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IMPACT ASSESSMENT OF THE FOOD, ENERGY AND FINANCE CRISIS ON KOSOVO AGRICULTURE



IMPACT ASSESSMENT OF THE FOOD, ENERGY AND FINANCE CRISIS ON KOSOVO AGRICULTURE

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EXECUTIVE SUMMARY

This report examines the multifaceted impact of the global food, energy, and finance crisis on Kosovo's agricultural sector, focusing on key production factors (land, labor and capital), input use, yields, farm profitability, sustainable farming attitudes, food security, migration trends, farming strategies, agricultural competitiveness, and policy support perceptions.

The study employs a combination of survey data, sector-specific analyses, and stakeholder interviews to provide a comprehensive understanding of how the crisis has reshaped the agricultural landscape in Kosovo and to offer resilience and sustainability enhancing recommendations.

Impact on key production factors

The crisis has significantly affected farmers utilization of land, labor, and capital in Kosovo. Land use per farm increased 8.7 percent, from 5.73 has in 2019 to 6.23 has in 2023, primarily through additional land leasing to maintain flexibility amidst market volatility. Labor usage saw a modest rise of 6.4 percent, with a notable 62.6 percent increase in full-time employed labor, reflecting efforts to secure a stable workforce despite labor shortages and increased competition from other sectors. Wages for agricultural labor also surged, with daily wages increasing by 57.9 percent and monthly wages by 24.7 percent, exacerbating financial pressures on farmers.

Capital utilization was subject to adjustments because of soaring input costs; many farmers reduced chemical fertilizer application and faced escalating machinery expenses due to high fuel prices. Despite these challenges, farmers continued to invest an average of EUR 23 529 per farm in their operations, indicating a proactive approach to enhancing productivity and adapting to market conditions. However, over 90 percent of these investments were funded from personal resources, highlighting limited access to outside capital and underscoring the need for improved financial support mechanisms.

Effects on input use, yields, and farm profitability

The crisis led to varied impacts on input use, yields, and profitability across different agricultural sectors. Rising fertilizer and fuel prices prompted farmers to reduce input use; for instance, pepper farmers decreased NPK fertilizer usage by 21.3 percent. Yields fluctuated from sector to sector: wheat yields initially increased but later declined by 7.7 percent in 2023, pepper yields consistently fell, and vineyard yields saw a significant drop of 24.2 percent in 2023. Conversely, raspberry yields remained relatively stable, and milk yields per cow increased by 4.4 percent in 2023. Farm profitability also varied; while the pepper and dairy sectors experienced substantial gains due to higher product prices and efficiency improvements, the raspberry and vineyard sectors faced declines attributed to increased production costs and market pressures, including competition from Ukrainian imports affecting raspberry prices. Overall, the mean gross margin per farm increased, but the median gross margin decreased, indicating disparities in profitability among farmers.

Attitudes toward sustainable farming

Farmers had mixed attitudes toward adopting sustainable and innovative farming practices. While some were open, particularly raspberry farmers due to market demand for sustainable products, a significant portion, especially vineyard farmers, were reluctant to adopt precision farming technologies. Economic barriers, limited awareness, and adherence to traditional practices contributed to this hesitation. Vertical value chain coordination remained relatively stable, with many farmers maintaining consistent relations with buyers, although the crisis strained some of these relations, notably in the wheat and pepper sectors. Horizontal cooperation was limited, with only 17.9 percent of farmers participating in organized groups, with willingness to engage more in the future being moderate. Access to advisory services was limited; 42 percent of farmers have received advice in the past five years, primarily from input suppliers and private consultants. However, 58 percent did not access these services due to a perceived lack of need, while a significant majority were unwilling to pay for expert advice, reflecting a gap in knowledge support for sustainable practices.

Impact on food security

The crisis prompted farmers in Kosovo to increase domestic production of staple crops to enhance food security and reduce reliance on imports. Wheat production rose from 280 616 tonnes in 2018 to 330 913 tonnes in 2022, improving self-sufficiency from 57 percent to nearly 70 percent. Maize production also increased, reaching over 81percent self-sufficiency in 2022. These efforts strengthened food security amid global disruptions; however, the continued dependence on imported inputs and exposure to price fluctuations remain challenges. Farmers retained more of their production for household consumption, reflecting concerns over food availability and the need for self-sufficiency.

Migration trends and labour availability

The crisis intensified migration from rural areas, exacerbating labor shortages in the agricultural sector. The average annual rate of households with migrants increased from 1.83 percent between 2012 and 2018 to 3.40 percent between 2019 and 2023. The pepper and vineyard sectors experienced significant hikes in migration rates, while the wheat sector saw a decrease, possibly due to government support measures. Cumulatively, 46.0 percent of vineyard and 43.0 percent of pepper farming households had at least one member in migration, highlighting substantial labor outflows. The dairy sector faced severe decline, with a 47.2 percent reduction in farming households between 2019 and 2023. These trends underscore the vulnerability of rural communities and the need for policies to support rural livelihoods and stabilize agricultural employment.

Farming strategies and willingness to continue farming

Farmers showed a preference for stability and diversification within familiar domains rather than significant changes or relocation. While 41 percent considered engaging in non-farm work, a majority were reluctant to expand their farms or migrate. Dairy farmers were the most open to diversification, whereas vineyard farmers were resistant to expanding land ownership or migrating. Succession planning revealed that over half of the farmers were undecided or lacked a designated successor, with a notable gender imbalance favoring male successors. Investment intentions varied, with 47.6 percent planning to invest in their operations. Dairy farmers led in planned investments, focusing on infrastructure and efficiency improvements, while vineyard farmers were least inclined to invest due to high cost or uncertain returns. Barriers to investment included economic constraints, labor shortages, and limited government support.

Impact on agricultural competitiveness

The agrifood sector in Kosovo demonstrated resilience, with exports growing from EUR 41.68 million in 2015 to EUR 147.99 million in 2023. However, imports also increased, sustaining a substantial trade deficit despite an improved export-to-import coverage ratio. The crisis exposed vulnerabilities such as dependency on imported inputs and sensitivity to global market fluctuations. Export prices nearly doubled, but trade terms declined, indicating import prices rising faster than export prices, resulting in reduced purchasing power. The influx of Ukrainian agricultural products into the European Union intensified competition, impacting particularly raspberry exports in the form of reduced prices and revenue potential for farmers. These factors highlight the need to strengthen competitive positioning, improve production efficiency, and reduce reliance on imports.

Farmers' perceptions of policy support

Farmers had mixed perceptions of government policy support during the crisis. While financial assistance to manage rising operational costs was appreciated, many farmers felt current measures were insufficient, particularly in supporting new technology adoption and environmentally friendly practices.

Climate change, labor shortages, and high fertilizer costs were identified as the most pressing challenges. Investment Grants were overwhelmingly favored as the top support instrument, indicating a need for long-term investments in infrastructure and technology. Demand for better-targeted input subsidies, risk protection, and income support to enhance sectoral resilience was also present. Farmers took a neutral position regarding support to cover increasing costs but showed dissatisfaction with assistance for adopting new technologies and sustainable practices, suggesting areas for policy improvement.

RECOMMENDATIONS

To address the identified challenges, the report proposes several recommendations:

1. Tailored Policies for Striving Sectors

Specific policies to stabilize and revitalize the vineyard and raspberry sectors are needed. It is essential to assess the financial viability of small and medium-sized farms in the vineyard sector and the importance developing policy responses in the wine sector, including transitional measures for specific support. Addressing market volatility in the raspberry sector through the exploration of private (market) and public risk protection mechanisms, such as insurance and diversification, and through the adoption of effective policies to manage price fluctuations and support farmers is essential.

2. Measures to enhance sustainability

Implementing long-term (strategic) measures can improve overall agriculture sustainability in Kosovo, aligning it with the European Union Common Agricultural Policy (CAP) and enhancing resilience.

Reducing reliance on synthetic fertilizers and implement cross-compliance measures:

- (i) encourage soil testing every three years for efficient fertilizer use,
- (ii) link direct payments to compliance with measures like soil testing, maintaining fertilizer records, adopting Integrated Pest Management practices,
- (iii) strengthen regulations to ensure quality fertilizers and plant protection products,
- (iv) promote organic fertilizers through awareness and training to support soil health,
- (v) encourage innovation such as precision farming, biological pest control, and drone use for sustainable practices, (vi) implement animal welfare policies by conditioning support on adherence to standards.

Addressing climate change: (i) develop policies to adopt crop varieties resistant to heat, humidity, pests, and diseases to improve farming adaptability, (ii) improve insurance schemes to better compensate farmers for damages from extreme weather conditions, ensuring they are protected against climate-related losses.

With the implementation of these recommendations, Kosovo can enhance agricultural sustainability, improve resilience against crises, and align its practices with the European Union CAP and Green Deal agendas. This comprehensive approach would strengthen the entire agricultural sector, leveraging current momentum despite the focus on the vineyard and raspberry sectors.

1. INTRODUCTION

1.1 Study rationale

In the face of ongoing challenges such as climate change, the COVID-19 pandemic, and other interconnected global uncertainties, the war in Ukraine has compounded the strains on the global economy. This conflict has escalated a cascade of disruptions in the availability of critical commodities like gas, fuel, wheat, barley, and fertilizers, leading to significant and unpredictable price fluctuations. These changes jeopardize the food and nutrition security of vulnerable communities, reducing their access to essential food supplies amidst spiraling inflation. Concurrently, surging energy prices have exacerbated the cost-of-living crisis, straining household budgets and the financial health of agricultural enterprises, thereby threatening food security in Kosovo.

The onset of the COVID-19 pandemic resulted in substantial disruptions across agricultural sector in Kosovo, which were multifaceted due to the pandemic's broad economic impact and the government's containment measures. The initial shock disrupted agricultural supply chains, affecting agricultural inputs and consumer goods availability and price. While no significant supply shortages were present during the early months of the pandemic, logistical challenges posed by movement restrictions had potential long-term implications for food supply, affecting particularly high-value and perishable commodities.

Significant fiscal interventions were put in place to mitigate these effects. The Kosovo government enacted a fiscal emergency package valued at EUR 179.6 million, targeting a wide range of beneficiaries, including agricultural enterprises (GoK, 2020). This package aimed to mitigate the negative economic shock by supporting businesses with subsidies, facilitating lease and utility payments, and extending loans with subsidized interest rates. Additionally, government efforts to stabilize the agricultural market included increasing subsidies for key agricultural products and inputs, such as a substantial increase in subsidies for dairy cows, from EUR 70 to EUR 85 per animal, and for vegetables grown in protected areas, from EUR 300 to EUR 450 per ha.

Despite these measures, the agricultural sector faced price volatility and altered market demands due to shifts in consumer behavior from dining out, to increased retail and home consumption. The changes in market dynamics required quick adaptation measures on the side of agricultural producers to realign their production and marketing strategies to new consumer patterns.

Following the pandemic disruptions, the war in Ukraine added another layer of complexity to Kosovo's already strained agricultural sector. The war catalyzed severe disruptions in global supply chains, leading to skyrocketing prices for essential agricultural inputs such as fertilizers, seeds, and fuel. This inflation in input costs placed considerable strain on the financial sustainability of farms across Kosovo, diminishing both profitability and operational efficiency.

The crisis (known as the food, energy, and finance crisis) escalated a sharp increase in inflation, notably reflected in a 10.2 percent year-on-year rise in the consumer price index for food by mid-2022 (KAS, 2023). This escalation significantly impacted consumer affordability and altered market dynamics, hitting lower-income families hardest and intensifying food security challenges. As agricultural operations struggled with rising production costs, the necessity for enhanced agricultural output became clear, albeit challenging under the circumstances.

Moreover, the crisis exacerbated labor shortages in the agricultural sector, driven by the relatively lower wages (or profitability) in agriculture compared to other sectors. This disparity, combined with the rising cost of living, has made the agricultural sector less attractive. This labor shortage has severely impacted the sector's ability to maintain consistent production levels, particularly affecting labor-intensive activities crucial to crop and livestock management. Crisis impacts were uneven across various agricultural subsectors, with those reliant on imported inputs or engaged in exports facing particularly severe challenges due to fluctuating market conditions and trade barriers. These differential impacts underscore the critical need for tailored government support and strategic sector-specific interventions.

A comprehensive examination of the interrelated impacts of the COVID-19 pandemic and the ongoing food, energy, and financial crisis on Kosovo's agricultural sector is imperative. Such an analysis is vital not only for understanding the broader impact of external shocks but also for developing robust, data-driven policy responses. These policies must tackle the immediate challenges these crises have posed, while proactively strengthening sector resilience against potential future disruptions. Exploring the wide-ranging consequences - from input cost unpredictability and labor market strains, to the shifting dynamics of markets and the fragility of supply chains - will provide the essential insights required to formulate targeted and effective interventions. These strategic measures are crucial to improving sector sustainability and resilience, thereby reinforcing Kosovo's food security and economic stability in the face of global uncertainties.

1.2 Brief background information on agriculture in Kosovo

Based on Green Report 2023 (MAFRD, 2023), despite facing global challenges like rising input costs and economic disruptions, in 2022 the agricultural sector in Kosovo continued to play a crucial role in the economy. The sector contributed 7.4 percent to the Gross Domestic Product (GDP), underscoring its significance in Kosovo's economic development. This was particularly notable as it marked a 4.5 percent increase from the previous year, reflecting a resilient performance amidst broader economic pressures.

The sector is characterized by a mix of crop and livestock production, with notable quantities of wheat, maize, and dairy products produced annually. The overall utilized agricultural area spans over 420 thousand has. Of this, 51.6 percent consists of pastures and meadows, followed by 44.8 percent of arable land. The remaining 3.6 percent is gardens, tree plantations, vineyards and nurseries.

Public support for agriculture is robust and has evolved significantly, particularly through two annual programs: the Direct Payments/Subsidies Program and the Rural Development Program. In 2022, these programs supported a total of 26 categories with a budget expenditure of EUR 57.5 million, nearly doubling support from the previous year (MAFRD, 2022). The Rural Development Program further supported measures 1, 3, 5, and 7, with the total amount of approved projects reaching EUR 24.2 million in the form of public support out of a total amount of EUR 36 million for projects (MAFRD, 2022).

Despite the growth in 2022 and increased government support, the sector faces challenges exacerbated by external shocks, such as price fluctuations in agricultural inputs and market dynamics. For instance, data from the 2023 green report show that the cost of key agricultural inputs has increased considerably, impacting farming practices profitability and sustainability. For instance, fertilizers prices surged by 91 percent, while feed costs rose by 29.4 percent. These increases are particularly significant as they represent the largest shares of intermediate agricultural consumption in 2022. Specifically, feed accounted for 53 percent of the total intermediate consumption, followed by fertilizers and soil improvers at 14 percent.

These cost hikes pose substantial challenges to maintaining economic viability Kosovo's agricultural sector.

The export value of agrifood products in Kosovo has consistently increased, reaching EUR 118.9 million in 2022, increasing by 28.4 percent compared to the previous year. Notwithstanding this growth, the trade balance remains negative with agrifood imports at approximately EUR 1.2 billion in 2022 (also increasing by 24 percent), resulting in a trade deficit of around EUR 1.1 billion. The import coverage by exports was only 9.9 percent, highlighting substantial reliance on imported agrifood products. Although agrifood exports accounted for 13 percent of total exports in 2022, with a slight improvement from 2021, they still lag behind earlier years (in 2018 and 2019 they amounted to 17 percent; in 2020 to 16 percent). Similarly, agrifood imports consistently accounted for about 21 percent of total imports, stressing persisting challenges and the need for enhanced domestic production to reduce reliance on foreign agrifood products.

Despite its significant role in ensuring food security and the development of rural areas, the agricultural sector faces multiple challenges, including underdeveloped infrastructure, insufficient market access, limited application of technology and quality of education and social services. These factors are critical in understanding the rural development level, which is intertwined with improving the quality of life and economic well-being of people living in rural areas through the utilization of natural resources in agriculture, forestry and other activities.

1.3 Research questions and objectives

This report aims to feed the development of cost-effective response measures, taking into account the recessionary context created by the current

crisis, where public finances are dwindling and borrowing costs are soaring. The study, which includes economic assessments and policy evaluations, seeks to answer the following questions:

1. What is the impact of the food, energy, and finance crisis on the utilization of key production factors like land, labor, and capital?
2. How has the food, energy, and finance crisis affected input use (i.e., fertilizers), yields, and farm profitability?
3. What are farmers' attitudes toward sustainable farming?
4. How has the food, energy, and finance crisis affected food security in Kosovo?
5. What is the impact of the food, energy, and finance crisis on migration/emigration and labor availability?
6. How has the food, energy, and finance crisis affected farmer strategies, and their willingness to continue their farming businesses?
7. What is the impact of the food, energy, and financial system crisis on the Kosovo agriculture competitiveness?
8. What are farmers' perceptions about the policy support provided for mitigating the negative effects of the food, energy, and finance crisis?

To tackle these questions, the report employs a qualitative and quantitative methodology. Data is sourced from structured surveys, interviews and focus groups and, where possible, secondary production and international trade statistics. These datasets are subjected to rigorous descriptive and inferential statistical analyses to provide a comprehensive understanding of the situation (please see the Methodology section).



2. STUDY METHODOLOGY

This chapter outlines the methodological framework employed in the study assessing Kosovo's agricultural sector. It begins with the selection of key agricultural products, informed by expert consultations and confirmations from the Ministry of Agriculture, Forestry, and Rural Development (MAFRD). The chapter then presents the research questions and their operational definitions, detailing how each question will be measured and analyzed. Following this, it describes the sampling strategy and data collection methods, including the questionnaire design and pilot testing, as well as the farmer selection process across various communes. Finally, the chapter explains the data analysis procedures, emphasizing the use of statistical techniques and qualitative assessments to ensure the reliability and validity of the findings.

2.1 Product selection

The product selection process was informed by interviews with experts and individuals

Table 1. Research questions and operationalization

Research questions	Operational definition	Measured in
1. What is the impact of the food, energy, and finance crisis on the utilization of key production factors?		
Land (input level)	Land used before and after ²	Ha
Labor (input level)	Labor used before and after; Labor cost change	Full time and part time employees, both household members and hired In EUR
Capital (input level)	Production costs (input use)	In quantities
	Investment executed	Investment value in EUR
Access to capital	Access to specific financing sources	percent of financing sources

² Data from 2019 (pre-crisis) is compared to data from 2022 (representing the immediate observed effects or initial shift), and 2022 data is compared to 2023 data (reflecting adaptation to the changing situation)

knowledgeable about Kosovo's agricultural sector. For example, during an interview with the MAFRD deputy minister, he emphasized that wheat is critical to food security in Kosovo. Additionally, confirmation of the selected products was obtained from the ministry's focal point at two stages: initially at the start of the qualitative research and later during the preliminary findings presentation. Consequently, the study selected the following products:

1. Dairy
2. Wheat
3. Peppers
4. Raspberries
5. Vineyards

2.2 Research questions and operationalization

Research questions	Operational definition	Measured in
2. How has the crisis affected input use [i.e., fertilizers], yields, and farm profitability?		
Yields (output level)	Yields per unit of land and livestock	Land and livestock yield
Farm profitability (output level)	Gross margin per establishment (product) before and after	Gross income-intermediate consumption (purchased input), in EUR
3. What are farmer attitudes toward sustainable farming?		
Willingness to adopt innovative production methods	Farmer readiness to adopt innovative sustainable farming production methods	Likert scale
Farmer willingness to cooperate, horizontally	Willingness to jointly hire a production technology expert	Y/N
Farmer willingness to cooperate with buyers	Change in the relations during Ukraine crisis	Likert scale
How knowledge system is supporting sustainable farming	Access Type of actor	Y/N Public VS Private
4. How has the food, energy, and finance crisis affected Kosovo food security?		
Analysis of changes in food supply and self-sufficiency; secondary data	Analysis of changes in food supply and self-sufficiency; secondary data	Tonnes
	Self-sufficiency	In percent
Trends in food production at farm level - survey data	Production at farm level	Production quantities for 2019 and 2022
	Change in production	Change in percent between 2019 and 2022
5. What is the impact of the food, energy, and finance crisis on migration/emigration and labor availability?		
The impact of Ukraine war on migration/emigration and labor availability?	Household members in migration/emigration	In number and percent, for the 2012-2022 and 2019-2022 periods
	Migration/emigration at village level	percent change
	Trend in agricultural activities	percent change
6. Farming strategies and farmer willingness to continue the farming business?		
Farmer strategies	Likelihood of employing different strategies	Likert scale
Farmer willingness to continue farming business?	Whether there is a successor	Y/N
Plans to invest	Plans to invest	Y/N
7. What is the impact of the food, energy, and finance crisis on Kosovo agriculture competitiveness?		
Kosovo agriculture competitiveness	Competitiveness is defined based on two dimensions: 1. Trade balance (exports-imports) for specific products. 2. value in EUR/kg of a specific exported product	Trade balance in value and quantity Value EUR/kg
8. What are farmer perceptions about the policy support provided to mitigate negative food, energy, and finance crisis effects?		
What are farmer perceptions about the policy support provided to mitigate the negative effects of the crisis?	Farmer perceptions about the mitigating effects of policy support received, addressing the crisis.	Likert scale measure (from 1 to 5)
Preferred policy support package	Farmer opinions about most pressing issues	percent of responses
	Farmer opinions about most preferred policy support	percent of responses

2.3 Sampling and data collection

2.3.1 Questionnaire

Questionnaires were used as the primary data collection tool to answer the study's research questions, targeting five key agricultural subsectors: dairy, cereals (specifically wheat and maize), vegetables (focusing on peppers), fruit (particularly raspberries), and vineyards. The main sections of the questionnaires include:

- Introduction
- Demographics
- Production factors (land, labor capital/assets)
- Sustainable production
- Production capacity
- Outputs & yields
- Production costs
- Value chain organization & governance
- Investment
- Issues and policies
- Standards and management
- Advisory services
- Farm future & livelihood strategies
- Household income

Prior to implementation, the questionnaires were pilot tested to ensure effectiveness. This testing is crucial for several reasons:

- To ensure the clarity of questions and eliminate ambiguity
- To confirm that instructions are simple to understand
- To remove questions that do not gather valuable data
- To gauge time required for completion

2.3.2 Sampling

The sample size for this study is 500 farmers (100 farmers for each of the products under study), assuming that the population size is 100 000 farmers, with a 95 percent confidence interval, while the resulting margin³ of less than 5 percent.

Sampling strategy

Based on discussions with local office staff and coordinators hired for fieldwork, the second approach was selected.

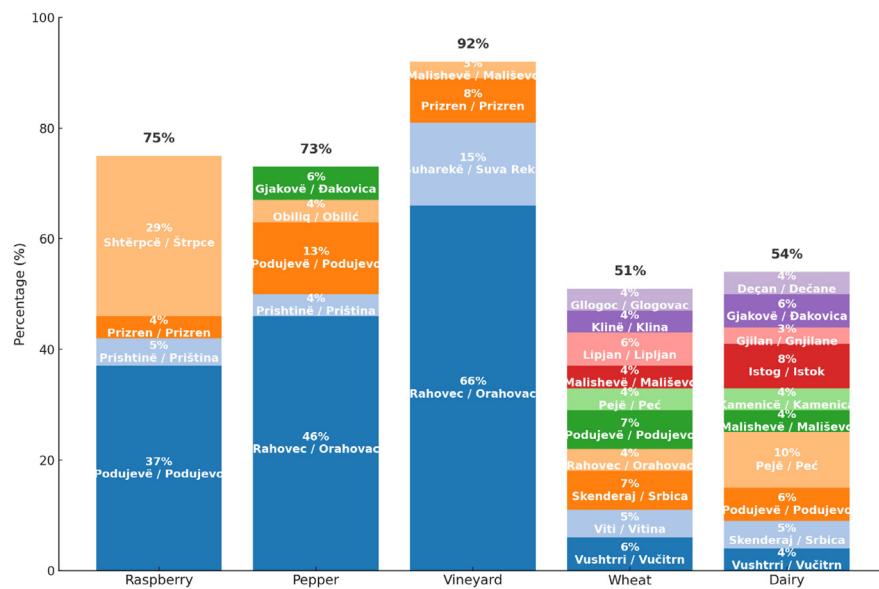
Farmers were selected according to the following steps:

- Step 1: Communes with high product concentration were selected (communes with at least 55 percent share of wheat and dairy farmers and at least 3/4 share of farmers for more regionalized products: strawberry, pepper and vineyard) were selected
- Step 2: Estimation of selected commune contribution share of the number of farmers for selected communes (number of selected communes = 100 percent)
- Step 3: Based on abovementioned share, estimation of number of questionnaires for selected communes was calculated by multiplying respective percentage by 100 questionnaires
- Step 4: Random farmer selection in each commune

The list of beneficiary and non-beneficiary farmers, provided by the MAFRD was used as sampling frame.

Based on this list, the communes were selected following the instruction in Step 1: Select communes where the product is concentrated (select communes with at least 55 percent share of wheat and dairy and at least 3/4 share of more regionalized products: strawberry, pepper and vineyard)

³ The margin of error indicates how much one can expect the survey results to reflect the views of the overall population. Moreover, the sample size doesn't change considerably for populations larger than 100,000.

Figure 1. Communes included in sample and percent of farmers for each commune

Source: Authors' own elaboration based on administrative data provided by MAFRD.

Considering 100 percent the number of farmers for the communes included in the sample for each sector and the proportion of farmers from

each commune relative to the total, the estimated number of farmers to be surveyed for each commune is as follows (Step 2 and Step 3)

Table 2. Distribution of surveyed farmers by sector and Commun

Municipality [Albanian / Serbian]	Vineyard	Raspberry	Pepper	Wheat	Dairy	Total
Rahovec / Orahovac	71		62	9		142
Suharekë / Suva Reka	17					17
Prizren / Prizren	8	6				14
Malishevë / Mališevë	4			8	8	20
Podujevë / Podujevo		48	18	13	12	91
Shërpçë / Štrpcë		38				38
Prishtinë / Priština		8	6			14
Gjakovë / Đakovica			8		11	19
Obiliq / Obilić			6			6
Skenderaj / Srbica				14	9	23
Lipjan / Lipljan				11		11
Vushtrri / Vučitn				11	8	19
Viti / Vitina				10		10
Klinë / Klina				8		8
Pejë / Peć			8	17		25
Glogoc / Glogovac				8		8
Istog / Istok					14	14
Deçan / Dečane					8	8

Table 2. Distribution of surveyed farmers by sector and Commune

Source: Author's own elaboration based on administrative data provided by MAFRD.

Farmers were selected randomly in each commune. (Step 4)

Municipality selection was also supported by secondary data on areas and number of animals provided by the Kosovo central institution in charge of AFRD, as discussed in the following analysis. Figure 2 provides information on the regional distribution of selected products by area and number of animals. Three municipalities — Podujevë / Podujevo, Shtime / Štimlje, and Prishtinë / Priština — comprise 74.6 percent of the raspberry cultivation area. Additionally, five municipalities, including Ferizaj / Uroševac and Prizren / Prizren along with the previously mentioned three, comprise 82.6 percent of the total raspberry cultivation area. Similarly, the municipalities of Rahovec / Orahovac, Podujevë / Podujevo, and Gjakovë / Đakovica comprise 74.6 percent of the area dedicated to pepper cultivation. Moreover, when including Obiliq / Obilić and Prishtinë / Priština, these five municipalities together comprise 84.3 percent of the overall area used for pepper growing.

Rahovec / Orahovac is notably specialized in viticulture, comprising 78.3 percent of

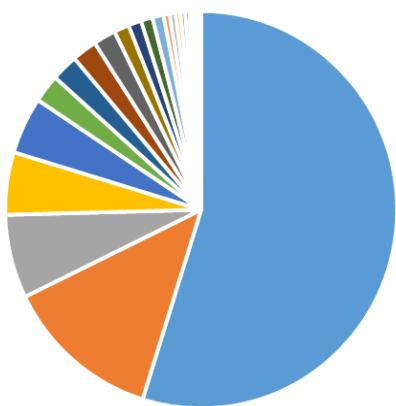
the vineyard land. Including two additional municipalities, namely Suharekë / Suva Reka and Prizren / Prizren, these areas together comprise 94.6 percent of the total cultivated vineyard land.

However, dairy farming and wheat cultivation are less concentrated across municipalities. The leading five municipalities in dairy production — Pejë / Peć, Istog / Istok, Gjakovë / Đakovica, Podujevë / Podujevo, and Vushtrri / Vučitrn — collectively house 37 percent of Kosovo's dairy cattle. The top ten municipalities, which in addition include Kamenicë / Kamenica, Skenderaj / Srbica, Deçan / Dečane, Gjilan / Gnjilane, and Rahovec / Orahovac, comprise 57.5 percent of the total dairy cattle population. In wheat production, the five leading municipalities — Lipjan / Lipljan, Skenderaj / Srbica, Vushtrri / Vučitrn, Podujevë / Podujevo, and Klinë / Klina — jointly contribute 33.1 percent of Kosovo's cultivated wheat area. Along with the next five municipalities — Ferizaj / Uroševac, Viti / Vitina, Malishevë / Mališevo, Rahovec / Orahovac, and Gjakovë / Đakovica — the top ten municipalities comprise 56.5 percent of the overall Kosovo wheat cultivation land.

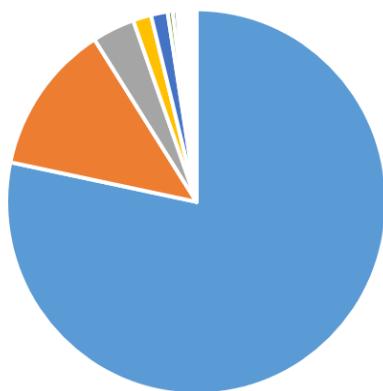
Figure 2. Selected product distribution by communes

Raspberry distribution by communes

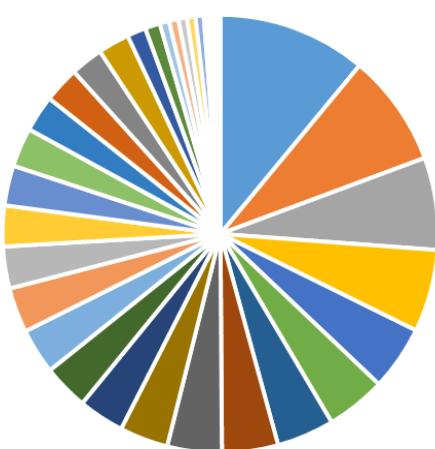


Pepper distribution by communes

- Rahovec / Orahovac
- Gjakovë / Đakovica
- Prishtinë / Priština
- Istog / Istok
- Lipjan / Lipljan
- Prizren / Prizren
- Shtime / Štimlje
- Mamushë / Mamuša
- Viti / Vitina
- Skenderaj / Srbica
- Graçanicë / Gračanica
- Fushë Kosovë / Kosovo Polje
- Gjilan / Gnjilane
- Podujevë / Podujevo
- Obiliq / Obilić
- Kllokot / Klokoč
- Pejë / Peć
- Glogoc / Glogovac
- Vushtrri / Vučitrn
- Suharekë / Suva Reka
- Deçan / Dečane
- Klinë / Klina
- Ferizaj / Uroševac
- Zubin Potok / Zubin Potok
- Mitrovicë / Mitrovica
- Kamenicë / Kamenica

Vineyard distribution by communes

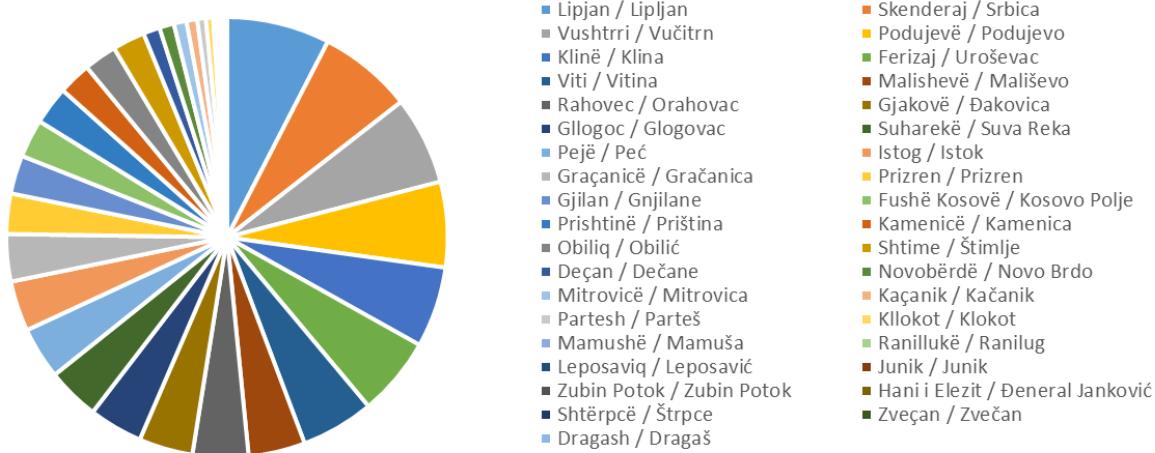
- Rahovec / Orahovac
- Prizren / Prizren
- Gjakovë / Đakovica
- Istog / Istok
- Mamushë / Mamuša
- Glogoc / Glogovac
- Skenderaj / Srbica
- Vushtrri / Vučitrn
- Fushë Kosovë / Kosovo Polje
- Suharekë / Suva Reka
- Malishevë / Mališevo
- Leposaviq / Leposavić
- Pejë / Peć
- Deçan / Dečane
- Lipjan / Lipljan
- Klinë / Klina
- Hani i Elezit / Đeneral Janković
- Ferizaj / Uroševac

Dairy distribution by communes

- Pejë / Peć
- Gjakovë / Đakovica
- Vushtrri / Vučitrn
- Skenderaj / Srbica
- Gjilan / Gnjilane
- Prishtinë / Priština
- Malishevë / Mališevo
- Dragash / Dragaš
- Ferizaj / Uroševac
- Glogoc / Glogovac
- Suharekë / Suva Reka
- Novobërdë / Novo Brdo
- Fushë Kosovë / Kosovo Polje
- Shtime / Štimlje
- Shtërpçë / Štrpce
- Graçanicë / Gračanica
- Zveçan / Zveçan
- Ranillukë / Ranilug
- Partesh / Parteš
- Istog / Istok
- Podujevë / Podujevo
- Kamenicë / Kamenica
- Deçan / Dečane
- Rahovec / Orahovac
- Klinë / Klina
- Mitrovicë / Mitrovica
- Viti / Vitina
- Lipjan / Lipljan
- Prizren / Prizren
- Kaçanik / Kačanik
- Obiliq / Obilić
- Leposaviq / Leposavić
- Hani i Elezit / Đeneral Janković
- Zubin Potok / Zubin Potok
- Mamushë / Mamuša
- Junik / Junik
- Kllokot / Klokoč

2. Study methodology

Wheat distribution by communes



Source: Author's own elaboration based on administrative data provided by MAFRD.

The following is a summary of regional distribution

Table 3. Regional distribution of products considered for structured survey

Product	Communes	percent (Area/No of animals)
Raspberry	Podujevë / Podujevo, Shtime / Štimlje, Prishtinë / Priština	74.6
	Podujevë / Podujevo, Shtime / Štimlje, Prishtinë / Priština, Ferizaj / Uroševac, Prizren / Prizren	82.6
Pepper	Rahovec / Orahovac, Podujevë / Podujevo, Gjakovë / Đakovica	74.6
	Rahovec / Orahovac, Podujevë / Podujevo, Gjakovë / Đakovica, Obiliq / Obilić, Prishtinë / Priština	84.3
Vineyard	Rahovec / Orahovac	78.3
	Rahovec / Orahovac, Suharekë / Suva Reka, Prizren / Prizren	94.6
Dairy cow	Pejë / Peć, Istog / Istok, Gjakovë / Đakovica, Podujevë / Podujevo, Vushtrri / Vučitrn, Kamenicë / Kamenica, Skenderaj / Srbica, Deçan / Dečane, Gjilan / Gnjilane, Rahovec / Orahovac	57.5
Wheat	Lipjan / Lipljan, Skenderaj / Srbica, Vushtrri / Vučitrn, Podujevë / Podujevo, Klinë / Klina	33.1
	Lipjan / Lipljan, Skenderaj / Srbica, Vushtrri / Vučitrn, Podujevë / Podujevo, Klinë / Klina, Ferizaj / Uroševac, Viti / Vitina, Malishevë / Mališevo, Rahovec / Orahovac, Gjakovë / Đakovica	56.5

Source: Author's own elaboration based on administrative data provided by MAFRD.

2.3.3 Data collection process

Data collection was carried out by trained enumerators. To guarantee data integrity, a random selection of 5 percent of the completed questionnaires was subjected to verification. Individuals who were interviewed

were contacted to confirm the accuracy of their responses. Furthermore, statistical tests were conducted to ensure no significant discrepancies existed between the data collected by different enumerators working within the same geographical region.

2.4 Data analysis

In-depth interviews with agri-food stakeholders were carefully analyzed and sorted by topic and subtopic. Statements from these interviews and focus groups were incorporated in the report, adhering to the interview framework and the report structure. This approach helped clarify and elaborate key findings.

Data collected from the structured survey was subjected to a comprehensive range of statistical analyses, particularly descriptive statistics, ANOVA and t-tests. The aim of such rigorous statistical analysis is to ensure the reliability and validity of the report findings, thereby providing a robust empirical foundation for future policymaking.

A change analysis research design, focusing on associations, was implemented to examine the impact of the Ukraine war on agriculture in Kosovo. For the variables of interest, data from 2019 (pre-crisis) was compared to data from 2022 (representing the immediate observed effects or initial shift), and 2022 data was compared to 2023 data (reflecting adaptation to the changing situation). It is important to note that the changes observed are not necessarily attributed solely to the Ukraine war. Other external factors, particularly those related to climate change, have collectively contributed to the observed changes. Therefore, this analysis does not aim to establish causality.

The analysis of key variables or issues will be disaggregated by farm size — small, medium, and large — across different sectors to provide a more nuanced understanding.

3. RECENT DEMOGRAPHIC CHANGES AND TRENDS

This chapter examines recent demographic changes impacting Kosovo's agricultural sector, focusing on migration patterns and their effects on farm households and rural communities in Kosovo. It explores the dynamics of farm household structures, including size, education, and employment status, and analyzes migration trends before and during the Ukraine crisis.

In assessing sector-specific migration rates and the resulting labor availability, the chapter sheds light on the challenges encountered by different agricultural sectors. The insights provided offer a comprehensive understanding of how demographic shifts are influencing agricultural productivity, sustainability, and the long-term viability of farming in Kosovo.

3.1 Demographic changes in Kosovo

Despite policies for visa liberalization, which typically would be expected to increase emigration rates, interviews suggest that there has been no significant acceleration in emigration in the agricultural sector. This stability might indicate that those most likely to emigrate may have already done so in previous years.

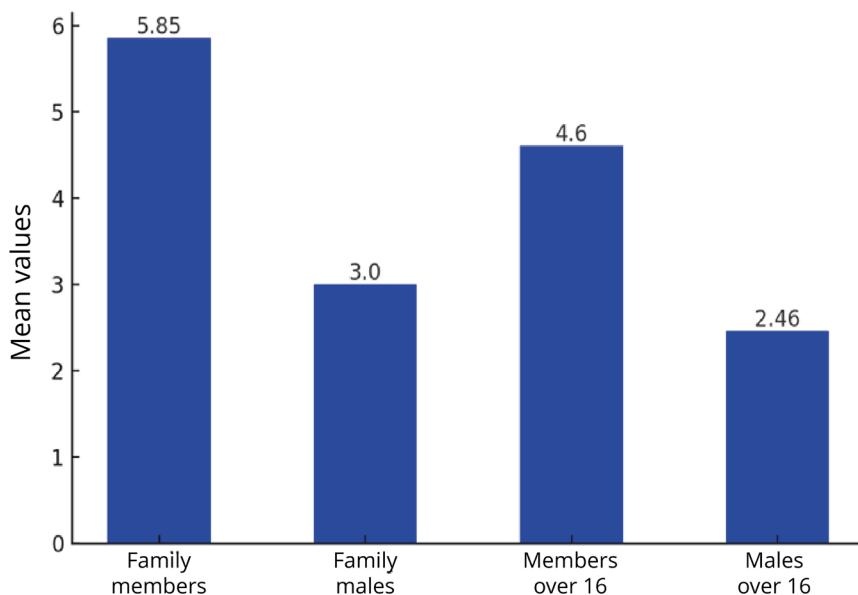
The interviews highlighted a particular concern with youth emigration, which affects the availability of the next generation of agricultural workers. Young people moving away from rural areas for better opportunities in urban centers or abroad reduces the labor force available for farming, impacting the long-term sustainability of agricultural practices.

3.2 Demographics at farm and rural areas level

3.2.1 Farm manager and farm household demographic information

Farm household size

An analysis of 500 farm households reveals that the average household consists of approximately 5.85 members, with a median of 6 (Figure 3). This indicates that most farm households are moderately sized. The average number of males per family is 3, suggesting a balanced gender composition with an estimated 2.85 females on average. Adults (members over 16 years old) constitute a significant portion of the household, with an average of 4.6 members, and among them, 2.46 are males. The close alignment between mean and median values across these variables indicates consistent family structures within the sample.

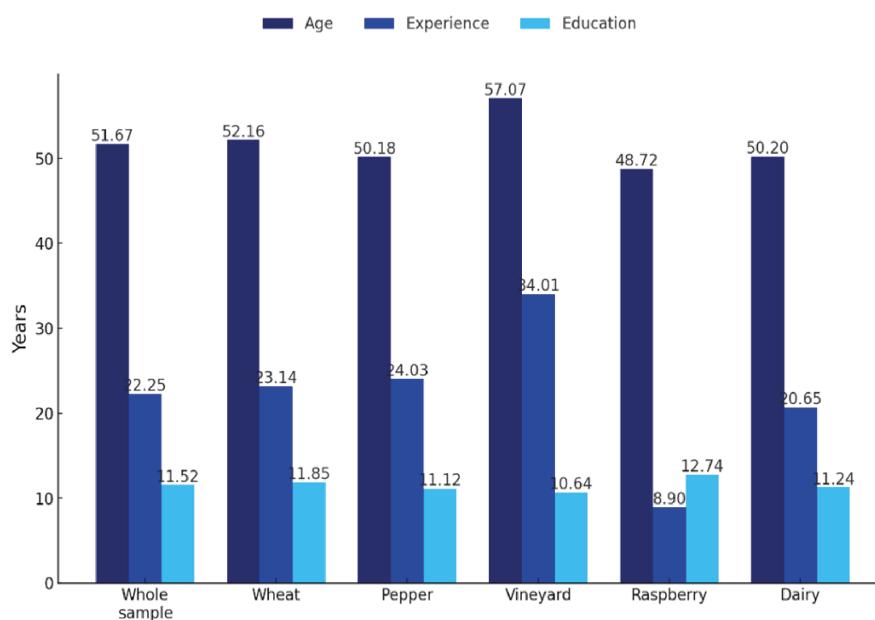
Figure 3. Farm household size

Source: Author's own elaboration based on survey data.

Farm manager profile

Farm managers play a crucial role in agricultural decision-making and operations. The data show

that farm managers have varying levels of experience and education, which can influence farm productivity and adoption of new technologies (see Figure 4).

Figure 4. Farm manager age, experience, and education

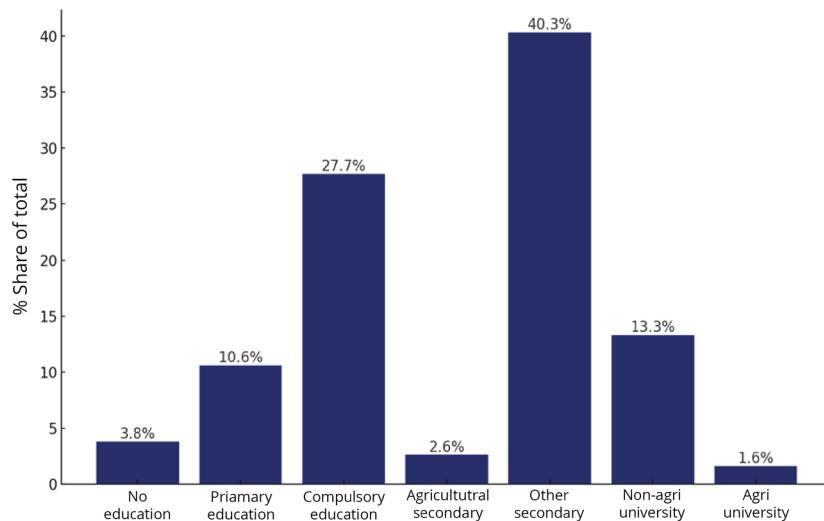
Source: Author's own elaboration based on survey data.

