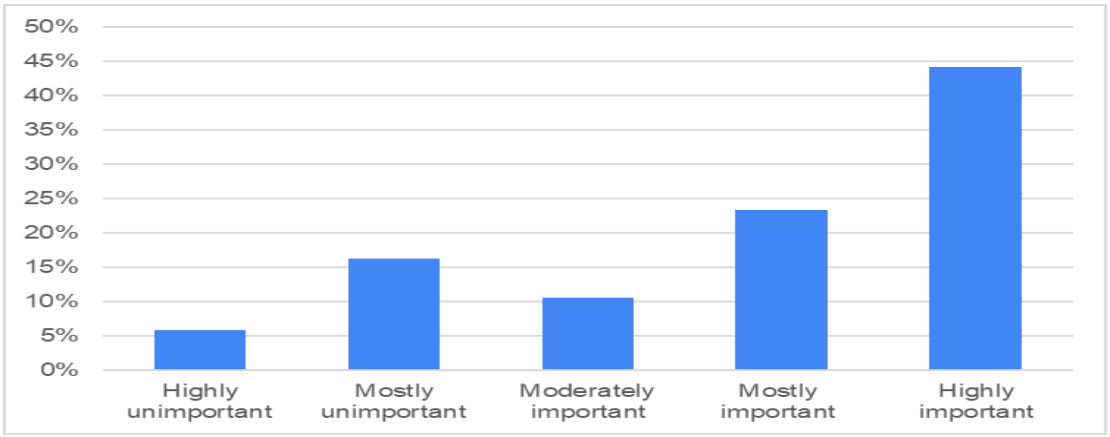


**Figure 5.** Importance of risk management (%)
*Source: Own calculations*

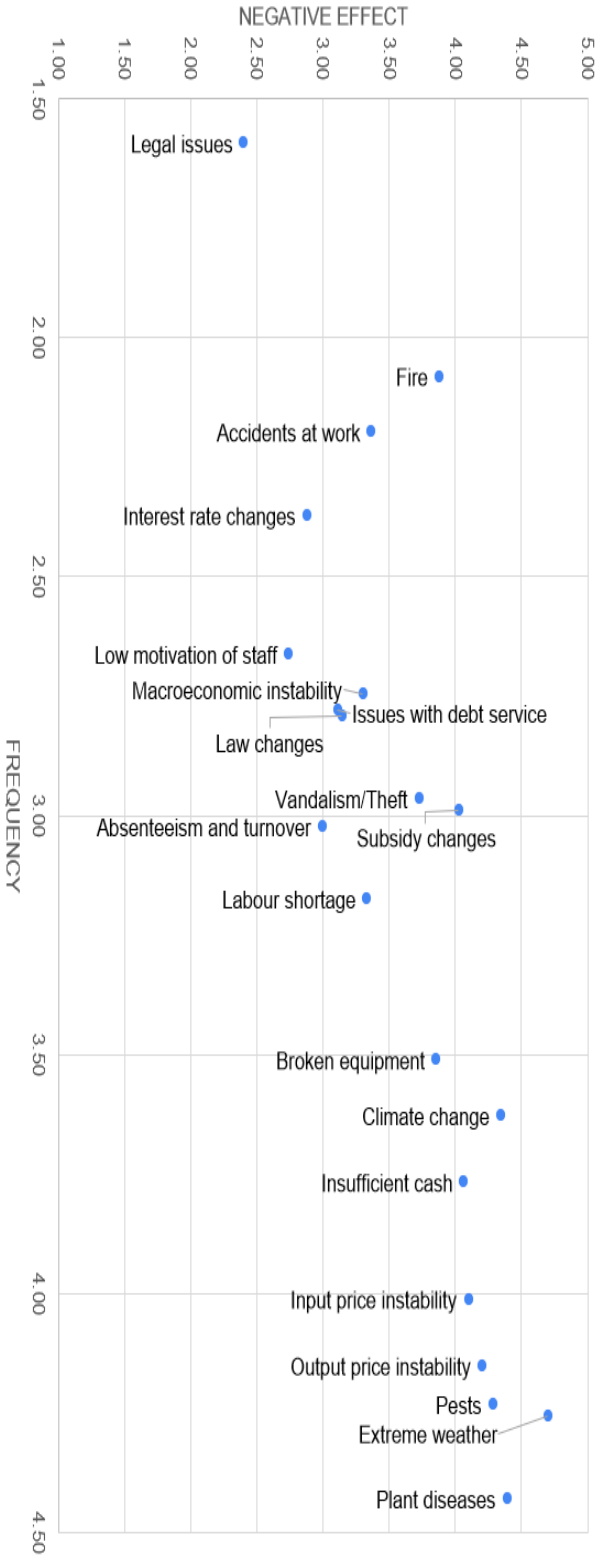


**Figure 6.** Risk assessment (5-step Likert scale; horizontal axis – negative effect, vertical axis – frequency)
*Source: Own calculations*

The survey results indicate the relative importance of risk management for most fruit-growers, which motivates the exploration of its current state and potential improvements.

***Risk assessment***

The study explores 20 different types of risks as part of the assessment process. The selected key risks in agriculture were evaluated based on the 5-step Likert scale. In terms of frequency, the least likely risk is indicated with the lowest value (1), whereas the most common ones are denoted with number 5. In a similar manner, the negative impact of each risk is assessed by the same scale ranging from 1 (marginal impact) to 5 (maximum severity).

Considering the utilized 5-step Likert scale, risks are positioned depending on the average scores in terms of their likelihood and negative impact. The data indicate that fruit-growers face risks with different relevance. Extreme weather and climate change are risks with the highest negative impact, whereas plant diseases occur most frequently. Pests are another key risk with relatively high score resulting from combination of both probability and negative impact. Unstable input and selling prices are also quite relevant risks with high likelihood and impact for local fruit-growers. At the opposite end of the evaluation scale, the legal issues appear to be quite uncommon risk (Fig. 6). Considering all, 17 out of 20 types of risks have at least one dimension – frequency or negative impact – above the neutrality threshold of three based on the 5-step assessment scale (Fig. 6). Thus, most of the analysed risks appear to be quite relevant for the surveyed fruit-growers regardless of the aggregate variations across demographic groups and types of orchards.

The risk assessment process is also presented in a more compact form by showing the major groups of risks. Thus, each group is comprised of several specific types of risks belonging to the respective group. The approach aims to show a general view by eliminating the