Household members educational attainment

The household members educational background is essential to understanding the human capital available within farm households (Figure 5). The majority of household members have attained secondary education, with 40.3 percent completing non-agricultural secondary education and 27.7 percent completing compulsory

education. A smaller proportion has pursued higher education, with 13.3 percent holding non-agricultural university degrees and only 1.6 percent having completed agricultural university studies. The minimal representation in agricultural-specific education suggests limited formal training in agriculture, which may impact the adoption of modern farming practices.

Figure 5. Household members educational attainment



Source: Author's own elaboration based on survey data.

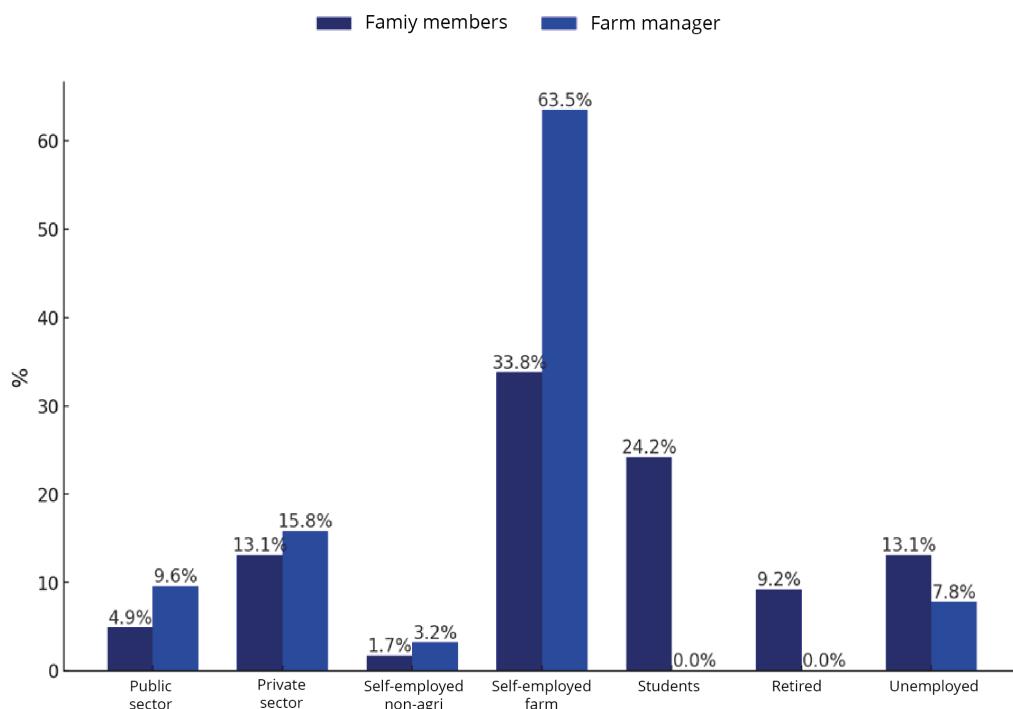
Household members educational attainment

Employment patterns within farm households provide insights into economic diversification and reliance on agriculture (Figure 6):

- *Public sector employment:* Farm managers have a higher participation rate (9.6 percent) compared to household members (4.9 percent), indicating that managers may seek additional income sources outside the farm.
- *Private sector employment:* Slightly higher among farm managers (15.8 percent) than household members (13.1 percent).

- *Self-employment on the farm:* Significantly higher for farm managers (63.5 percent) than household members (33.8 percent), underscoring the central role of managers in farm operations.
- *Students:* A notable 24.2 percent of household members are students, reflecting a notable focus on education within household demographics.
- *Unemployment and retirement:* Unemployment is slightly higher among household members (13.1 percent) than farm managers (7.8 percent), while 9.2 percent of household members are retired, a category not present among farm managers.

Figure 6. Farm managers and household members employment status



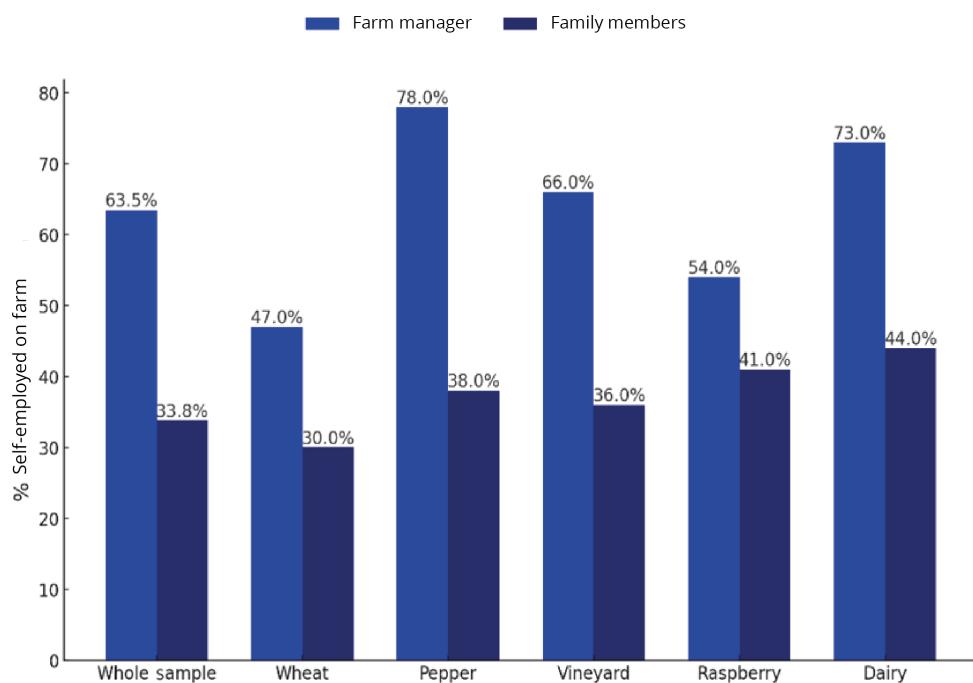
Source: Authors based on survey data.

Self-employment in the farm

The degree of involvement in on-farm activities varies by agricultural sector (Figure 7):

- *Pepper sector:* Highest self-employment among farm managers 78 percent and significant participation of household members 38 percent, indicating labor-intensive operations.
- *Dairy sector:* High self-employment for both farm managers 73 percent and household members 44 percent, reflecting the demands of dairy farming.

- *Vineyard sectors:* Self-employment rate of 66 percent among farm managers and 36 percent among household members, suggesting a moderate level of engagement for both
- *Raspberry sectors:* Farm manager self-employment rate drops to 54 percent, with household members involved at a slightly higher rate of 41 percent,
- *Wheat sector:* Lower self-employment rates for farm managers (47 percent) and household members (30 percent), possibly due to mechanization and less labor-intensive practices.

Figure 7. Self-employment on the farm

Source: Authors based on survey data.

3.2.2 Migration trends

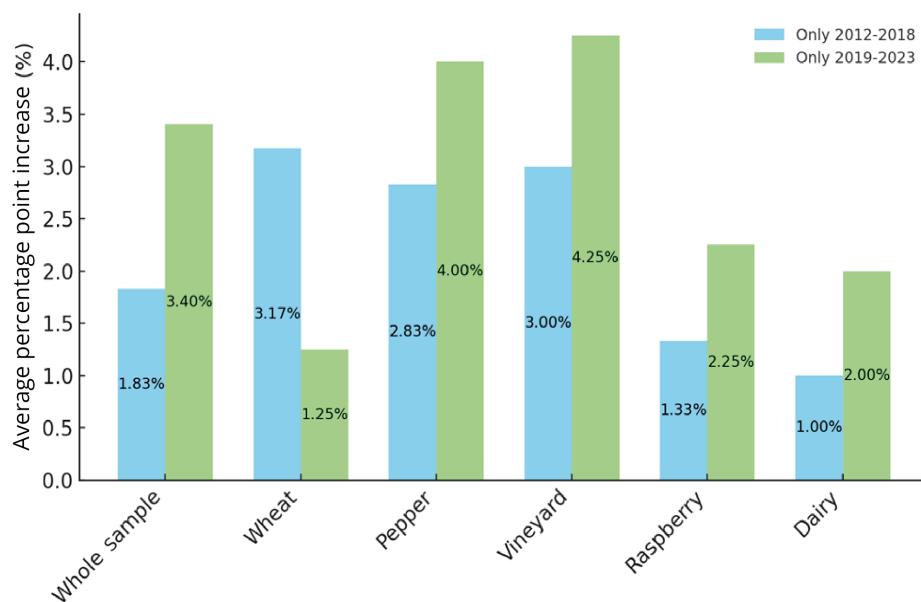
Migration patterns among farm households

Migration is a critical factor influencing labor availability in agriculture. The study examined migration trends over two periods: for 2012 to 2018 (before the Ukraine crisis) and from 2019 to 2023 (during and after the onset of the crisis).

Across the entire sample, the average annual percentage increase of households with migrants from 1.83 percent in the 2012 to 2018 period to 3.40 percent in the 2019 to 2023 period (Figure 8). This acceleration suggests that migration became a more prevalent strategy for coping with economic pressures during the crisis.

Sector-specific migration trends

- *Pepper and Vineyard sectors:* these sectors experienced a significant rise in migration rates, from 2.83 percent to 4 percent and from 3 percent to 4.25 percent, respectively. These sectors may have faced heightened economic challenges, prompting higher migration.
- *Raspberry and Dairy sectors:* The raspberry and dairy sectors also saw a rise in migration rate, albeit more moderate, with rates in the raspberry sector raising from 1.33 percent to 2.25 percent and in dairy from 1 percent to 2 percent.
- *Wheat Sector:* Notably, migration rates fell from 3.17 percent to 1.25 percent, possibly due to government support measures aimed at stabilizing cereal production during the crisis.

Figure 8. Average annual percentage increase of households with migrants

Source: Author's own elaboration based on survey data.

Cumulative migration rates

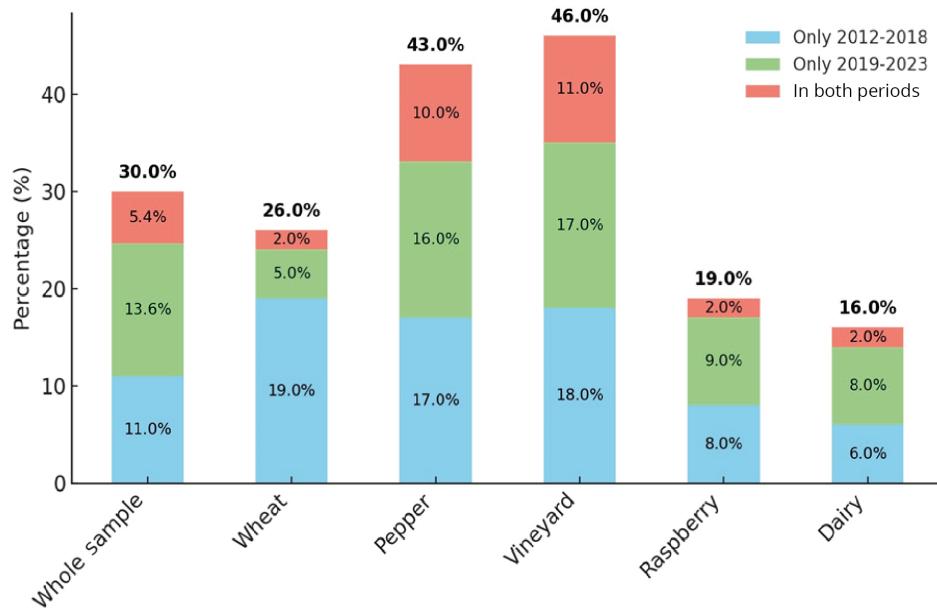
Figure 9 provides a cumulative overview of migration patterns among rural households across different agricultural product types for two time periods: 2012 to 2018 (before the Ukraine crisis) and 2019 to 2023 (during and after the onset of the Ukraine crisis). The cumulative data, disaggregated into migration for Only 2012 to 2018, Only 2019 to 2023, and In Both Periods, show significant shifts and provide valuable insights into how migration has changed over time and also by sector.

The total cumulative migration percentage is 30.0 percent for the entire sample. The increase from 11.0 percent in 2012 to 2018 to 13.6 percent in 2019 to 2023 suggests rising migration pressures during the Ukraine crisis. The cumulative sample value provides an average benchmark against which sector-specific migration trends can be analyzed.

The sector-specific analysis shows that:

- the Vineyard sector: has the highest cumulative migration at 46.0 percent.
- the Pepper sector: has cumulative migration of 43.0 percent.
- the Wheat sector: has lower cumulative migration at 26.0 percent, indicating relative stability.
- the Raspberry and Dairy sectors: have cumulative migration rates of 19.0 percent and 16.0 percent, respectively.

Figure 9. Share of households with migrants



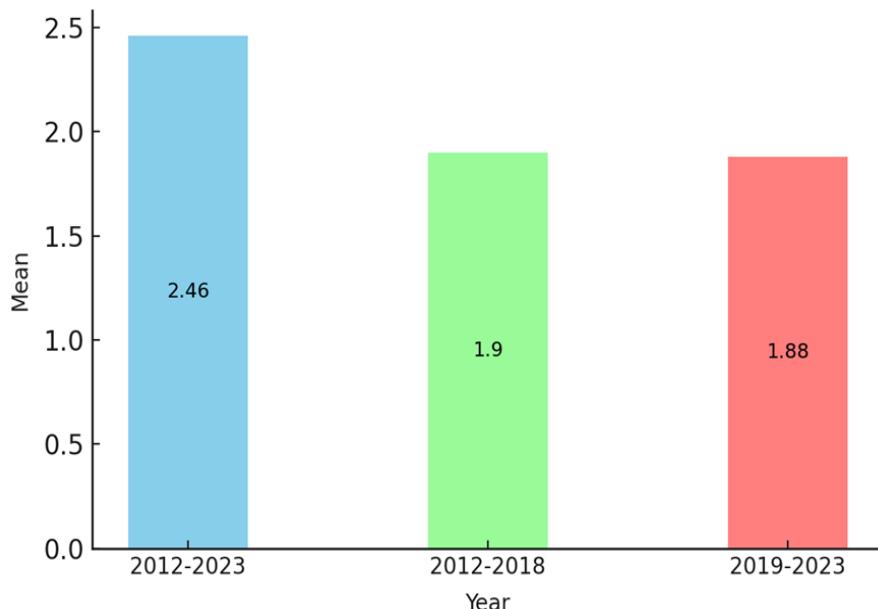
Source: Author's own elaboration based on survey data.

Number of migrants per household

Figure 10 shows the average number of household members who have migrated across three

periods: 2012 to 2023 (11 years), 2012 to 2018 (6 years), and 2019 to 2023 (4 years). The averages highlight migration trends and the impact of the Ukraine crisis on rural households.

Figure 10. Average number of migrants per household with migrants



Source: Author's own elaboration based on survey data.

For the entire period (2012–2023), the average number of household members migrating per household was 2.46. This suggests migration was a consistent strategy for supporting livelihoods. In the pre-crisis period (2012 to 2018), the average number of migrants was 1.9 per household. This reflects moderate migration under stable conditions. During the crisis period (2019 to 2023), the average also stood at 1.9, despite the period being shorter by two years. This indicates a significant acceleration in migration — households sent the same number of members abroad within a shorter timeframe, driven by economic pressures from the Ukraine crisis. Migration became an urgent strategy to cope with rising costs and uncertainty. This accelerated migration trend highlights the vulnerability of rural communities to external shocks, emphasizing the need for effective support during crises.

Farm household migration in the 2019 to 2022 period

The data on households having exited the farming sector between 2019 and 2023 support the finding

about migration among household farmers across various agricultural sectors from 2019 to 2023 (Table 4)⁴. The figures not only capture those remaining households who have adjusted or reduced their agricultural activities but also farming households who have entirely left agriculture and are thus not reflected in these figures.

As shown in Table 4 the reduction of farming households highlights the extent to which households are exiting agriculture:

- Overall sample: Average decline of 26.6 percent in farming households.
- Dairy sector: Sharpest decline with an average reduction of 47.2 percent, reflecting significant challenges in this sector.
- Wheat, Pepper, Vineyard, and Raspberry sectors: Moderate declines ranging from 19.4 percent to 24.3 percent.

Table 4. Reduction of farming households between 2019 and 2023

Product Type	Mean Change (percent)	SD Change (percent)	Median Change (percent)
Whole Sample	-26.6	38.6	-25.0
Wheat	-22.4	39.0	-21.5
Pepper	-19.4	38.7	-20.0
Vineyard	-24.3	31.7	-16.7
Raspberry	-19.6	38.9	-20.5
Dairy	-47.2	37.9	-50.0

Source: Authors based on survey data.

⁴ This indicator was captured by asking surveyed respondents about their perceptions about changes in farm households involved in agricultural activity in their communities between 2019 and 2023.

The data underscore an accelerated agricultural sector abandonment trend, especially in labor- and cost-intensive sectors like dairy farming.

3.3 Section summary

The chapter highlights significant demographic shifts affecting Kosovo's agricultural sector, particularly the increase in migration rates during the Ukraine crisis. Despite liberalized visa policies, no significant acceleration in emigration overall has been noted, but youth migration remains a concern, threatening future labor force in agriculture. Farm households average around 5.85 members with balanced gender composition, but only a small fraction have formal agricultural education, potentially impacting the adoption of modern farming practices.

Employment patterns show that farm managers are predominantly self-employed in the farm, while household members also contribute but often seek education or employment in other fields. Migration trends indicate an acceleration during the crisis, with the average annual percentage increase of households with migrants rising from 1.83 percent to 3.40 percent. Sectors like pepper and vineyard experienced the highest cumulative migration rates, while the dairy sector saw a significant decline in farming households, highlighting severe challenges. Overall, demographic changes underscore the vulnerability of rural communities and the need for targeted interventions to retain labor, support farmers, and ensure the sustainability of Kosovo's agricultural sector.



4. IMPACT ON CRISIS ON PRODUCTION FACTORS USAGE AND FARMING STRATEGIES

This chapter analyzes how the food, energy, and finance crisis has affected the utilization of key production factors—land, labor, and capital—in Kosovo's agricultural sector. It explores shifts in land use patterns, adjustments in labor force employment and wages, and changes in input use, particularly fertilizers and machinery. The chapter also examines farmers' strategic responses to the crisis, including their willingness to continue farming, invest in their operations, and adapt their practices to new economic realities. Through sector-specific analyses of wheat, pepper, vineyard, raspberry, and dairy farming, the chapter provides a comprehensive understanding of the challenges encountered, and the resilience shown by farmers during this turbulent period.

4.1. Changes in land utilization

The food, energy, and finance crisis has significantly affected land use in Kosovo's agricultural sector. Surveys and interviews with 500 farmers reveal shifts in land utilization, including changes in crop choices, adjustments between owning and leasing land, and responses to fluctuating costs and market demands.

From 2019 to 2022, total land use increased from 5.73 has to 5.99 has, a 4.5 percent growth (Figure 11). This rise is mainly due to greater reliance on leased land, which grew from 2.41 has (42.1 percent of total land) to 2.67 has (44.6 percent of total), while owned land remained steady at around 3.32 has. Farmers reported that leasing land provides flexibility to adapt to rising input costs and market uncertainties caused by the Ukraine crisis. It allows them to adjust land use without the financial burden of purchasing land, reducing risk in a volatile environment. This trend shows a sector-wide move toward flexible land management, with leasing playing a key role in scaling operations and responding to market pressures.

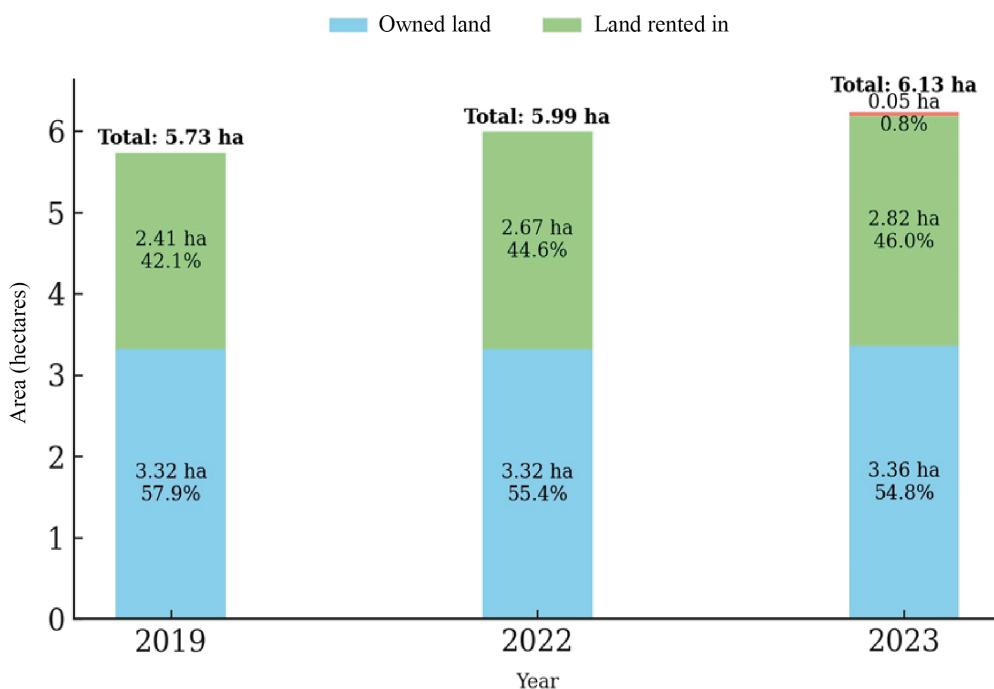
Statistical analysis confirmed significant increases in land area usage over the years, indicating that these changes are meaningful and not coincidental.

In 2023, as the crisis continued, total land use further increased to 6.23 has, a 4 percent increase from 2022, with leased land making up an even larger portion, at 2.82 has (45.6 percent of total land). Owned land saw a slight increase to 3.36 has. This pattern reflects

ongoing reliance on leased land to cope with economic uncertainties. Despite high input costs, leasing land has allowed farmers to expand and adjust production areas, helping them stabilize income and maintain productivity amid

fluctuating conditions. The growing use of leased land demonstrates the agricultural sector's adaptability, serving as a buffer that enables rapid adjustments without long-term investment commitments.

Figure 11. Land use for 2019, 2022 and 2023



Source: Author's own elaboration based on survey data.

Sector-specific adaptations

Examining responses by sector reveals notable changes influenced by profitability, government policies, and operational challenges (Table 5).

Land use among wheat farmers increased from 7.86 has in 2019 to 8.03 has in 2022, primarily due to more leased land. Public subsidies rose from EUR 150 to EUR 477 per ha, encouraging farmers to grow more wheat for food security. However, interviews revealed mixed responses. Some farmers expanded wheat cultivation to meet subsistence needs, while others reduced it due to low profitability and high input costs. For example, one farmer decreased wheat cultivation from 50 has in 2022 to 1.5 has in 2023 because of financial pressures. In 2023, the land used by wheat farmers expanded further to 8.31 has, leased land increasing to 3.94 has.

Land use by pepper farmers grew modestly from 4.74 has in 2019 to 4.86 has in 2022 and significantly to 5.28 has in 2023, mainly due to more leased land. Farmers leased more land to expand pepper production in response to market demand.

Land use for vineyards remained relatively stable, with a slight decrease from 3.36 has in 2019 to 3.34 has in 2022 and a small increase to 3.40 has in 2023. High input costs and low profitability led some farmers to reduce or withdraw from vineyard cultivation. Some requested to unregister their vineyards due to unviable economics.

Land used by raspberry farmers increased cautiously from 2.33 has in 2019 to 2.40 has in 2022 and to 2.50 has in 2023. The sector faced fluctuating land allocation tied to international market

competitiveness. Higher production costs in Kosovo (EUR 1.5 per kg) compared to Ukraine (EUR 0.72 per kg) made profit margins challenging. Leasing land for raspberries involves long-term commitments and high costs, averaging EUR 350 to EUR 400 per ha and sometimes up to EUR 700, typically with 10-year contracts. This adds stability but may discourage new entrants.

The dairy sector saw a significant increase in land use from 10.34 has in 2019 to 11.33 has in 2022 and further to 11.65 has in 2023, predominantly through leased land (58.6 percent in 2023). This reliance aligns with the need to scale production according to economic conditions. Dairy farmers prioritize leasing to avoid high fixed ownership costs, allowing them to expand during favorable market conditions without long-term financial risk.

Table 5. Land use by sector (ha)

Product Type	Owned land			Leased out	Leased			Land in use		
	2019	2022	2023		2023	2019	2022	2023	2019	2022
Whole Sample	3.32	3.32	3.36	0.05	2.41	2.67	2.82	5.73	5.99	6.23
Wheat	4.29	4.30	4.33	0.04	3.57	3.73	3.94	7.86	8.03	8.31
Pepper	2.94	2.95	2.94	0.04	1.80	1.91	2.30	4.74	4.86	5.28
Vineyard	2.56	2.56	2.55	0.10	0.80	0.78	0.75	3.36	3.34	3.40
Raspberry	2.12	2.12	2.13	0.06	0.21	0.28	0.31	2.33	2.40	2.50
Dairy	4.69	4.69	4.82	0.00	5.65	6.64	6.83	10.34	11.33	11.65

Source: Authors based on survey data.

Overall, the agricultural sector response illustrates strategic adaptation, balancing owned and leased land to navigate uncertain market conditions and rising costs. While the cereals, pepper, and dairy sectors show increased reliance on leased land for flexibility, high-value crops like raspberries and vineyards demonstrate cautious expansion, emphasizing stability and reducing exposure to market volatility. These shifts underscore the sector resilience, with leasing enabling adaptable and scalable practices amid ongoing global challenges.

Land lease trends

Land lease per ha has been critical for farmers adjusting to the crisis, with a gradual upward trend. Below are the changes in land leasing prices per ha between 2019 and 2023:

- **Overall:** Increased from EUR 264 in 2019 to EUR 276 in 2023.
- **Wheat:** Rose from EUR 122 to EUR 134, suggesting growing demand for land dedicated to wheat cultivation.
- **Pepper:** Grew from EUR 512 to EUR 532, reflecting ongoing strong demand for this high-value crop, indicating a consistent, high demand for land in pepper cultivation, which is likely driven by the profitability related to this crop.
- **Vineyard:** Increased from EUR 300 to EUR 320 by 2022, then remained stable at EUR 320 in 2023. Indicating that vineyard land demand has plateaued. The stability may reflect market saturation or a balance between supply and demand for vineyard land.
- **Raspberry:** Decreased from EUR 400 to EUR 380 in 2022, then decreased further in 2023 to EUR 341, signaling a decline in demand for raspberry land. This trend suggests possible challenges in raspberry profitability, or competition with other crops that may yield higher returns from investment in land.
- **Dairy:** Increased from EUR 126 to EUR 151 in 2022, further increasing to EUR 162 in 2023, indicating sustained or growing interest in dairy land, possibly

driven by the stable or rising demand for dairy products.

For more details, please refer to Land use.

4.2. Changes in the labor force utilization

This subsection examines labor utilization and wage trends from 2019 to 2023, highlighting how the sector adapted to economic pressures from the crisis.

Overall Labor Force Utilization Trends

Total labor days increased from 427.81 in 2019 to 443.12 in 2022, a 3.6 percent increase as the sector responded to disruptions (Figure 12). Full-time employed labor force grew by 28 percent,

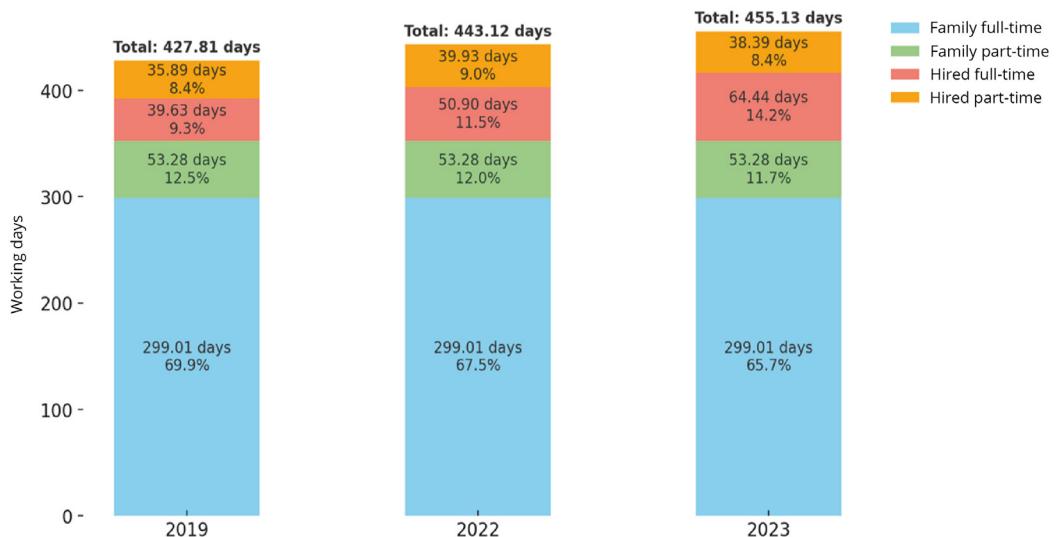
from 39.63 days (9.3 percent of total labor) to 50.90 days (11.5 percent), while part-time employed labor force rose by 11.3 percent, indicating a preference for stable, full-time positions to ensure workforce continuity.

Farmers reported difficulties in securing reliable labor force due to competition from other sectors and increased migration. Some employed seasonal workers to address shortages.

From 2022 to 2023, total labor days rose to 455.13, a 2.7 percent increase. Full-time employed labor force grew by 26.6 percent to 64.44 days (14.2 percent), while part-time labor force slightly declined. This underscores a strategic shift toward full-time work for reliability amidst ongoing uncertainty.

Changes in government subsidies, shifting from per ha to per kilogram, have influenced labor strategies encouraging more efficient practices, potentially affecting labor demand per ha.

Figure 12. Labor utilization: household labor and hired labor

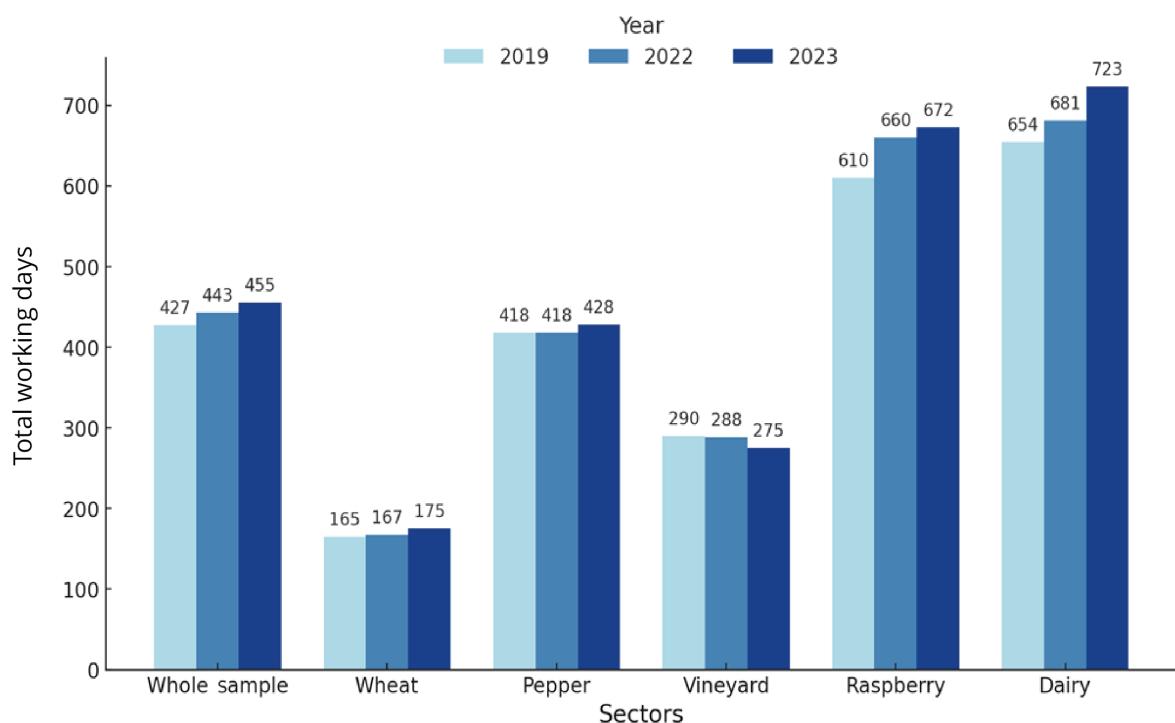


Source: Authors based on survey data.

Sector-specific labor utilization (Figure 13)

- **Wheat:** Labor days remained stable, increasing slightly from 165 in 2019 to 175 in 2023, reflecting the lower labor intensity in wheat cultivation.
- **Pepper:** Labor days remained steady, with a slight increase from 418 to 428 days, showing adaptability.
- **Vineyard:** Labor declined from 290 days in 2019 to 275 in 2023, possibly due to cost-saving measures like reduced fertilization frequency.
- **Raspberry:** Labor demand increased from 610 days to 672, with farmers employing younger workers due to adult labor shortages. For instance, during peak harvest season, it is not uncommon for children as young as 12 or 13 to be employed in the fields to fill these labor gaps.
- **Dairy:** Labor demands rose from 654 days in 2019 to 681 days in 2022, and further to 723 days in 2023. The high demand for consistent labor force in the dairy sector made it particularly vulnerable to labor shortages, leading farmers to rely on a mix of hired and household labor to sustain operations.

Figure 13. Total labor utilization by sector



Source: Authors based on survey data.

Wage trends

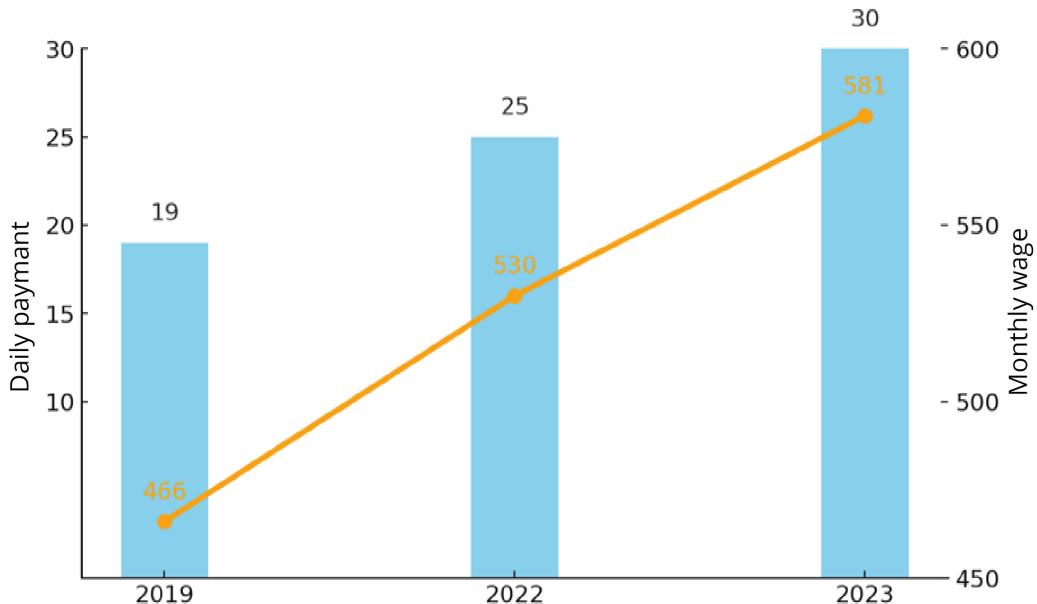
From 2019 to 2022, daily wages rose from EUR 19 to EUR 25 (31.6 percent increase), while monthly wages grew from EUR 466 to EUR 530 (13.7 percent). The faster growth in daily rates suggests a focus on competitive day rates to attract labor, despite budget constraints (Figure 14).

From 2022 to 2023, daily wages increased to EUR 30 (20 percent rise), and monthly wages to EUR 581 (9.6 percent). These adjustments highlight reliance on higher daily rates to retain labor amid inflation and demand pressures.

Sector-specific wage adjustments

- **Wheat and Pepper:** Wages remained stable due to lower demand for labor.
- **Vineyard:** Daily wages increased significantly to between EUR 40 and EUR 50, showing strong demand for labor.
- **Raspberry:** Harvesting wages surged from EUR 0.3 to EUR 0.8 per kg by 2023, leading to reliance on younger workers.
- **Dairy:** Wages rose steadily but moderately, balancing pressures with sustained demand.

Figure 14. Monthly and daily wages



Source: Authors based on survey data.

Overall, the sector demonstrated resilience by shifting toward full-time employment and competitive daily rates to stabilize the workforce amidst shortages and rising costs. Labor-intensive crops like raspberries and dairy faced

pronounced challenges, adapting through increased reliance on household and younger workers. The emphasis on labor stability and wage adjustments helped manage retention in a competitive market.

4.3. Changes in capital utilization

4.3.1. Change in input use

Rising fertilizer and fuel prices have significantly impacted agricultural practices in Kosovo, forcing farmers to adjust their input strategies to balance productivity with increasing production costs. This section explores these trends, combining insights from farmer surveys and interviews to illustrate the challenges and adaptations across wheat, pepper, vineyard, raspberry, and dairy sectors from 2019 to 2023.

Overall trends

Global supply chain disruptions due to the Ukraine war have led to higher input costs and availability challenges for farmers in Kosovo. Between 2019 and 2022, many farmers reduced fertilizer use as a cost-saving measure. Fertilizer prices surged dramatically during this period; for example, urea rose from EUR 8 to EUR 25 per unit in 2022 before settling at EUR 12 in 2023, and NPK (15/15/15) increased from EUR 9 to EUR 20 per unit before dropping to EUR 13 in 2023.

Shifts in input use (2019 vs. 2022)

Survey data show that wheat farmers slightly reduced nitrogen fertilizer use by 0.6 percent and NPK fertilizers by 1.6 percent. Pepper farmers cut NPK fertilizer use by 21.3 percent, vineyard farmers reduced it by 3.2 percent, and raspberry farmers decreased granular fertilizers by 3.7 percent and organic fertilizers by 19.1 percent. In contrast, dairy farmers increased NPK fertilizer use by 12 percent to boost pasture productivity amid rising feed costs.

Fuel prices also rose sharply, from EUR 1.20 per liter in 2021 to EUR 2.00 in 2022, before decreasing to EUR 1.35 in 2023, affecting all mechanized farming operations. Consequently, machinery expenses increased: for wheat farmers by 5.4 percent, for pepper and vineyard farmers by 9 percent, and for raspberry farmers by 12.5 percent. Some sectors adjusted other inputs; pepper farmers increased organic fertilizer use by 4.3 percent, vineyard farmers raised plant protection products by 2.3 percent, and raspberry farmers increased crystal fertilizer use by 3.9 percent. Dairy farmers significantly increased feed inputs, with concentrate feed up 14.1 percent, silage up 5.6 percent, and hay up 8.4 percent per cow.

Adaptations from 2022 to 2023

Between 2022 and 2023, farmers continued to adjust their input strategies in response to ongoing economic pressures. Some sectors increased input use due to price stabilization or necessity:

- Wheat farmers increased nitrogen fertilizer use by 8 percent and NPK fertilizers by 6.1 percent, possibly to replenish soil nutrients after previous reductions.
- Dairy farmers continued to raise NPK fertilizer application by 6.3 percent and significantly boosted feed inputs — concentrate feed by 12.4 percent, silage by 8.9 percent, and hay by 10.2 percent per cow—to maintain milk production.

Other sectors further reduced chemical fertilizer use or shifted to alternative inputs:

- Pepper farmers decreased NPK fertilizer use by 2 percent but increased organic fertilizer application by 25.1 percent, indicating a move toward more affordable or locally sourced inputs.
- Vineyard farmers reduced NPK use by 5.5 percent but increased plant protection products by 7.3 percent to safeguard crops.
- Raspberry farmers showed a mixed approach: a slight decrease in crystal fertilizer use by 0.8 percent, a modest increase in granular fertilizer by 2.5 percent, and a further reduction in organic fertilizers by 4.4 percent.

Machinery expenses continued to rise due to persistent high fuel prices and maintenance costs: wheat farmers saw a 17.3 percent increase, pepper farmers a 12.4 percent increase, and raspberry farmers a significant 31.1 percent rise. However, vineyard farmers reduced machinery expenses by 3.6 percent, possibly by adopting fuel-efficient practices or delaying non-essential maintenance.

Sector-specific analyses

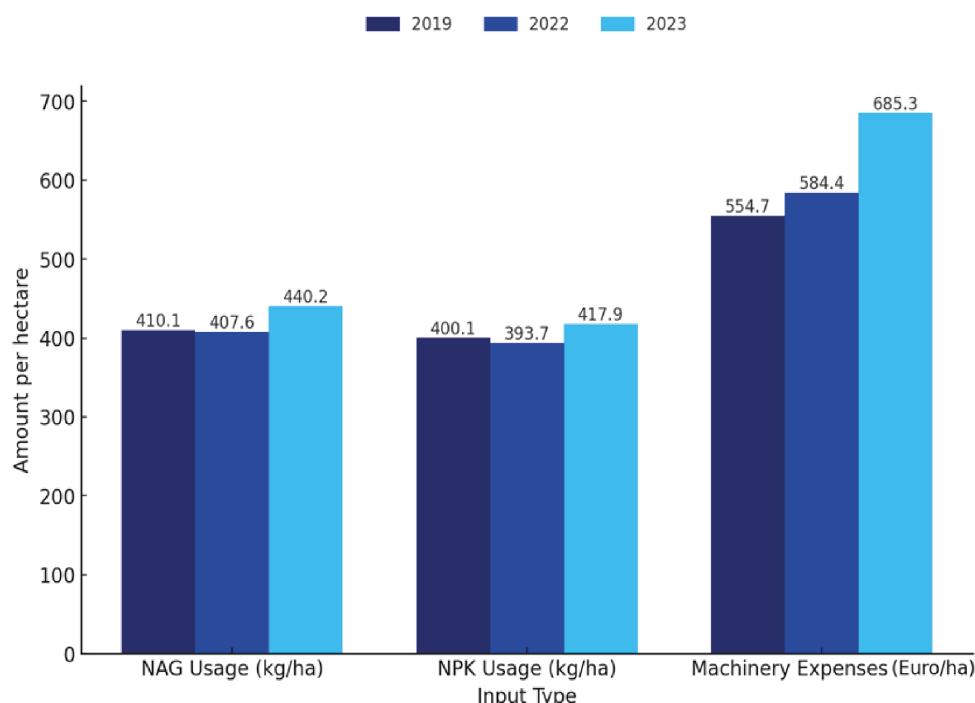
Wheat

Wheat farmers modified their input use in response to fluctuating costs (Figure 15). From 2019 to 2022, they slightly reduced

nitrogen fertilizer (NAG) use by 0.6 percent, from 410.1 kg/ha to 407.6 kg/ha, and NPK fertilizers by 1.6 percent, from 400.1 kg/ha to 393.7 kg/ha, to mitigate soaring fertilizer prices. Machinery expenses increased by 5.4 percent, from

EUR 554.7/ha to EUR 584.4/ha, due to higher fuel prices and maintenance costs.

Figure 15. Input use for wheat



Source: Authors based on survey data.