observed variations across the different items.

Two major conclusions can be drawn based on the data obtained. First, based on high frequency and strong negative impact, biological risks are still dominant. Biological risks combine pests, plant diseases, and key environmental risks related to extreme weather and climate change. Similarly, market-related risks are also quite relevant for the local fruit-growers with high negative impact and slightly lower degree of occurrence in comparison to biological risks. This key group of risks reflects the volatile input and output prices, as well as macroeconomic instability. The second important conclusion arises from the fact that several groups of risks are clustered. Political, financial, human resource, and asset-related risks have a similar likelihood of occurrence and show insignificant variations in terms of negative impact (Fig. 7).

Research findings indicate that all risks are highly relevant for local farmers, despite the observed variations in their evaluation. Thus, the empirical data confirms the theoretical suggestions that propose various types of risks for farmers, as previously discussed by Näther & Theuvsen (2012).

***Risk management***

Respondents provide mixed results regarding their satisfaction with the applied risk management practices. Most fruit-growers are moderately satisfied (37.2%), while the proportion of highly positive opinions remains low – 10.5%. The average level of satisfaction is expressed by 25.6% of participants. The combined share of negative opinions reaches 26.3% (Fig. 8). Overall, the survey findings indicate a mixed situation with considerable variations of opinions among fruit-growers.

In addition to the average satisfaction level, most of the survey participants are eager to increase investments in risk management. More specifically, 66.3% of respondents express a necessity to improve risk management. Only 20.9% of survey participants plan to make no changes, citing high satisfaction with the current performance outcomes. Moreover, risk management is becoming less important for 8.1% of participants, who intend to reduce their future engagement in the process (Fig. 9).

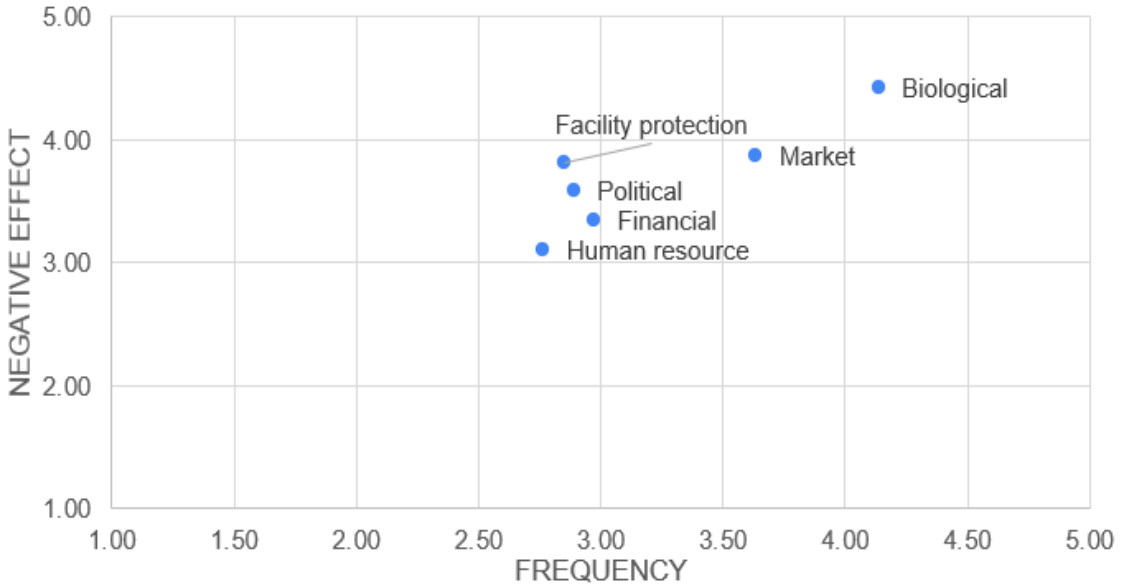


**Figure 7.** Risk assessment by groups of risks (5-step Likert scale; horizontal axis – frequency, vertical axis – negative effect)
*Source: Own calculations*