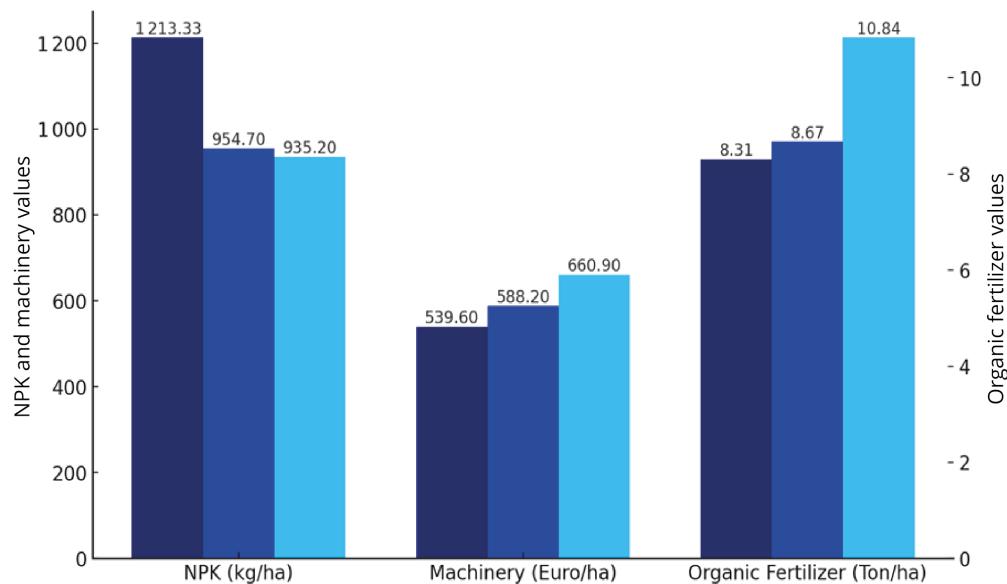
Between 2022 and 2023, wheat farmers increased NAG use by 8 percent and NPK use by 6.1 percent, possibly due to more stable prices or the need to replenish soil nutrients. Machinery expenses continued to rise, reaching EUR 685.3/ha in 2023, a 17.3 percent increase.

Pepper

Pepper farmers faced significant input cost challenges (Figure 16). From 2019 to 2022, they reduced NPK fertilizer use by 21.3 percent, from 1,213.33 kg/ha to 954.70 kg/ha, to manage costs.

Machinery expenses rose by 9 percent, from EUR 539.60/ha to EUR 588.20/ha, due to increased fuel prices. Organic fertilizer use increased slightly by 4.3 percent, suggesting a shift toward more affordable inputs.

Between 2022 and 2023, NPK fertilizer use decreased further by 2 percent, while organic fertilizer application increased by 25.1 percent, from 8.67 tonnes/ha to 10.84 tonnes/ha. Machinery expenses rose by 12.4 percent, reaching EUR 660.90/ha, reflecting ongoing cost pressures.

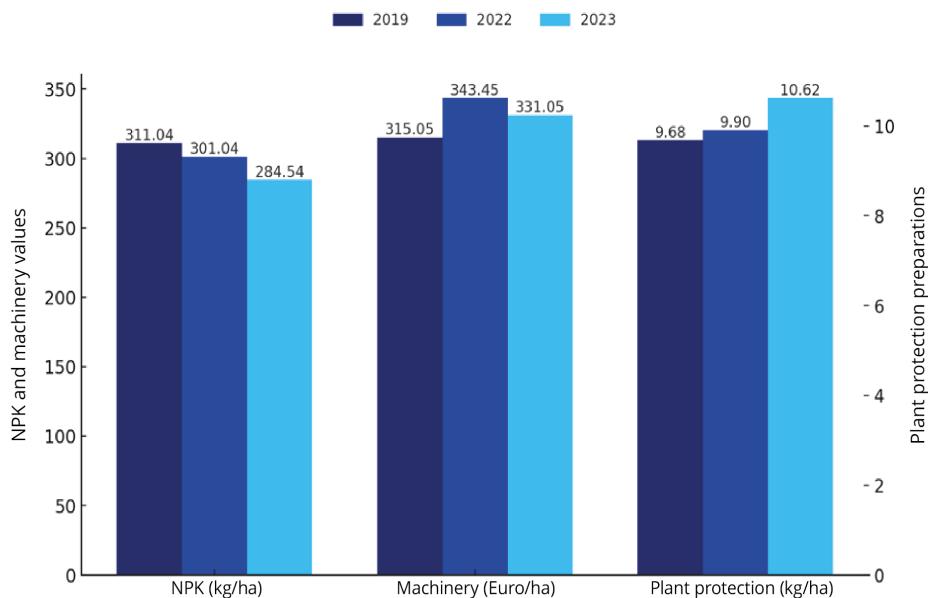
Figure 16. Input use for pepper

Source: Authors based on survey data.

Vineyards

Vineyard farmers adjusted their practices to cope with rising costs (Figure 17). From 2019 to 2022, they reduced NPK fertilizer use by 3.2 percent, from 311.04 kg/ha to 301.04 kg/ha. Machinery

expenses increased by 9 percent, from EUR 315.05/ha to EUR 343.45/ha, due to higher fuel and maintenance costs. Plant protection products use increased slightly by 2.3 percent, emphasizing the importance of crop health.

Figure 17. Input use for vineyard

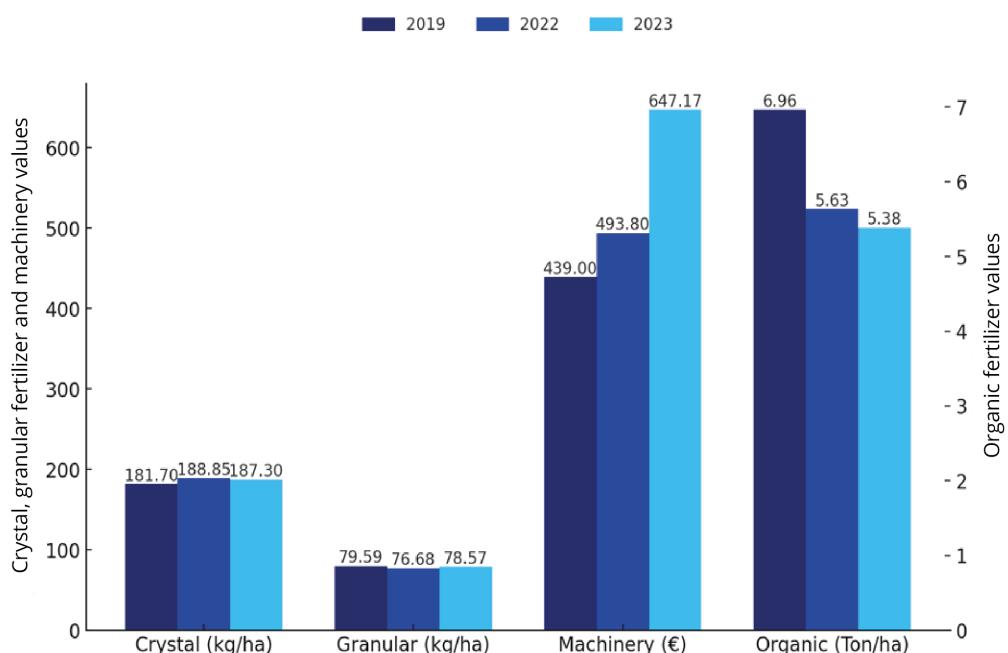
Source: Authors based on survey data.

Between 2022 and 2023, NPK fertilizer use decreased further by 5.5 percent, while plant protection products increased by 7.3 percent. Machinery expenses decreased by 3.6 percent, suggesting efforts to reduce costs through fuel efficient practices or deferred maintenance.

Raspberry

Raspberry farmers faced significant input challenges. From 2019 to 2022, they reduced granular fertilizer use by 3.7 percent and organic fertilizers by 19.1 percent, while slightly increasing crystal fertilizer use by 3.9 percent. Machinery expenses rose by 12.5 percent, from EUR 439.00/ha to EUR 493.80/ha, due to higher operational costs.

Figure 18. Input use for raspberry



Source: Authors based on survey data.

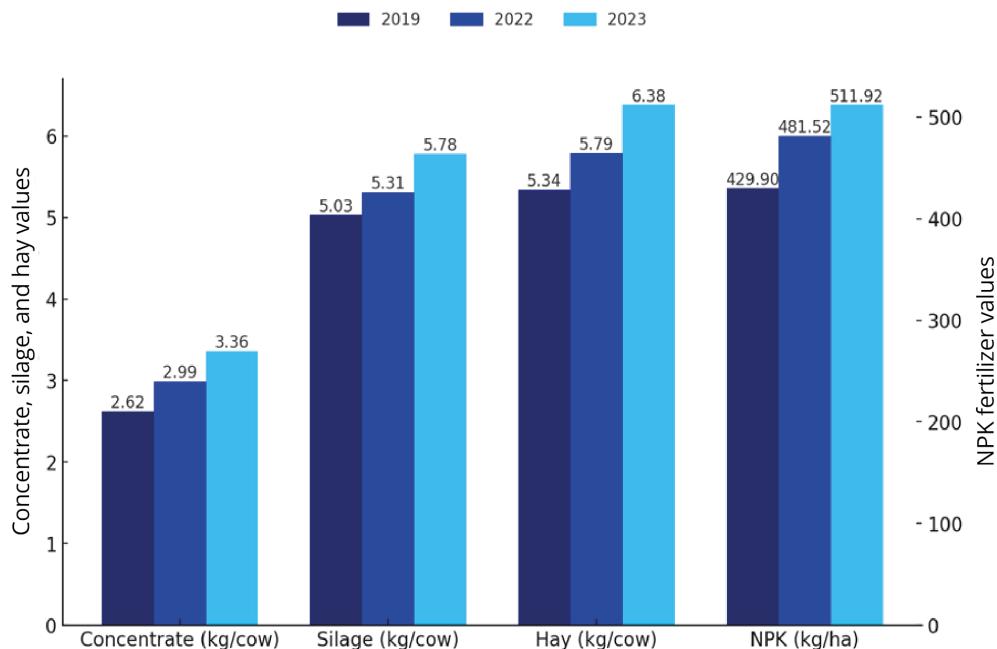
Between 2022 and 2023, crystal fertilizer use decreased slightly by 0.8 percent, and granular fertilizer use increased by 2.5 percent. Organic fertilizer use declined further by 4.4 percent. Machinery expenses saw a sharp increase of 31.1 percent, reaching EUR 647.17/ha, highlighting continued cost pressures.

Dairy

Dairy farmers increased input use to maintain production levels amid rising costs. From 2019

to 2022, they increased concentrate feed by 14.1 percent, silage by 5.6 percent, and hay by 8.4 percent per cow. NPK fertilizer use rose by 12 percent, from 429.90 kg/ha to 481.52 kg/ha, to enhance pasture productivity.

Between 2022 and 2023, concentrate feed increased by 12.4 percent, silage by 8.9 percent, and hay by 10.2 percent per cow. NPK fertilizer use grew by 6.3 percent, reaching 511.92 kg/ha. These adjustments reflect efforts to sustain milk production despite higher feed and fertilizer costs.

Figure 19. Input use for dairy

Source: Authors based on survey data.

The findings highlight how farmers across sectors have adapted their input strategies in response to escalating input costs, particularly during the Ukraine crisis. From 2019 to 2022, facing sharp increases in fertilizer and fuel prices, most farmers opted to reduce fertilizer use and adjust other inputs to manage rising costs. However, between 2022 and 2023, many farmers partially reversed these reductions, likely due to some price stabilization and the need to restore soil nutrient levels. Machinery expenses continued to increase across the board due to persistently high fuel prices and maintenance costs, creating an additional burden on farmers. Between 2019 and 2022, chemical fertilizer use generally decreased as farmers tried to mitigate costs. Wheat, pepper, vineyard, and raspberry farmers all reported reductions in NPK and nitrogen-based fertilizers. However, from 2022 to 2023, wheat and dairy farmers increased their fertilizer usage, possibly due to price adjustments and the necessity to replenish nutrients after previous cutbacks. Conversely, pepper and vineyard farmers continued reducing chemical fertilizers, potentially seeking alternative practices to maintain soil productivity with lower input costs. The Ukraine crisis has significantly increased synthetic fertilizer prices, leading to varied, sector-specific responses in organic fertilizer usage (semi-

structured interviews). For example, raspberry farmers reduced their use of organic fertilizers by 19.1 percent between 2019 and 2022, likely due to limited availability and higher costs. In contrast, pepper farmers increased their organic fertilizer usage by 4.3 percent during the same period, indicating that organic options were more affordable and accessible to them. This trend intensified from 2022 to 2023, with pepper farmers further increasing their use by 25.1 percent, suggesting a shift toward locally sourced, cost-effective alternatives as synthetic fertilizer prices remained high. Input suppliers have reported increased demand for imported organic fertilizers, which are seen as more affordable and beneficial for soil health than chemical options (semi-structured interviews). Despite this growing interest in organic practices, farmers face challenges that complicate the adoption of organic methods. These challenges include equipment limitations for spreading manure—particularly in vineyards—and higher weed control costs (semi-structured interviews).

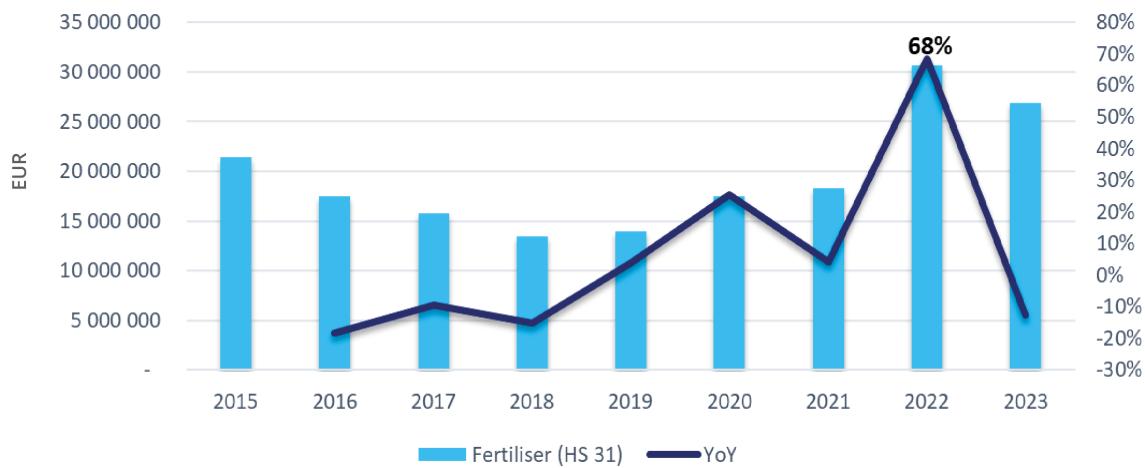
4.3.2. Overall fertilizer supply in Kosovo

To complement the survey data on input usage presented above, this section focuses on a macro view of the evolution of net fertilizer trade in Kosovo. Figure 20 shows a considerable

spike in net trade (import – exports) in terms of value for fertilizer in 2022. On the other hand, the net fertilizer volume in Kosovo starts declining starting in 2021 (Figure 21), decreasing by 17 percent compared to 2020, to decrease

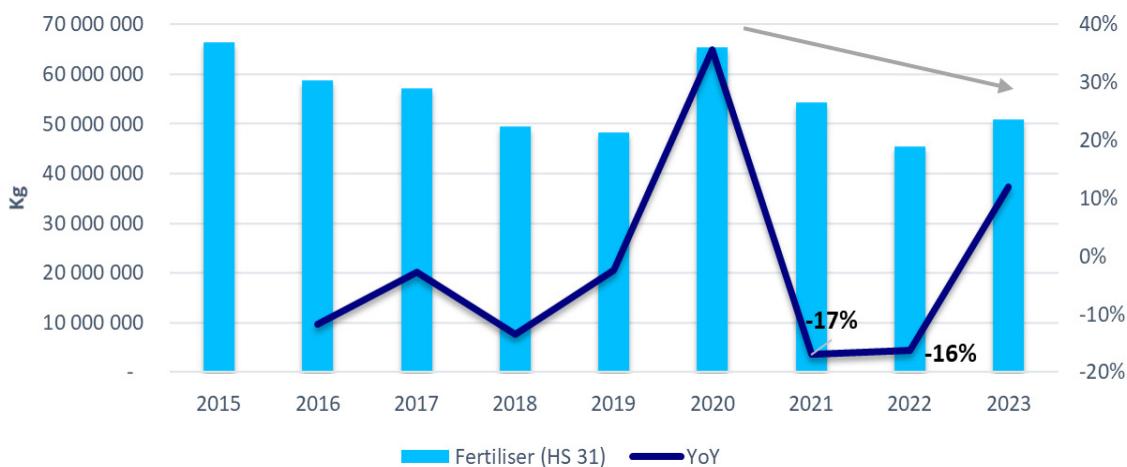
again by another 16 percent in 2022 compared to 2021. In 2023 the situation improves slightly but still the amount of fertilizer available in Kosovo is much smaller than in 2020.

Figure 20. Net trade difference in Euro for fertilizers from 2015 to 2023



Source: Authors based on data provided by MAFRD.

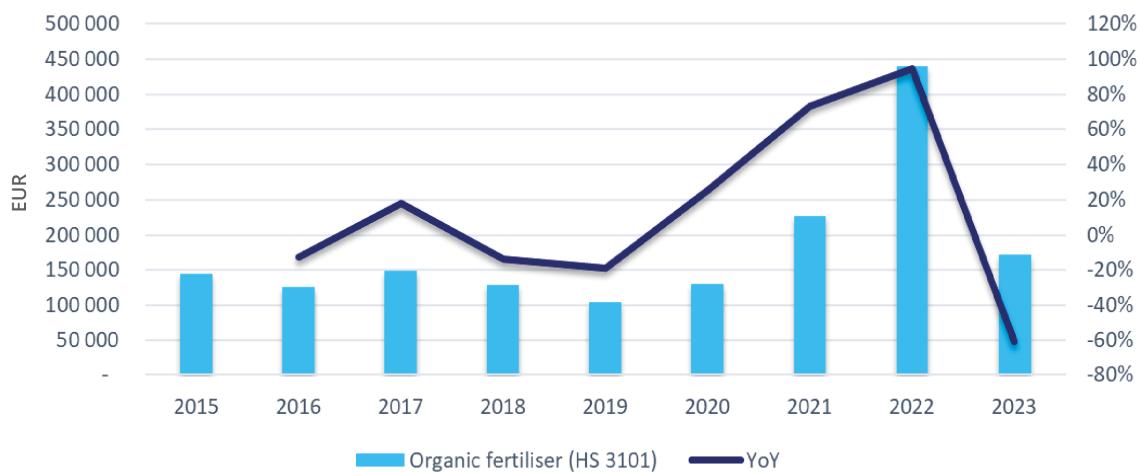
Figure 21. Net trade volume difference for fertilizers from 2015 to 2023



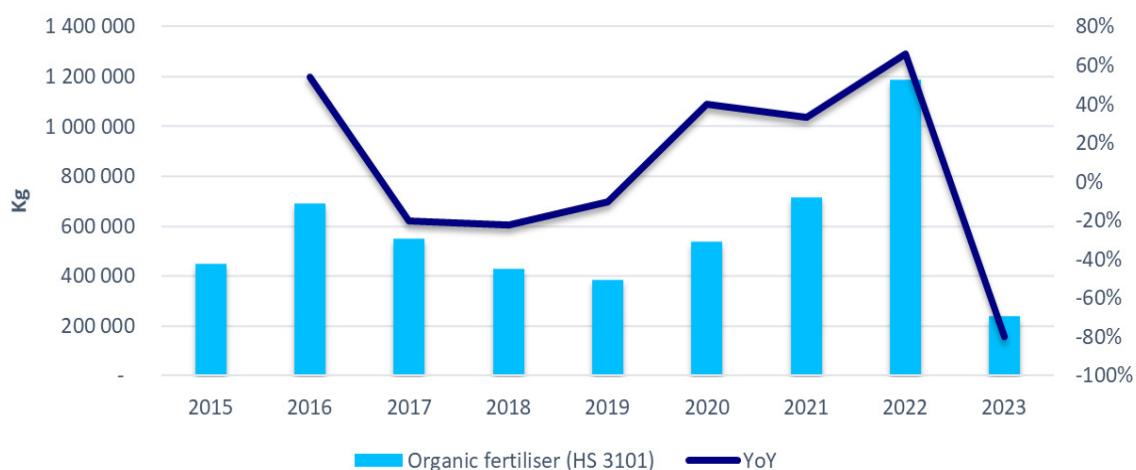
Source: Authors based on data provided by MAFRD.

On another note, imported organic fertilizer account for a very small share of the overall imported fertilizer. However, when examining trends, it grows in the opposite direction to the general trend described above, particularly when focusing on quantities (Figure 23). Thus, organic fertilizer imports (or net trade) have more

than doubled in quantity since 2020. This was also noted during interviews in which an input supplier stated that farmers are switching to imported organic fertilizer, which was cheaper than chemical fertilizer. In the meantime, organic fertilizer net quantities have decreased considerably in 2023 compared to 2022.

Figure 22. Net trade difference in Euro for organic fertilizers from 2015 to 2023

Source: Authors based on data provided by MAFRD.

Figure 23. Net trade volume difference for organic fertilizers from 2015 to 2023

Source: Authors based on data provided by MAFRD.

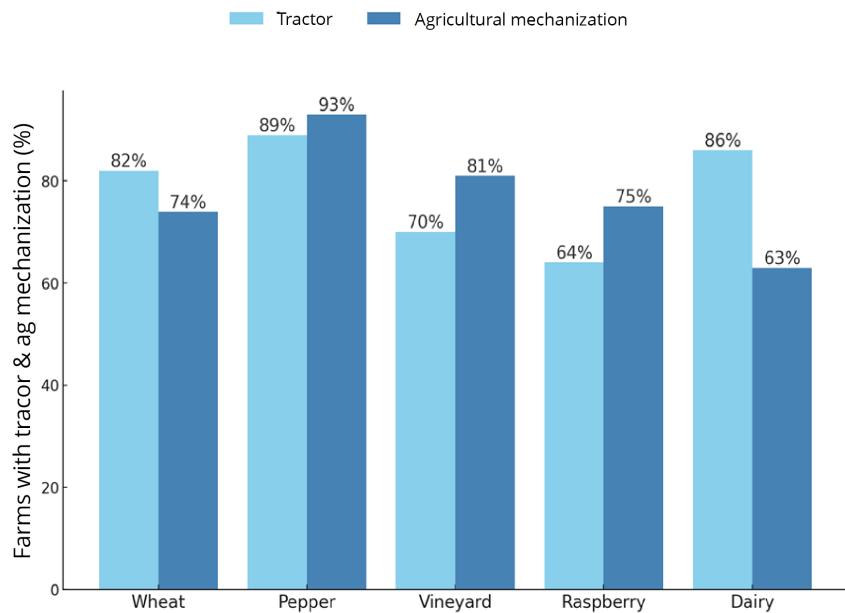
4.3.3. Farm assets and changes in farm investment

Farm assets

This section explores the use of tractors and other mechanical equipment across various agricultural sectors in Kosovo, including wheat, pepper, vineyard, raspberry, and dairy farming sectors. The data show that modern equipment

plays a crucial role in enhancing productivity and efficiency in farms.

Tractor use is substantial across all sectors, ranging from 64 percent to 89 percent of farms, underscoring the essential role they play in agricultural operations (Figure 24). Other agricultural machinery is also widely used, with adoption rates between 63 percent and 93 percent, indicating that farmers prioritize mechanization tailored to their specific needs.

Figure 24. Part of farmers with tractor and other agricultural machinery

Source: Authors based on survey data.

Some sectors utilize additional equipment like trucks and storage facilities, though these are less common and vary by sector. For example, trucks are used by 21 percent of pepper farms, 12 percent of vineyard farms, and 8 percent of wheat farms to facilitate transportation and logistics. Storage facilities are present in 3 percent of wheat farms and 6 percent of raspberry farms, assisting with post-harvest management. In the raspberry sector, 1 percent of farms use product standardization lines to ensure consistent quality.

Sector-specific mechanization trends (Figure 24)

- **Wheat:** About 82 percent of wheat farms use tractors, and 74 percent employ other agricultural machinery, supporting wheat cultivation requirements and enhancing efficiency. Additionally, 8 percent use trucks for transport, and 3 percent have storage facilities for post-harvest management.
- **Pepper:** Pepper farms exhibit the highest levels of mechanization, with 89 percent using tractors and 93 percent utilizing other machinery. This intensive mechanization meets pepper cultivation needs, including efficient planting and harvesting. Notably, 21 percent of pepper farms use trucks, highlighting the importance of transport in high-volume production.
- **Vineyard:** Approximately 70 percent of vineyard farms use tractors, and 81 percent employ other agricultural machinery, supporting key operations like pruning and harvesting. Trucks are used by 12 percent of vineyard farms, emphasizing the need for transport in managing vineyard operations.
- **Raspberry:** Raspberry farms have the lowest tractor usage at 64 percent, but maintain a high level of other mechanization (75 percent). This reflects

the need for specialized equipment suitable for delicate raspberry cultivation. A small percentage use trucks (5 percent) and storage facilities (6 percent), and 1 percent have product standardization lines for quality control.

- **Dairy:** Dairy farms show robust mechanization, with 86 percent using tractors and 63 percent employing other agricultural machinery. Beyond general equipment, dairy farms use specialized tools, where 64 percent have milking machines, 18 percent have cooling tanks, and 13 percent feed mixers, supporting milk production efficiency and quality.

Overall, the widespread use of mechanization underscores its importance in modern farming practices. Tractors and other machinery play a pivotal role in enhancing productivity, tailored to the specific needs of each sector.

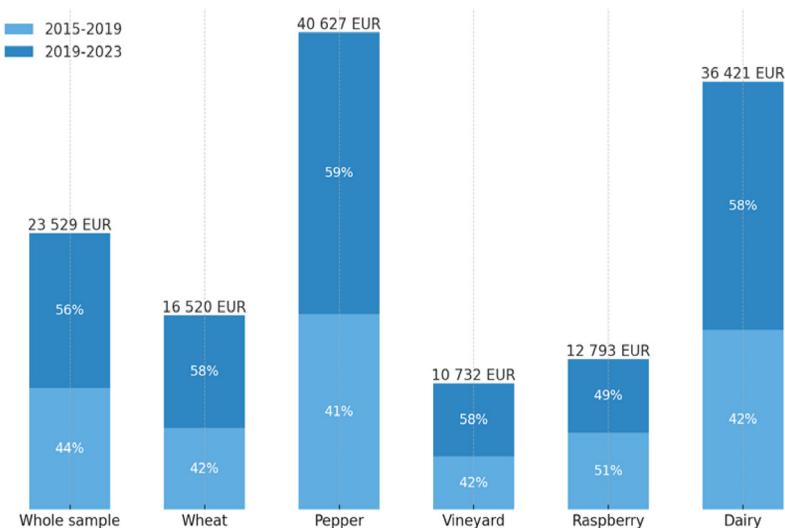
Changes in farm investment

Recent global events, particularly the Ukraine crisis, have influenced farm investment decisions across sectors. While some farmers expressed caution in investing due to economic uncertainties, survey data indicates that overall farm investments have increased during the crisis period from 2019 to 2023.

Overall investment trends

On average, farms have increased their investments during the crisis period. Across the entire sample, average investment per farm is EUR 23 529, with 56 percent of this investment occurring between 2019 and 2023 (Figure 25). This suggests that farmers are actively investing in their operations, possibly as a strategic response to market conditions or to enhance productivity.

Figure 25. Investment and investment distribution by periods and sectors



Source: Authors based on survey data.

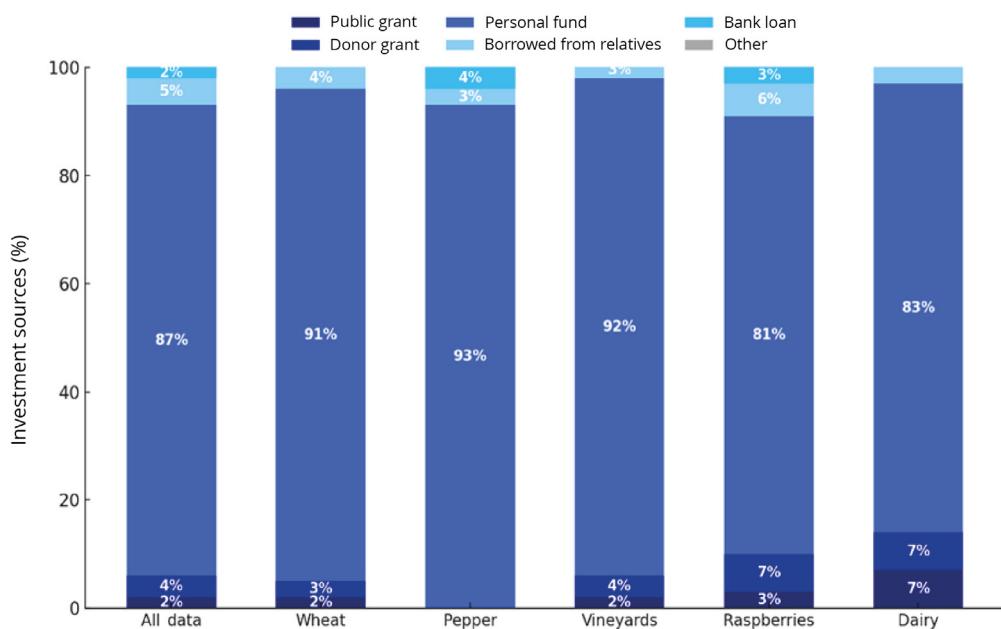
Sector-specific investment patterns (Figure 25)

- **Wheat:** Total investment per farm is EUR 16 520, with 58 percent occurring during the crisis period. This increase may reflect the strategic importance of wheat for food security, prompting farmers to invest despite challenges.
- **Pepper:** Pepper farms have invested an average of EUR 40 627 per farm, with 59 percent of investments between 2019 and 2023. The shift toward high-value crops like pepper may have encouraged farmers to invest more during this period.
- **Vineyard:** Vineyards show a total investment of EUR 10 732 per farm, with 58 percent during the crisis period. Investments include purchasing equipment like grape harvesting machines to reduce labor costs and improve efficiency.

- **Raspberry:** Raspberry farms invested EUR 12 793 per farm, with a balanced investment distribution—51 percent before the crisis and 49 percent during the crisis. While some farmers expressed hesitancy due to market volatility and weather impacts, others invested in profitable ventures like greenhouse production.
- **Dairy:** Dairy farms have an average investment of EUR 36 421 per farm, with 58 percent during the crisis period. Increased milk prices may have encouraged farmers to invest in livestock and equipment, such as automated milking systems.

Despite some farmers expressing caution, the data suggest that many have been investing more during the crisis period, possibly to adapt to new market conditions, improve efficiency, or meet growing demand.

Figure 26. Investment sources



Source: Authors based on survey data.

4.3.4. Investment sources

An analysis of investment sources reveals that farmers predominantly rely on personal funds across all sectors, indicating a strong culture of financial independence (Figure 26).

- **Personal funds:** The main source of investment, accounting for 91 percent in wheat, 93 percent in pepper, 92 percent in vineyards, 87 percent in raspberry, and 83 percent in dairy farming.
- **Public grants:** Provide modest support, with dairy farms receiving 7 percent, possibly due to specific subsidies supporting milk production.
- **Donor grants:** Play a minor role overall, but are more significant in the raspberry sector at 7 percent, suggesting targeted support programs.
- **Bank loans:** Represent a small share of financing, ranging from 3 percent in pepper farming to 7 percent in dairy farming, indicating limited use of formal lending.
- **Borrowing from relatives:** Accounts for a minimal share (1-3 percent) across sectors, showing that informal loans are less common.

This reliance on personal funds highlights the self-reliant nature of farmers in Kosovo's agricultural sector. While government and donor grants provide some support, especially in dairy and raspberry sectors, their overall impact is limited. Access to formal credit through bank loans is modest, suggesting potential areas for improvement of financial support mechanisms for farmers.

4.4. Farming strategies and farmers' willingness to continue farming business

4.4.1. Farming strategies

The survey data reveal farmers' attitudes toward various adaptation and diversification

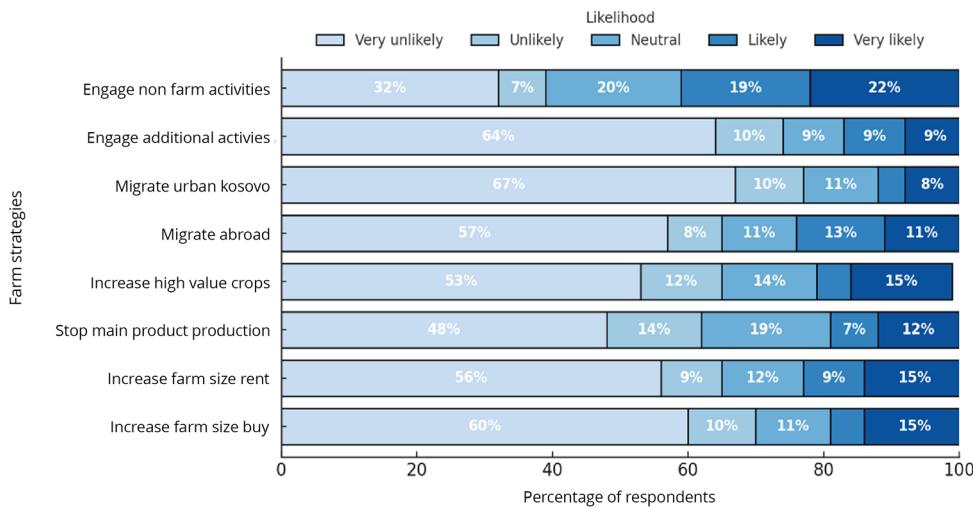
strategies, such as expanding farm sizes, migrating, or engaging in non-farming work. When responses are grouped into "Likely" (Likely + Very Likely) and "Unlikely" (Unlikely + Very Unlikely), clear preferences emerge. While there is some openness to non-farming activities, there is significant reluctance toward expansion or migration. These insights highlight the priorities and constraints within the agricultural community, offering guidance for targeted support.

Overall trends

Across the five sectors, farmers show the most interest in engaging in non-farming activities, with 41 percent indicating they are likely to pursue this option, compared to 39 percent who are reluctant (Figure 27). This suggests that farmers may view non-farm work as a viable way to enhance economic stability, especially if agricultural income is uncertain. Additionally, 29 percent express interest in cultivating high-value crops, indicating an awareness of the profitability in niche markets or premium products.

In contrast, there is a significant reluctance to expand farm size through additional land purchase or lease, with 70 percent and 65 percent of farmers unlikely to pursue these strategies respectively. Financial constraints or satisfaction with current operations may contribute to this hesitance. Migration to urban areas or abroad is also strongly opposed, with 77 percent and 65 percent of the farmers unwilling to consider these options respectively, reflecting attachment to rural life or skepticism about opportunities elsewhere. Furthermore, 74 percent are reluctant to engage in additional farming activities, preferring to maintain their current operations rather than undertake new ventures.

These findings suggest that while farmers are cautiously open to certain strategies like non-farming work and high-value crops, they are generally resistant to significant changes such as farm expansion or migration. This preference likely stems from economic limitations and cultural ties to rural life. For policymakers, these insights underscore the potential to support non-farming opportunities and specialized crop production, while acknowledging the resistance to large-scale changes in farming practices or relocation.

Figure 27. Farming strategies: all sample

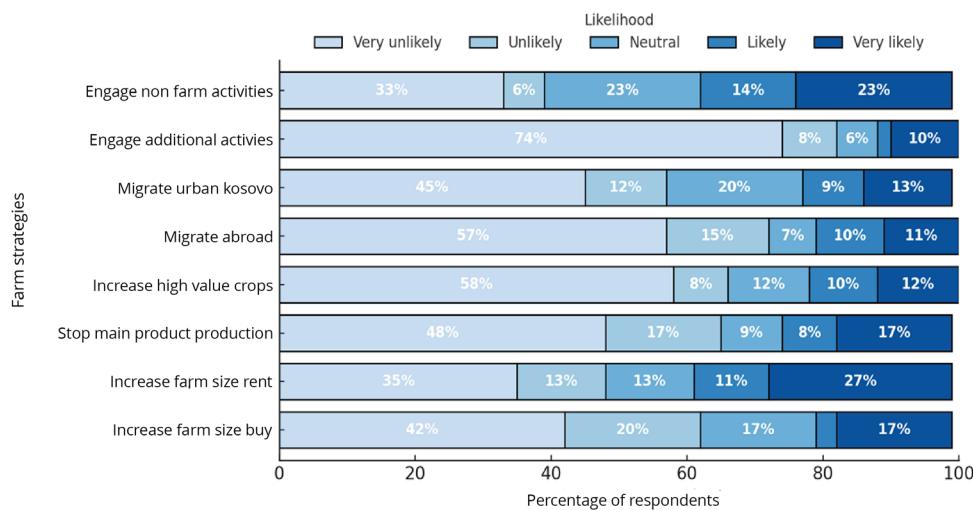
Source: Authors based on survey data.

Sector-specific insights

Wheat farmers

Wheat farmers show a relatively high likelihood of engaging in non-farming activities, with 37 percent indicating they are likely to pursue this option (Figure 28). There is also some interest in cultivating high-value crops

(22 percent). However, they are reluctant to expand their farm size by purchasing (62 percent unlikely) or leasing land (48 percent unlikely), possibly due to financial constraints. Migration to urban areas or abroad is also opposed by 57 percent and 68 percent of farmers respectively, suggesting a strong attachment to rural life.

Figure 28. Farming strategies: wheat farmers

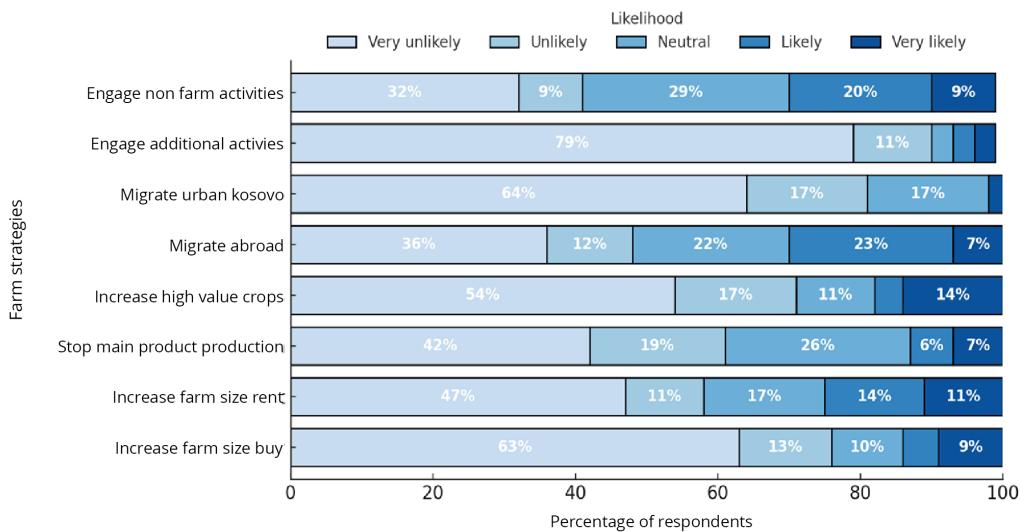
Source: Authors based on survey data.

Pepper farmers

Pepper farmers are open to engaging in non-farming activities, with 29 percent neutral and another 29 percent likely or very likely to pursue this option (Figure 29). Interest in high-value crops is also present (25 percent likely or very

likely). However, there is significant reluctance to expand farm size by purchasing land (63 percent very unlikely) or to migrate to urban areas (64 percent very unlikely), indicating financial barriers and a preference for their current lifestyle.

Figure 29. Farming strategies: pepper farmers



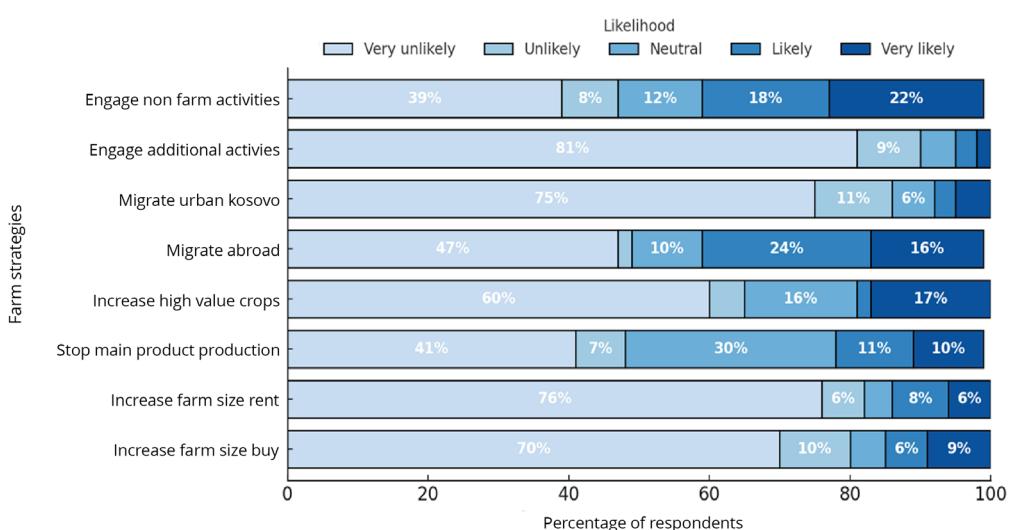
Source: Authors based on survey data.

Vineyard farmers

Vineyard farmers show considerable interest in non-farming activities (40 percent likely or very likely) and in cultivating high-value crops (33 percent likely or very likely) (Figure 30). They are, however, reluctant to expand farm size by

purchasing (70 percent very unlikely) or leasing land (76 percent very unlikely), and strongly opposed to migration to urban areas (75 percent very unlikely). Financial constraints and attachment to rural communities may influence these preferences.

Figure 30. Farming strategies: vineyard farmers



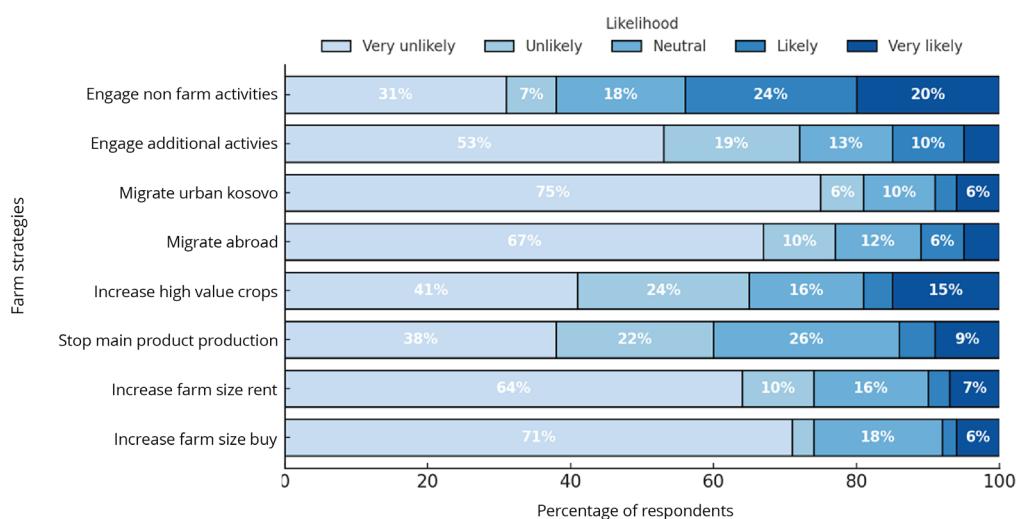
Source: Authors based on survey data.

Raspberry farmers

Raspberry farmers are open to engaging in non-farming activities, with 44 percent likely or very likely to consider this option (Figure 31). They also show interest in high-value crops (31 percent likely or very likely). Yet, they are

reluctant to expand farm size by purchasing (71 percent very unlikely) or leasing land (64 percent very unlikely), and opposed to migration to urban areas (75 percent very unlikely) or abroad (67 percent very unlikely). This suggests a preference for stability and a cautious approach to change.