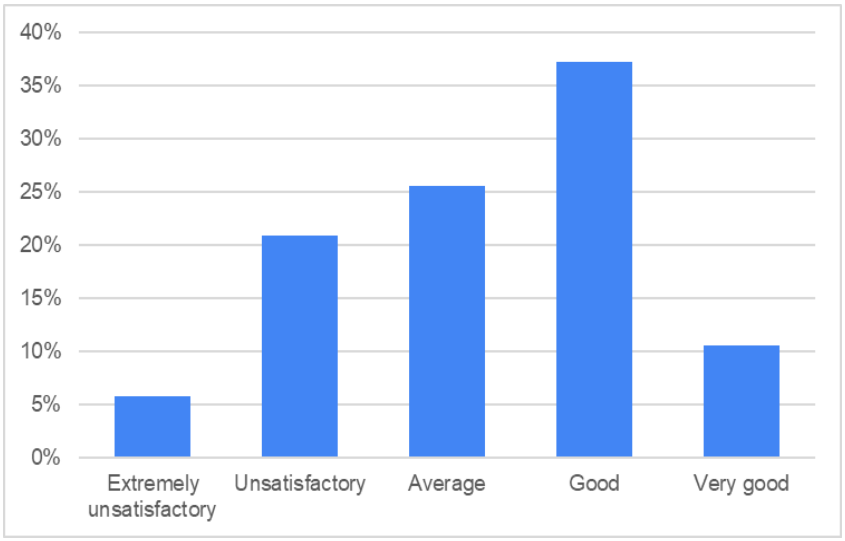


**Figure 8.** Level of satisfaction with the already applied risk management strategies (%)
*Source: Own calculations*

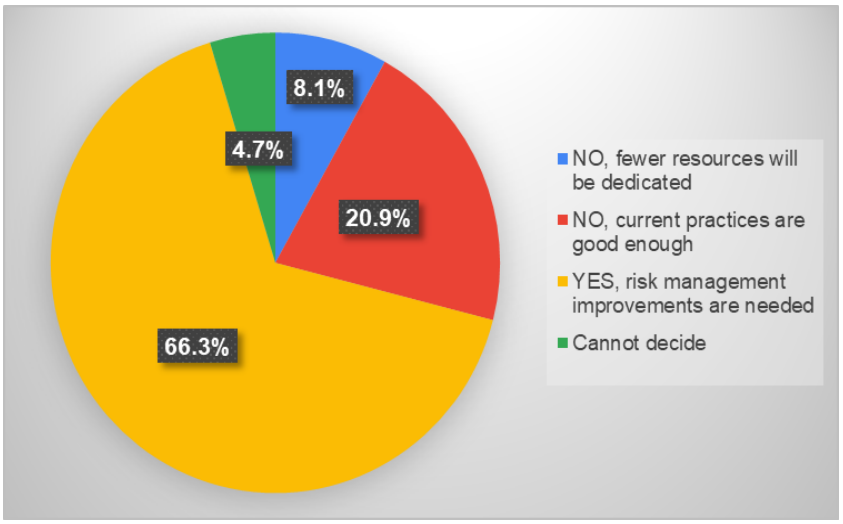


**Figure 9.** Intentions for future engagement in risk management (%)
*Source: Own calculations*

Considering all factors, the evidence clearly shows that there is a room for improvement and a stated intention to engage more proactively in risk management. Hence, it is important to explore the applied risk management practices in more detail to identify performance gaps motivating additional improvements.

Results indicate considerable variations in the level of application of risk management practices. First, risk reduction strategies are explored. The most common procedures in this area include the introduction of more resilient plant varieties (54.7%), and investments in physical protection based on nets, tunnels or other physical protective measures (51.2%). These two options are the most common risk management strategies, employed by more than half of the survey participants. Risk is also reduced by purchasing new equipment – a strategy which not only reduces the risk of technical failure, but also contributes to an improved productivity and competitiveness. Risk is also effectively reduced by diversifying

the plants in an orchard (30.2%). This strategy aims to offset the existing variations in the production and prices of different plants and is commonly used by farmers in general (Thuevsen, 2013). In addition, risk reduction is also manifested by accumulating additional financial resources as buffer - a strategy used by 43% of survey participants. To a lesser extent, risk is also reduced by investing in human capital (16.3%), and improving the working environment (8.1%).

Risk transfer is also utilised by fruit-growers, primarily through the popularity of insurance (45.3%), making it the third most common risk management practice. It is further demonstrated by the use of long-term contracts with suppliers and buyers – a strategy adopted by 26.7% of participants to stabilize volatile input and output prices (Fig. 10).

Risk avoidance is less popular, according to the survey results. It mainly involves completely avoiding activities which fruit-growers consider risky (22.1%). Avoiding over-indebtedness is regarded by 18.6% of participants as an effective method for eliminating financial risk. Improvements in planning and access to specialised consultancy services may also contribute to risk avoidance; however, their popularity remains relatively modest with shares of 18.6% and 15.1%, respectively (Fig. 10).

The evidence also suggests that 12.8% of survey participants do not apply any risk management practice at all (Fig. 10), accepting the potential risks of agricultural activities. The literature suggests that some individuals have a risk-taking personality, which explains their appetite for risk (Schaper et al., 2012). In the current case, however, the share of risk-taking professionals appears to be quite high. Furthermore, the level of application of the discussed risk management practices is modest, as only two practices exceed the key threshold of 50% of farmers (Fig. 10).