Figure 31. Farming strategies: raspberry farmers



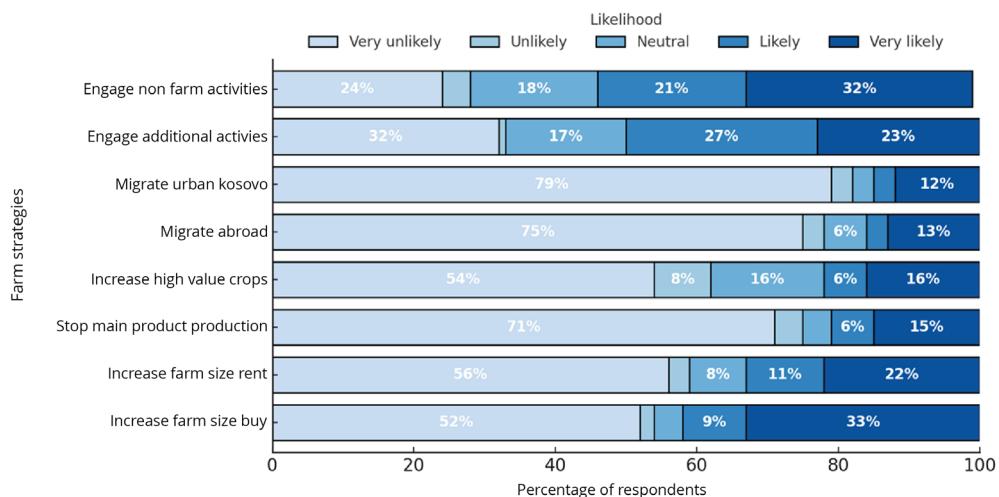
Source: Authors based on survey data.

Dairy farmers

Dairy farmers demonstrate significant interest in engaging in non-farming activities (53 percent likely or very likely) and in additional agricultural activities (50 percent likely or very likely) (Figure 32). However, they are less interested in

expanding farm size by purchasing (52 percent very unlikely) or leasing land (56 percent very unlikely), and are strongly opposed to migrating to urban areas (79 percent very unlikely) or abroad (75 percent very unlikely). This indicates a preference for diversifying within their existing framework rather than making substantial changes.

Figure 32. Farming strategies: dairy farmers



Source: Authors based on survey data.

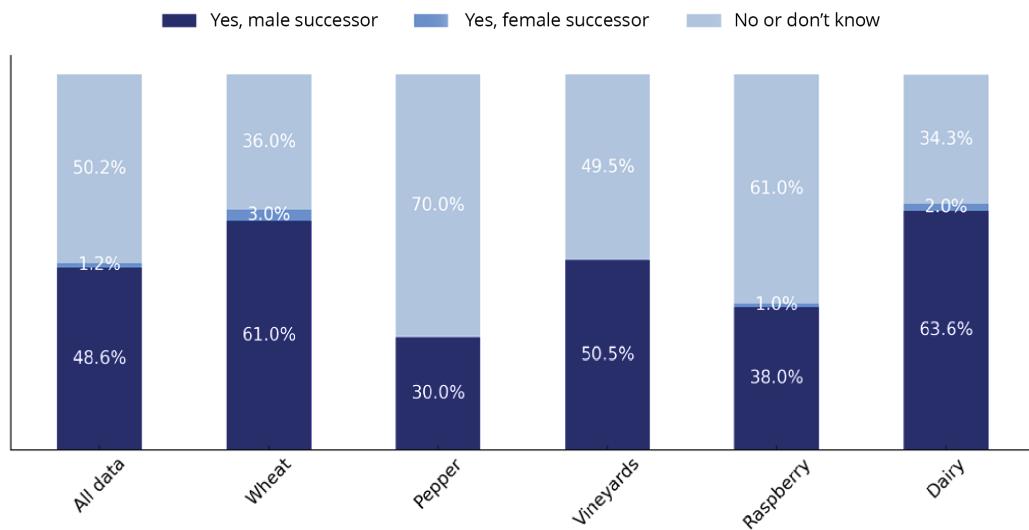
4.4.2. Farm succession

The survey also explores farmers' succession plans across various sectors, highlighting whether they have identified a successor for their farm.

Overall trends

Across the sample, slightly more than half of the respondents (50.2 percent) are unsure or do not have a successor (Figure 33). Among those who have identified a successor, 48.6 percent have chosen a male successor, while only 1.2 percent have chosen a female successor. This indicates a significant share of farmers has no clear succession plan, and a notable gender imbalance favoring male successors.

Figure 33. Farm succession: Is there any successor for your farm?



Source: Authors based on survey data.

Sector-specific insights

Wheat farmers: Among wheat farmers, 61 percent have identified a male successor, and 3 percent have a female successor. However, 36 percent are undecided or have no successor, indicating that while succession planning is more common in this sector, uncertainty remains.

Pepper farmers: Uncertainty levels among pepper farmers are high, with 70 percent reporting no successor or that they are uncertain. Only 30 percent have identified a male successor, and none have a female successor, suggesting a significant gap in succession planning.

Vineyard farmers: Vineyard farmers are split, with 50.5 percent having a male successor and 49.5 percent undecided or without a successor. No respondents reported having a female successor, highlighting a gender imbalance.

Raspberry farmers: In the raspberry sector, 61 percent have no successor or are uncertain, while 38 percent have a male successor and 1 percent have a female successor. This reflects limited succession planning and a lack of diversity in successors.

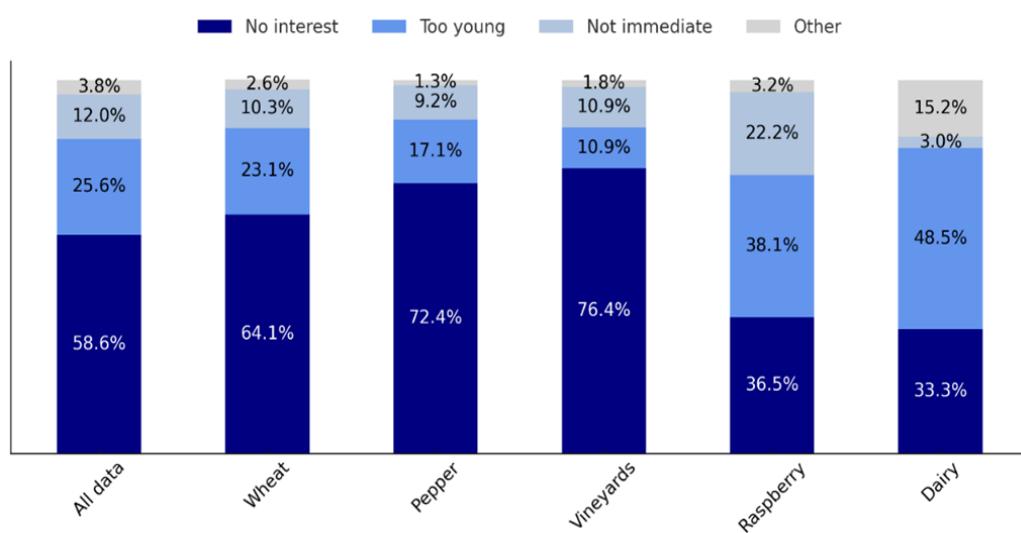
Dairy farmers: Dairy farmers show a higher commitment to succession planning, with 63.6 percent having a male successor and 2 percent a female successor. Only 34.3 percent are undecided or without a successor, indicating greater certainty in this sector.

Reasons for lack of a successor

Among those without a successor, the primary reason across all sectors is "No Interest" from potential successors (58.6 percent) (Figure 34). This is particularly pronounced in the vineyard (76.4 percent), pepper (72.4 percent), and wheat (64.1 percent) sectors. "Too Young" is the second

most common reason (25.6 percent), especially in the raspberry (38.1 percent) and dairy (33.3 percent) sectors, indicating that potential successors are not yet ready to succeed because of age. "Not Immediate" accounts for 12 percent of responses overall, suggesting that succession is not an immediate concern for some farmers.

Figure 34. Farm succession: Reasons for not having a successor



Source: Authors based on survey data.

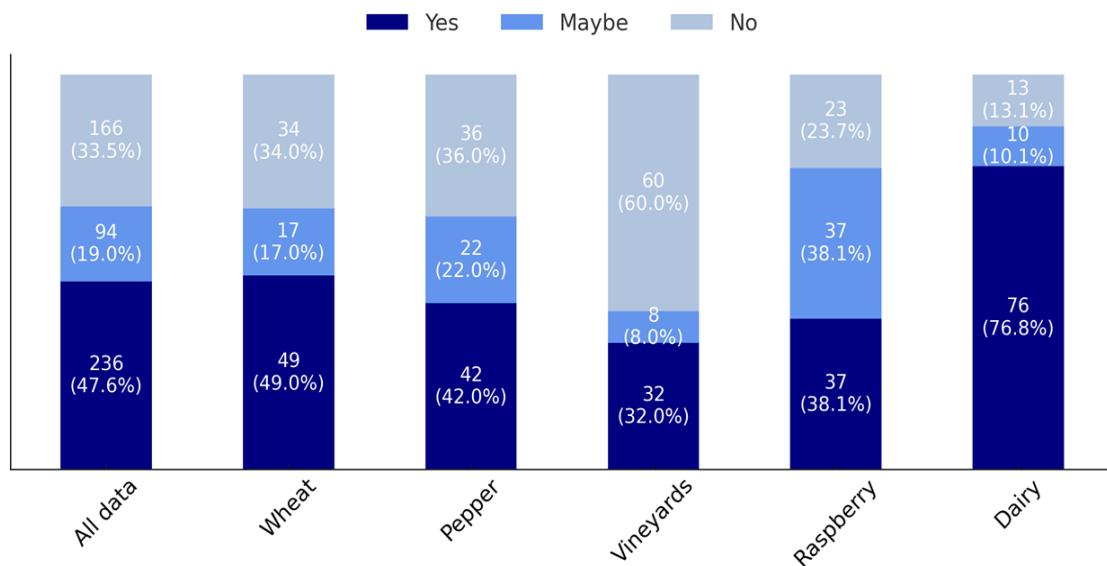
These findings highlight challenges in farm succession, including a lack of interest among the next generation and age-related readiness. The significant gender imbalance in identified successors suggests potential cultural or societal barriers to female succession. Addressing these issues may require targeted programs to engage and encourage younger generations and women in agriculture, ensuring the sustainability of farming operations.

4.4.3. Plans to invest

The study also examined farmers' intentions to invest across different agricultural sectors, revealing both overall trends and sector-specific insights.

Overall investment intentions

Among all respondents, 47.6 percent plan to invest in their farming operations, showing a nearly even split between those committed to further investment and those with reservations (Figure 35). About 19.0 percent are uncertain, reflecting indecision that may stem from sector-specific challenges or external factors. Meanwhile, 33.5 percent have no plans to invest, suggesting that one-third of farmers see little incentive or capacity to invest, possibly due to high costs, labor shortages, or other constraints.

Figure 35. Plans to invest

Source: Authors based on survey data.

Sector-specific insights (Figure 35)

- **Wheat:** 49 percent of wheat farmers intend to invest, 17 percent are uncertain, and 34 percent do not plan to invest. This balance reflects motivation and hesitation, likely due to economic or structural issues in wheat farming.
- **Pepper:** 42 percent plan to invest, 22 percent are uncertain, and 36 percent do not plan to invest. The higher uncertainty may stem from high input costs or labor requirements in pepper cultivation.
- **Vineyards:** Only 32 percent intend to invest—the lowest among all sectors—with 8 percent being uncertain and 60 percent not planning to invest. This reluctance may be due to high setup costs, long timelines for returns, or market fluctuations affecting vineyard operations.
- **Raspberry:** 38.1 percent plan to invest, 38.1 percent are uncertain—the highest level of indecision—and 23.7 percent do not plan to invest. The uncertainty could be related to environmental risks or market concerns in raspberry farming.

- **Dairy:** A strong 76.8 percent of dairy farmers plan to invest—the highest across all sectors—indicating confidence in dairy farming profitability. Only 10.1 percent are uncertain, and 13.1 percent do not plan to invest.

Barriers to investment

In assessing the reasons why farmers across various sectors are not pursuing further investments, several cross-cutting themes emerge. These barriers reflect both personal and structural challenges, ranging from financial constraints to labor shortages, and limited government support. The section below is a detailed breakdown of each major barrier, supported by specific data on the number of farmers affected.

- **Economic constraints:** The most frequently mentioned barrier, affecting 25 farmers, particularly in the vineyard (14 farmers) and pepper (8 farmers) sectors. High costs and limited financial resources hinder investment.
- **Labor shortages:** Stated by 23 farmers, especially in the raspberry (7 farmers), vineyard (6 farmers), and pepper (6 farmers) sectors. Difficulty in securing reliable labor impacts the ability to expand or improve operations.

- **Lack of interest:** Mentioned by 10 farmers, notably in the vineyard (4 farmers) and dairy (4 farmers) sectors. This may reflect generational shifts or perceptions of low profitability.
- **Lack of government support:** A concern for 5 farmers, particularly in the raspberry (3 farmers) and wheat (2 farmers) sectors, indicating reliance on subsidies or assistance.
- **Alternative employment and migration:** Noted by 6 wheat farmers, showing that labor is being drawn away from agriculture due to other employment opportunities or emigration.

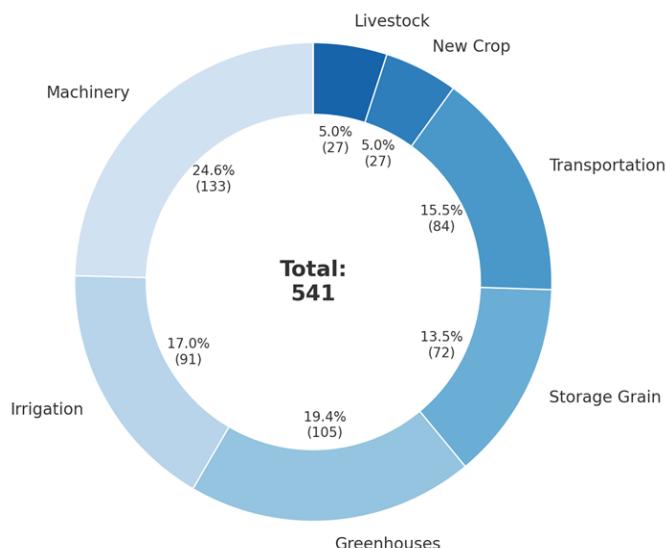
Planned investment types

Farmers intending to invest focus on several key areas to enhance productivity and efficiency. Machinery is the leading category, with 133 projects representing 24.6 percent of the total (Figure 36). This substantial focus on machinery

suggests a broad need for mechanization across sectors, likely to improve operational efficiency and reduce labor costs. Greenhouses are the second-largest category, with 105 projects (19.4 percent), indicating strong interest in controlled environments to extend growing seasons and protect crops from adverse weather conditions. Irrigation comprises 92 projects (17 percent), emphasizing the importance of water management, a critical factor in maintaining crop health and maximizing yields, especially in water-scarce areas.

Transportation follows with 84 projects (15.5 percent), reflecting the need for effective logistics to ensure that agricultural products reach markets efficiently. Grain Storage is the focus of 73 projects (13.5 percent), pointing to a significant focus on post-harvest management to minimize losses and maintain product quality. Lastly, New Crop and Livestock each are the focus of 27 projects (5 percent each), demonstrating a moderate interest in diversifying crop types and improving livestock management practices.

Figure 36. Investment types: Whole sample



Source: Authors based on survey data.

Sector-specific investment focus

In this section the focus is on examining investment patterns across the five agricultural sectors in question. Each sector has a unique allocation of investments plans across categories such as machinery, irrigation, greenhouses, storage, transportation, new crop development, and livestock (Figure 37). When considering both the percentage and absolute number of investments in each category, as well as all planned projects for each sector, the results provide a comprehensive overview of how each sector prioritizes its resources to optimize production and meet specific needs.

Wheat: Emphasis is on machinery (32.8 percent of its investments) and grain storage (17.9 percent), reflecting a need for efficiency and post-harvest management. Livestock investments (14.9 percent) suggest diversification within farm operations.

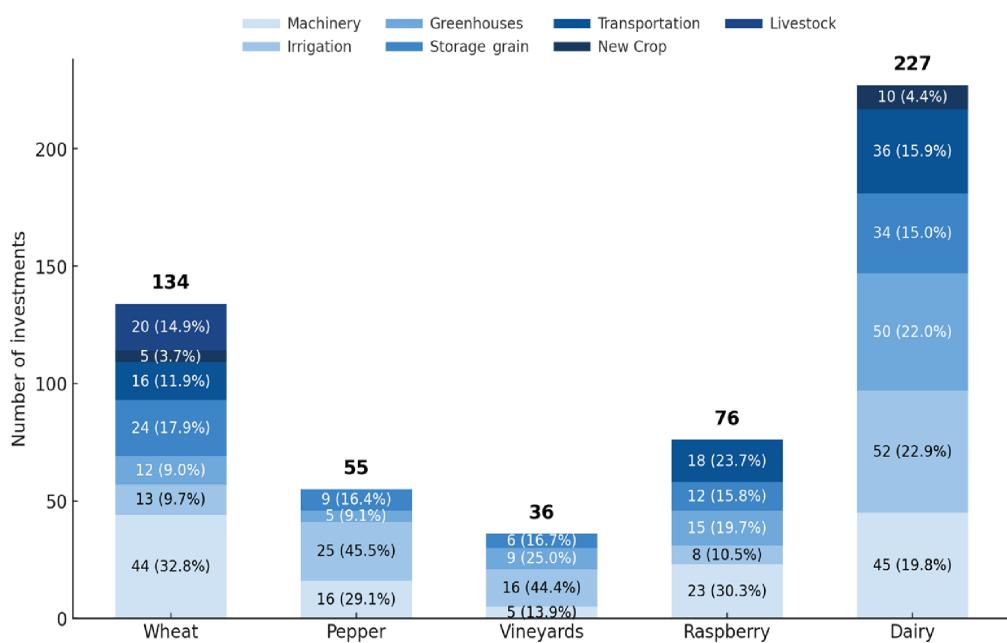
Pepper: Focus is on irrigation (45.5 percent) and machinery (29.1 percent), highlighting the critical role of water management and mechanization due to high input requirements.

Vineyards: Priority is on greenhouses (44.4 percent) and irrigation (25 percent), indicating a focus on environmental control and water management to maintain grape quality. Investments in machinery are lower (13.9 percent), possibly due to traditional cultivation methods.

Raspberry: Investments are distributed across machinery (30.3 percent), livestock (23.7 percent), irrigation (19.7 percent), and new crop development (15.8 percent), reflecting a balanced approach to enhancing productivity and exploring innovation.

Dairy: Has the highest number of planned projects, emphasizing irrigation (22.9 percent), greenhouses (22.0 percent), machinery (19.8 percent), and transportation (15.0 percent). This supports all aspects of dairy production, from feed cultivation to milk distribution.

Figure 37. Plans for investment types by sector and type



Source: Authors based on survey data.

In addition, the number of planned investments per farmer varies significantly across agricultural sectors, reflecting differing priorities and needs within each sector. The Dairy sector stands out with the highest ratio, at 2.27 projects per farmer. This high level of planned investment suggests that dairy farmers are particularly focused on enhancing infrastructure, technology, and other resources essential for managing the intensive demands of dairy production.

On the other end, the vineyard sector has the lowest ratio, with 0.36 projects per farmer. This lower investment ratio indicates a more selective approach, likely focused on a few key areas such as irrigation and transportation, which are vital for vineyard operations but may require fewer overall projects compared to other sectors.

This contrast between the highest and lowest investment ratios highlights the distinct priorities among farmers in Kosovo. While dairy farmers are driving a high level of self-initiated projects to support intensive production needs, vineyard farmers are focusing efforts on a smaller number of targeted improvements. This sector-specific approach underscores the diverse strategies farmers are using to enhance productivity and sustainability within their agricultural practices.

4.5. Section summary

The crisis led to significant adaptations in land use, with farmers increasing total land utilization by 4.5 percent from 2019 to 2022, primarily through leasing rather than purchasing land. This shift allowed for greater flexibility in responding to rising input costs and market uncertainties. For instance, wheat and dairy farmers expanded their leased land to scale operations without long-term financial commitments, while high-value crops like raspberries saw cautious expansion due to profitability concerns.

Labor utilization also evolved, with a 3.6 percent increase in total labor days between 2019 and 2022. Farmers shifted toward hiring more full-time personnel to ensure workforce stability amidst shortages and competition from other sectors. Wages rose significantly, especially daily rates, as farmers sought to attract and retain labor despite budget constraints. Sector-specific challenges were evident, such as labor-intensive raspberry farming relying on younger workers due to adult labor shortages.

Input use adjustments were marked by reduced fertilizer application between 2019 and 2022 as a cost-saving response to soaring prices caused by global supply chain disruptions. However, from 2022 to 2023, some sectors increased fertilizer use due to price stabilization and the need to replenish soil nutrients. Machinery expenses consistently rose due to high fuel prices and maintenance costs, placing additional financial strain on farmers.

In terms of farming strategies, there was a general reluctance to expand farm size or migrate, with farmers showing more interest in engaging in non-farming activities and cultivating high-value crops. Succession planning revealed that slightly more than half of the farmers were unsure or lacked a successor, often due to a lack of interest from the next generation. Investment intentions varied by sector, with dairy farmers showing the highest commitment to investing in their operations, while vineyard farmers were the least likely to plan further investments.

Overall, the chapter highlights the resilience and adaptability of farms in Kosovo in the face of the crisis. By adjusting land use, labor practices, and input strategies, they navigated the challenges posed by rising costs and market volatility. The findings underscore the need for targeted support to address sector-specific issues, encourage investment, and ensure the long-term sustainability of the agricultural sector.

5. EFFECTS ON CAPACITIES, YIELDS, AND FARM PROFITABILITY

This chapter analyzes the impact of the Ukraine crisis on Kosovo's agricultural production capacities, yields, and farm profitability across the key sectors of wheat, pepper, vineyards, raspberries, and dairy farming. In examining changes to cultivated land area, livestock numbers, yields, production volumes, sales, prices, and gross margins from 2019 to 2023, the chapter provides insights into how farmers have adapted their strategies in response to market disruptions, rising input costs, and shifting demand. The analysis highlights sector-specific trends and resilience patterns, offering a comprehensive understanding of the economic viability and challenges faced by farmers during this turbulent period.

5.1. Production capacities (land use and number of cows) and yield

5.1.1. Changes in cultivated land and number of cows

The Ukraine crisis has significantly affected agricultural production strategies in Kosovo, prompting farmers to adjust their crop areas and

livestock numbers. This section examines changes in production capacities—measured in has for crops and the number of cows for livestock—across the key sectors of wheat, pepper, vineyards, raspberries farming, and dairy cows. Data comparison from 2019 (before the crisis) with 2022 (during initial disruptions) and 2023 (as adjustments continue) helps in understanding how farmers have adapted to new challenges.

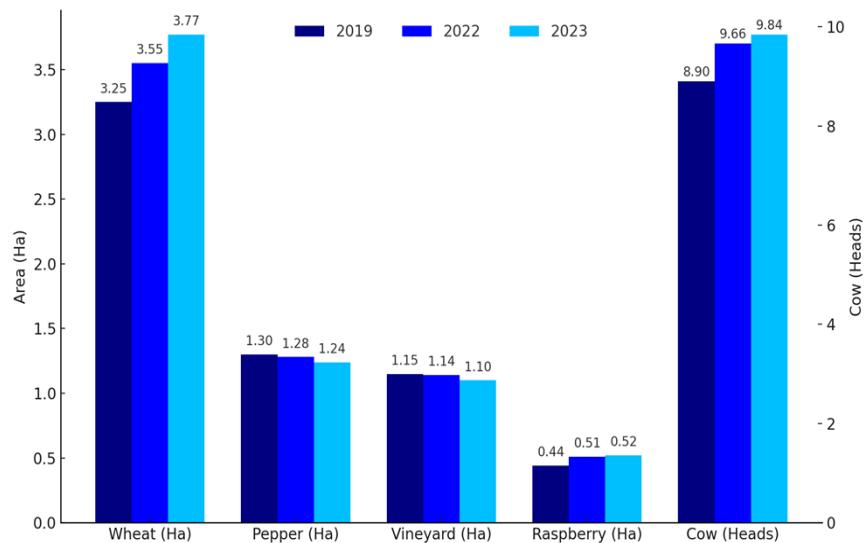
Overall trends

Farmers strategically expanded staple and high-value crops between 2019 and 2022 to enhance food security and economic stability (Figure 38). Wheat cultivation increased by 9.2 percent, from 3.25 to 3.55 has, reflecting its importance as a staple crop. Raspberry production grew even more significantly by 15.9 percent, from 0.44 to 0.51 has, indicating a focus on profitable high-value crops. In contrast, pepper and vineyard areas decreased slightly by 1.5 percent and 0.9 percent, respectively, suggesting a cautious shift away from crops perceived as more vulnerable to market disruptions. The number of dairy cows rose by 8.5 percent, from 8.90 to 9.66 cows per farm, highlighting an emphasis on securing essential dairy and meat supplies.

Farmers continued refining their strategies in 2022 and 2023. Wheat and raspberry areas expanded further by 6.2 percent and 2 percent, respectively, reinforcing their roles in the agricultural landscape. Pepper and vineyard areas decreased by another 3.1 percent and

3.5 percent, indicating ongoing shifts away from less resilient sectors. The number of dairy cows increased modestly by 1.9 percent, reaching 9.84 cows per farm, showing stabilization in livestock capacities.

Figure 38. Changes in cultivated area and number of cows



Source: Authors based on survey data.

Sector-specific changes

Wheat: The wheat cultivated area grew consistently, reaching 3.77 has by 2023. This expansion underscores the critical role of wheat in food security during supply chain disruptions.

Pepper: Pepper cultivation decreased to 1.24 has in 2023. Farmers may have reduced pepper production due to lower returns or higher vulnerability to market and input challenges.

Vineyards: Vineyard areas contracted to 1.10 has by 2023. This reduction suggests farmers are deprioritizing vineyards, possibly due to increased input costs or shifting demand.

Raspberries: Raspberry cultivation increased slightly to 0.52 has in 2023. The sustained interest reflects the crop profitability and resilience in niche markets.

Dairy Cows: The number of cows rose steadily, highlighting a focus on maintaining dairy production to meet essential food needs amid uncertainties.

The Ukraine crisis has prompted substantial adjustments across agricultural sectors, with each crop and livestock area showing unique trends based on resilience, profitability, and market demands. From 2019 to 2022, the initial phase of crisis response saw expansions of staple crops like wheat and high-value products like raspberry, while crops like pepper and vineyard experienced minor contractions. During the 2022 to 2023 period, farmers further adapted by reinforcing areas that showed resilience and profitability, while scaling back those that proved more vulnerable or less essential. These sector-specific strategies underscore the agricultural sector's dynamic response to crisis pressures, highlighting both the resilience and flexibility of farmers as they navigate prolonged economic and supply chain challenges.

5.1.2. Change in yields

This section examines how agricultural yields shifted from 2019 to 2023, reflecting the impact of the Ukraine crisis and farmers' adaptation efforts. This cross-cutting analysis focuses on overarching trends across agricultural sectors during two periods impacted by a prolonged crisis: 2019 to 2022 and 2022 to 2023.

The analysis highlights resilience patterns, common vulnerabilities, and adaptive strategies within the agricultural sector under sustained challenging conditions by examining yield shifts in wheat, pepper, vineyard, raspberry, and cow milk.

During the initial period (2019 to 2022), sectors with relatively stable input access or adaptive practices, such as wheat and cow milk, showed slight increases in yield, suggesting resilience against immediate crisis impacts. On the other hand, more specialized or input-dependent sectors like vineyard and pepper experienced declines, while raspberry exhibited growth. This indicates that sectors dependent on specific inputs or labor were more vulnerable to early disruptions, while those with robust supply chains and flexibility, such as dairy, showed greater resilience.

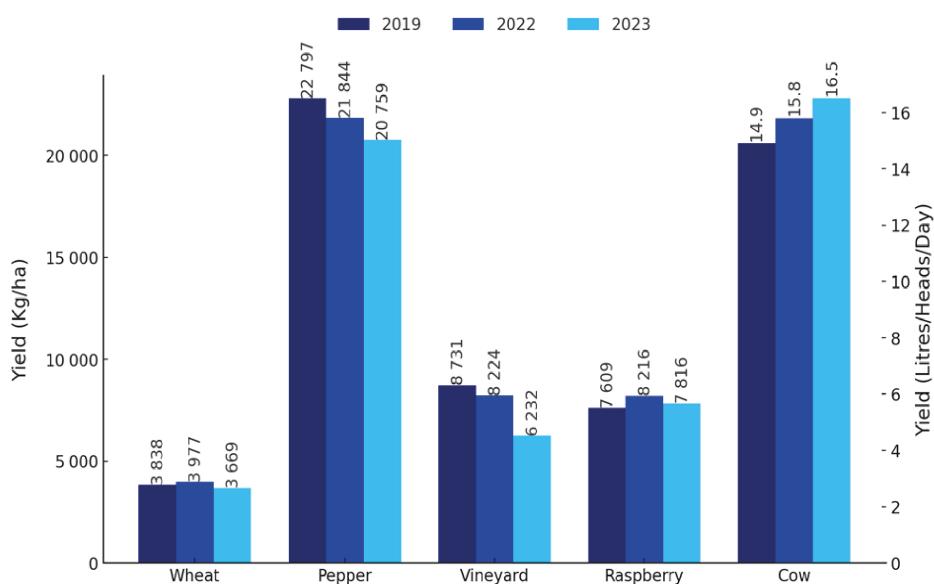
In the subsequent period (2022 to 2023), further differentiation in adaptability became evident. While wheat and pepper yields continued to decline, indicating prolonged pressures on crops requiring consistent inputs, dairy production showed continued growth, while raspberry production remained relatively stable. These trends suggest that some sectors successfully implemented adaptive strategies, such as improved management practices in dairy. In contrast, the ongoing challenges in wheat, pepper, and vineyard production underscore the limitations in adaptability for crops heavily reliant on external inputs and labor.

Overall, the findings suggest that sectors with flexible management practices or lower dependency on specialized inputs were better able to adapt and recover during the crisis. In contrast, input-dependent sectors faced more significant challenges under prolonged pressure.

More specifically, from 2019 to 2022, yields in some sectors increased slightly, while others declined (Figure 39):

- **Wheat yield:** Increased by 3.6 percent from 3 838 kg/ha to 3 977 kg/ha, showing resilience despite the crisis.
- **Pepper yield:** Decreased by 4.2 percent from 22 797 kg/ha to 21 844 kg/ha, indicating moderate impact from initial disruptions.
- **Vineyard yield:** Dropped by 5.8 percent from 8 731 kg/ha to 8 224 kg/ha, reflecting challenges in input supply or market conditions.
- **Raspberry yield:** Rose by 8 percent from 7 609 kg/ha to 8 216 kg/ha, suggesting effective adaptation in this high-value crop.
- **Milk yield per cow:** Increased by 6 percent from 14.9 to 15.8 liters per cow per day, pointing to improvements in dairy farming practices.

Figure 39. Yields trends by sectors



Source: Authors based on survey data.

From 2022 to 2023, some sectors faced ongoing challenges:

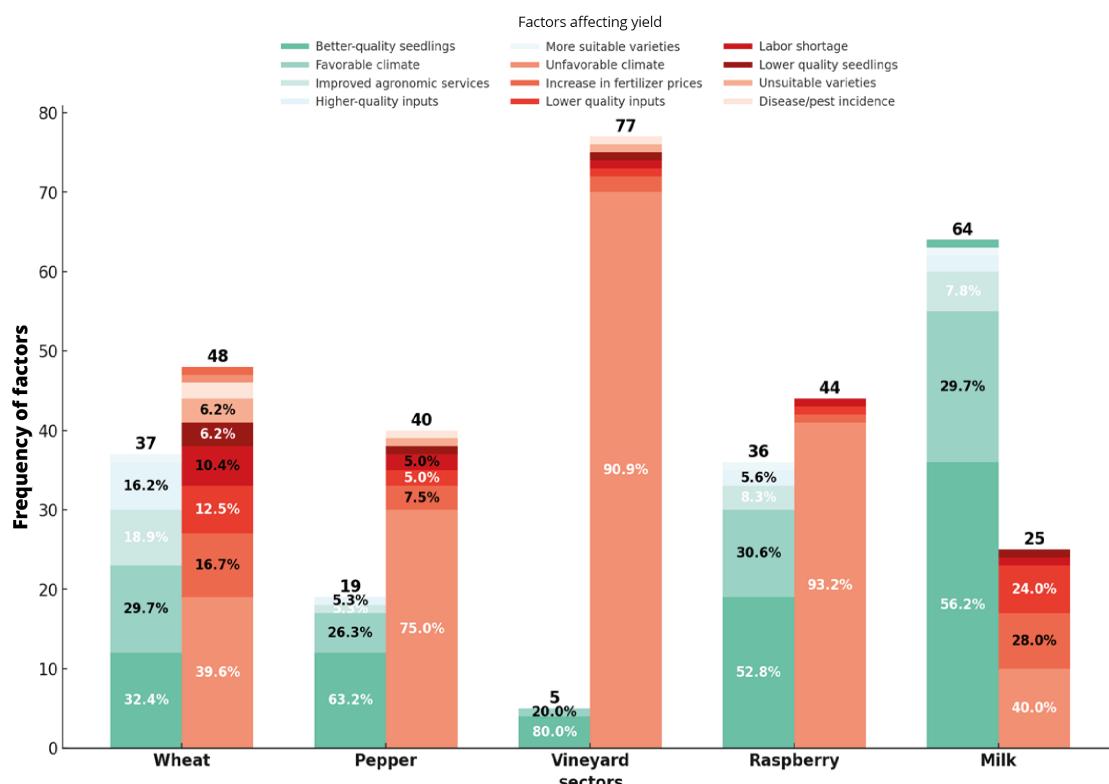
- **Wheat yield:** Decreased by 7.7 percent to 3 669 kg/ha, indicating prolonged pressures affecting production.
- Pepper yield: Fell by another 5 percent to 20 759 kg/ha, likely due to continued input and labor challenges.
- **Vineyard yield:** Experienced a significant drop of 24.2 percent to 6 232 kg/ha, suggesting persistent difficulties in management and production.
- **Raspberry yield:** Slightly declined by 4.9 percent to 7 816 kg/ha, showing minor challenges but overall stability.

- **Milk Yield per Cow:** Continued to increase by 4.4 percent to 16.5 liters per cow per day, reflecting successful adaptation in the dairy sector.

Factors influencing yield changes

Figure 40 presents the main factors influencing yield increases and decreases across the five agricultural sectors of wheat, pepper, vineyard, raspberry farming, and milk yield per cow. Each sector has distinct factors contributing to yield improvements or reductions, with climate conditions being a prominent factor across multiple sectors. Notably, climate conditions appear as both positive and negative factors due to the medium-term period considered in this analysis (2019–2023), where varying weather patterns can impact yields differently across seasons.

Figure 40. Farmers stated reasons for yield change



Source: Authors based on survey data.

The main positive factors driving yield increases include favorable climate conditions in the wheat, pepper, vineyard, and raspberry sectors. Better-quality seedlings and improved agronomic services (fertilization, pest control) are also essential in wheat, while higher-quality inputs and more suitable varieties further boost yields. Improvement in feed quality is the biggest contributor in the milk sector, with breed improvement also enhancing productivity. Across sectors, favorable environmental conditions and high-quality inputs have significantly supported yield gains.

Conversely, yield reductions are primarily driven by unfavorable climate conditions, especially in plant-based sectors like wheat, pepper, vineyards, and raspberry. Wheat faces additional challenges, such as rising fertilizer costs and lower-quality inputs, while adverse climate impacts are overwhelmingly significant in the vineyard and raspberry sectors. In the milk sector, herd aging and breed degradation notably reduce productivity.

In conclusion, the analysis underscores the need for climate adaptation strategies and investment in high-quality inputs to sustain yields. Resilient crop and livestock management practices are essential to harness favorable conditions while mitigating adverse impacts over the 2019–2023 period. On the other hand, suitable insurance policies are critical to address climate change challenges. Farmers express a strong need for strategies to mitigate climate-related risks, such as drought-resistant crop varieties and technologies that reduce reliance on unpredictable weather. However, existing insurance schemes are criticized for not fully covering risks associated with climate variability, leaving farmers feeling unprotected and financially vulnerable. This lack of comprehensive climate risk coverage influences farmers' attitudes towards sustainability, as they feel limited support in managing the impacts of climate change on their livelihoods. These concerns were frequently noted in semi-structured interviews.

5.1.3. Production, sales and prices

The agricultural sectors in Kosovo have undergone significant shifts in production and sales between 2019 and 2023, largely influenced

by the Ukraine crisis. This period can be divided into two key phases: the initial impact from 2019 to 2022 and the subsequent adaptations from 2022 to 2023. An analysis of these changes reveals how farmers have responded to market uncertainties and supply chain disruptions (Figure 41).

Cross-Cutting Trends (2019–2022)

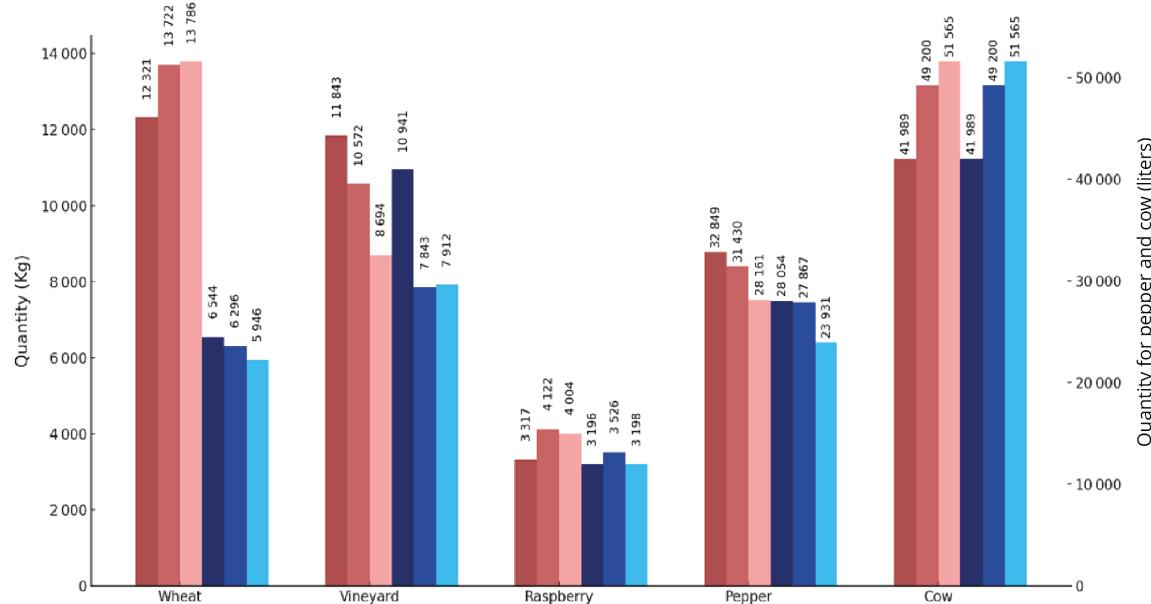
Production in some sectors grew overall in the period between 2019 and 2022, notably so in the wheat and raspberry sectors. Wheat production rose by 11.4 percent, suggesting that farmers anticipated potential shortages and aimed to bolster food security by increasing staple crop output. However, sales of wheat decreased by 3.8 percent, indicating that the additional production may have been retained for family consumption or processing rather than sold in the market.

In contrast, vineyard production declined by 10.7 percent, and sales dropped significantly by 28.3 percent. This suggests that farmers possibly shifted focus toward home processing or consumption due to lower market demand or challenges in distribution channels. The dairy sector displayed resilience, with milk production increasing by 17.2 percent and sales rising correspondingly, reflecting sustained or growing demand for dairy products during the crisis.

Adaptations (2022–2023)

From 2022 to 2023, farmers adjusted their production strategies to align more closely with market demand. Sectors such as vineyards and peppers saw reductions in production by 17.8 percent and 10.4 percent, respectively. These decreases were mirrored by declines in sales, indicating a deliberate effort to prevent oversupply and manage resources efficiently amid ongoing uncertainties.

The dairy sector continued its positive trajectory, with milk production and sales increasing by 4.8 percent. This consistent growth underscores the essential nature of dairy products and the sector's capacity to adapt and meet consumer needs even during prolonged economic challenges.

Figure 41. Production and sales trends

Source: Authors based on survey data.

Sector-Specific Analysis

Wheat

From 2019 to 2022, wheat production increased from 12,321 kg to 13,722 kg, an 11.4 percent rise. Despite this, sales decreased by 3.8 percent, from 6 544 kg to 6 296 kg. The divergence suggests that farmers retained more wheat for personal use or processing, likely as a precaution against market volatility and to ensure household food security.

Between 2022 and 2023, wheat production experienced a marginal increase of 0.5 percent, while sales declined by 5.6 percent. This trend indicates persistent market challenges, prompting farmers to continue prioritizing self-sufficiency over market sales.

Peppers

Pepper production decreased by 4.3 percent from 32,849 kg in 2019 to 31,430 kg in 2022, with sales remaining relatively stable during the same period. However, from 2022 to 2023, both production and sales declined significantly by 10.4 percent and 14.1 percent, respectively. The sharper decline in sales suggests that market demand weakened, leading farmers to reduce production accordingly.

Vineyards

Vineyard production decreased from 11 843 kg in 2019 to 10 572 kg in 2022, a 10.7 percent reduction. Sales fell more sharply by 28.3 percent, from 10 941 kg to 7 843 kg. Between 2022 and 2023, production further declined by 17.8 percent, while sales remained relatively stable. This pattern indicates that farmers may have shifted towards home processing or reduced output in response to decreased demand and persistent market uncertainties.

Raspberries

Raspberry production increased by 24.3 percent from 3 317 kg in 2019 to 4,122 kg in 2022, with sales also rising. This growth suggests strong market demand or profitability during the initial crisis phase. However, production and sales declined by 2.9 percent and 9.3 percent respectively from 2022 to 2023, possibly due to market saturation or increased competition affecting profitability.

Dairy (Milk production)

Milk production showed substantial growth, increasing by 17.2 percent from 41 989 liters in 2019 to 49 200 liters in 2022. Sales mirrored this

upward trend. From 2022 to 2023, production and sales continued to grow by 4.8 percent, highlighting the dairy sector robustness and consistent consumer demand throughout the crisis period.

5.1.3.1. Changes in Prices

Price fluctuations during the crisis reflect shifting demand and supply dynamics across different agricultural products (Figure 42).

Overall Trends (2019–2022)

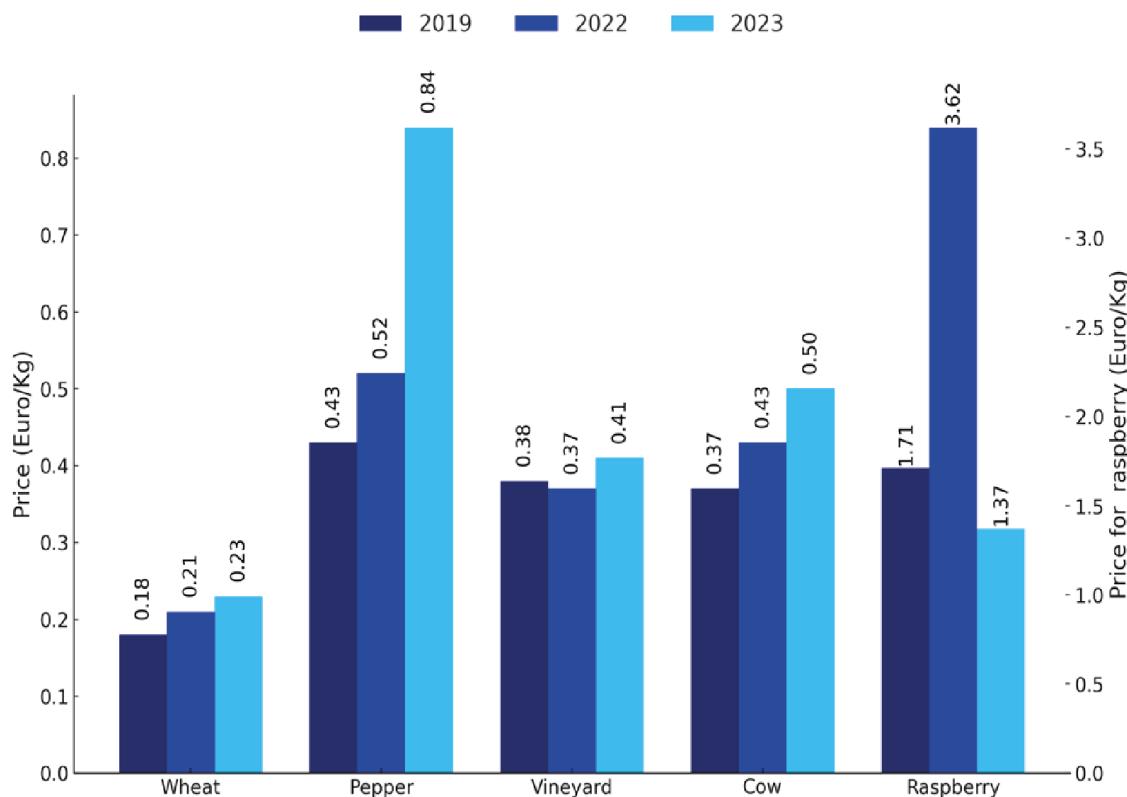
Essential commodities like wheat and cow milk experienced moderate price increases of 16.7 percent and 16.2 percent, respectively. Wheat prices rose from EUR 0.18 to EUR 0.21 per kilogram, while cow milk prices increased from EUR 0.37 to EUR 0.43 per liter. These increments suggest steady demand for staple foods despite economic uncertainties.

Pepper prices increased by 20.9 percent, from EUR 0.43 to EUR 0.52 per kilogram, indicating heightened demand or reduced supply during the crisis. Conversely, vineyard product prices remained relatively stable, decreasing slightly by 2.6 percent from EUR 0.38 to EUR 0.37 per kilogram. Raspberry prices surged dramatically by 111.7 percent, from EUR 1.71 to EUR 3.62 per kilogram, likely due to supply constraints or increased production costs affecting this high-value crop.

Adaptations (2022–2023)

Staple commodities continued to see price increases between 2022 and 2023. Wheat prices rose by 9.5 percent to EUR 0.23 per kilogram, and cow milk prices increased by 16.3 percent to EUR 0.50 per liter, reflecting ongoing strong demand.

Figure 42. Change in farmers prices



Source: Authors based on survey data.

Pepper prices surged by 61.5 percent to EUR 0.84 per kilogram, possibly due to persistent supply challenges or robust market demand. Vineyard product prices experienced a modest increase of 10.8 percent to EUR 0.41 per kilogram, suggesting a gradual recovery in consumer demand for these products.

In contrast, raspberry prices declined sharply by 62.2 percent, from EUR 3.62 to EUR 1.37 per kilogram. This significant drop is primarily linked to the Ukraine production entering the EU market as it diverted from the normal channel it had to Russian markets.

5.2. Farm profitability and economic viability

5.2.1. Gross margin for entire sample

Gross margin for all farm sizes

This subsection examines changes in gross margin per farm and per ha (or per cow) across two intervals: from 2019 to 2022 and from 2022 to 2023 (Table 6). Both mean and median values are analyzed for each interval, with attention to any significant discrepancies between them, as these may indicate variability within the sample.

Table 6. Gross margin: Entire sample

Gross margin	Mean	Q1	Median	Q3
Gross margin per farm 2023	9 173	331	2 509	11 519
Gross margin per farm 2022	7 749	471	3 387	11 365
Gross margin per farm 2019	6 193	436	1 892	7 251
Gross margin per ha (Cow) 2023	4 632	194	2 096	6 221
Gross margin per ha (Cow) 2022	6 964	350	1 907	9 227
Gross margin per ha (Cow) 2019	3 841	423	1 880	5 868

Source: Authors based on survey data.

Shifts in gross margin (2019 vs. 2022)

Gross margins increased markedly across the sample between 2019 and 2022. The mean gross margin per farm rose from EUR 6 193 in 2019 to EUR 7 749 in 2022, while the median increased from EUR 1 892 to EUR 3 387, indicating improved profitability for many farms. The higher mean compared to the median suggests that some farms achieved particularly high profitability, potentially skewing the average upward.

For gross margin per ha (or per cow), the mean jumped from EUR 3 841 in 2019 to EUR 6 964 in 2022, yet the median remained relatively stable, moving from EUR 1 880 to EUR 1 907. This large gap between mean and median values implies that while a few farms made significant efficiency gains, the majority experienced more modest changes.

Continued adaptations (2022 vs. 2023)

The mean gross margin per farm continued to grow between 2022 and 2023, rising from

EUR 7 749 to EUR 9 173. However, the median decreased from EUR 3 387 to EUR 2 509, suggesting that while some farms increased profitability others faced challenges, possibly due to rising costs or uneven resource distribution.

In terms of gross margin per ha (or per cow), the mean declined from EUR 6 964 in 2022 to EUR 4 632 in 2023, while the median slightly increased from EUR 1 907 to EUR 2 096. This contrast indicates that some high-yield farms saw reduced efficiency, whereas smaller farms or those with fewer resources may have maintained or improved their margins per ha.

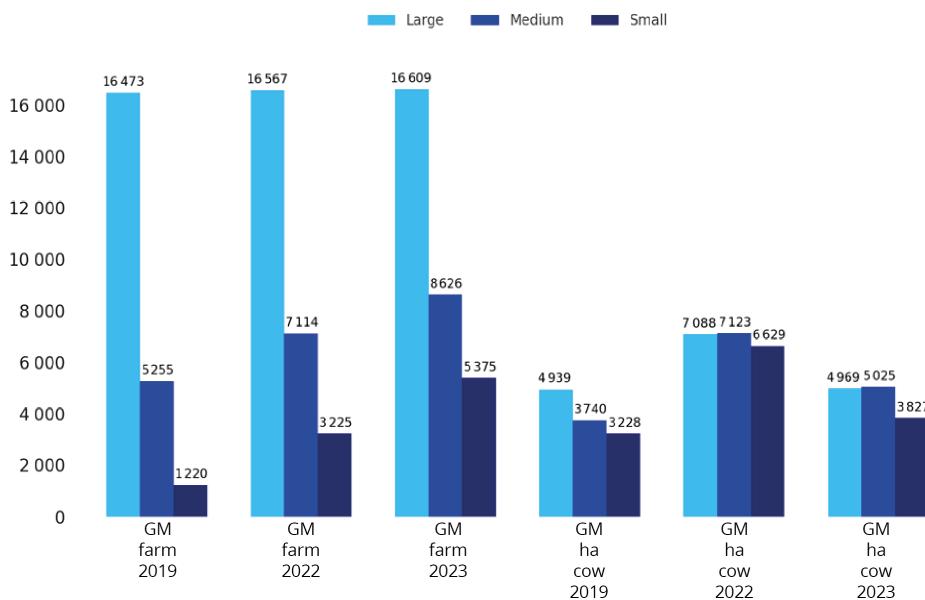
Overall, the data highlight dynamic changes in gross margins, with steady gains from 2019 to 2022, followed by a more complex picture between 2022 and 2023. These patterns underscore the diverse experiences within the sector, shaped by varying capacities for adaptation and resilience among farms.

Gross margin by farm size (Figure 43)

The analysis presented in Figure 43 examines shifts in gross margins for small, medium, and large farms across two periods: 2019 to 2022 and 2022 to 2023. Focusing on gross margin per farm

and per ha (or per cow) across five agricultural sectors—wheat, pepper, vineyard, raspberry, and dairy—the aim is to identify trends in profitability and resilience, highlighting how each farm size responds to external shocks affecting labor, land, and capital costs.

Figure 43. Gross margin per farm and ha (cow): Entire sample



Source: Authors based on survey data.

Shifts in gross margin (2019 vs. 2022)

From 2019 to 2022, small and medium farms showed significant increases in gross margin per farm, indicating improved profitability. Small farms saw their gross margin per farm rise from EUR 1 220 to EUR 3 225, while medium farms increased from EUR 5 255 to EUR 7 114. Large farms remained relatively stable, with gross margin per farm moving from EUR 16 473 to EUR 16 567, suggesting limited change in profitability for larger operations.

For gross margin per ha (or per cow), all farm sizes experienced significant increases, reflecting strong improvements in per-unit profitability. Small farms increased from EUR 3 228 to EUR 6 629, medium farms from EUR 3 740 to EUR 7 123, and large farms from EUR 4 939 to EUR 7 088. This trend indicates that, despite potential external challenges, all farm sizes maintained or enhanced efficiency at the unit level during this period.

Continued adaptations (2022 vs. 2023)

Between 2022 and 2023, gross margin per farm continued to rise for small and medium farms, with small farms increasing from EUR 3 228 to EUR 5 375 and medium farms from EUR 7 114 to EUR 8 626, suggesting ongoing adaptability and profitability gains. Large farms remained relatively stable, with gross margin per farm moving slightly from EUR 16 567 to EUR 16 609, showing resilience but limited growth in profitability.

However, gross margin per ha (or per cow) declined for all farm sizes in 2023, indicating challenges at the per-unit level. Small farms decreased from EUR 6 629 to EUR 3 827, medium farms from EUR 7,123 to EUR 5 025, and large farms from EUR 7 088 to EUR 4 969. This suggests that external pressures affected unit-level productivity in 2023.

Resilience and response to shocks

The data reveal strong adaptability for small and medium farms, which showed substantial gains in gross margin per farm. Stable, large farms grew less, indicating resilience but limited capacity for further profitability increases. The decrease in gross margin per ha (or per cow) across all sizes in 2023 highlights a sector-wide sensitivity to external shocks that impacted per-unit productivity, emphasizing the need for strategies to improve resilience at the unit level.

Table 7. Gross margin: Wheat farms

Gross margin	Mean	Q1	Median	Q3
Gross margin per farm 2023	1 283	74	697	1 914
Gross margin per farm 2022	901	123	707	1 737
Gross margin per farm 2019	996	181	575	1 450
Gross margin per ha 2023	271	51	204	556
Gross margin per ha 2022 ⁵	292	57	323	563
Gross margin per ha 2019	282	97	244	463

Source: Authors based on survey data.

Shifts in gross margin (2019 vs. 2022)

Wheat farms saw a slight decrease in the mean gross margin per farm between 2019 and 2022, from EUR 996 to EUR 901, while the median increased from EUR 575 to EUR 707. This suggests that while average profitability slightly declined, a greater number of farms achieved moderate profitability gains. The higher median indicates that the typical farm improved its profitability, even though some underperforming farms may have pulled the mean down.

In relation to gross margin per ha, the mean increased slightly from EUR 282 to EUR 292, and the median rose more substantially from EUR 244 to EUR 323. The larger rise in the median compared to the mean suggests that more farms improved efficiency on a per-ha basis, although high variability may still exist across the sample.

Continued adaptations (2022 vs. 2023)

The mean gross margin per farm increased from EUR 901 to EUR 1 283 from 2022 to 2023, indicating improved profitability on average. However, the median decreased slightly from EUR 707 to EUR 697, suggesting that while some farms saw notable gains, others faced challenges, possibly due to rising input costs or unfavorable conditions.

5.2.2. Gross margin sector analysis

5.2.2.1. Wheat

Gross margin for all farm sizes

This section examines changes in gross margins for wheat farms across two intervals: 2019 to 2022 and 2022 to 2023 (Table 7). The focus is on shifts in gross margin per farm and per ha, analyzing mean and median values to identify trends and discrepancies within the sample.

In relation to gross margin per ha, both the mean and median decreased from EUR 292 to EUR 271 and from EUR 323 to EUR 204, respectively. The significant decline in the median indicates that many farms struggled with lower efficiency per ha, likely due to increased production costs or environmental factors.

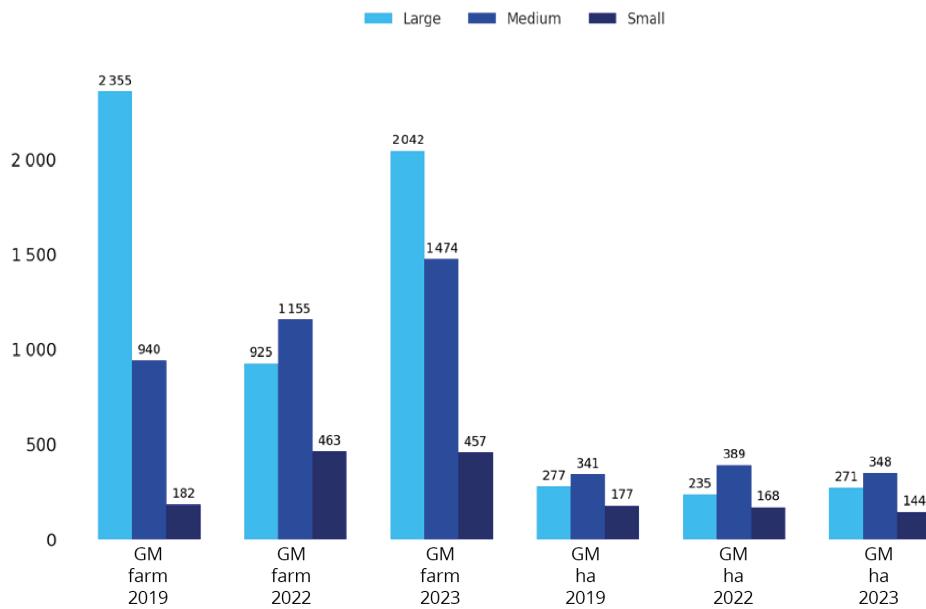
Semi-structured interviews revealed that wheat farmers faced profitability pressures due to rising input costs and declining wheat prices, especially during the summer of 2023 when prices dropped to EUR 0.20 per kilogram. This price drop during the harvest period led to significant losses for many farmers.

Gross margin by farm size (Figure 44)

Shifts in gross margin (2019 vs. 2022)

From 2019 to 2022, small and medium farms demonstrated growth in gross margin per farm. Small farms rose from EUR 182 to EUR 463, and medium farms from EUR 940 to EUR 1 155, indicating resilience and improved efficiencies in smaller operations. Large farms experienced a decline from EUR 2 355 to EUR 925, suggesting they were more affected by external pressures during this period.

⁵ Based on MAFRD, the gross margin for wheat in 2019 was 234 Euro per ha and 44 Euro per ha in 2022

Figure 44. Gross margin per farm and ha: Wheat

Source: Authors based on survey data.

In terms of gross margin per ha, large farms showed a slight decrease from EUR 277 to EUR 235, while medium farms increased from EUR 341 to EUR 389. Small farms had a slight decrease from EUR 177 to EUR 168. This pattern suggests that medium farms were the most resilient in terms of per-ha profitability, while large farms faced greater challenges maintaining unit-level profitability.

Continued adaptations (2022 vs. 2023)

Large farms rebounded significantly between 2022 and 2023, with gross margin per farm increasing from EUR 925 to EUR 2 042, demonstrating strong adaptability and recovery. Medium farms also showed improvement, rising from EUR 1 155 to EUR 1 474. Small farms saw a minor decline from EUR 463 to EUR 457, indicating vulnerability to adverse conditions.

Gross margin per ha decreased across all farm sizes in 2023, with small farms dropping to EUR 144, medium farms to EUR 348, and large farms to EUR 271. This suggests that external pressures impacted per-unit returns across the board.

Resilience and response to shocks

Large farms exhibited strong resilience with a notable recovery in gross margin per farm from 2022 to 2023. Medium farms demonstrated adaptability with steady profitability gains. Small farms showed vulnerability, particularly in per-ha profitability. This variation highlights the differing capacities of each farm size to absorb shocks.

5.2.2.2. Pepper sector

Gross margin for all farm sizes

Now we shift to evaluate changes in gross margins for pepper farms over two periods: 2019 to 2022 and 2022 to 2023 (Table 8). The focus is on gross margin per farm and per ha, analyzing both mean and median values to uncover trends in profitability and efficiency across the sample.

Table 8. Gross margin: Pepper farms

Gross margin	Mean	Q1	Median	Q3
Gross margin per farm 2023	18 585	5 369	13 531	25 647
Gross margin per farm 2022	11 867	3 007	8 676	14 681
Gross margin per farm 2019	10 800	2 059	7 366	12 777
Gross margin per ha 2023	14 689	7 075	12 461	19 050
Gross margin per ha 2022 ⁶	8 980	3 819	7 965	11 976
Gross margin per ha 2019	7 780	3 647	6 247	9 763

Source: Authors based on survey data.

Shifts in gross margin (2019 vs. 2022)

Pepper farms experienced substantial growth in gross margins between 2019 and 2022. The mean gross margin per farm increased from EUR 10 800 to EUR 11 867, and the median rose from EUR 7 366 to EUR 8 676. This indicates that many farms achieved profitability improvements, with gains shared across the sector.

In relation to gross margin per ha, the mean rose from EUR 7 780 to EUR 8 980, and the median increased significantly from EUR 6 247 to EUR 7 965. The growth in both mean and median values suggests widespread efficiency gains, potentially due to improved production practices or favorable market conditions.

Continued adaptations (2022 vs. 2023)

Gross margins saw even more pronounced growth from 2022 to 2023. The mean gross margin per farm surged from EUR 11 867 to EUR 18 585, and the median increased from EUR 8 676 to EUR 13 531. This substantial rise indicates broad profitability improvements across pepper farms.

Similarly, gross margin per ha increased substantially, with the mean growing from EUR 8 980 to EUR 14 689 and the median from EUR 7 965 to EUR 12 461. The alignment of mean and median growth suggests that efficiency gains were experienced by a wide range of farms, possibly due to enhanced production techniques or strong market demand.

Gross margin by farm size (Figure 45)

Shifts in gross margin (2019 vs. 2022)

Gross margin per farm increased across small and medium pepper farms from 2019 to 2022.

Small farms saw an increase from EUR 2 175 to EUR 4 001, and medium farms from EUR 9 382 to EUR 10 809, indicating improved profitability for these operations. Large farms experienced a slight decline from EUR 27 465 to EUR 26 411, suggesting they faced some pressures impacting profitability.

In relation to gross margin per ha, all farm sizes experienced increases. Small farms rose from EUR 6 044 to EUR 7 332, medium farms from EUR 7 797 to EUR 9 080, and large farms from EUR 10 016 to EUR 10 868. These gains reflect enhanced efficiency and productivity per unit area across the sector.

Continued adaptations (2022 vs. 2023)

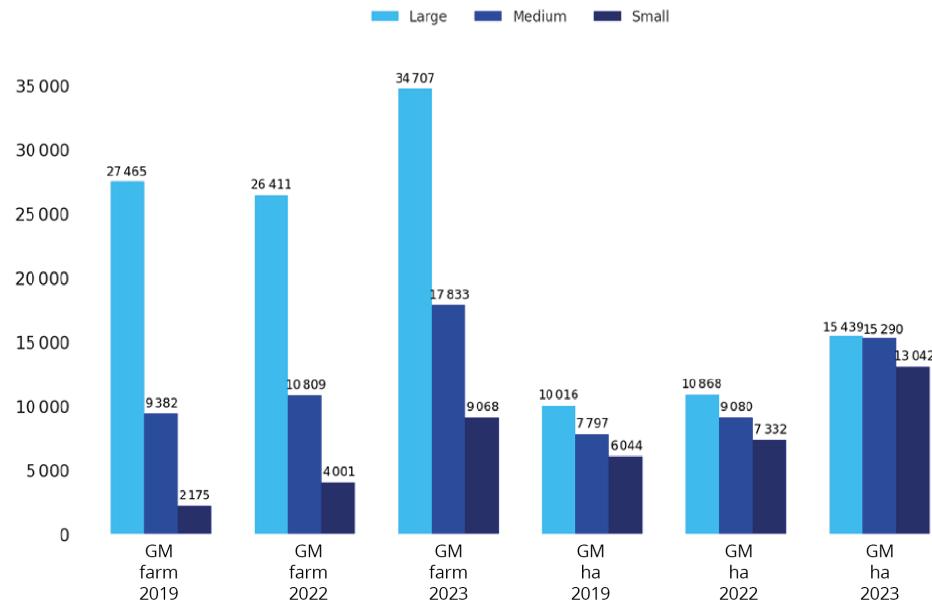
All farm sizes in the pepper sector saw notable gains in gross margin per farm between 2022 and 2023. Small farms more than doubled their gross margin from EUR 4 001 to EUR 9 068. Medium farms increased from EUR 10 809 to EUR 17 833, and large farms from EUR 26 411 to EUR 34 707. This widespread growth suggests that the pepper sector benefitted from favorable market conditions or effective adaptations.

Gross margin per ha also increased for all sizes: small farms reached EUR 13 042, medium farms EUR 15 290, and large farms EUR 15 439. These improvements indicate enhanced productivity and profitability at the unit level.

Resilience and response to shocks

The data speak of strong resilience and adaptability across all farm sizes in the pepper sector. The significant gains in both gross margin per farm and per ha suggest that farms effectively responded to external shocks, capitalizing on favorable conditions to improve profitability.

⁶ Based on MAFRD, the gross margin for pepper in 2019 was 8,909 Euro per ha and for 2022 was 18,167 Euro per ha

Figure 45. Gross margin per farm and ha: Pepper

Source: Authors based on survey data.

5.2.2.3. Vineyard sector

Gross margin for all farm sizes

Now we review changes in gross margins for vineyard farms over two periods: 2019 to 2022 and

2022 to 2023 (Table 9). In examining gross margin per farm and per ha, the analysis identifies trends and discrepancies within the sample.

Table 9. Gross margin: Vineyard farms

Gross margin	Mean	Q1	Median	Q3
Gross margin per farm 2023	2 366	-581	42	1 149
Gross margin per farm 2022	2 231	-425	370	1 371
Gross margin per farm 2019	2 902	121	667	2 386
Gross margin per ha 2023	392	-836	173	3 005
Gross margin per ha 2022 ⁷	397	-717	1 136	2 477
Gross margin per ha 2019	1 583	288	1 553	3 126

Source: Authors based on survey data.

Shifts in gross margin (2019 vs. 2022)

Vineyard farms experienced a decline in gross margins from 2019 to 2022. The mean gross margin per farm dropped from EUR 2,902 to EUR 2,231, and the median decreased from EUR 667 to EUR 370, indicating profitability challenges for many farms. The higher mean compared to the median suggests that a few higher-performing farms skewed the average upward.

Gross margin per ha fell sharply, with the mean decreasing from EUR 1 583 to EUR 397 and the median from EUR 1 553 to EUR 1 136. This decline reflects a broad reduction in per-ha efficiency, possibly due to increased costs or market pressures affecting most vineyard farms.

⁷ Based on MAFRD data, the gross margin for table grape in 2019 was 2,251 Euro per ha and 2,533 Euro per ha in 2022.

Continued adaptations (2022 vs. 2023)

Changes in gross margins were minimal between 2022 and 2023. The mean gross margin per farm slightly increased from EUR 2 231 to EUR 2 366, while the median dropped from EUR 370 to EUR 42. This discrepancy suggests that while some farms remained profitable, others faced significant challenges, lowering the median value.

Gross margin per ha remained relatively stable, with the mean moving slightly from EUR 397 to EUR 392, but the median decreased from EUR 1 136 to EUR 173. The reduction in the median indicates that many farms continued to struggle with efficiency per ha.

Gross margin by farm size (Figure 46)

Shifts in gross margin (2019 vs. 2022)

Gross margin per farm declined across all vineyard farm sizes between 2019 and 2022. Small farms moved from EUR 172 to a negative EUR 165, indicating losses. Medium farms decreased from EUR 1 157 to EUR 575, and large farms from EUR 11 509 to EUR 10 078. This suggests that small and medium farms were more heavily impacted by adverse conditions.

Gross margin per ha also declined. Small farms dropped significantly from EUR 554 to a negative EUR 1 293, medium farms from EUR 1 642 to EUR 658, and large farms from EUR 3 142 to EUR 2 573. These reductions indicate lower per-unit profitability across the sector.

Continued adaptations (2022 vs. 2023)

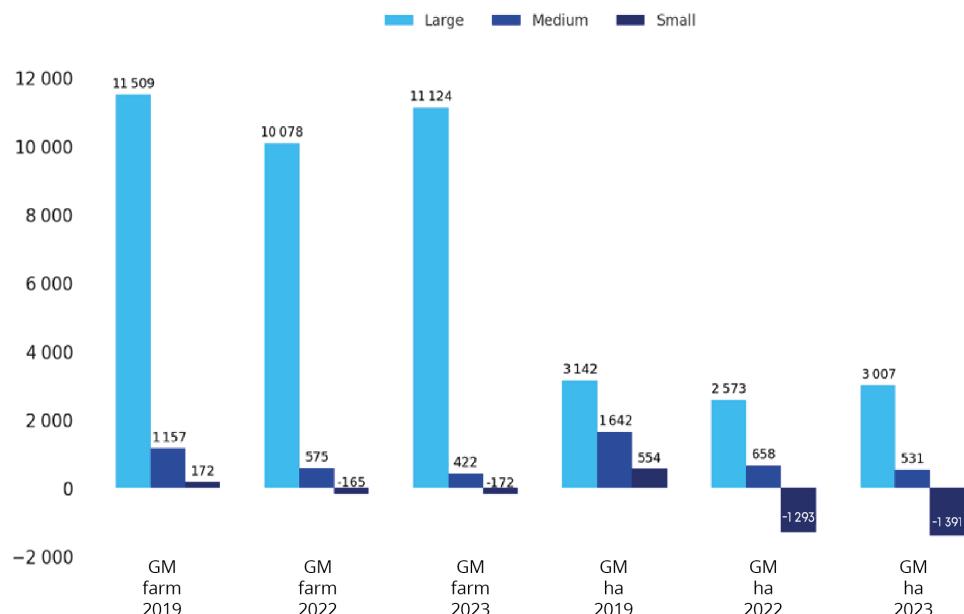
Large farms showed some recovery from 2022 to 2023, with gross margin per farm increasing from EUR 10 078 to EUR 11 124. Medium farms continued to decline from EUR 575 to EUR 422, and small farms remained in negative territory, worsening slightly from negative EUR 165 to negative EUR 172.

Gross margin per ha improved for large farms, rising from EUR 2 573 to EUR 3 007, indicating resilience at the unit level. Medium farms decreased further to EUR 531, and small farms dropped to negative EUR 1 391.

Resilience and response to shocks

Large vineyard farms exhibit resilience, recovering profitability despite challenging conditions. Medium and small farms face ongoing difficulties, with small farms particularly struggling to maintain positive margins. The data suggest that larger farms are better equipped to withstand external shocks.

Figure 46. Gross margin per farm and ha: Vineyard



Source: Authors based on survey data.

5.2.2.4. Raspberry sector

Gross margin for all farm sizes

This section explores changes in gross margins for raspberry farms across two periods: 2019 to

2022 and 2022 to 2023 (Table 10). By comparing gross margin per farm and per ha, we identify trends in profitability and efficiency, noting differences between mean and median values.

Table 10. Gross margin: Raspberry farms

Gross margin	Mean	Q1	Median	Q3
Gross margin per farm 2023	2 368	785	1 799	3 339
Gross margin per farm 2022	10 392	5 103	8 213	12 318
Gross margin per farm 2019	3 907	1 030	2 574	4 436
Gross margin per ha 2023	5 646	2 321	5 003	9 471
Gross margin per ha 2022 ⁸	23 926	14 973	22 831	32 478
Gross margin per ha 2019	8 217	4 570	7 696	11 608

Source: Authors based on survey data.

Shifts in gross margin (2019 vs. 2022)

Raspberry farms saw significant growth in gross margins between 2019 and 2022. The mean gross margin per farm rose from EUR 3 907 to EUR 10 392, and the median from EUR 2 574 to EUR 8 213, indicating improved profitability across the sector.

Gross margin per ha also increased substantially, with the mean rising from EUR 8 217 to EUR 23 926 and the median from EUR 7 696 to EUR 22 831. These gains suggest favorable market conditions or efficiency improvements benefiting many farms.

Continued adaptations (2022 vs. 2023)

From 2022 to 2023, raspberry farms experienced a sharp downturn. The mean gross margin per farm declined from EUR 10 392 to EUR 2 368, and the median from EUR 8 213 to EUR 1 799, reflecting widespread reductions in profitability.

Gross margin per ha fell steeply, with the mean decreasing from EUR 23 926 to EUR 5 646 and the median from EUR 22 831 to EUR 5 003. These declines indicate significant challenges, possibly due to rising production costs and market volatility.

Semi-structured interviews revealed that input costs for fertilizers and fuel increased sharply, raising production expenses. At the same time, market prices for raspberries dropped from EUR 3.5 per kilogram to EUR 1.25 per kilogram in 2023, compressing profit margins and leading to profitability setbacks.

Gross margin by farm size (Figure 47)

Shifts in gross margin (2019 vs. 2022)

Gross margin per farm increased substantially across all farm sizes between 2019 and 2022. Small farms rose from EUR 1 488 to EUR 5 888, medium farms from EUR 2 631 to EUR 9 946, and large farms from EUR 10 145 to EUR 18 059. This growth reflects strong profitability gains, likely due to favorable market conditions.

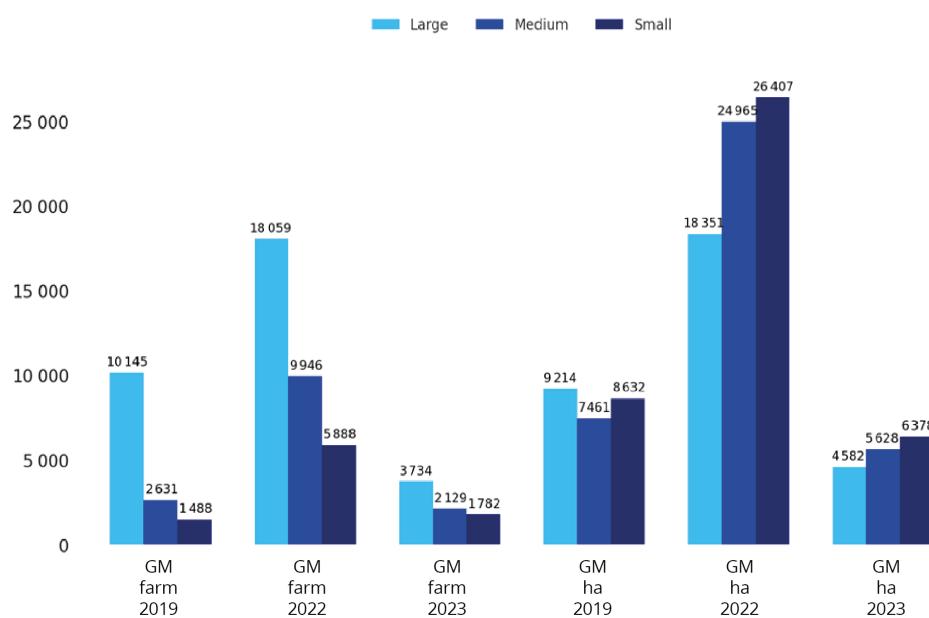
Gross margin per ha also saw significant improvements. Small farms increased from EUR 8 632 to EUR 26 407, medium farms from EUR 7 461 to EUR 24 965, and large farms from EUR 9 214 to EUR 18 351, indicating enhanced efficiency and productivity.

Continued adaptations (2022 vs. 2023)

Gross margin per farm declined sharply for all farm sizes from 2022 to 2023. Small farms dropped from EUR 5,888 to EUR 1 782, medium farms from EUR 9 946 to EUR 2 129, and large farms from EUR 18 059 to EUR 3 734. These declines suggest the sector was adversely affected by external shocks, such as price drops and increased costs.

Gross margin per ha fell across all farm sizes. Small farms decreased from EUR 26 407 to EUR 6 378, medium farms from EUR 24 965 to EUR 5 628, and large farms from EUR 18 351 to EUR 4 582, reflecting significant pressures on unit-level profitability.

⁸ Based on MAFRD, the gross margin for raspberry in 2019 was 2893 Euro per ha and for 2022 was 25390 Euro per ha

Figure 47. Gross margin per farm and ha: Raspberry

Source: Authors based on survey data.

Resilience and response to shocks

The data reveal that while all raspberry farms benefitted from favorable conditions between 2019 and 2022, they faced substantial downturns in 2023. Large farms, despite experiencing steep absolute drops, may have more resources to weather such shocks. Small and medium farms show vulnerability to sustained adverse conditions.

5.2.2.5. Dairy sector

Gross margin for all farm sizes

This section examines gross margin trends in the dairy sector over two periods: 2019 to 2022 and 2022 to 2023 (Table 11). The focus is on gross margins per farm and per cow, analyzing both mean and median values to capture changes in profitability and efficiency.

Table 11. Gross margin: Cow farms

Gross margin	Mean	Q1	Median	Q3
Gross margin per farm 2023	21 264	8 560	15 672	31 514
Gross margin per farm 2022	13 353	1 519	9 126	22 342
Gross margin per farm 2019	12 361	128	7 128	15 492
Gross margin per Cow 2023	2 172	1 160	2 073	3 222
Gross margin per Cow 2022	1 302	286	1 319	2 245
Gross margin per Cow 2019	1 216	613	1 254	1 915

Source: Authors based on survey data.

Shifts in gross margin (2019 vs. 2022)

Dairy farms experienced moderate gains in gross margins between 2019 and 2022. The mean gross margin per farm rose from EUR 12 361 to EUR 13 353, and the median from EUR 7 128 to EUR 9 126, indicating overall growth in profitability. The close alignment between mean and median figures suggests that gains were relatively uniform across farms.

Gross margin per cow increased slightly, with the mean rising from EUR 1 216 to EUR 1 302 and the median from EUR 1 254 to EUR 1 319, reflecting modest efficiency improvements per cow.

Continued adaptations (2022 vs. 2023)

The dairy sector saw significant improvements from 2022 to 2023. The mean gross margin per farm increased markedly from EUR 13 353 to EUR 21 264, and the median from EUR 9 126 to EUR 15 672, reflecting broad profitability gains.

Gross margin per cow grew substantially, with the mean increasing from EUR 1 302 to EUR 2 073 and the median from EUR 1 319 to EUR 2 073. These gains suggest enhanced efficiency and productivity per cow across the sector.

According to semi-structured interviews, the increase in profitability is largely due to a hike in milk prices, which climbed from EUR 0.22 per liter prior to recent geopolitical events to EUR 0.47 per liter in 2023. This price increase incentivized dairy farmers to expand their herds, despite rising feed and other input costs.

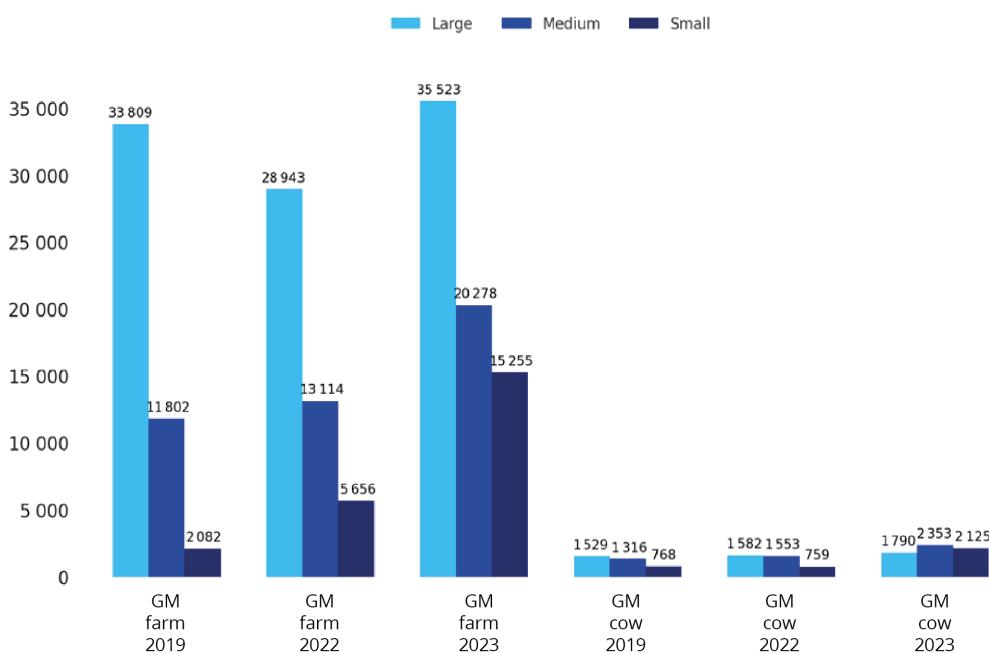
Gross margin by farm size (Figure 48)

Shifts in gross margin (2019 vs. 2022)

All dairy farm sizes experienced growth in gross margin per farm between 2019 and 2022. Small farms increased from EUR 2 082 to EUR 5 656, medium farms from EUR 11 802 to EUR 13 114, while large farms saw a slight decline from EUR 33 809 to EUR 28 943, suggesting some challenges for larger operations.

Gross margin per cow remained relatively stable for small farms, decreasing slightly from EUR 768 to EUR 759. Medium farms increased from EUR 1 316 to EUR 1 553, and large farms saw a minor increase from EUR 1 529 to EUR 1 582, indicating maintained or improved efficiency per cow.

Figure 48. Gross margin per farm and ha (cow): Dairy cow



Source: Authors based on survey data.

Continued adaptations (2022 vs. 2023)

All farm sizes showed significant gains from 2022 to 2023. Small farm gross margin per farm rose sharply from EUR 5 656 to EUR 15 255. Medium farms margins increased from EUR 13 114 to EUR 20 278, and large farms margins from EUR 28 943 to EUR 35 523.

Gross margin per cow increased for all sizes: small farms from EUR 759 to EUR 2 125, medium farms from EUR 1 553 to EUR 2 353, and large farms from EUR 1 582 to EUR 1 790. These gains reflect improved productivity and profitability at both the farm and unit levels.

Resilience and response to shocks

The dairy sector data reveal strong adaptability and resilience across all farm sizes. Small farms showed the largest relative gains, indicating robust capacity to adapt effectively. Medium farms consistently performed well, and large farms rebounded strongly after initial challenges.

5.3. Section summary

Kosovo's agricultural sector underwent significant adjustments due to the Ukraine crisis between 2019 and 2023. Farmers expanded cultivation of staple crops like wheat (up by 9.2 percent) and high-value crops like raspberries (up by 15.9 percent) between 2019 and 2022, reflecting efforts to enhance food security and capitalize on profitable markets. In contrast, areas cultivated with pepper and vineyards decreased slightly, indicating a cautious shift away from crops more

vulnerable to market disruptions. The number of dairy cows increased by 8.5 percent, emphasizing the importance of maintaining essential dairy production.

Yields displayed mixed trends across sectors. Wheat and dairy sectors demonstrated resilience, with wheat yields increasing by 3.6 percent and milk yield per cow rising by 6 percent from 2019 to 2022. However, yields for pepper and vineyards declined due to challenges like input supply issues and unfavorable climate conditions. Raspberry yields initially rose by 8 percent but faced minor declines later, possibly due to market saturation and increased competition. Price fluctuations were notable, with essential commodities like wheat and milk experiencing moderate price increases, while raspberry prices surged by 111.7 percent before dropping sharply by 62.2 percent due to shifting market dynamics.

Farm profitability varied significantly among sectors and farm sizes. The pepper and dairy sectors saw substantial profitability improvements, with gross margins per farm increasing markedly, especially between 2022 and 2023. Conversely, the vineyard and raspberry sectors faced declines in gross margins due to rising input costs and decreased market prices. Small and medium farms generally showed adaptability and resilience, improving their gross margins per farm, while large farms exhibited stability but limited growth. The findings highlight the diverse experiences within Kosovo's agricultural sector, underscoring the resilience, and challenges farmers encountered in maintaining economic viability amid external shocks.

6. FARMER ATTITUDES TOWARD SUSTAINABLE FARMING

This chapter examines the willingness of farmers in Kosovo to adopt sustainable farming practices and innovative production methods. It explores their openness to precision agriculture technologies, analyzes the nature of their relationships within the value chain, both vertically with buyers and horizontally with other farmers, and assesses the role of advisory services in supporting sustainable farming. Focusing on sectors such as raspberry, vineyard, wheat, pepper, and dairy, the chapter provides insights into the factors influencing farmers decisions to embrace or resist sustainable practices.

6.1. Willingness to adopt innovative production methods

This section explores the willingness of farmers in Kosovo's raspberry and vineyard sectors to adopt new precision farming technologies. These technologies enable targeted treatments for fertilization, irrigation, and pest management, leading to improved efficiency and better outcomes. Farmers were presented with a scenario involving an apple farmer in Korça, Albania, who successfully implemented precision farming. Based on this scenario, farmers were asked about their intentions and attitudes toward adopting similar technologies on their farms. The analysis provides insights into the responses from farmers across both sectors, highlighting general trends and sector-specific observations.

Box 1. Farmers willingness to adopt new technologies

Situation presented to raspberry and vineyard farmers

An apple farmer in Korça/Albania is implementing precision farming technology. He fertilizes, irrigates, and treats only the parcel sections requiring such work, and in the amount required. His results in terms of yield, quality, and cost are very good. We would like to ask you some questions to understand your willingness to adopt this technology in your farm.

Code	How much do you agree with the following statements	Circle only one
GT1	I plan to use the new technology in the future (Plan to use)	1 – 2 – 3 – 4 – 5
GT2	I intend to use the new technology (Intend to use)	1 – 2 – 3 – 4 – 5
GT3	I always strive to use new technologies on my farm (Strive to use)	1 – 2 – 3 – 4 – 5

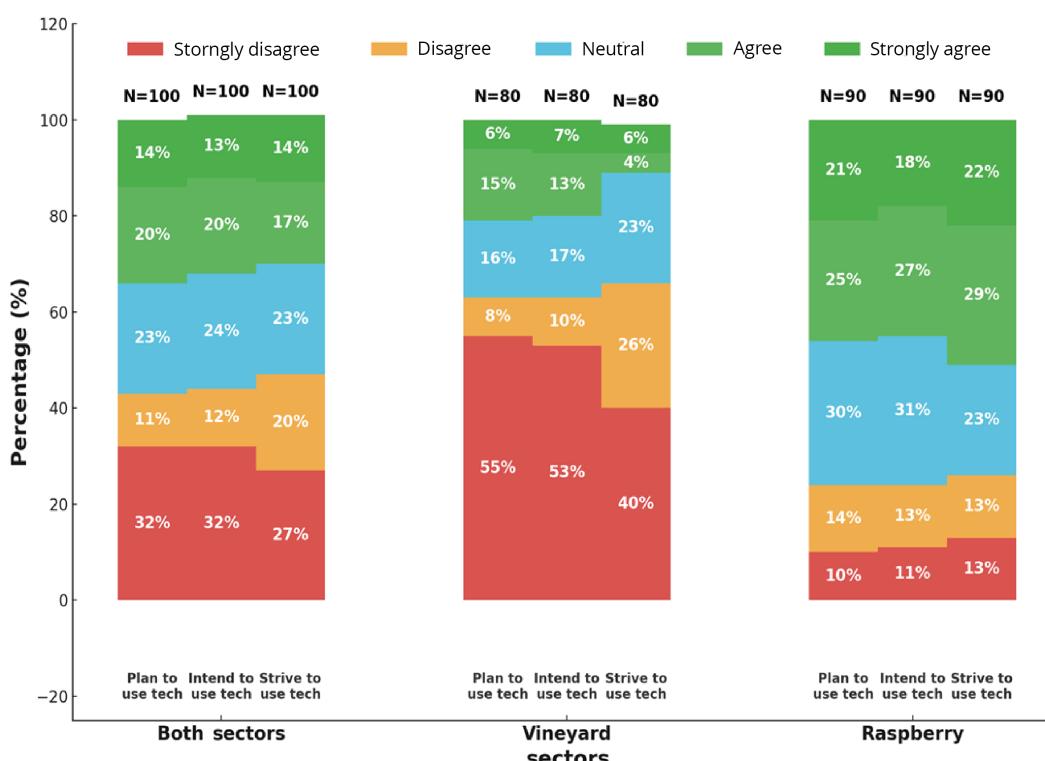
Source: Authors.