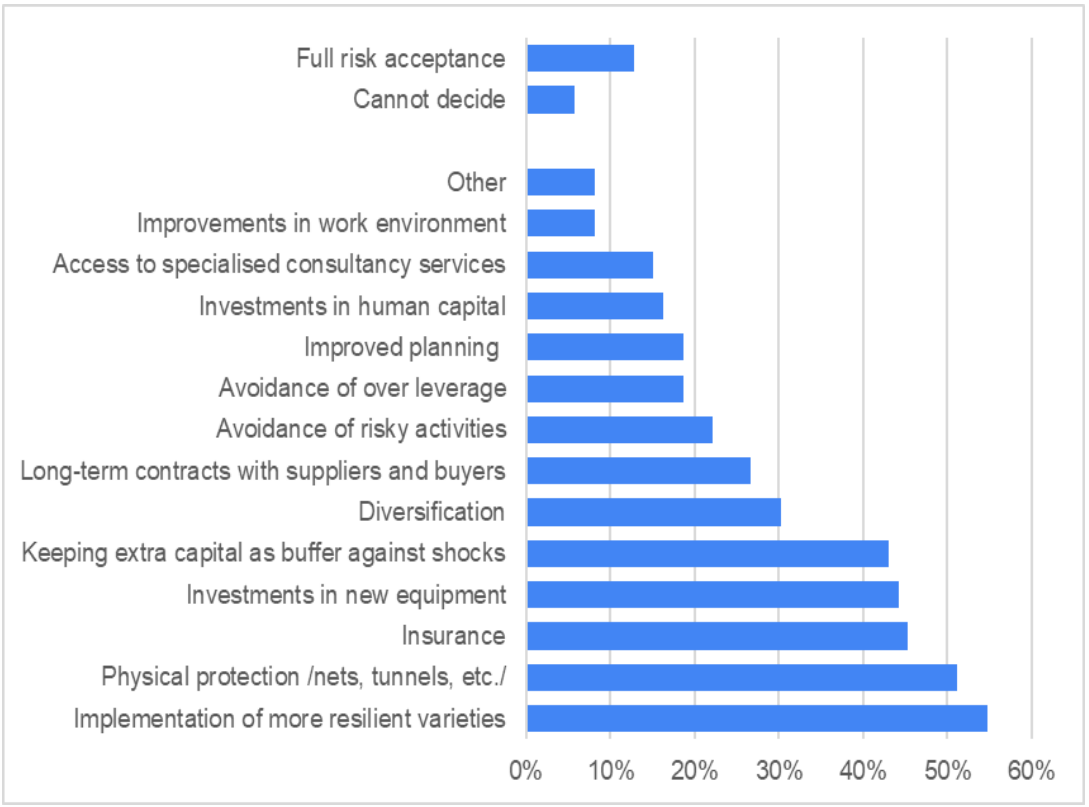


**Figure 10.** Applied risk management practices by respondents (%, multiple answers provided)
*Source: Own calculations*

Given these findings, it can be suggested that risk management has significant potential for further improvement. Efforts are being made to mitigate the most significant risks; however, these efforts remain largely sporadic and lack a consistent approach. Several key performance gaps leave fruit-growers vulnerable to external risks of various origins. One possible explanation could be the limited resources available for risk management practices. Many fruit-growers are also likely to miss important pieces of information and fail to recognise the existence of certain potential risks. The lack of awareness results in more limited efforts to manage risks. In other cases, risks become more severe or frequent due to market or policy failures, leading to external instability. While farmers cannot control such risks, they remain responsible for managing them effectively to avoid financial losses.

## CONCLUSIONS

The significance of the study lies in its attempt to explore the increasingly relevant topic of risk management in a generally unexplored field – the fruit-growing sector in Bulgaria. The research findings are informative and indicative of a developing trend, suggesting clear directions for improvement at both policy and individual levels. It can be concluded that fruit growers face diverse risks with varying likelihoods and impacts. The complex situation requires a more proactive approach to risk management, particularly concerning the most relevant biological/environmental threats and market risks, due to their strong negative effect on fruit-growing activities. Future improvements must be consistent and focused to achieve sustainable outcomes. At the individual level, fruit growers are advised to continue improving proven risk management strategies, such as enhancing physical protection, adopting better plant varieties, diversification, and utilizing insurance. Other strategies must be more extensively implemented, including faster renewal of existing equipment and improvements in the work environment, along with greater use of specialized consultancy services, which are often provided free of charge by universities, non-governmental organizations, and private specialists. In addition, fruit growers must more seriously consider the potential of horizontal integration as a strategy for stabilizing output prices. At the policy level, substantial capital investments are needed to improve existing irrigation infrastructure and haze protection facilities. More efforts are required to mitigate the negative impacts of climate change. In the case of Bulgaria, financial engineering is underdeveloped; therefore, establishing a futures market can be a key strategy. The use of derivatives may offer protection against output price volatility. Overall, improvements in risk management require consistent and coordinated efforts from multiple agencies at both the local and national levels.

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