Overall willingness across both sectors

The responses indicate mixed willingness among farmers to adopt new technologies (Figure 49). Approximately 32 percent of farmers strongly disagree with planning to use new technology in the future. Approximatively 20 percent to 23 percent of farmers remain neutral or express some level of agreement. About 27 percent

strongly disagree with striving to use new technologies in daily management. These trends suggest significant hesitancy among farmers, with only a smaller percentage expressing strong interest in embracing new technologies. The reluctance may stem from economic constraints, lack of awareness, or skepticism about the benefits.

Figure 49. Farmers' willingness to adopt advanced technologies



Source: Authors based on survey data.

Vineyard farmers willingness

In the vineyard sector, the majority of farmers are resistant to adopting new technologies, with 55 percent strongly disagreeing with plans to use technology in the future. Only a small proportion, about 4 percent to 6 percent, show willingness to adopt new technology. This reluctance may be due to the traditional nature of vineyard farming, economic concerns, or uncertainty about the applicability and benefits of precision farming. The findings suggest that vineyard farmers may view new technologies as risky or disruptive to established practices. Targeted education and reassurance could help address these concerns.

Raspberry farmers willingness

In contrast, raspberry farmers exhibit a relatively higher openness to adopting new technologies. Approximately 25 percent to 29 percent express interest in incorporating precision farming into daily management. A significant portion (30 percent to 31 percent) remains neutral, possibly due to uncertainty about practical benefits. A smaller group (10 percent to 11 percent) strongly disagrees with adopting these methods. These mixed attitudes indicate that while raspberry farmers are more receptive to innovation, they may need additional support and information to fully commit to new methods.

Factors affecting attitudes toward sustainable practices

Market demand, especially from export markets, influences raspberry farmers attitudes toward sustainable practices. Farmers recognize that goods produced sustainably can secure premium markets, motivating them to adopt eco-friendly practices. There is a growing interest in greenhouse production for raspberries, allowing better control over environmental conditions, reduced pesticide use, and improved water efficiency. In adopting greenhouse methods, farmers align with international sustainability standards and improve resource efficiency. These shifts reflect a broader move toward more resilient and market-responsive agriculture.

Changes in government subsidy schemes have affected incentives for sustainable practices. The move from subsidies per ha to those based on per-kilogram production aims to encourage efficiency and sustainability. However, farmers express concerns that current support is insufficient to offset higher costs associated with sustainable methods. The perceived inadequacy of subsidies may discourage full commitment to sustainable practices, especially as costs for organic and eco-friendly inputs rise.

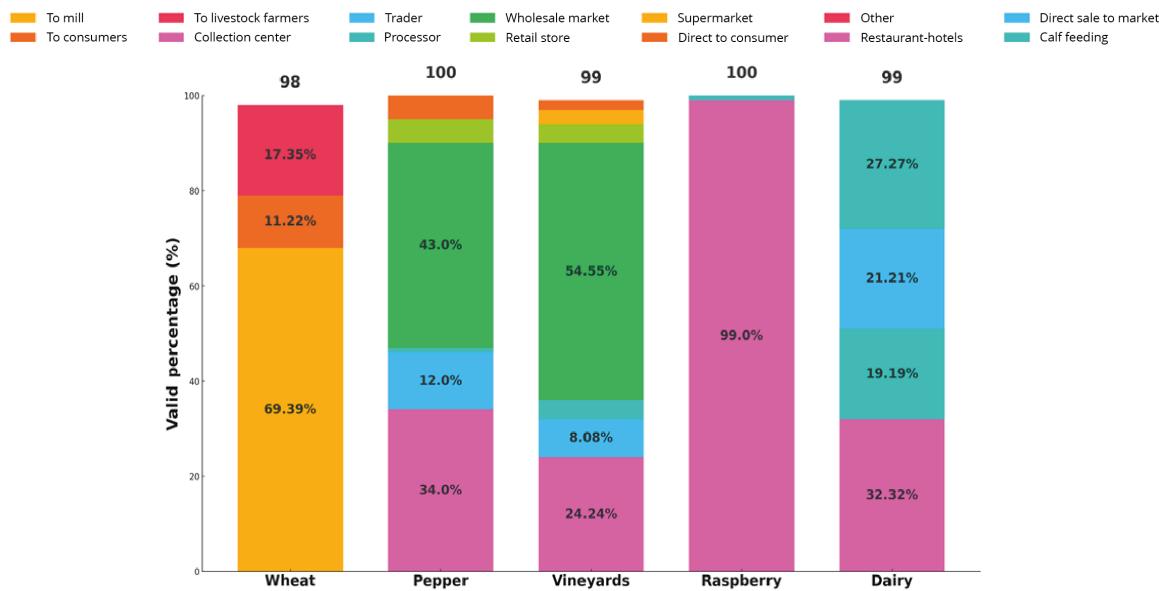
6.2. Vertical value chain coordination and horizontal cooperation

6.2.1. Vertical value chain coordination

This subsection examines the primary marketing channels used by farmers in various agricultural sectors—wheat, pepper, vineyard, raspberry, and dairy—and analyzes the stability and nature of relationships between farmers and buyers. Understanding these dynamics provides insights into how products flow from producers to consumers and how value chains are organized.

Marketing channels chosen by farmers

Farmers strategically select marketing channels that align with their products characteristics (Figure 50). Staple commodities like wheat and dairy heavily rely on specialized processing channels due to processing needs and perishability. Perishable crops like pepper and vineyard products utilize a mix of wholesale markets, collection centers, and other channels for flexibility. Raspberry farmers almost exclusively use collection centers for efficient aggregation. Overall, farmers choose marketing channels that balance processing requirements, perishability, and the desire for optimal market access and profitability.

Figure 50. Marketing channels chosen by farmers

Note: Figure 50 illustrates the distribution of product sales across different marketing channels for each sector.

Source: Authors based on survey data.

As shown in Figure 50, 69 percent of wheat is sold to mills, with 17 percent going to livestock farmers and 11 percent sold directly to consumers. This dominance of the milling channel indicates that wheat production is mainly integrated into processing chains, converting raw wheat into flour for broader food production.

Pepper farmers rely significantly on wholesale markets, where 43 percent of the produce is sold. Collection centers account for 34 percent, while smaller portions go to traders (12 percent), retail stores (5 percent), and direct to consumers (5 percent). This diverse mix of channels shows that pepper farmers have various market pathways, allowing flexibility based on demand from different buyer types.

Vineyard farmers favor wholesale markets, selling 54 percent of their products through this channel. Collection centers follow at 24 percent, with smaller quantities distributed to traders (8 percent), processors (4 percent), retail stores (4 percent), and supermarkets (3 percent). This suggests that vineyard products are widely distributed through wholesale channels, reaching different consumer segments.

Raspberry farmers almost exclusively use collection centers, with 99 percent of their produce directed to these hubs. This high percentage indicates a reliance on centralized

collection facilities for consolidation and further distribution, with very limited use of alternative channels.

In the dairy sector, 27 percent of production is used for calf feeding, while 32 percent goes to collection centers and 19 percent to processors. This distribution reflects the perishable nature of dairy products, requiring efficient processing or specialized uses within the sector.

Stability in farmer-buyer relations

Across the sample, nearly half (47.7 percent) of the farmers work with a single buyer, indicating a high level of commitment and stability in their business relations (Figure 51). Approximately 20 percent rely on 2 to 3 main buyers, suggesting some stability with flexibility, while 32.3 percent distribute to many buyers, displaying a more opportunistic approach. This variety highlights different strategies employed by farmers to balance stability and market access.

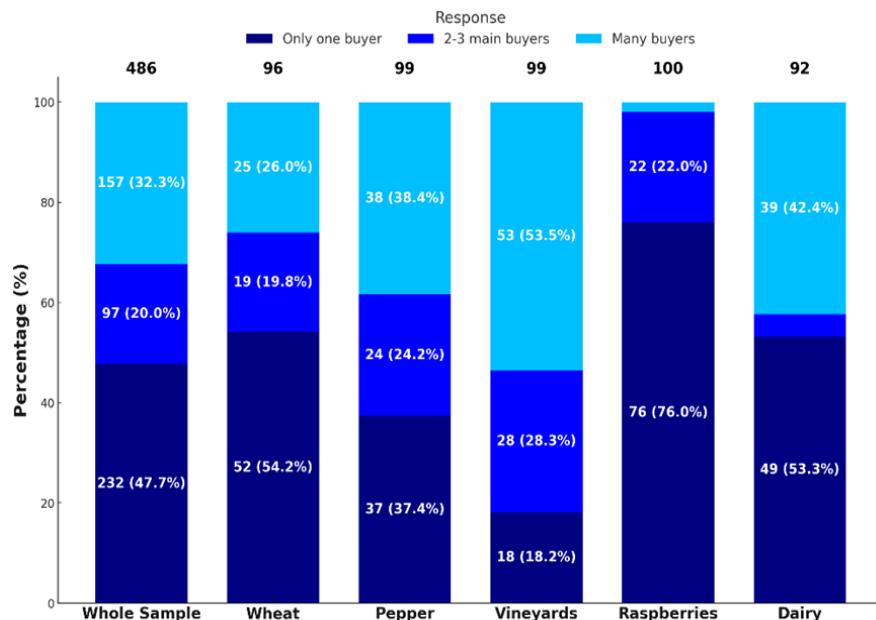
Sector-Specific Analysis

In the wheat sector, 54.2 percent of farmers sell to only one buyer, indicating a strong inclination toward stable, committed business relations. This reliance on a single buyer may stem from the nature of the wheat supply chain, where mills and specific large buyers play a dominant role, fostering long-term relations.

Pepper farmers present a more balanced approach between stability and opportunism. While 37.4 percent have only one buyer, 24.2 percent have 2 to 3 main buyers, and 38.4 percent sell to many. This distribution indicates a sector where farmers value both stable relations and the flexibility to engage with various buyers, perhaps due to the perishable nature of peppers and diverse market demand.

Vineyard farmers show the highest tendency toward opportunistic behavior, with 53.5 percent selling to many buyers and only 18.2 percent maintaining a single buyer. This suggests that vineyard farmers are more inclined to seek flexible market arrangements, possibly to capitalize on varying demands and price fluctuations.

Figure 51. Farmers stability in sales – number of buyers for farmers



Source: Authors based on survey data.

Raspberry farmers display a strong preference for stability, with 76.0 percent selling to only one buyer. This high level of commitment could reflect limited market options or a strong reliance on specific collection centers, serving as centralized points for distribution.

In the dairy sector, 53.3 percent of farmers sell to only one buyer, reflecting stability, while a significant 42.4 percent sell to many buyers, indicating opportunism. This mix may arise from the continuous demand for dairy products across various channels.

Types of agreements between farmers and buyers

Now we shift the focus on types of agreements between farmers and buyers – The survey data reveal that 52.8 percent of the whole sample operates without any formal agreement, suggesting a high level of informal or trust-based transactions. This trend is especially pronounced

in the vineyard and pepper sectors, where 76.8 percent and 67.0 percent of farmers, respectively, have no agreement in place with buyers. In contrast, raspberry farmers show a distinct preference for written agreements, with 62.0 percent formalizing their buyer relations, indicating a higher level of commitment and an effort to secure stability in sales. Dairy farmers also display a significant level of formalization, with 33.0 percent using written agreements, though 47.0 percent still operate without any contract. Wheat farmers rely mostly on verbal agreements (32.3 percent), which may reflect long-standing relations based on trust.

Value chain organization

The value chain organization varies widely across sectors. Only 16.3 percent of farmers receive services from their main buyers, suggesting limited buyer engagement in supporting farmers beyond purchasing their products. Raspberry

farmers stand out, with 33.0 percent receiving additional services, indicating stronger buyer-farmer relations in this sector.

Advance payments from buyers are exceedingly rare, with only 2.7 percent of farmers receiving them. Dairy farmers receive the highest proportion (7.1 percent), likely reflecting the ongoing demand for dairy and a need for liquidity in maintaining operations. Other sectors show extremely low advance payment rates, suggesting that most farmers bear financial risk alone.

The timing of payments varies significantly. In sectors such as wheat, pepper, and vineyards, the majority of farmers receive payments immediately upon sale, suggesting transactional relationships with prompt payments but limited long-term financial support. Conversely, raspberry farmers experience a high rate of delayed payments (52.6 percent), which could hinder cash flow and create uncertainty. In the dairy sector, payments are more varied, suggesting a mix of buyer relations.

Payment formalization is indicated by the use of bank transfers. In the raspberry sector, 88.0 percent of farmers receive payments via bank transfer, showing a high degree of formality and suggesting a more organized and transparent transaction process. Dairy farmers also show moderate formalization (39.8 percent). In contrast, the wheat, pepper, and vineyard sectors heavily rely on cash payments, indicating lower levels of formalization and potentially less transparent business practices.

Impact of the Ukraine crisis on farmer-buyer relations

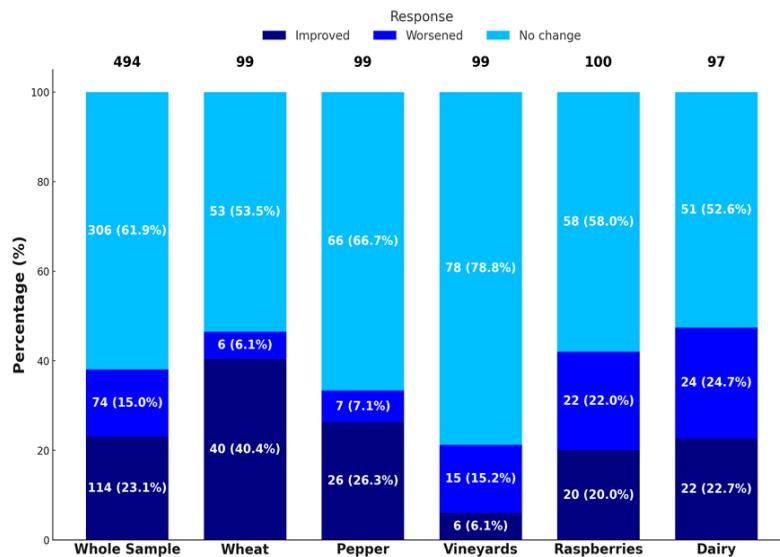
Survey farmers were asked whether their trading relations has changed with their buyers since 2019. Out of all valid responses of 494 farmers, a majority (61.9 percent) report no change in their relations with buyers, suggesting baseline stability (Figure 52). However, 23.1 percent report improved relations, exceeding the 15.0 percent who report deterioration. This pattern offers some support for the hypothesis that during times of crisis, farmers may seek to strengthen relations with buyers to secure stability.

Sector-Specific Observations

In the wheat sector, 40.4 percent of farmers indicate that their relations have worsened, a much higher proportion than the 6.1 percent who report improvements. This sector has the highest deterioration rate, suggesting that the Ukraine crisis intensified pressures, leading to more strained interactions instead of fostering stronger ties.

Pepper farmers also display a trend toward deteriorating relations, with 26.3 percent indicating worsening relations compared to 7.1 percent reporting improvements. This mirrors the wheat sector's trend, with the crisis seeming to heighten competitive dynamics.

Vineyard farmers demonstrate the highest level of stability, with 78.8 percent reporting no change in buyer relations. Only 6.1 percent report improvements, while 15.2 percent indicate worsening relations. This suggests that vineyard farmers largely maintained existing buyer connections without significant shifts.

Figure 52. Change in farmer-buyer relations 2019-2023

Source: Authors based on survey data.

In the raspberry sector, 22.0 percent of farmers report improved relations, closely matched by the 20.0 percent who report deterioration. This sector demonstrates a more dynamic response to the crisis, with some farmers strengthening ties, perhaps due to steady demand or specialized market opportunities.

The dairy sector shows the highest rate of improvement, with 24.7 percent reporting stronger relations with buyers. However, 22.7 percent also report deteriorated relations, reflecting a mixed impact.

The overall findings across sectors provide partial support for the hypothesis that farmers would seek stronger buyer relations during the Ukraine crisis. Across the sample, improvements slightly outweigh deterioration, suggesting that some farmers succeeded in bolstering connections with buyers. However, sector-specific variations reveal that this effect is not uniform. Wheat and pepper farmers report more deterioration than improvement, indicating that the crisis strained relations rather than fostering stability in these sectors. Raspberry and dairy farmers show more balanced outcomes, with similar rates of improvement and worsening, suggesting that some were able to strengthen ties, while others faced challenges. Vineyard farmers primarily experienced stability, with minimal changes in either direction, suggesting resilience without significant relations enhancement. These findings suggest that while the crisis did encourage

stronger relations for some, the impact varied widely across sectors, likely influenced by each sector's unique market dynamics and level of exposure to external pressures.

6.2.2. Horizontal cooperation

Cooperation among farmers is crucial in Kosovo's agricultural context, where small farm sizes and limited bargaining power are common. This subsection examines the farmers' current participation in organized groups and their willingness to participate in the future across different sectors.

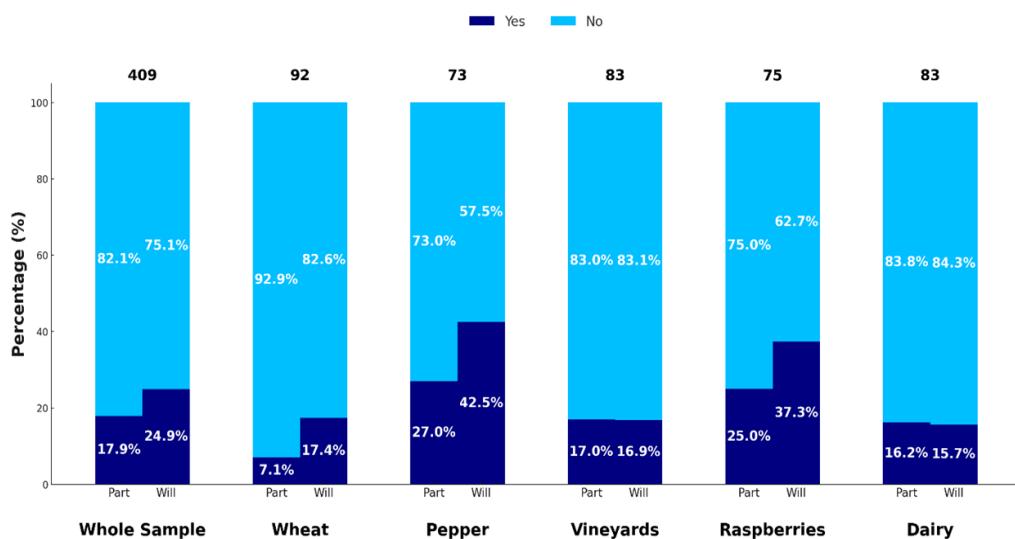
Figure 53 highlights that farmers' participation in organized groups is relatively low across Kosovo's agricultural sectors. Overall, only 17.9 percent of the total sample reports being involved in a farmer group. This trend varies by sector, with the wheat sector showing the lowest engagement at 7.1 percent. The pepper sector shows a higher level of group participation, with 27.0 percent of farmers involved. The vineyard and dairy sectors display similar participation rates, around 17 percent. Raspberry farmers have a higher participation level, with 25.0 percent involved in organized groups.

Among those who do participate, group advice is the most common form of engagement, with 82.0 percent of participating farmers seeking advice within their groups. This form of

collaboration is especially prevalent in the pepper sector, where all participating farmers (100.0 percent) utilize group advice. Participation in joint sales is less common, with 25.8 percent

engaged in this activity. Joint purchases and shared machinery are the least frequent forms of collaboration, indicating specific preferences and needs within each sector.

Figure 53. Farmers participation and willingness to participate in farmers groups



Source: Authors based on survey data.

When examining the willingness of farmers to join farmer groups in the future, there is an observable increase across most sectors. Across the sample, 24.9 percent of farmers express a willingness to participate in groups, which is higher than the current participation rate. In the wheat sector, willingness (17.4 percent) is more than double the current participation level, indicating potential for increased collaboration. The pepper sector stands out with a substantial willingness rate of 42.5 percent, suggesting that many pepper farmers are open to joining groups if barriers are addressed. The vineyard and dairy sectors show minimal changes in willingness compared to current participation, indicating limited interest. The raspberry sector shows a moderate increase, with 37.3 percent willing to participate in the future.

The data highlights a disparity between current participation in farmer groups and the willingness to participate in the future, revealing a modest yet significant interest in collective action among farmers in Kosovo. While current participation

rates are generally low, with only 17.9 percent of the total sample involved in organized groups, there is a clear willingness to engage in collaborative efforts, particularly in sectors like wheat, where farmers interest in joining groups is more than double the current participation rate. This latent willingness suggests that, with supportive policies or cooperative initiatives, these participation levels could be increased. The pepper and raspberry sectors, which already show higher engagement than other sectors, could serve as models for promoting collective action in other areas. However, sectors like dairy and vineyards demonstrate limited interest in group collaboration, both in terms of current participation and future willingness, indicating potential sector-specific challenges that may hinder cooperation. Overall, these findings emphasize the importance of targeted strategies to boost farmers' bargaining power and access to resources through collective structures, particularly in sectors with notable interest but low participation.

6.3. Knowledge system in support of sustainable farming

This subsection examines farmers access to advisory services over the past five years across the sectors under study, highlighting variations in the extent to which farmers have benefited from these services. Access to advisory services is crucial for providing valuable insights, improving productivity, and helping farmers adapt to market changes or external shocks. The analysis explores differences in advisory service access among the wheat, pepper, vineyard, raspberry, and dairy sectors.

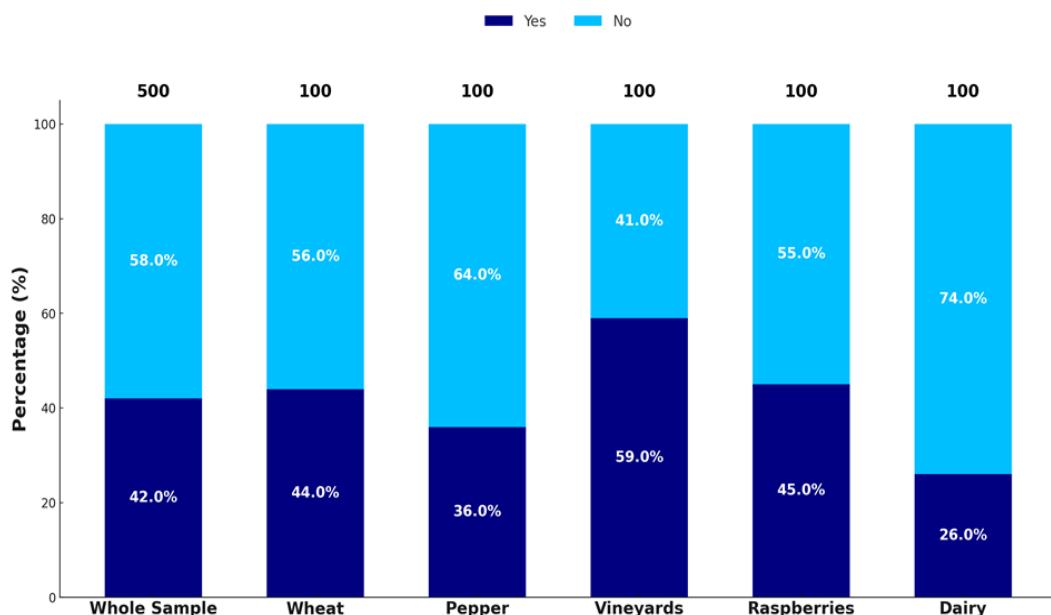
Across the entire sample of 500 farmers, 42 percent reported having accessed advisory services in the past five years, while 58 percent

had not. This moderate level of access indicates that while advisory services are available to a portion of farmers, the majority remain without such support, potentially limiting their ability to improve or expand their operations.

In the wheat sector, 44 percent of farmers reported accessing advisory services, slightly above the whole sample average. However, with 56 percent lacking support, there is room for improved outreach and resource provision for wheat producers.

Pepper farmers reported a lower access rate, with only 36 percent receiving advisory services and a substantial 64 percent lacking access. This is the lowest access rate among the sectors, suggesting that pepper farmers may have fewer opportunities or resources for advisory support. This gap could limit the sector's growth and innovation potential, highlighting the need for targeted advisory efforts.

Figure 54. Part of farmers having received advice during last five years



Source: Authors based on survey data.

Vineyard farmers had the highest rate of advisory service access, with 59 percent reporting they had received support in the past five years, while 41 percent had not. This relatively high access rate suggests that vineyard farmers may have a stronger infrastructure or network for obtaining advice, possibly due to the specialized nature of viticulture and its need for targeted knowledge and expertise.

Among raspberry farmers, 45 percent reported access to advisory services, close to the sample average. However, with 55 percent lacking advisory services, the sector's development could be limited, especially in adapting to market changes or introducing new practices.

Dairy farmers reported the lowest access to advisory services, with only 26 percent having received support and a significant 74 percent lacking access. This low level of advisory support may reflect challenges in reaching dairy farmers or limited resources for advisory services within the dairy sector, potentially hindering productivity improvements and adaptation in this high-demand field.

Sources of agricultural advice

On the other hand, the analysis of the sources of agricultural advice for farmers across different sectors, highlights the roles of commercial, public, and non-profit advisors. Understanding these advisory patterns provides insight into the support structures shaping productivity, market adaptation, and resilience within each sector.

Across the sample, input suppliers are the primary source of advice, with 38.1 percent of farmers consulting them, highlighting the strong commercial influence on agricultural practices. Private consultants are also commonly accessed (20.5 percent), reflecting a demand for specialized, independent advice. Conversely, public advisory sources, such as ministry agronomists (4.8 percent) and municipal specialists (7.6 percent), play a limited role. NGO support (11.9 percent) is concentrated in specific sectors, suggesting targeted assistance.

In sector-specific terms, vineyard and pepper farmers predominantly rely on input suppliers for advice (55.9 percent and 52.8 percent, respectively), indicating a strong reliance on commercial sources. Wheat farmers also rely heavily on private consultants (29.5 percent),

suggesting a need for tailored expertise. Raspberry farmers have a unique advisory profile, with 37.8 percent depending on buyer advice—likely influenced by market demands and quality standards—and 31.1 percent receiving NGO support, possibly for sustainable practices. Dairy farmers consult input suppliers (23.1 percent) but rely on municipal specialists (19.2 percent) as well, reflecting the local government role in addressing dairy-specific needs.

Demand and supply for advisory services

Despite the significant role advisory services play in enhancing productivity and adaptability, 58 percent of surveyed farmers reported receiving no agricultural advice over the past five years. Understanding the reasons behind this gap is crucial, as it highlights potential barriers to farmers access to or interest in advisory services.

The primary reason cited across the whole sample is a perceived lack of need, with 76.9 percent of farmers stating they did not require advisory support. This sentiment is particularly strong among wheat (92.9 percent), vineyard (90.2 percent), and dairy farmers (94.6 percent), indicating a common view in these sectors that external guidance is unnecessary. Such high percentages suggest that many farmers may not fully understand how professional advice could enhance their practices, productivity, and resilience, especially in navigating market shifts or environmental changes.

Among pepper farmers, 75 percent also cited "no need" as a reason, reflecting a similar outlook. However, the raspberry sector stands out, with only 29.1 percent of farmers citing "no need," while a significant 70.9 percent report the absence of advisors in their area as the main reason for not receiving advice. This indicates that raspberry farmers may recognize the value of professional support but face geographical or logistical challenges in accessing it. Limited advisory access in this sector could hinder productivity gains, as raspberry farming often benefits from specialized guidance in areas like quality standards, pest management, and market alignment.

Other sectors, such as wheat, pepper, vineyard, and dairy, show relatively low percentages of farmers citing advisor availability as a barrier (ranging from 7.1 percent to 25.0 percent), suggesting that the "no need" perception is the

more prevalent reason for their lack of engagement with advisory services.

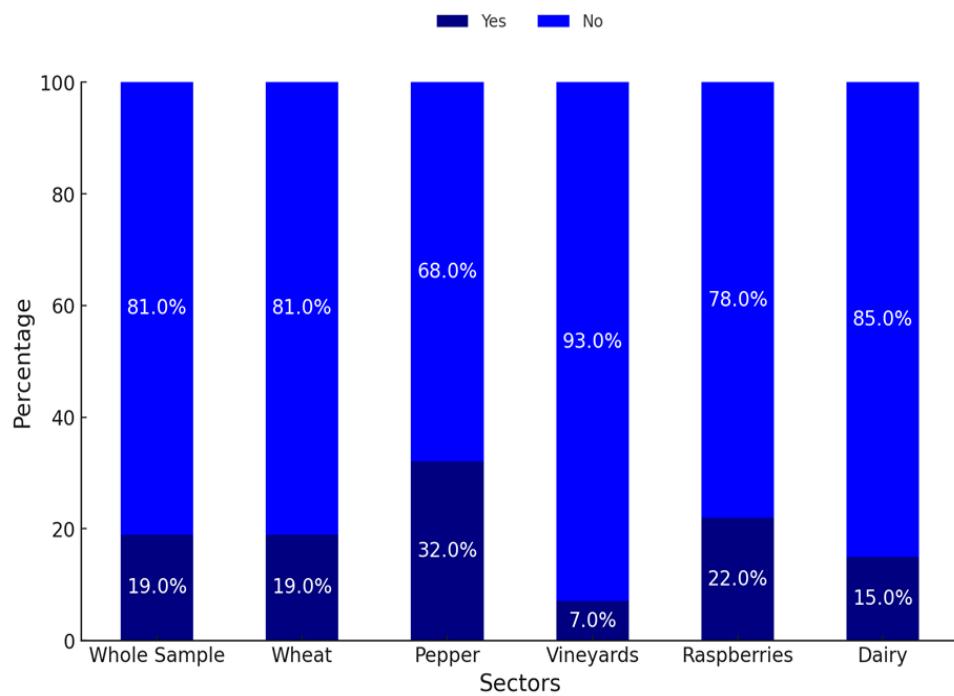
Willingness to pay for advisory services

The findings above show that most farmers who have not received advice cite a perceived lack of need, reflecting limited awareness of how professional guidance could improve their operations. This sentiment is particularly pronounced in the wheat, dairy, and vineyard sectors. Raspberry farmers, on the other hand, primarily face a lack of available advisors, despite recognizing the potential benefits of advice. Addressing these gaps—by increasing awareness of advisory benefits and expanding services

to underserved areas—could enhance sector resilience, productivity, and adaptability, enabling farmers to make more informed decisions in a rapidly evolving agricultural landscape.

The lack of perceived need for agricultural advice is further supported by the low willingness to pay for such services (Figure 55). Overall, the majority of farmers (81 percent) are unwilling to pay for collective agricultural technology advice by hiring an expert, with only 19 percent expressing a willingness to contribute financially. This reflects a general hesitation among farmers toward investing in collective expert advice, potentially due to concerns about costs, perceived value, or budget constraints.

Figure 55. Farmers willingness to pay for advice



Source: Authors based on survey data.

Box 2. Farmers willingness to pay for agricultural advice

Farmers were asked the following question:

"Would you be willing to pay a monthly fee (randomly determined between 30-80 Euros) for expert agronomist advice as part of a farmer group to improve production technology? In the second question the fee was adjusted by 10 Euros based on the farmer's initial response.

Farmers who have answered "Yes" in one of the rounds represent the farmers who are willing to pay for group provision of agricultural advice

Source: Authors.

The data on farmers willingness to pay (WTP) for collective agricultural technology advice reveals distinct levels across sectors (Figure 55). Pepper farmers demonstrate the greatest openness, with 32 percent willing to pay, likely due to a strong perceived benefit in expert guidance for their production needs. In the medium WTP category, raspberry and dairy farmers show moderate interest, with 22 percent and 15 percent willing to pay, respectively. These farmers may recognize some value in collective advice, though not as strongly as those in the pepper sector.

In contrast, the low WTP group includes wheat and vineyard farmers, with only 19 percent and 7 percent willing to invest in advice. Vineyard farmers, in particular, exhibit the most reluctance, perhaps due to sector-specific factors that diminish the perceived utility of external expert input. This distribution suggests that while some sectors see clear advantages in shared advisory services, others may need more targeted strategies to boost their interest.

The variation across sectors suggests that the perceived value or necessity of technological advice differs by crop or type of farming. Farmers in the pepper, raspberry, and dairy sectors appear more open to collective investment in expert advice, while vineyard farmers are notably reluctant. This information highlights the need for tailored strategies to improve the adoption of expert advice by addressing the unique concerns and perceived benefits within each sector.

6.4. Section summary

The findings reveal a mixed willingness among farmers to adopt new sustainable and innovative farming practices. Raspberry

farmers show a relatively higher openness to precision farming technologies, motivated by market demands for sustainably produced goods and the potential for premium markets. In contrast, vineyard farmers exhibit significant reluctance, possibly due to traditional practices, economic concerns, or skepticism about the benefits of new technologies. Overall, economic constraints, lack of awareness, and uncertainty contribute to hesitancy in adopting sustainable methods.

Vertical value chain coordination indicates that many farmers maintain stable relations with a main buyer, especially in sectors like wheat and dairy. However, a significant portion operates without formal agreements, suggesting a reliance on trust-based transactions. The Ukraine crisis has had mixed effects on these relations, with some sectors strengthening ties to secure stability, while others experience deterioration due to intensified market pressures. Horizontal cooperation among farmers is relatively low, with only 17.9 percent participating in organized groups. Nonetheless, there is a moderate willingness to engage more in the future, indicating potential for increased collaboration to enhance bargaining power and resource access.

Access to advisory services is moderate, with 42 percent of farmers having received advice in the past five years, primarily from input suppliers and private consultants. However, a majority of farmers perceive no need for such services, and willingness to pay for expert advice is low. This reflects limited awareness of the potential benefits of professional guidance in improving productivity and adapting to market changes. Addressing these barriers by increasing awareness, expanding advisory services, and fostering cooperative initiatives could enhance sustainability practices in Kosovo's agricultural sector.

7. FOOD SECURITY AND AGRIFOOD SECTOR COMPETITIVENESS

This chapter analyzes the impact of global crises—including the COVID-19 pandemic and the Ukraine war—on food security and the competitiveness of Kosovo's agrifood sector. It explores how rising input costs, shifts in crop choices, and disruptions in international trade have affected domestic food production, self-sufficiency rates, and trade dynamics. By examining key staples like wheat and maize, as well as trade performance indicators from 2015 to 2023, the chapter provides insights into the challenges and adaptations within Kosovo's agricultural landscape.

7.1. Impact of global crises on Kosovo's food security

The food, energy, and finance crisis, along with the COVID-19 pandemic, have had a complex impact on Kosovo food security. The dramatic rise in the costs of key agricultural inputs such as fertilizers and fuel has affected farmers' ability to produce food efficiently. For example, the price of nitrogen-based fertilizers and urea tripled at the onset of the crisis, making it financially challenging for farmers to maintain previous levels of crop nutrition, which is crucial for achieving high yields.

As a direct consequence of increased input costs, farmers have reduced the use of these inputs, which has led to decreased agricultural yields. This reduction in productivity can threaten the availability of food, affecting Kosovo food reserves and overall food security.

Economic pressures have led to a shift in crop choices, with farmers increasingly turning to high-value crops like raspberries, which can potentially yield higher returns than staple crops. This shift might impact the diversity and balance of food production, focusing less on staple foods that are crucial for Kosovo food security. The focus on profitability, especially in challenging economic times, might detract from the cultivation of essential staple crops, which are vital for domestic food security but may offer lower returns.

The introduction of Ukrainian agricultural products into the EU market has affected the prices of local products, notably raspberries. Lower prices can discourage farmers from investing in crop production, potentially leading to a decrease in food availability.

The crisis has also highlighted vulnerabilities in Kosovo's food system, particularly its dependency on imported agricultural inputs and certain food products. Disruptions in global

supply chains could therefore pose significant risks to food availability and stability.

Changes in government subsidies, from per-ha to per-kilogram of production, aim to encourage more productive and efficient farming practices. While this could enhance food production efficiency, the transition might also create temporary disruptions as farmers adjust to new expectations.

Inadequate insurance schemes for weather-related damage and the lack of support for adopting sustainable and resilient farming practices could hinder the farmers' ability to manage risks associated with climate change and economic fluctuations, thereby affecting food production stability.

Interviews noted that there are sufficient storage facilities for crops like raspberries, which are important for managing surplus and stabilizing supply throughout the year. Proper storage is essential for maintaining food security by regulating market supply and prices.

At the community and household levels, there is a practice of maintaining food reserves, such as pickles, wheat, and potatoes. This practice helps buffer households against food supply fluctuations and contributes to food sovereignty at the local level.

7.2. Food supply and self-sufficiency trends for staple crops

This subsection examines the current state of food security in Kosovo by analyzing key staple crops—wheat and maize—over the period from 2018 to 2022. The focus is on assessing the availability, production trends, and potential supply disruptions affecting these staples, especially in the context of global events such as the COVID-19 pandemic and the Ukraine war.

Table 12 summarizes the key indicators for wheat supply and self-sufficiency in Kosovo from 2018 to 2022 (Au, 2023). The data in the table indicates a gradual increase in domestic wheat production, rising from 280 616 tons in 2018 to 330 913 tonnes in 2022. Despite this increase, Kosovo remains partially dependent on imports to meet its wheat consumption needs. Imports peaked at 220 208 tons in 2019 but have since stabilized around 149 000 tonnes by 2022.

Exports of wheat and wheat equivalents are minimal and have been decreasing, from 10 326 tonnes in 2018 to 5 463 tonnes in 2022, suggesting that most of the domestic production is consumed within Kosovo. The self-sufficiency rate, which measures the extent to which domestic production meets domestic demand, improved from a low of 57.0 percent in 2019 to approximately 69.7 percent in 2022.

Wheat consumption per capita, including wheat-containing products, has increased from 200 kg in 2018 to 213 kg in 2022, reflecting stable or growing demand for wheat products among the population.

Table 12. Wheat supply and self-sufficiency (2018-2022)

Indicator	2018	2019	2020	2021	2022
Domestic Production (tons)	280 616	284 999	341 818	322 018	330 913
Imports (tons)	175 252	220 208	132 952	148 825	149 328
Exports (tons)	10 326	5 093	8 364	8 395	5 463
Self-sufficiency Rate (percent)	63	57	73.3	69.6	69.7
Consumption per Capita (kg)	200	232	204	207	213

Source: Authors based on Green report 2023.

The improvement in self-sufficiency after 2019 aligns with the onset of the COVID-19 pandemic. Faced with global supply chain disruptions and uncertainties in international markets, farmers of Kosovo responded by increasing domestic wheat production. As presented in chapter 5, wheat cultivation areas expanded by 9.2 percent between 2019 and 2022, from 3.25 to 3.55 ha per farm. This strategic shift aimed to enhance food security by reducing reliance on imports and ensuring a stable supply of staple foods.

Similarly, Table 2 presents the key indicators for maize supply and self-sufficiency from 2018 to 2022 (Au, 2023). Maize production in Kosovo has shown a consistent upward trend, increasing from 151 921 tonnes in 2018 to 175 226 tonnes in

2022. Imports of maize have decreased over the same period, from 54 071 tonnes in 2018 to 40 803 tons in 2022, indicating a reduced reliance on external sources.

Exports of maize are minimal, with slight increases observed over the years. The self-sufficiency rate has improved from 73.9 percent in 2018 to 81.3 percent in 2022, suggesting that domestic production is increasingly meeting maize consumption needs in Kosovo.

Maize consumption per capita, including maize-containing products, has decreased from 45 kg in 2018 to 40 kg in 2022. This could reflect changing dietary preferences or increased availability of alternative food sources.

Table 13. Maize supply and self-sufficiency (2018–2022)

Indicator	2018	2019	2020	2021	2022
Domestic Production (tons)	151 921	163 930	175 180	170 393	175 226
Imports (tonnes)	54 071	55 498	58 741	48 595	40 803
Exports (tonnes)	303	328	555	445	548
Self-sufficiency Rate (percent)	73.9	74.8	75.1	78	81.3
Consumption per Capita (kg)	45	47	49	44	40

Source: Authors based on Green report 2023.

The observed increase in self-sufficiency for both wheat and maize after 2019 suggests that farmers proactively adjusted their production strategies in response to external shocks. The COVID-19 pandemic disrupted global supply chains, making imports less reliable and prompting concerns over food availability.

While the initial increase in self-sufficiency is linked to the COVID-19 pandemic, the Ukraine crisis further impacted agricultural strategies. As a significant global exporter of wheat and maize, disruptions in Ukraine's supply affected international markets. Farmers in Kosovo responded by continuing to expand staple crop production in 2022 and 2023 (see also chapter 5) to mitigate potential shortages and price volatility.

The rise in self-sufficiency rates for wheat and maize in Kosovo from 2020 onwards reflects a strategic response by farmers to global disruptions caused by the COVID-19 pandemic and the Ukraine crisis. By expanding cultivation

of staple crops, farmers aimed to enhance food security and reduce dependence on uncertain international markets. However, challenges remain due to ongoing import reliance, price volatility, and trade deficits.

7.3. Effects of global crises on agrifood sector competitiveness

This section examines the competitiveness of Kosovo's agrifood sector, focusing on the effects of the COVID-19 pandemic and the Ukraine war crisis on trade performance. We aim to understand how these global events have influenced Kosovo's agricultural trade dynamics analyzing key trade indicators—including exports, imports, trade balance, export-to-import ratios, export and import prices, and terms of trade—from 2015 to 2023 (based on the data provided by the MAFRD).

Box 3. What is competitiveness?

In the study of economics, there is no consensus on the definition of "international competitiveness." One of the best-known definitions comes from Bela Balassa, who describes competitiveness as the "ability to sell." However, the ability to sell one's products in the market does not fully describe competitiveness. If a company lowers its prices far enough, it can always sell its products. However, it will not earn any profit and may even suffer losses. Competitiveness, therefore, also includes the "ability to earn." Therefore, our definition of trade competitiveness refers to "the ability of a country or region to sell its products on the world market without the Terms of Trade deteriorating (Petersen T, 2021).

Source: Authors.

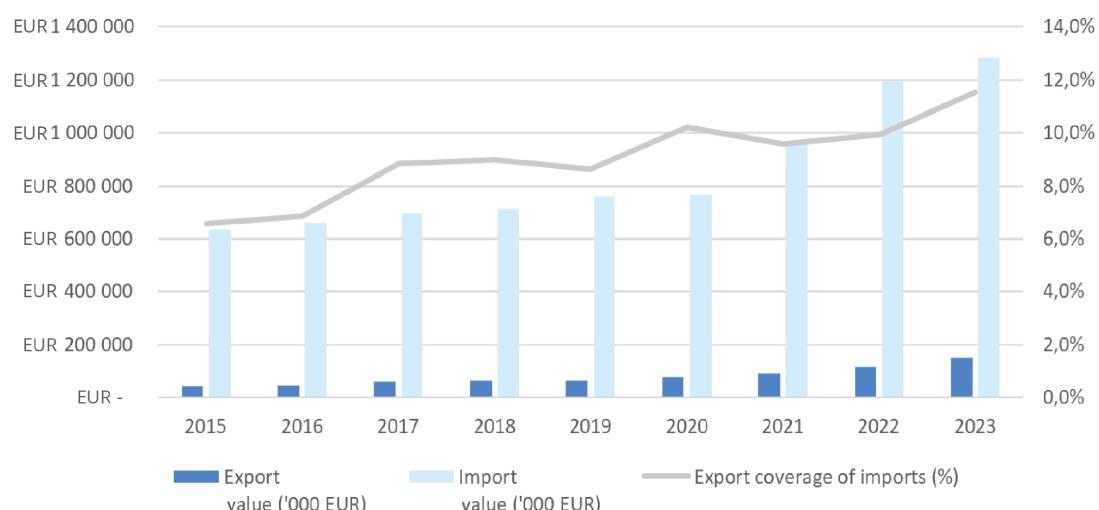
From 2015 to 2023, Kosovo's agrifood sector has experienced significant changes in trade performance (Figure 56). The export value of agrifood products increased steadily from EUR 41.68 million in 2015 to EUR 147.99 million in 2023, marking a compound annual growth rate (CAGR) of approximately 15percent. Export quantities also rose from 88 142 tonnes to 160 754 tonnes during the same period. This growth reflects an expanding presence of Kosovo's agricultural products in international markets and suggests improvements in production capacity and market access.

Conversely, imports of agrifood products have also grown, with the import value rising from EUR 633.70 million in 2015 to EUR 1 284.97

million in 2023, and import quantities increasing from 877 302 tonnes to 1 058 706 tonnes. Despite the growth in imports, the export coverage of imports improved from 6.6 percent in 2015 to 11.5percent in 2023, indicating a gradual strengthening of Kosovo's agrifood sector competitiveness (Figure 56).

In 2020, the COVID-19 pandemic caused unprecedented disruptions in global trade and supply chains. Despite these challenges, Kosovo's agrifood exports demonstrated resilience. The export value increased from EUR 65.51 million in 2019 to EUR 78.08 million in 2020, a growth of approximately 19 percent. Export quantities also rose, indicating sustained production and demand for Kosovo's agrifood products.

Figure 56. Development of Kosovo's trade balance for agrifood products⁹ (2015–2023)



Source: Authors based on data provided by MAFRD.

⁹ Includes HS 01 to 24

Moreover, the onset of the Ukraine war in 2022 further complicated global trade dynamics, particularly in the agrifood sector, leading to supply shortages and price volatility worldwide. In 2022, Kosovo's agrifood export value surged to EUR 118.95 million, a significant increase of about 28 percent from EUR 92.64 million in 2021. Import values also rose sharply to EUR 1 197.13 million from EUR 965.57 million in 2021 but at a slower pace than export growth. One of the main reasons for the surge in values of both exports and imports are inflationary pressures characterizing this period with rising costs of inputs and transportation. However when looking at exports and imports of agrifood products in quantity terms export grew by 26 percent between 2022–2023 (from 127 424 tons to 160 754 tons), whereas imports quantity increased by 5 percent from 1 010 580 ton in 2022 to 1 058 706 tons in 2023.

Despite export growth, Kosovo continues to run a significant trade deficit in agrifood products. The export coverage of imports improved from 6.6 percent in 2015 to 11.5 percent in 2023, indicating progress but also highlighting the need for further development to reduce dependency on imports.

Export prices per kilogram increased from EUR 0.47 in 2015 to a peak of EUR 0.93 in 2022, before slightly decreasing to EUR 0.92 in 2023 (Figure 57). Import prices per kilogram showed a consistent upward trend from EUR 0.72 in 2015 to EUR 1.21 in 2023. The export price index (using 2015 as the baseline year) reached 194.67 in 2023, indicating that export prices nearly doubled over this period. The import price index rose to 168.03 in 2023.

The consistent increase in export values and quantities demonstrates the sector's potential. However, the slight decrease in export price per kilogram from EUR 0.93 in 2022 to EUR 0.92 in 2023 may indicate increased competition or shifts in the export product mix.

Box 4. Terms of trade definition

The formula for calculating the terms of trade (TOT) in international trade is the ratio of the export price index to the import price index, multiplied by 100. The formula can be expressed as:

$$\text{TOT} = (\text{Index of Export Prices} / \text{Index of Import Prices}) \times 100$$

Where:

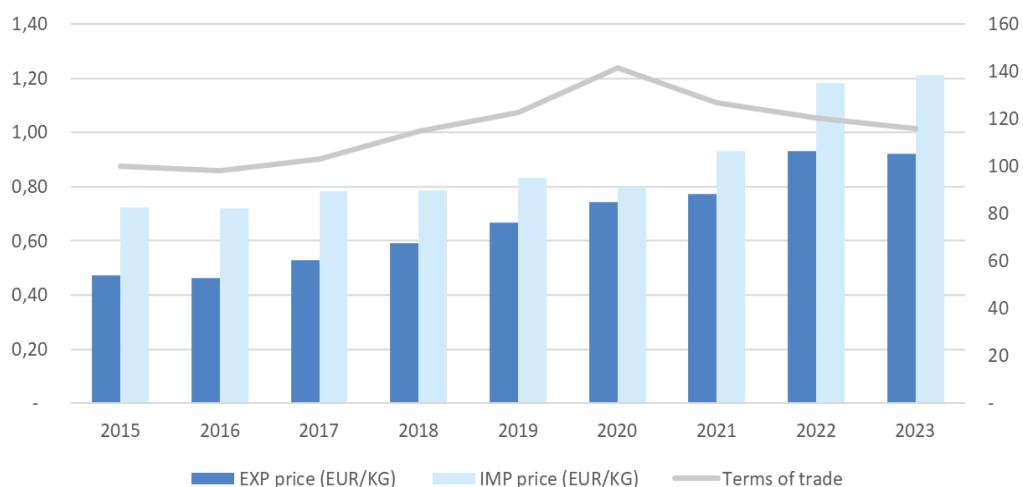
- Index of Export Prices: the average price of a country's exports
- Index of Import Prices: the average price of a country's imports

The TOT is a measure of the relative prices of a country's exports and imports and reflects the amount of imports a country can purchase with a given quantity of exports. The TOT can be calculated as a barter or commodity TOT, which is the ratio of the price of export goods to the price of import goods, or as an index number TOT, which is calculated using a base year and the current period. The index number TOT is used to calculate the change in the TOT over time (Dutta, N. 2023).

Kosovo's terms of trade improved from 1.00 in 2015 to a peak of 1.42 in 2020. However, since then there has been a decline, with TOT decreasing to 1.27 in 2021, 1.20 in 2022, and further to 1.16 in 2023 (Figure 57). This decline suggests that import prices have been rising faster than export prices since 2020. The rising import values and prices suggest that Kosovo

is importing more and paying higher prices, possibly due to inflation, increased demand, or lack of domestic substitutes. Moreover, the declining terms of trade since 2020 indicate that export prices of Kosovo are not keeping pace with import prices, reducing its purchasing power. This can strain the economy, making imports more expensive relative to exports.

Figure 57. Export and import prices of agrifood products and terms of trade



Source: Author's own elaboration based on data provided by MAFRD.

Lastly, interviews with stakeholders pointed out that the influx of agricultural products from Ukraine into the EU market has led to increased competition and lower prices for Kosovo's exports, particularly noted in the raspberry sector. This has directly impacted the revenue farmers can expect from their crops.

7.4. Section summary

The convergence of the COVID-19 pandemic and the Ukraine crisis has significantly impacted Kosovo's food security and agrifood sector competitiveness. Rising costs of essential agricultural inputs, such as fertilizers and fuel — exacerbated by global supply chain disruptions — have strained farmers' ability to maintain production levels. For instance, the tripling of fertilizer prices forced many farmers to reduce input usage, leading to decreased yields and potential threats to Kosovo food availability.

In response to these challenges, farmers in Kosovo strategically shifted their focus toward increasing the cultivation of staple crops like wheat and maize to enhance self-sufficiency. From 2019 to 2022, domestic wheat production rose from 280 616 tons to 330 913 tons, improving the self-sufficiency rate from 63 percent to nearly 70 percent. Similarly, maize production increased, raising self-sufficiency from 73.9 percent to 81.3 percent. These adjustments reflect a concerted effort to reduce reliance on imports amid global uncertainties.

However, the agrifood sector's competitiveness remains challenged by external factors. The influx of Ukrainian agricultural products into the EU market has intensified competition and driven down prices for Kosovo's exports, particularly in the raspberry sector. Trade analysis from 2015 to 2023 shows that while export values and quantities have grown — indicating potential in international markets — Kosovo still faces a significant trade deficit in agrifood products. The terms of trade have declined since 2020, suggesting that import prices are rising faster than export prices, which reduces Kosovo's purchasing power and strains the economy.

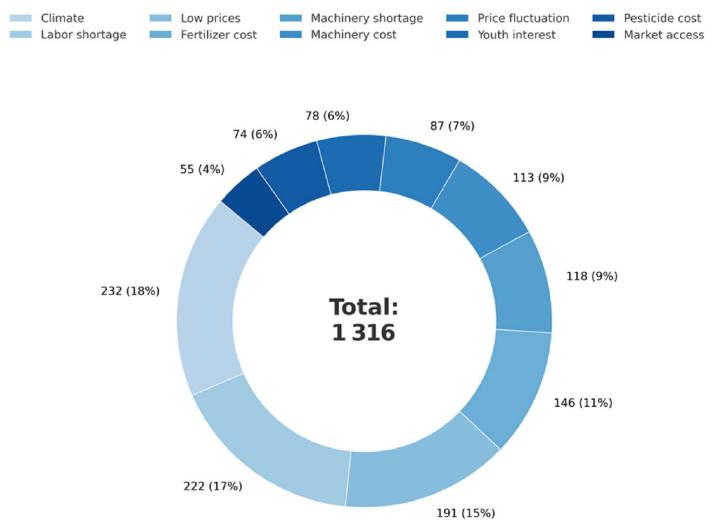
8. FARMERS' NEEDS AND POLICY SUPPORT

This chapter examines the most pressing challenges faced by farmers in Kosovo's agricultural sector and analyzes their opinions on the most relevant policy support instruments to address these issues. By analyzing survey data and sector-specific responses, the chapter highlights key problems such as climate change, labor shortages, high input costs, and infrastructural limitations. It also explores farmers' preferences for different types of policy support, including investment grants, income support, input subsidies, and risk protection. Additionally, the chapter assesses farmers' perceptions of government assistance in mitigating the negative effects of the Ukraine crisis, providing insights into areas where policy interventions may be improved or expanded.

8.1. Farmers' most pressing problems

The following analysis illustrates the main issues farmers face, based on responses from the survey data, where a farmer could choose up to 3 main problems – totaling 1 316 entries (Figure 58). Each segment represents a specific issue category and its respective percentage of responses, providing an overview of challenges affecting farmers' productivity and sustainability.

Figure 58. Farmers perception on ost relevant issues for farmers: part of farmers in percent



Source: Author's own elaboration based on data provided by MAFRD.

The data highlights several key challenges, with the most pressing issues revolving around environmental, financial, and infrastructural factors. The leading concern, accounting for 18 percent of responses (232 responses), is related to climate challenge, underlining the vulnerability of agricultural practices to climate variability and extreme weather conditions. This is closely followed by labor shortage (17 percent, 222 responses) and high fertilizer cost (15 percent, 191 responses), reflecting both reliance on manual labor in agriculture and the increasing cost of essential inputs. These issues significantly hinder productivity, especially in regions where labor is scarce and input costs are high.

Machinery costs are mentioned by 11 percent of respondents (146 responses), signaling the financial burden associated with maintaining and acquiring agricultural machinery. Other notable concerns include low youth interest in agriculture (9 percent, 118 responses) and lack of market access (9 percent, 113 responses), indicating challenges in engaging younger generations and reaching profitable markets. These factors could lead to long-term sustainability issues in the agricultural sector.

Additional concerns are price fluctuation (7 percent, 87 responses), high pesticide costs (6 percent, 78 responses), and machinery shortage (6 percent, 74 responses). Price volatility can directly impact farmers' income stability, while the cost and shortage of pesticides and machinery further strain resources.

Sector-specific analysis

Wheat sector

In the wheat sector, the most pressing problems are predominantly financial and environmental. The leading issue is high fertilizer cost, accounting for 17 percent of the responses (48 responses), indicating that fertilizer expenses are a substantial burden for wheat farmers. This is followed closely by concerns about climate change (15 percent, 42 responses) and low wheat prices (15 percent, 41 responses). These issues reveal the vulnerability of wheat production to both environmental factors and market price fluctuations, affecting profitability and sustainability.

Labor shortage and machinery shortage are also notable concerns, making up 12 percent (35 responses) and 11 percent (31 responses) of responses, respectively. These issues suggest operational difficulties in securing sufficient workforce and equipment, critical for timely and efficient farming practices. Additionally, the high cost of agricultural machinery (10 percent, 29 responses) underscores the high investment required for wheat farming operations.

Other pressing issues include high pesticide costs (9 percent, 24 responses), which increase the financial strain on farmers. Low youth interest (6 percent, 17 responses) signals a generational shift, indicating fewer young

people are interested in pursuing careers in wheat farming, potentially leading to long-term sustainability challenges. Lack of crop disease control (4 percent, 10 responses) and high fluctuation in product prices (2 percent, 5 responses) are lesser but relevant concerns, indicating potential yield losses due to crop diseases and income instability from price volatility.

Pepper sector

For pepper farmers, the most significant challenge is the lack of labor, with 22 percent of respondents (58 responses) highlighting it as a primary issue. This underscores the dependence of pepper farming on manual labor and the difficulty in securing an adequate workforce. The next major concern is climate change, accounting for 19 percent of responses (50 responses), reflecting the vulnerability of pepper crops to weather variability, which can disrupt production and impact yields.

Another key issue is the high fertilizer cost, identified by 13 percent of respondents (34 responses), placing a financial burden on farmers and affecting their ability to maintain soil fertility. Additional challenges include machinery shortage and high fluctuation in product prices, each cited by 8 percent of respondents (21 responses each). These indicate operational limitations due to equipment shortages and income instability due to price volatility.

Financial constraints are further emphasized with 8 percent of respondents (20 responses) noting the high cost of agricultural machinery and 5 percent (14 responses) pointing out the high pesticide costs. These costs add economic pressure, especially for small-scale farmers. Lack of market access, identified by 6 percent of respondents (17 responses), limits farmers' ability to reach profitable markets. Smaller but still relevant issues include low youth interest and rise in crop diseases, each mentioned by 5 percent of respondents (14 and 13 responses, respectively).

Vineyard sector

Vineyard owners identify climate change as the most significant issue, representing 26 percent of responses (67 responses). This highlights the vulnerability of vineyards to changing weather patterns and extreme conditions, which can profoundly impact grape yield and quality.

Following climate concerns, low product prices rank as the second-most pressing issue, with 17 percent of respondents (43 responses) indicating reduced profitability.

Labor shortage, cited by 14 percent of respondents (37 responses), shows the labor-intensive nature of vineyard work and difficulties in finding a sufficient workforce. Low youth interest accounts for 8 percent of responses (20 responses), suggesting a generational gap that could pose long-term challenges for sustainability.

Other concerns include lack of market access (7 percent, 19 responses), limiting opportunities to expand market reach. High fertilizer cost and high pesticide costs are each cited by 7 percent of respondents (17 responses each), reflecting the financial burden of maintaining grape health. Increase in crop diseases (6 percent, 16 responses) affects grape quality and yield, while high fluctuation in product prices (5 percent, 14 responses) creates income instability. Difficult trade relations with buyers (3 percent, 9 responses) highlight supply chain complexities impacting revenue.

Raspberry sector

Raspberry farmers identify low product prices as the most significant issue, representing 28 percent of responses (76 responses). This indicates struggles with market prices directly impacting profitability. Climate change is the second most pressing issue (25 percent, 68 responses), emphasizing susceptibility to weather variability affecting yield and quality.

High fluctuation in product prices ranks third, cited by 14 percent of respondents (38 responses), reflecting market instability and adding uncertainty to income and planning. High fertilizer cost (11 percent, 31 responses) highlights financial burdens in maintaining soil fertility. Labor shortage accounts for 10 percent of responses (27 responses), pointing to challenges in securing sufficient workforce.

Other challenges include the increase in crop diseases (4 percent, 12 responses), lack of market access (3 percent, 7 responses), high pesticide costs and high cost of agricultural machinery (each 2 percent, 6 responses), and low youth interest (2 percent, 5 responses).

Dairy sector

Dairy farmers report labor shortage as the leading challenge (23 percent, 65 responses), reflecting high labor demands and difficulties in finding adequate workforce. Machinery shortage follows closely (22 percent, 61 responses), indicating dependency on equipment for efficient operations. The high cost of agricultural machinery is another prominent issue (20 percent, 55 responses), underscoring financial strains.

Low youth interest makes up 8 percent of responses (22 responses), pointing to generational shifts affecting long-term sustainability. Low product prices (7 percent, 21 responses) further highlight financial constraints, as low prices reduce profitability. High fertilizer costs (6 percent, 16 responses) and high pesticide costs (5 percent, 13 responses) increase input cost burdens.

Additional challenges include lack of cooling tanks (4 percent, 10 responses), indicating a need for proper storage infrastructure, while the lack of market access and high fluctuation in product prices (3 percent, 9 responses each), impact the ability to sell products at stable, profitable rates.

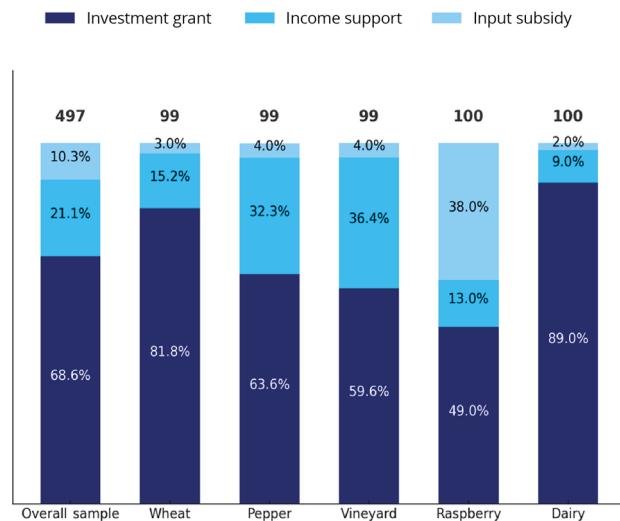
8.2. Farmers opinions about most relevant policy packages

Preferred policy support instruments

The following analysis provides an overview of the preferred groups of policy support instruments among farmers across the various agricultural sectors of wheat, pepper, vineyard, raspberry, and dairy farming (Figure 59). Farmers were asked to select their first choice of support, grouped into three categories: Investment Grants, Income Support, and Input Subsidies. These choices reflect the differing financial and operational needs within each sector.

Across the entire sample (497 responses), Investment Grants are overwhelmingly the most preferred support instrument group, with 68.6 percent of farmers identifying it as their top choice (Figure 59). This preference underscores a widespread demand for financial assistance to support long-term investments in machinery, technology, and infrastructure—elements crucial for enhancing productivity and resilience.

Access to grants: Farmers report mixed experiences with government support for investments. Grants from the MAFRD are perceived as difficult to obtain, while those offered at the commune level are more accessible but limited in scope and amount. In 2023 for example, only 10 farmers benefited about EUR 1100 for seedling purchase (semi-structured interviews). Some farmers indicate a lack of information on how to access government support or dissatisfaction with the complexity of the application processes. There's a call for better communication by government agencies and more practical assistance in navigating the bureaucratic processes involved in obtaining support. (semi-structured interviews).

Figure 59. First choice of most preferred group of policy support instruments

Source: Authors based on survey data.

Effectiveness and allocation: There's a sentiment that while grants are available, they might not always be allocated in the most effective manner. Farmers suggest that the process for obtaining grants could be more transparent and better targeted to meet the actual needs of the agricultural community (semi-structured interviews)

Support for specific sectors: There seems to be targeted support for certain sectors, such as dairy and raspberry farming, which includes subsidies for inputs like fertilizers and fuels, and direct payments based on production. However, farmers in other sectors might feel that support is not evenly distributed or tailored to their specific challenges (semi-structured interviews).

Sector-specific analysis

The wheat sector exhibits the strongest preference for Investment Grant, with 81.8 percent of respondents selecting it as their first-choice support instrument. This indicates a pronounced need for capital-intensive support to boost wheat production capabilities. Income Support (15.2 percent) and Input Subsidy (3.0 percent) are considerably less favored.

The pepper sector favors Investment Grant at 63.6 percent, followed by a substantial 32.3 percent for Income Support and 4.0 percent for Input Subsidy. The increased demand for Income Support suggests that pepper farmers may face income stability challenges, highlighting the need for direct financial assistance.

The vineyard sector prioritizes Investment Grant (59.6 percent), with Income Support (36.4 percent) as a notable secondary preference, and Input Subsidy at 4.0 percent. This pattern suggests vineyard farmers seek both capital for long-term investments and support to manage income fluctuations due to market volatility and climate-related risks.

The raspberry sector shows a distinctive distribution, with Investment Grant at 49.0 percent, Income Support at 13.0 percent, and Input Subsidy notably higher at 38.0 percent. The substantial demand for Input Subsidy suggests raspberry farmers are particularly impacted by high input costs, such as fertilizers and pesticides.

In the dairy sector investment Grant is the predominant choice, with 89.0 percent of respondents prioritizing this support instrument. Income Support (9.0 percent) and Input Subsidy (2.0 percent) are minimal in comparison, reflecting a strong emphasis on the need for capital investments in infrastructure, machinery, and herd management.

The data reveals a consistent preference for Investment Grants across all sectors, emphasizing the importance of capital investment. However, variations highlight specific needs: pepper and vineyard farmers show a greater need for Income Support, while raspberry farmers prioritize Input Subsidy. Tailoring support to address these unique sectoral demands can provide more targeted assistance, promoting resilience and sustainability through well-aligned policy support.

The data in Table 14 outlines the specific instruments preferred within two Groups of Policy Support Instruments: Income Support and Input Subsidy. Each group reflects different

priorities among farmers, offering insights into the types of financial assistance most sought after within each category.

Table 14. Specific instruments preferred

Groups of instruments	Specific Instrument	Frequency	Percentage (percent)
Income support	Payments per ha subject to GAP	72	68.6
	Payments per livestock animal	12	11.4
	Payments per unit delivered to buyer	21	20.0
	Total	105	100.0
Input subsidy	Subsidy for chemical/organic fertilizers	30	58.8
	Subsidy for livestock feed	1	2.0
	Subsidy for fuel	20	39.2
	Total	51	100.0

Source: Authors based on survey data.

Within the **Income Support** group, **Payments per ha (ha) subject to Good Agricultural Practices (GAP)** is the most favored instrument, with 68.6 percent of respondents (72 out of 105) selecting it. This strong preference, indicated by structured survey data, highlights farmers' interest in income support that encourages sustainable practices, as it rewards adherence to environmentally responsible farming. The next preferred option, **Payments per unit delivered to buyer**, was chosen by 20.0 percent of respondents (21 responses), suggesting that some farmers also value income support linked to production outcomes and market transactions. **Payments per livestock animal** received the least interest, with only 11.4 percent (12 responses) selecting it, indicating that livestock-based income support is generally a lower priority.

The *semi-structured interviews* show that the recent shift from per ha subsidies to per kilogram (unit) of production subsidies has been met with positive responses. Many farmers see this change as incentivizing actual productivity and efficiency rather than simply rewarding land ownership. However, the shift also introduces challenges, as farmers now need to maintain higher productivity levels to qualify for these subsidies, which can be difficult given current economic pressures.

In conclusion, while the structured survey data underscores a strong overall preference for

per ha payments across farmers, particularly in sustainable practices, the semi-structured interview data indicate support for per-unit subsidies in some cases. Despite these mixed views, the overwhelming preference for per-ha payments in the structured representative survey suggests that most farmers favor stability through per-ha payments over per-unit subsidies, even though some sectors, like the pepper sector, may lean toward per production unit support.

In semi-structured interviews, farmers and sector experts emphasized the need for more in-depth analysis to enable the government to design support policies (such as subsidies) that align more closely with the actual costs and returns of farming.

Second choice of Policy Support Instruments Group

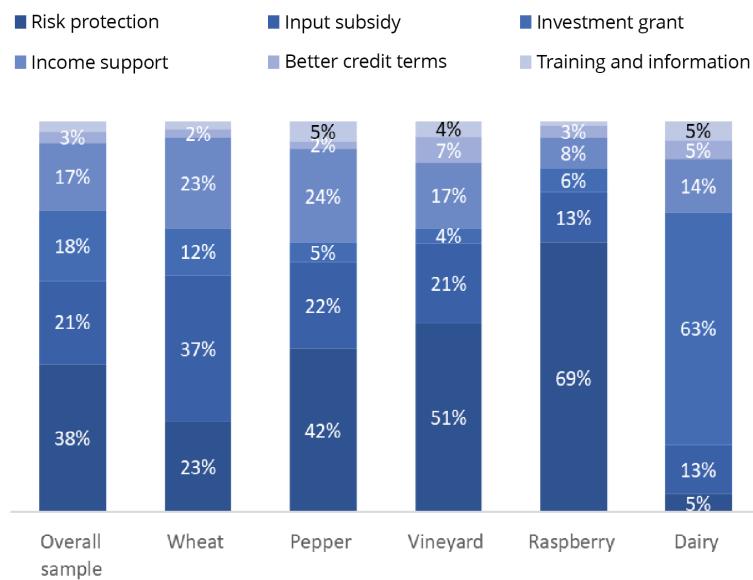
Figure 60 presents farmers' second-choice preferences for Groups of Policy Support Instruments across various agricultural sectors, including wheat, pepper, vineyard, raspberry, and dairy. This data reveal additional areas where farmers seek support, supplementing their primary choices, and provides insight into sector-specific secondary priorities.

Across the entire sample, Risk Protection is the most popular second-choice preference, with 38 percent of respondents choosing it. This suggests that many farmers value security

against risks such as market volatility, weather extremes, or crop failure, in addition to their primary support needs. Income Support and Input Subsidy follow, with 21 percent and 18 percent of responses, respectively, indicating a strong interest in financial stability and support for input costs. Notably, Investment Grants (17 percent) and Better Credit Terms (3 percent) are less favored as second choices, possibly because they align more with long-term planning than immediate needs.

Farmers have expressed concerns about the design of insurance schemes. Existing policies are perceived as inadequate because they compensate only for specific conditions (e.g., temperature thresholds for heat damage). Farmers feel these schemes do not adequately reflect the variety of risks they face, especially from increasingly unpredictable weather patterns due to climate change (semi-structured interviews).

Figure 60. Second choice of most preferred group of policy support instruments



Source: Authors based on survey data.

In the **Wheat** sector, Risk Protection (23 percent) and Income Support (37 percent) emerge as prominent second-choice preferences. This reflects wheat farmers' concerns about financial stability and risk management. Input Subsidy also holds significant importance at 23 percent, highlighting the cost-intensive nature of wheat production. In the **Pepper** sector, Risk Protection leads as the preferred second choice at 42 percent, followed by Income Support (22 percent) and Input Subsidy (24 percent). These preferences indicate a high demand for risk management and financial support to maintain stable production.

For **Vineyard** farmers, Risk Protection is strongly favored, with 51 percent of responses, showing a substantial need for support against risks, likely due to the sector's vulnerability to climate variability and market fluctuations. Income Support (21 percent) and Input Subsidy (17 percent) are also notable, reflecting demand

for financial stability and input cost assistance. In the **Raspberry** sector, Income Support stands out as the dominant second choice at 69 percent, suggesting that raspberry farmers prioritize income stability, perhaps due to price sensitivity and market challenges. Finally, in the **Dairy** sector, Investment Grant is the preferred second choice at 63 percent, highlighting a need for capital investment to sustain and expand operations. Income Support (14 percent) and Input Subsidy (13 percent) are secondary, indicating a balanced demand for financial assistance and input support in dairy farming.

The data illustrates sector-specific priorities in secondary policy support, with Risk Protection and Income Support emerging as key preferences across most sectors. These secondary needs reflect concerns about financial stability, risk management, and input costs, indicating that farmers value support that addresses immediate and long-term

challenges. Tailoring policies to accommodate these second-choice preferences can enhance agricultural resilience and provide a well-rounded support framework for farmers across diverse sectors.

8.3. Farmers' perceptions about policy support provided to mitigate the negative effects of the crisis

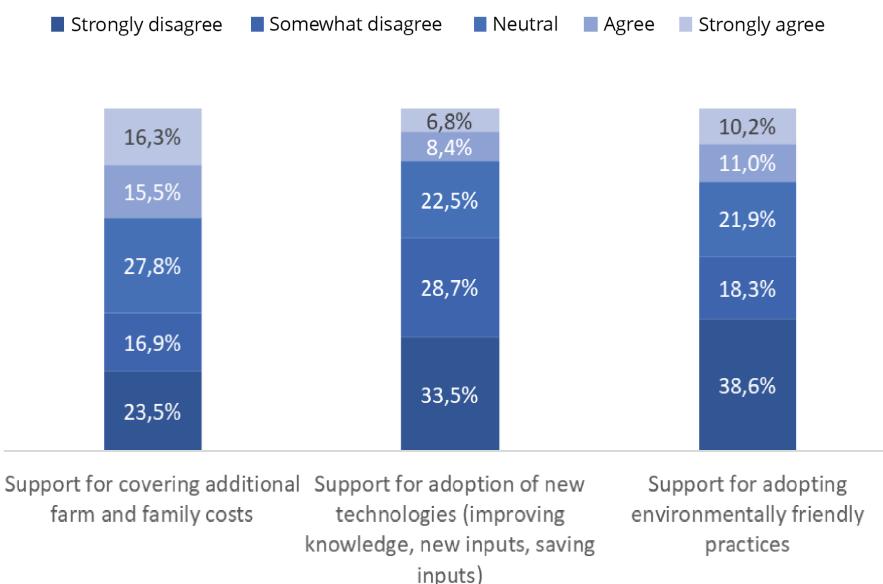
Figure 61 provides insights into farmers' perceptions of policy support by the Kosovo government in mitigating the negative effects of the Ukraine crisis. The crisis has had widespread implications on agricultural markets, including supply chain disruptions and increased input costs. Farmers were asked to express their agreement with statements about government assistance in areas such as covering additional farm and household costs, adoption of new technologies, and environmentally friendly practices.

Regarding support for covering additional farm and household costs, the responses indicate mixed opinions among farmers. The mean value is close to neutral, with 23.5 percent strongly agreeing and 16.3 percent strongly disagreeing. This suggests that while some farmers feel supported in covering these additional costs, a substantial number do not, reflecting diverse experiences and expectations within the farming community.

Conversely, as regards statements on support for the adoption of new technologies and support for adopting environmentally friendly practices, the mean values fall below the neutral zone, indicating a general sense of disagreement. When considering adoption of new technologies, 33.5 percent of farmers disagree with the statement, while only 6.8 percent express strong agreement. This response suggests that farmers perceive limited government support in adopting technologies that could help mitigate the impacts of the crisis, such as those aimed at improving productivity or reducing input dependencies.

Similarly, in relation to environmentally friendly practices, 38.6 percent disagree with the adequacy of support, and only 10.2 percent strongly agree. This points to a perception that the government has not effectively prioritized sustainability measures that could enhance resilience in times of crisis.

Figure 61. Farmers' perception of effects of Ukraine support package, part of farmers in percent



Source: Authors based on survey data.

In summary, farmers have a neutral attitude toward assistance for covering additional costs but show dissatisfaction with government support for technological and environmental advancements. The data indicate a potential need for more robust policies aimed at promoting innovation and sustainability in agriculture, which could enhance resilience during global disruptions such as the Ukraine crisis. Addressing these gaps could lead to a more comprehensive and effective support framework for farmers.

8.4. Section summary

Farmers across Kosovo identify climate change as the most significant challenge, emphasizing their vulnerability to weather variability and extreme conditions. Labor shortages and high input costs for fertilizers and machinery also emerge as critical issues, affecting operational efficiency and profitability. Sector-specific challenges vary, with wheat farmers particularly concerned about fertilizer costs and low product prices, while raspberry farmers struggle with market price fluctuations and low product prices. These challenges underscore the need for targeted interventions to address environmental and economic factors affecting agriculture.

When considering policy support, a majority of farmers express a strong preference for investment grants, indicating a need for financial assistance to support long-term investments in machinery, technology, and infrastructure. This preference is consistent across most sectors, although raspberry farmers also show significant interest in input subsidies due to the high cost of inputs in their operations. As a secondary preference, farmers highlight the importance of risk protection mechanisms, reflecting concerns about financial stability and the ability to manage uncertainties such as market volatility and adverse weather conditions.

Farmers' perceptions of government support in mitigating the effects of the Ukraine crisis are mixed. While some acknowledge assistance in covering additional costs, many express dissatisfaction with the support for adopting new technologies and environmentally friendly practices. This indicates gaps in policies promoting innovation and sustainability within the agricultural sector. Addressing these gaps through tailored interventions that align with farmers' specific needs can enhance resilience, improve productivity, and ensure the long-term viability of Kosovo's agricultural sector.





9. SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

In the concluding chapter of this report, the objective is to respond to the questions posed initially. Recommendations were developed based on a synthesis of the findings to mitigate the repercussions of the current crisis and to strengthen the agricultural sector against potential future shocks.

9.1. Addressing the research questions

The food, energy, and finance crisis has significantly impacted the utilization of key production factors—land, labor, and capital—in Kosovo's agricultural sector. Farmers have adapted their strategies in response to rising input costs, market uncertainties, and financial pressures, leading to notable shifts in land use, labor employment, and capital investment.

1. What is the impact of the food, energy, and finance crisis on the utilization of key production factors?

Land (input level)	Land used before and after	Ha
Labor (input level)	Labor used before and after; Labor cost change	Full time and part time employees, both household members and hired In EUR
Capital (input level)	Production costs (input use)	In quantities
	Investment made	Investment value in EUR
Access to capital	Access to specific financing sources	percent of financing sources

Land utilization

Total land use per farm increased from 5.73 has to 6.23 has, marking an 8.7 percent growth between 2019 and 2023. This expansion is primarily due to a greater reliance on leased land, which grew from 2.41 has (42.1 percent of total land) in 2019 to 2.82 has (45.6 percent) in 2023. Owned land remained relatively stable, around 3.32 to 3.36 has. Farmers opted to lease additional land rather than purchase, seeking flexibility to adjust to rising input costs and market volatility without the financial burden of ownership. Sector-specific adaptations varied: wheat and dairy farmers expanded leased land to scale operations, while high-value crops like raspberries and vineyards showed cautious expansion due to profitability concerns and long-term commitments associated with leasing.

Labor utilization

Labor utilization experienced a modest increase, with total labor days per farm rising from 427.81 in 2019 to 455.13 in 2023, a 6.4 percent increase. Notably, full-time employed labor grew significantly by 62.6 percent, from 39.63 days (9.3 percent of total labor) in 2019 to 64.44 days (14.2 percent) in 2023. This shift indicates a strategic move toward securing a stable workforce amidst labor shortages and competition from other sectors. Wages also increased substantially: daily wages rose from EUR 19 in 2019 to EUR 30 in 2023 (a 57.9 percent increase), and monthly wages increased from EUR 466 to EUR 581 (a 24.7 percent increase). These wage adjustments reflect efforts to attract and retain labor despite budget constraints, with labor-intensive sectors like raspberry and vineyard farming particularly affected due to their higher labor demands.

Capital utilization

The crisis led to adjustments in input use as farmers grappled with soaring prices for

fertilizers and fuel. From 2019 to 2022, many farmers reduced chemical fertilizer applications to mitigate costs—for example, pepper farmers decreased NPK fertilizer use by 21.3 percent, and raspberry farmers reduced organic fertilizer use by 19.1 percent. However, between 2022 and 2023, some sectors partially reversed these reductions due to price stabilization and the necessity to replenish soil nutrients. Machinery expenses consistently increased due to high fuel prices and maintenance costs, placing additional financial strain on farmers. For instance, machinery expenses for wheat farmers rose from EUR 554.70 per ha in 2019 to EUR 685.30 in 2023, a 23.5 percent increase.

Investments

Despite economic uncertainties, farmers continued to invest in their operations. The average investment per farm was EUR 23,529, with 56 percent of this investment occurring during the crisis period (2019–2023). Sector-specific investments varied: dairy farms invested an average of EUR 36,421 per farm (58 percent during the crisis), and pepper farms invested EUR 40,627 per farm (59 percent during the crisis). These investments suggest that farmers are actively seeking to enhance productivity and adapt to market conditions, potentially as a strategic response to the challenges posed by the crisis.

Access to capital

Farmers predominantly relied on personal funds for investments, accounting for over 90 percent of investment sources across all sectors. Access to external funding was limited, with public grants providing modest support—up to 7 percent in the dairy sector—and bank loans constituting a small portion of funding (ranging from 3 percent to 8 percent across sectors). This heavy reliance on personal funds underscores a need for improved financial support mechanisms to enable farmers to invest more confidently and sustainably, especially during periods of economic instability.

2. How has the crisis affected input use (i.e., fertilizers), yields, and farm profitability?

Yields (output level)	Yields per unit of land and animal	Land and animal yield
Farm profitability (output level)	Gross margin per enterprise (product) before and after	Gross income minus intermediate consumption (purchased input), in EUR

The food, energy, and finance crisis significantly impacted input use, yields, and farm profitability across Kosovo's agricultural sectors. Farmers adapted their strategies in response to rising input costs, market uncertainties, and shifts in demand, leading to varied outcomes in different sectors.

Input Use

The crisis led to soaring prices for fertilizers and fuel due to global supply chain disruptions. Many farmers reduced fertilizer application to mitigate costs between 2019 and 2022:

- **Wheat farmers** slightly decreased nitrogen fertilizer use by 0.6 percent and NPK fertilizers by 1.6 percent.
- **Pepper farmers** reduced NPK fertilizer use by 21.3 percent but increased organic fertilizer application by 4.3 percent.
- **Raspberry farmers** decreased granular fertilizer use by 3.7 percent and organic fertilizers by 19.1 percent.
- **Dairy farmers** increased NPK fertilizer use by 12 percent to boost pasture productivity amid rising feed costs.

Fuel price hikes led to increased machinery expenses across sectors:

- **Wheat farmers** saw machinery costs rise by 5.4 percent, from EUR 554.70 to EUR 584.40 per ha.
- **Pepper and vineyard farmers** experienced a 9 percent increase in machinery expenses.
- **Raspberry farmers** faced a 12.5 percent rise in machinery costs.

Some farmers partially reversed previous fertilizer reductions between 2022 and 2023 due to price stabilization and the need to replenish soil nutrients:

- **Wheat farmers** increased nitrogen fertilizer use by 8 percent and NPK fertilizers by 6.1 percent.

- **Pepper farmers** further reduced NPK fertilizer use by 2 percent but increased organic fertilizer application by 25.1 percent.
- **Machinery expenses** continued to rise due to persistent high fuel prices, with wheat farmers experiencing a 17.3 percent increase and raspberry farmers a significant 31.1 percent rise.

Yields

Yield changes varied by sector from 2019 to 2023:

- **Wheat:** Yield increased by 3.6 percent from 3,838 kg/ha to 3,977 kg/ha between 2019 and 2022, but decreased by 7.7 percent to 3,669 kg/ha in 2023 due to prolonged pressures affecting production.
- **Pepper:** Yield declined by 4.2 percent from 22,797 kg/ha to 21,844 kg/ha between 2019 and 2022 and further by 5 percent to 20,759 kg/ha in 2023, likely due to input and labor challenges.
- **Vineyard:** Yield decreased by 5.8 percent from 8,731 kg/ha to 8,224 kg/ha between 2019 and 2022 and dropped significantly by 24.2 percent to 6,232 kg/ha in 2023, reflecting persistent difficulties in management and production.
- **Raspberry:** Yield increased by 8 percent from 7,609 kg/ha to 8,216 kg/ha between 2019 and 2022 but slightly declined by 4.9 percent to 7,816 kg/ha in 2023, showing overall stability with minor challenges.
- **Milk Yield per Cow:** Increased by 6 percent from 14.9 liters/day to 15.8 liters/day between 2019 and 2022 and continued to rise by 4.4 percent to 16.5 liters/day in 2023, reflecting successful adaptation in the dairy sector.

Factors influencing these yield changes included climate conditions, input availability, and farming practices. For instance, favorable climate and better quality inputs boosted yields, while unfavorable weather and rising costs led to declines.

Farm profitability

Farm profitability showed mixed trends across sectors:

- **Overall**, the mean gross margin per farm increased from EUR 6,193 in 2019 to EUR 7,749 in 2022 and further to EUR 9,173 in 2023, indicating improved profitability on average. However, the median gross margin per farm decreased from EUR 3,387 in 2022 to EUR 2,509 in 2023, suggesting variability and challenges for some farms.
- **Wheat Sector**: Gross margin per farm decreased from EUR 996 in 2019 to EUR 901 in 2022 but then increased to EUR 1,283 in 2023. The gross margin per ha decreased in 2023, reflecting difficulties due to rising input costs and lower wheat prices, which dropped to EUR 0.20/kg during the 2023 harvest.
- **Pepper Sector**: This sector experienced substantial profitability gains. Gross margin per farm increased from EUR 10,800 in 2019 to EUR 11,867 in 2022 and surged to EUR 18,585 in 2023. Gross margin per ha also grew significantly, indicating enhanced efficiency and strong market demand.
- **Vineyard Sector**: Faced profitability challenges. Gross margin per farm declined from EUR 2,902 in 2019 to EUR 2,231 in 2022 and slightly increased to EUR 2,366 in 2023. Many vineyards struggled with declining yields and market issues, impacting per-ha efficiency.
- **Raspberry Sector**: Saw gross margin per farm rise from EUR 3,907 in 2019 to EUR 10,392 in 2022 but plummeted to EUR 2,368 in 2023. The sharp decline was due to increased production costs and a significant drop in market prices—from EUR 3.62/kg in 2022 to EUR 1.37/kg in 2023—partly caused by competition from Ukrainian products entering the EU market.
- **Dairy Sector**: Showed strong profitability growth. Gross margin per farm increased from EUR 12,361 in 2019 to EUR 13,353 in 2022 and significantly to EUR 21,264 in 2023. Gross margin per cow improved from EUR 1,216 in 2019 to EUR 2,172 in 2023. Higher milk prices, rising from EUR 0.37 to EUR 0.50 per liter, and increased efficiency contributed to these gains.

Overall, the crisis led to increased input costs and variable yields, affecting farm profitability differently across sectors. While some sectors like dairy and pepper improved profitability due to higher product prices and efficiency gains, others like raspberry and vineyard faced declines due to market pressures and increased costs. Farmers adapted by adjusting input use, altering production capacities, and implementing efficiency measures, highlighting both resilience and the need for continued support to manage ongoing challenges.

3. What are farmers' attitudes toward sustainable farming?

Willingness to adopt innovative production methods	Farmers readiness to adopt innovative sustainable farming production methods	Likert scale
Farmers willingness to cooperate, horizontally	Willingness to jointly hire a production technology expert	Y/N
Farmers willingness to cooperate with buyers	Change in the relations during Ukraine crisis	Likert scale
How knowledge system is supporting sustainable farming	Access Type of actor	Y/N Public vs Private

Willingness to adopt innovative production methods

Farmers in the raspberry and vineyard sectors demonstrated mixed reactions to adopting precision farming technologies. Precision farming, which targets specific areas for fertilization, irrigation, and pest management, was presented to farmers through a hypothetical example of its success in neighboring Albania.

Overall Trends: About 32 percent of farmers strongly disagreed with the idea of planning to use precision farming technologies, while around 27 percent were not inclined to incorporate new technologies into their daily practices. Only a small percentage showed strong interest, indicating economic barriers, limited awareness, or doubts regarding the benefits of such investments.

Sector-specific willingness:

- **Vineyard farmers:** Showed significant reluctance, with 55 percent strongly disagreeing with future technology use. This hesitancy could stem from traditional practices, financial concerns, or uncertainty about the compatibility of precision farming with vineyard-specific needs.
- **Raspberry farmers:** Displayed more openness, with 25-29 percent expressing interest in adopting precision farming and around 10 percent strongly disagreeing. The raspberry sector's openness is influenced by growing market demands for sustainable products, especially in premium export markets.
- **Influencing factors:** Market demand, particularly in export sectors, motivates raspberry farmers to adopt sustainable practices. Subsidy schemes, though intended to promote sustainable practices, are perceived by farmers as inadequate for covering the high costs of sustainable inputs, which discourages full commitment to sustainable methods.

Vertical value chain coordination and horizontal cooperation

Farmers' relations with buyers and peers shape their sustainability practices and market access strategies.

Vertical value chain coordination:

- **Marketing channels:** Farmers select marketing channels based on product characteristics and perishability. Wheat and dairy are primarily sold through processing channels (e.g., mills and collection centers), while pepper and vineyard products are sold through wholesale markets. Raspberry farmers rely almost exclusively on collection centers, given the centralized nature of the market.
- **Stability of buyer relationships:** About 47.7 percent of farmers rely on a single buyer, showing commitment and stability. Wheat and dairy farmers display higher reliance on single buyers (54.2 percent and 53.3 percent, respectively), while vineyard farmers have more diverse buyer relationships, with 53.5 percent selling to multiple buyers.
- **Impact of Ukraine war:** The crisis has had mixed effects on buyer relationships. While 61.9 percent of farmers reported no change, 23.1 percent experienced improved relationships, especially in the dairy sector, where 24.7 percent of farmers noted strengthened connections. Conversely, wheat farmers saw a deterioration in relations due to intensified pressures from the crisis.

Horizontal cooperation:

- **Current participation:** Only 17.9 percent of farmers are currently in organized groups, with the highest engagement seen in the pepper (27 percent) and raspberry (25 percent) sectors.

- **Future willingness:** Across sectors, 24.9 percent of farmers expressed interest in joining groups, especially wheat farmers, whose interest (17.4 percent) more than doubles their current participation rate. Pepper farmers showed substantial interest (42.5 percent), indicating potential for increased cooperation if barriers are addressed.
- **Cooperation trends:** Group advice is the most common form of engagement among those participating in farmer groups, especially in the pepper sector. Joint sales and machinery sharing are less common, highlighting specific cooperation needs within each sector.

Knowledge system in support of sustainable farming

Access to advisory services over the past five years was varied across sectors, highlighting gaps in knowledge support and advisory infrastructure. Approximately 42 percent of farmers reported receiving advisory services in the past five years, with vineyard farmers (59 percent) showing the highest access rates, and dairy farmers (26 percent) the lowest.

Input suppliers are the primary source, consulted by 38.1 percent of farmers. Private consultants are also frequently accessed (20.5 percent), reflecting a demand for specialized advice. Vineyard and pepper farmers rely heavily on input suppliers (55.9 percent and 52.8 percent, respectively). Raspberry farmers uniquely depend on buyer advice (37.8 percent) and NGO support (31.1 percent), which aligns with their sustainable production focus.

Despite the role of advisory services in enhancing productivity, a large portion of farmers (58 percent) did not access these services due to a perceived lack of need. This sentiment was particularly strong among wheat (92.9 percent), dairy (94.6 percent), and vineyard farmers (90.2 percent). In contrast, 70.9 percent of raspberry farmers cited the unavailability of advisors as a barrier, suggesting high demand but low access in this sector.

A significant majority (81 percent) of farmers were unwilling to pay for expert advice, though pepper farmers showed the highest willingness (32 percent), likely due to perceived benefits in their production practices. The willingness to pay is low among vineyard farmers (7 percent), reflecting sector-specific skepticism about the value of external input.

Overall findings on sustainable farming attitudes

While raspberry farmers show a higher inclination towards sustainable practices driven by market incentives, vineyard farmers exhibit strong reluctance. Economic limitations, limited awareness, and traditional practices are key barriers across sectors, with most farmers hesitant to adopt advanced technologies or seek expert advice. Vertical coordination remains largely stable, though the crisis strained some buyer relations, especially in wheat and pepper sectors. Horizontal cooperation has room for growth, with moderate willingness for future group participation, indicating potential benefits if collective action and advisory support are improved.

4. How has the food, energy and finance crisis affected Kosovo food security?

Analysis of changes in food supply and self-sufficiency, secondary data	Production, import, export and food supply	Tons
	Self-sufficiency	In percent
Trends in food production at farm level- survey data	Production at farm level	Production in quantities for 2019 and 2022
	Change in production	Change in percent between 2019 and 2022

In response to these crises, farmers in Kosovo have strategically increased domestic production of staple crops to reduce reliance on imports and support food security:

- **Wheat:** Domestic production rose from 280 616 tonnes in 2018 to 330 913 tonnes in 2022, while imports stabilized, improving self-sufficiency from 57 percent in 2019 to nearly 70 percent in 2022. Wheat sales, however, declined, as farmers retained more for household consumption.

- **Maize:** Production increased from 151 921 tonnes in 2018 to 175,226 tons in 2022, with imports decreasing and self-sufficiency reaching over 81 percent in 2022.

Overall, Kosovo's focus on staples like wheat and maize has strengthened self-sufficiency since 2019, supporting food security amid ongoing global disruptions. However, reliance on imported inputs and exposure to price fluctuations remain ongoing challenges, highlighting the need for continued support to stabilize production and reduce external dependencies.

5. What is the impact of the food, energy and finance crisis on migration/emigration and labor availability?

The impact of Ukraine war on migration/emigration and labor availability?	Family members migrated/emigrated	In number and percent, for the period 2012-2022 and 2019-2022
	Migration/emigration at village level	percent change
	Trend in agricultural activities	percent change

The COVID 19 and the food, energy, and finance crisis, has intensified migration and reduced labor availability in Kosovo's agricultural sector. Economic pressures have led to a notable increase in migration, with the average annual rate of households with migrants rising from 1.83 percent between 2012 and 2018 to 3.40 percent from 2019 to 2023. This acceleration reflects how migration has become a coping strategy for families facing high input costs and economic instability. Migration trends vary by sector, with the pepper and vineyard sectors experiencing significant increases in migration rates—from 2.83 percent to 4.00 percent and 3.00 percent to 4.25 percent, respectively—while the wheat sector saw a decrease, potentially due to government support measures for staple crops.

From a cumulative perspective (i.e., share of farm households with at least one family member in migration), the vineyard and pepper sectors have the highest migration rates

(46.0 percent and 43.0 percent), indicating considerable labor outflow, while the wheat sector remains more stable at 26.0 percent. The dairy sector saw a steep decline in farming households, with a reduction of 47.2 percent between 2019 and 2023, highlighting severe labor and operational challenges. Across all sectors, there was a 26.6 percent reduction in farming households over the same period, signaling a broader shift away from agriculture under crisis conditions.

These migration trends underscore the vulnerability of Kosovo's rural communities to external shocks, as families increasingly rely on migration to alleviate financial pressures. The labor shortages resulting from these dynamics particularly affect high-cost agricultural activities, emphasizing the need for policies that support rural livelihoods and stabilize agricultural employment to maintain productivity during times of crisis.

6. Farming strategies and farmers' willingness to continue the farming business

Farmers strategies	Likelihood of following different strategies	Likert scale
Farmers' willingness to continue the farming business?	Whether there is a successor	Y/N
Plans to invest	Plans to invest	Y/N

The survey highlights distinct farming strategies and investment plans among Kosovo's agricultural sectors, providing information on farmers' willingness to continue in the agricultural business. While many farmers express openness to non-farm activities, they show reluctance toward expanding their farms or migrating. Across sectors, 41 percent of farmers consider engaging in non-farm work to diversify income, while only 29 percent show interest in cultivating high-value crops. Conversely, a significant majority—70 percent and 65 percent, respectively—are unlikely to purchase or lease additional land, and 77 percent are opposed to migrating, indicating an attachment to their current operations and lifestyle.

Sector-specific trends reveal that dairy farmers are the most open to both non-farm activities (53 percent likely) and additional agricultural activities, while wheat and pepper farmers also show moderate interest in diversification. Vineyard farmers, though relatively interested in non-farm work, remain highly resistant to expanding land ownership or migrating. These preferences suggest that farmers prioritize stability and diversification within familiar domains rather than engaging in substantial changes or relocations.

In terms of succession, 50.2 percent of farmers across all sectors are undecided or lack a designated successor, with a notable gender imbalance—48.6 percent of successors are male, while only 1.2 percent are female. Dairy farmers display the highest succession

planning rates, with 63.6 percent identifying a male successor, while pepper farmers exhibit the greatest uncertainty, with 70 percent lacking a successor. Many farmers without successors state a lack of interest from the next generation or age-related unpreparedness as primary reasons, underscoring the challenges of generational continuity in agriculture.

Investment intentions also vary by sector, with 47.6 percent of farmers planning to invest in their operations. Dairy farmers lead in planned investments (76.8 percent), focusing on enhancing infrastructure and efficiency, while vineyard farmers are the least inclined to invest, likely due to high costs or uncertain returns. Machinery, greenhouses, and irrigation systems are the top investment priorities, reflecting a strong interest in mechanization, climate resilience, and water management. Sectoral preferences further highlight diverse strategies, with wheat and pepper farmers investing heavily in machinery and irrigation, and raspberry farmers showing balanced investments across machinery, irrigation, and new crop development.

Barriers to investment include economic constraints, labor shortages, and limited government support, with vineyard, raspberry, and pepper sectors particularly affected by these challenges. The diverse investment focus across sectors, from dairy's intensive infrastructure improvements to vineyard's selective approach, illustrates Kosovo's varied agricultural needs and the strategic planning required for sustainability and productivity.

7. What is the impact of the food, energy and finance crisis on Kosovo agriculture competitiveness?

Kosovo agriculture competitiveness	<p>Competitiveness is defined over two dimensions:</p> <ol style="list-style-type: none"> 1. Trade balance (exports-imports) for specific products. 2. value in EUR/kg of a specific exported product 	<p>Trade balance in value and quantity</p> <p>Value EUR/kg</p>
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The global food, energy, and finance crisis has significantly impacted the competitiveness of Kosovo's agrifood sector, especially regarding trade balance and product pricing. Kosovo's agrifood exports grew from EUR 41.68 million to EUR 147.99 million from 2015 to 2023, marking a 15 percent annual growth rate, while export quantities rose from 88 142 tonnes to

160,754 tonnes. However, imports have also expanded, reaching EUR 1.28 billion in value and 1.06 million tons by 2023, keeping Kosovo's agrifood trade deficit substantial, despite an improved export-to-import coverage ratio from 6.6 percent to 11.5 percent.

The sector's resilience during crises is evident, as agrifood exports continued to grow during the COVID-19 pandemic and the Ukraine war. For example, export values jumped by 28 percent in 2022 amid the Ukraine crisis, driven by rising input and transportation costs. Yet, the crisis exposed vulnerabilities, such as dependency on imported inputs and sensitivity to global market fluctuations. Export prices nearly doubled from EUR 0.47 per kg in 2015 to EUR 0.92 in 2023, though they showed signs of slight decline, possibly reflecting competitive pressures or shifts in product composition.

Kosovo's terms of trade (TOT), which peaked in 2020, have declined in recent years, indicating that import prices have risen faster than export prices. The TOT dropped from 1.42 in 2020 to 1.16 in 2023, suggesting a reduction in

purchasing power due to increased import costs. Rising prices of imported goods, combined with inflationary pressures, have placed financial strain on Kosovo's agricultural sector, underscoring the importance of enhancing local production capacity and diversifying export markets.

Furthermore, the influx of Ukrainian agricultural products into the European Union has intensified competition, particularly impacting Kosovo's raspberry exports by reducing prices and revenue potential for farmers. These shifts underscore the need for Kosovo's agrifood sector to strengthen competitive positioning, improve production efficiency, and reduce reliance on imports to bolster resilience against future global crises.

8. What are farmers' perceptions about the policy support provided to mitigate the negative effects of the food, energy and finance crisis?

What are farmers' perceptions about the policy support provided to mitigate the negative effects of the crisis?	Farmer's perception about the mitigating effects of received policy support targeting the crisis.	Likert scale measure (from 1 to 5)
Preferred policy support package	Farmers opinions about most pressing problems	percent of responses
	Farmers opinions about most preferred policy support	percent of responses

Farmers in Kosovo have mixed perceptions of the policy support provided to mitigate the negative effects of the recent food, energy, and finance crisis. While farmers generally value financial assistance to manage rising operational costs, many feel that the current support measures fall short in key areas, particularly in supporting new technology adoption and environmentally friendly practices.

Pressing challenges and preferred support

Farmers identify climate change (18 percent), labor shortages (17 percent), and high fertilizer costs (15 percent) as their most pressing challenges. These challenges vary by sector, with wheat farmers citing high fertilizer costs and pepper farmers struggling with labor shortages. Farmers overwhelmingly favor Investment Grants, with 68.6 percent choosing this as their top support instrument, indicating a strong need for long-term investments in infrastructure and technology. Additionally,

58.8 percent of those interested in input subsidies prioritize fertilizer support, reflecting high dependency on these essential inputs.

Sector-specific policy needs

Sector preferences reveal specific support needs. For instance, while wheat farmers prioritize investment in infrastructure, raspberry farmers seek substantial input subsidies, especially for fertilizers and pesticides, to reduce production costs. Dairy farmers, who prioritize Investment Grants, also express interest in improving infrastructure and machinery to enhance production efficiency.

Perceptions of crisis mitigation policies

Farmers have a neutral perception of government support in offsetting increased costs due to the Ukraine crisis, with responses divided. Only 23.5 percent feel strongly supported in covering additional farm and

family costs, and many cite bureaucratic hurdles in accessing support. Dissatisfaction is more pronounced in regard to technology adoption and environmentally friendly practices: 33.5 percent and 38.6 percent of farmers, respectively, disagree that adequate support was provided in these areas. The perception that sustainability measures and technological support are insufficient suggests an area for policy improvement.

Overall, farmers in Kosovo highlight the need for accessible, targeted support addressing both immediate financial burdens and long-term productivity enhancements. While Investment Grants are widely appreciated, there is demand for better-targeted input subsidies, risk protection, and income support to sustain sectoral resilience. Addressing these areas with tailored policies could foster a more resilient agricultural sector in Kosovo, better equipped to handle future crises.

9.2. Recommendations

The study results suggest that based on the gross margin per farm (GM/farm)—an indicator that reflects the remuneration of land, labor, and capital—the dairy, wheat, and pepper sectors exhibited similar trends. Large farmers experienced a decline in 2022 compared to 2019 (the first year of the crisis), followed by a recovery in 2023 compared to 2022, indicating adaptation. Interestingly, small and medium farmers showed an upward trend during both periods, suggesting that these categories are less susceptible to external shocks.

Conversely, the remaining two sectors are critically affected by the crisis, though for fundamentally different reasons. The raspberry sector has shown vulnerability across all farm sizes, with a sharp increase in 2022 compared to 2019 and a drastic decrease in 2023 compared to 2022 due to price fluctuations. The vineyard sector exhibits difficulty in recovering. Large farmers saw a significant decrease in 2022 compared to 2019 and some recovery afterward (but still below the 2019 level). Small and medium-sized farms experienced decreases during both periods, particularly small farms, which even marked negative profitability.

Tailored policies are needed for the sectors heavily affected by the crisis:

- **Vineyard sector:** An in-depth analysis is required, focusing particularly on small and medium farms that experienced negative profitability during the crisis. Key questions to address include:

1. What is the importance of small and medium farmers for the wine sector in Kosovo?
2. What is the financial viability of small and medium farming?
3. What policy responses are appropriate, including transitional price support with justification of 'sector in difficulty' (safeguard measure)?

- **Raspberry sector:** This sector needs particular attention due to its vulnerability to external demand and price fluctuations. The main questions to consider are:

1. What market-based mechanisms can address market volatility, including insurance and diversification?
2. What policy packages can effectively address market volatility?

The results also indicate an overall reduction in the use of synthetic fertilizers across sectors, more pronounced in 2022 compared to 2019 (due to a sharp price increase) than in 2023 compared to 2022 (despite price decreases, prices remained higher than in 2019). In response to chemical fertilizer prices remaining high, farmers are seeking alternatives by using organic fertilizers, planning the adoption of new technologies such as drone spraying, and showing a willingness to adopt precision farming.

Despite the tailored focus to address issues in the Vineyard and Raspberry sectors, our understanding is that the time is right time to leverage the current momentum to enhance the sustainability of Kosovo's agriculture and align it with the EU Common Agricultural Policy. The following policy recommendations are designed to serve this purpose.

9.2.1. First category –reduce reliance on synthetic fertilizers and other cross-compliance measures

1.1. Promote the soil test-based plant fertilization policy

Current situation: While attempts have been made to introduce plant nutrition based on chemical soil analysis (raspberry case), fertilization based on soil chemical analysis is limited (or not used at all).

Proposed Measures: The government is advised to consider promoting the soil testing based policy of plant fertilization. The intervention may consider the following steps: (i) Farmers are required to conduct soil tests at least every three years (expert inputs from semi-structured interviews), with (ii) results sent electronically to extension workers, (ii) who would then provide guidance on the appropriate type and amount of fertilizer needed.

Relevance: This measure is essential for farmers, particularly given the need to improve fertilizer efficiency amid persistently high synthetic fertilizer prices. Study findings reveal a reduction in chemical fertilizer use across sectors in 2022 compared to 2019, with pepper farmers showing a notable decrease of 21.3 percent. This downward trend continued into 2023, albeit at a slower rate. For the government, this measure also supports alignment with the Common Agricultural Policy (CAP) 2023-2027, where soil testing could potentially be classified as an eco-scheme.

1.2. Improve current direct payment (per ha) to align with EU CAP policy¹⁰

Current situation: The government provides substantial direct payments per ha across various sectors, reaching up to EUR 1 000 per ha for vineyards. In addition, communes contribute further funding to farmers from their own budgets. Currently, this support is not tied to any cross-compliance requirements – Statutory Management Requirements (SMR) of Good Agricultural and Environment Practices (GAEC).

Proposed Measures: Consider conditioning direct (per ha) payment with fulfillment of feasible Cross Compliance measures. Some realistic conditions could be

- **Soil testing frequency.** *Condition:* Farmers must conduct soil testing at least once every three years to monitor nutrient levels, pH, and organic matter. *Verification:* Farmers would need to submit soil test results from a certified laboratory or an approved local agricultural extension service. The records would show the date, field location, and results verifying compliance.
- **Fertilizer application records.** *Condition:* Farmers are required to maintain detailed records of fertilizer type, application rates, and dates for each field. *Verification:* Regular on-site inspections and submission of fertilizer purchase receipts, along with logbooks or digital records, would allow authorities to verify compliance. Additionally, random soil nutrient tests could be used to check for excess application.
- **Integrated Pest Management (IPM) Adoption.** *Condition:* Farmers must implement at least one IPM practice, such as crop rotation, biological pest control, or restricted pesticide use. *Verification:* Documentation of crop rotation plans, biological control agents purchased, or pesticide application records can be requested. Inspections can confirm these practices are in place, especially in the case of crop rotation and biological control presence in fields.

Refer to Annexes for a more complete list of Cross compliance measures to consider

Relevance: Aligning current direct payments with EU CAP policy benefits farmers by promoting efficient input use and enhancing farming sustainability. Survey data indicate that a majority of farmers—68.6 percent (72 out of 105 respondents)—prefer per-ha payments conditional on adherence to Good Agricultural Practices (GAP). This preference holds significant policy relevance, underscoring the importance of aligning Kosovo agricultural support with EU CAP standards.

¹⁰ Cross compliance measures include Statutory Management Requirements (SMRs) and Good Agricultural and Environmental Conditions (GAECs): SMR are obligations derived from existing EU legislation that all farmers must follow, regardless of whether they receive CAP support. SMRs encompass regulations related to public health, animal and plant health, and animal welfare. GAECs are standards are specifically applicable to farmers receiving CAP payments. GAECs are designed to ensure that land is maintained in a condition conducive to environmental sustainability. They address issues such as soil erosion, soil organic matter levels, and the preservation of habitats.

1.3. Improve implementation of fertilizer and PPP policies and regulations

Current Situation: Insufficient regulation has led to the circulation of low-quality and less effective fertilizers and plant protection products (PPPs). Sector experts stress the importance of ensuring that chemicals available on the market meet quality standards, noting that "before implementing more sophisticated measures like soil tests, we need to ensure the chemicals available are of decent quality and effectiveness." Farmers, especially wheat growers, also view the low quality of chemical inputs as a key factor contributing to declining yields.

Proposed Measures: improve implementation of fertilizer and PPP control. This would call for strengthen institutional capacities and infrastructure.

Relevance: This measure is crucial for farmers, especially considering the need to enhance fertilizer effectiveness also due to the still high prices of synthetic fertilizers. The measure holds also policy relevance since it is related to food safety.

1.4. Promotion of organic fertilizers use

Current situation: After initial hesitation, farmers have begun to recognize the benefits of using pelleted organic fertilizers, leading to an increase in their application. This trend is especially notable among pepper farmers, who raised organic fertilizer use by 25.1 percent in 2023 compared to 2022, reflecting a shift toward more affordable or locally sourced inputs. However, overall application levels remain limited.

Proposed measures: Raising awareness about the benefits of organic matter application and providing training on the optimal quantity and timing of application for different crops should be a primary focus of extension services. Although the cost of organic matter may not be a concern, the government could consider offering promotional pricing until its widespread adoption is achieved.

Relevance: It is crucial for farmers in terms of both plant nutrition and the maintenance and enhancement of soil health. Organic fertilizers not only contain essential nutrients, including a variety of amino acids vital for plant growth, but also harbour microorganisms beneficial for soil health. Given the persistently high costs of synthetic fertilizers, the use of organic matter is

particularly timely. Furthermore, it is significant for the government's efforts to align policies with the Common Agricultural Policy (CAP) for 2023-2027 and the Green Deal agenda.

1.5. Promote innovation and digitalization

Current situation: Innovation in agricultural practices remains limited, with no reported cases of precision farming, biological pest control, or drone use for pest management. Farmers rely on traditional methods, limiting opportunities for optimized input use and environmentally friendly solutions. However, there are plans to introduce drones for pest and disease control, which could allow more precise pesticide application, reduce input costs, and minimize environmental impact. This step reflects a growing interest in technology to support sustainable agriculture.

Proposed measures: Pilot projects may be developed to explore precision farming, biological pest control, and drone use for targeted pest management. Precision farming would optimize inputs like fertilizers and water through data-driven practices, while biological pest control would promote natural predator-pest balance, reducing reliance on chemical pesticides. Drone applications would improve the precision of pesticide use, enabling targeted pest and disease control with minimal environmental impact.

Importance: This measure is crucial given the high costs of fertilizers and plant protection products (PPPs) and the limited availability of labour. It also supports the government's efforts to align agricultural policies with the 2023-2027 Common Agricultural Policy (CAP) and the Green Deal agenda, promoting sustainable and resource-efficient farming practices. The structured survey indicates that one in three farmers in the vineyard and raspberry sectors (34 percent) agree or strongly agree on adopting new technologies. The interest is notably higher in the raspberry sector, where one in two farmers express a willingness to adopt new technology.

1.6. Introduce animal welfare policy

Proposed measures: Option 1 - conditionality: condition per support may be respecting statutory requirements (animal welfare: space, ventilation, light, transport, etc.). Legislation in force may be considered when setting conditionalities. The process may start with feasible requirements and incremental

additions. Option 2 – promoting best practices: increased per-animal support for farmers who have good animal housing conditions and awareness for those who need to improve animal housing

Current situation: In general, farmers have issues with conditions that ensure animal welfare (space, ventilation, housing, transport, etc.). However, some farmers have invested in proper animal housing.

Relevance: Improving animal welfare is crucial for farmers, as it leads to better animal health and higher productivity. It is also significant for the government in its efforts to align policies with the PPBE 2023-2027, focusing on public good provision such as animal welfare. Financial analysis of the dairy sector indicates that the sector has actually benefited from the Ukraine crisis. Based on this positive performance, now is an opportune time to gradually introduce better standards for the sector.

9.2.2. Second category: Measures addressing climate change

2.1. Testing varieties more resistant to climate change (heat, humidity, pests and diseases)

Current situation: Some value chain actors, like the Raspberry Association, have initiated variety testing to explore climate-resistant options with development agency support. However, a coherent policy to improve farming adaptability to climate change, particularly in terms of cultivar adaptability, is still lacking.

Proposed measures: Designate a body (public institutions or private business association) for testing cultivar varieties, develop an action plan, and support its

implementation. The "project may also take the form of public-private partnership – a regulated relation between a public body and several farmers associations.

Relevance: Developing and implementing a coherent policy to improve cultivar adaptability to climate changes in critical for farmers given the frequency of extreme weather conditions which have led to large damages for farmers. This measure should be part of a government strategy to address climate changes issues.

2.2. Improving the design of insurance products to consider the effects of climate change better

Current situation: The government, in collaboration with insurance companies, has taken significant steps to introduce insurance for farmers, marking a major advance in mitigating the negative impacts of climate change. Additionally, a protective measure has been implemented to safeguard farmers against catastrophic events, such as floods. However, farmers have raised concerns about the design of the insurance product.

Proposed measures: MARDF may consider improving current insurance product design by involving farmers, experts, and insurance companies.

Relevance: This is important for compensating farmers given the verified damages. The current situation shows that climate change effects—such as flooding and extreme temperatures—are the leading factors in yield decreases, especially for vineyard farms, where 90 percent of 77 farmers identified it as the main cause, as well as for raspberry farmers (93 percent of 44) and pepper farmers (75 percent of 40).

Box 5. Insurance scheme design

The design of the insurance product is inadequate. For instance, as it stands, if the temperature drops to -5 degrees for two days by April 30, you qualify for 100 percent compensation on costs incurred. However, apple damage can occur at milder temperatures, such as -1 degree during flowering, -2 degrees when fruits are very small, and even -2 degrees when fruits are larger. Under these circumstances, no compensation is provided, leaving farmers unprotected against common temperature variations that can cause significant damage.

Source: Semi-structured interviews.



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11. ANNEXES

11.1. Land use

Land Data Summary - Whole Sample

Variable	Mean	Std.Dev	Median	Min	Max	N.Valid
Owned Land 2023	3.36	3.67	2.28	0	24.03	500
Owned Land 2022	3.32	3.65	2.1	0	24.06	500
Owned Land 2019	3.32	3.64	2.21	0	24.06	500
Land Leased Out 2023	0.05	0.33	0	0	3	500
Land LeasedIn 2023	2.82	5.18	0.5	0	30	500
Land Leased In 2022	2.67	5.11	0	0	30	500
Land Leased In 2019	2.41	5.01	0	0	30	500
Land Lease per ha 2023	276.41	263.77	150	50	1 000	237
Land Lease per ha 2022	264.64	250.6	120	50	1 000	223
Land Lease per ha 2019	264.35	255.83	100	50	1 000	201
Land Area Irrigated 2023	1.66	3.18	0.34	0	20	500
Fallow Land 2023	0.23	0.74	0	0	5	500
Fallow Land 2022	0.21	0.69	0	0	4.33	500
Fallow Land 2019	0.21	0.69	0	0	4.34	500
Land in use 2023	6.18	6.72	3.95	0.12	44.03	500
Land in use 2022	5.99	6.64	3.6	0	44.06	500
Land in use 2019	5.73	6.59	3.5	0	44.06	500

Source: Authors based on survey data.

Land Data Summary - Wheat

Variable	Mean	Std.Dev	Median	Min	Max	N.Valid
Owned Land 2023	4.33	4.52	3	0	24.03	100
Owned Land 2022	4.3	4.53	3	0	24.06	100
Owned Land 2019	4.29	4.52	3	0	24.06	100
Land Leased Out 2023	0.04	0.33	0	0	3	100
Land Leased In 2023	3.94	6.34	2	0	30	100
Land Leased In 2022	3.73	6.17	1.5	0	30	100
Land Leased In 2019	3.57	6.17	1	0	30	100
Land Lease per ha 2023	134.19	66.89	100	100	500	62
Land Lease per ha 2022	123.5	57.51	100	80	400	60
Land Lease per ha 2019	121.75	53.42	100	70	350	57
Land Area Irrigated 2023	1.5	3.19	0	0	20	100
Fallow Land 2023	0.07	0.52	0	0	5	100
Fallow Land 2022	0.02	0.16	0	0	1.5	100
Fallow Land 2019	0.02	0.16	0	0	1.5	100
Land in use 2023	8.26	7.79	5	1	40	100
Land in use 2022	8.03	7.69	5	0	40	100
Land in use 2019	7.86	7.67	5	0	40	100

Source: Authors based on survey data.

Land Data Summary - Pepper

Variable	Mean	Std.Dev	Median	Min	Max	N.Valid
Owned Land 2023	2.94	3.73	1.5	0	24.03	100
Owned Land 2022	2.95	3.74	1.5	0	24.06	100
Owned Land 2019	2.94	3.73	1.5	0	24.06	100
Land Leased Out 2023	0.04	0.24	0	0	2	100
Land Leased In 2023	2.3	3.04	1.3	0	13	100
Land Leased In 2022	1.91	2.69	1	0	13	100
Land Leased In 2019	1.8	2.47	1	0	12	100
Land Lease per ha 2023	531.54	313.07	500	50	1 000	65
Land Lease per ha 2022	515.83	284.26	500	50	1 000	60
Land Lease per ha 2019	511.53	279.89	500	50	1 000	59
Land Area Irrigated 2023	3.33	3.36	2	0	15	100
Fallow Land 2023	0.06	0.29	0	0	2	100
Fallow Land 2022	0.07	0.33	0	0	2	100
Fallow Land 2019	0.07	0.33	0	0	2	100
Land in use 2023	5.24	4.92	3.5	0.5	25	100
Land in use 2022	4.86	4.63	3	0.5	25	100
Land in use 2019	4.74	4.55	3.1	0.5	25	100

Source: Authors based on survey data.

Land Data Summary - Vineyard

Variable	Mean	Std.Dev	Median	Min	Max	N.Valid
Owned Land 2023	2.55	1.78	2.1	0.12	10	100
Owned Land 2022	2.56	1.78	2.1	0.12	10	100
Owned Land 2019	2.56	1.78	2.1	0.12	10	100
Land Leased Out 2023	0.1	0.48	0	0	3	100
Land Leased In 2023	0.75	2.06	0	0	13	100
Land Leased In 2022	0.78	2.14	0	0	13	100
Land Leased In 2019	0.8	2.22	0	0	13	100
Land Lease per ha 2023	320	316.4	125	50	1 000	10
Land Lease per ha 2022	320	316.4	125	50	1 000	10
Land Lease per ha 2019	300	271.83	125	50	800	10
Land Area Irrigated 2023	0.09	0.36	0	0	3	100
Fallow Land 2023	0.22	0.74	0	0	5	100
Fallow Land 2022	0.19	0.68	0	0	4.33	100
Fallow Land 2019	0.19	0.68	0	0	4.34	100
Land in use 2023	3.31	2.98	2.5	0.12	17	100
Land in use 2022	3.34	3.03	2.5	0.12	17	100
Land in use 2019	3.35	3.08	2.5	0.12	17	100

Source: Authors based on survey data.

Land Data Summary - Raspberry

Variable	Mean	Std.Dev	Median	Min	Max	N.Valid
Owned Land 2023	2.13	2.12	1.5	0	12	100
Owned Land 2022	2.12	2.14	1.5	0	12	100
Owned Land 2019	2.12	2.14	1.5	0	12	100
Land Leased Out 2023	0.06	0.37	0	0	3	100
Land Leased In 2023	0.31	0.86	0	0	6.3	100
Land Leased In 2022	0.28	0.85	0	0	6.3	100
Land Leased In 2019	0.21	0.8	0	0	6.3	100
Land Lease per ha 2023	341.39	296.23	220	80	1 000	18
Land Lease per ha 2022	380	306.87	300	80	1 000	15
Land Lease per ha 2019	400	323.11	400	80	1 000	13
Land Area Irrigated 2023	0.88	1.2	0.5	0	10	100
Fallow Land 2023	0.76	1.15	0.25	0	5	100
Fallow Land 2022	0.69	1.11	0	0	4.33	100
Fallow Land 2019	0.7	1.12	0	0	4.34	100
Land in use 2023	2.44	2.09	1.97	0.2	12	100
Land in use 2022	2.39	2.12	1.87	0	12	100
Land in use 2019	2.33	2.14	1.55	0	12	100

Source: Authors based on survey data.

Land Data Summary - Dairy

Variable	Mean	Std.Dev	Median	Min	Max	N.Valid
Owned Land 2023	4.82	4.52	4	0	24.03	100
Owned Land 2022	4.69	4.44	3.75	0	24.06	100
Owned Land 2019	4.69	4.44	3.75	0	24.06	100
Land Leased Out 2023	0	0	0	0	0	100
Land Leased In 2023	6.83	7.24	4.75	0	30	100
Land Leased In 2022	6.64	7.35	4.25	0	30	100
Land Leased In 2019	5.65	7.55	3	0	30	100
Land Lease per ha 2023	162.13	101.24	100	75	600	82
Land Lease per ha 2022	150.71	83.46	100	75	500	78
Land Lease per ha 2019	126.05	66.15	100	70	500	62
Land Area Irrigated 2023	2.5	4.6	0.18	0	20	100
Fallow Land 2023	0.06	0.36	0	0	3	100
Fallow Land 2022	0.08	0.5	0	0	4	100
Fallow Land 2019	0.07	0.43	0	0	3	100
Land in use 2023	11.65	8.47	9	2	44.03	100
Land in use 2022	11.34	8.59	9	2	44.06	100
Land in use 2019	10.35	8.97	7	1	44.06	100

Source: Authors based on survey data.

Statistical analysis of changes only for Land in USE at entire sample level and by product, as well as land lease per ha only at entire sample level

Land area in use – entire sample

A Friedman test was conducted to assess differences in land_area_inUSE_2019 across 2019, 2022, and 2023. The test indicated a statistically significant difference in land_area_inUSE_2019 across these time points ($\chi^2 = 34.452$, $df = 2$, $p\text{-value} = 3.3e-08$).

This suggests that changes in land_area_inUSE_2019 were not random, and significant variation exists between the years.

To further understand the direction of these changes, post-hoc pairwise comparisons were conducted using the Wilcoxon signed-rank test with Bonferroni adjustment to control for multiple comparisons. The results of the pairwise comparisons are as follows:

2019 vs 2022: The adjusted p-value was $8.83e-05$, indicating a statistically significant increase in land_area_inUSE_2019 from 2019 to 2022.

2019 vs 2023: The adjusted p-value was $7.3e-08$, indicating a statistically significant increase in land_area_inUSE_2019 between 2019 and 2023.

2022 vs 2023: The adjusted p-value was 0.00169 , indicating a statistically significant increase in land_area_inUSE_2019 from 2022 to 2023.

Land area in use – wheat

A Friedman test was conducted to evaluate differences in land_area_inUSE_2019 across the years 2019, 2022, and 2023. The test indicated a non-statistically significant difference in land_area_inUSE_2019 across these time points (chi-squared = 2.710, df = 2, p-value = 0.258)

Land area in use – pepper

A Friedman test was conducted to evaluate differences in land_area_inUSE_2019 across the years 2019, 2022, and 2023. The test indicated a **non-statistically significant difference** in land_area_inUSE_2019 across these time points (chi-squared = 3.735, df = 2, p-value = 0.154).

Land area in use – vineyard

A Friedman test was conducted to evaluate differences in land_area_inUSE_2019 across the years 2019, 2022, and 2023. The test indicated a **non-statistically significant difference** in land_area_inUSE_2019 across these time points (chi-squared = 1.077, df = 2, p-value = 0.584).

Land area in use – Raspberry

A Friedman test was conducted to evaluate differences in land_area_inUSE_2019 across the years 2019, 2022, and 2023. The test indicated a statistically significant difference in land_area_inUSE_2019 across these time points (chi-squared = 18.865, df = 2, p-value = 8.01e-05). This suggests that changes in land_area_inUSE_2019 were not random, and significant variation exists between the years.

To further understand the direction of these changes, post-hoc pairwise comparisons were conducted using the Wilcoxon signed-rank test with Bonferroni adjustment to control for multiple comparisons. The results of the pairwise comparisons are as follows:

2019 vs 2022: The adjusted p-value was 0.177, indicating a non-significant change in land_area_inUSE_2019 from 2019 to 2022.

2019 vs 2023: The adjusted p-value was 0.00755, indicating a statistically significant increase in land_area_inUSE_2019 between 2019 and 2023.

2022 vs 2023: The adjusted p-value was 0.0424, indicating a statistically significant increase in land_area_inUSE_2019 from 2022 to 2023.

Land area in use – Dairy

A Friedman test was conducted to evaluate differences in land_area_inUSE_2019 across the years 2019, 2022, and 2023. The test indicated a statistically significant difference in land_area_inUSE_2019 across these time points (chi-squared = 25.489, df = 2, p-value = 2.92e-06). This suggests that changes in land_area_inUSE_2019 were not random, and significant variation exists between the years.

To further understand the direction of these changes, post-hoc pairwise comparisons were conducted using the Wilcoxon signed-rank test with Bonferroni adjustment to control for multiple comparisons. The results of the pairwise comparisons are as follows:

2019 vs 2022: The adjusted p-value was 0.00104, indicating a statistically significant increase in land_area_inUSE_2019 from 2019 to 2022.

2019 vs 2023: The adjusted p-value was 0.000102, indicating a statistically significant increase in land_area_inUSE_2019 between 2019 and 2023.

2022 vs 2023: The adjusted p-value was 0.08, indicating a non-significant change in land_area_inUSE_2019 from 2022 to 2023.

Land Lease payment - entire sample

A Friedman test was conducted to evaluate differences in land_rent_per_ha_2019 across the years 2019, 2022, and 2023. The test indicated a statistically significant difference in land_rent_per_ha_2019 across these time points (chi-squared = 69.355, df = 2, p-value = 8.7e-16). This suggests that changes in land_rent_per_ha_2019 were not random, and significant variation exists between the years.

To further understand the direction of these changes, post-hoc pairwise comparisons were conducted using the Wilcoxon signed-rank test with Bonferroni adjustment to control for multiple comparisons. The results of the pairwise comparisons are as follows:

2019 vs 2022: The adjusted p-value was 2.17e-05, indicating a statistically significant increase in land_rent_per_ha_2019 from 2019 to 2022.

2019 vs 2023: The adjusted p-value was 3.44e-08, indicating a statistically significant increase in land_rent_per_ha_2019 between 2019 and 2023.

2022 vs 2023: The adjusted p-value was 2e-05, indicating a statistically significant increase in land_rent_per_ha_2019 from 2022 to 2023.

11.2. Labor use

The share of farm households that had at least one member e/migrate between 2012-2023 is 30 percent.

Household Emigration Information

Variable	Mean	Std.Dev	Q1	Median	Q3	N.Valid
Number of Household Members Emigrated 2012-2023	2.46	1.92	1	2	4	150
Household Members Emigrated 2012-2018	1.9	1.61	1	1	2	90
Household Members Emigrated 2019-2023	1.88	1.35	1	1	3	101

Source: Authors based on survey data.

Farm Household Emigration Proportions by Product Type and Emigration Period

Product Type	Only 2012-2018	Only 2019-2023	In Both Periods
Entire Sample	11.00 percent	13.60 percent	5.40 percent
Wheat	19.00 percent	5.00 percent	2.00 percent
Pepper	17.00 percent	16.00 percent	10.00 percent
Vineyard	18.00 percent	17.00 percent	11.00 percent
Raspberry	8.00 percent	9.00 percent	2.00 percent
Dairy	6.00 percent	8.00 percent	2.00 percent

Source: Authors based on survey data.

For those farm households that had household members emigrate between 2012-2023, 5 percent state to have returning migrants

Village-Level Information - perceptual

Variable	Mean	Std.Dev	Q1	Median	Q3	N.Valid
Village Households Before 2019	226	267.7	25	110	300	499
Village Households in 2023	235.5	278.2	23	120	340	499
Households with Production Before 2019	99.38	127.9	10	30	156	499
Households with Production in 2023	73.57	106.8	6	20	100	499

Source: Authors based on survey data.

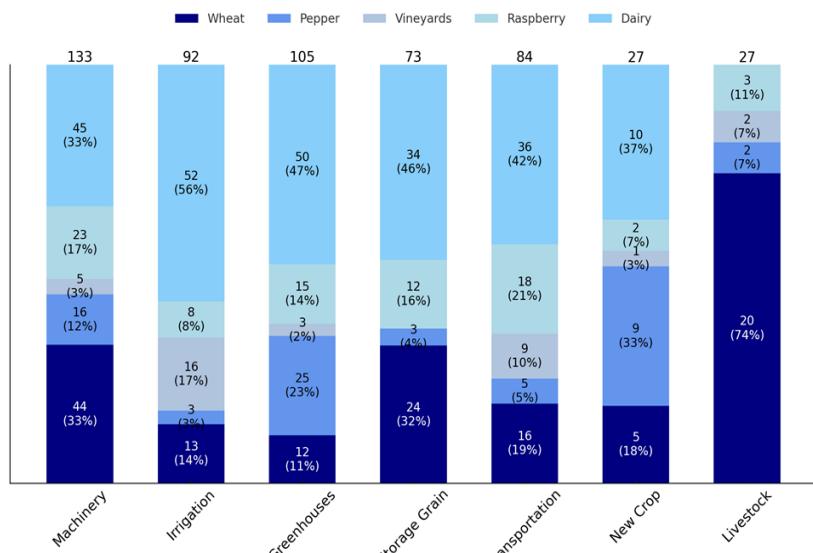
Change in Households with Production (2019-2023) by Product Type

Product Type	Mean Change (percent)	SD Change (percent)	Median Change (percent)
Entire Sample	-26.6 percent	38.6 percent	-25.0 percent
Wheat	-22.4 percent	39.0 percent	-21.5 percent
Pepper	-19.4 percent	38.7 percent	-20.0 percent
Vineyard	-24.3 percent	31.7 percent	-16.7 percent
Raspberry	-19.6 percent	38.9 percent	-20.5 percent
Dairy	-47.2 percent	37.9 percent	-50.0 percent

Source: Authors based on survey data.

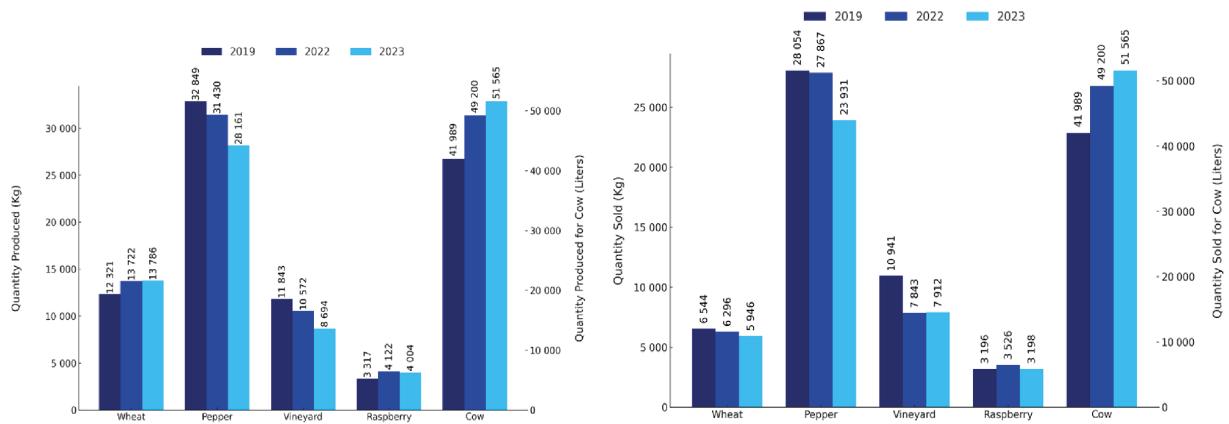
11.3. Investment

Figure 62. Investment type by sectors



Source: Authors based on survey data.

11.4. Production and sales



11.5. Gross margin per full time worker

Gross margin for all farmers – regardless farm size

Gross margin per full time worker: whole sample

	Mean	Q1	Median	Q3
Gross_margin_2023	4 578	178	1 315	6 597
Gross margin_ 2022	4 400	319	1 751	5 110
Gross margin_ 2019	3 387	241	1 028	3 684

Source: Authors based on survey data.

Gross margin per full time worker: wheat

	Mean	Q1	Median	Q3
Gross_margin_2023	749	34	232	1 159
Gross margin_ 2022	675	92	436	1 267
Gross margin_ 2019	590	78	336	792

Source: Authors based on survey data.

Gross margin per full time worker: pepper

	Mean	Q1	Median	Q3
Gross_margin_2023	9 203	2 823	7 013	12 996
Gross margin_ 2022	6 305	1 655	4 383	7 965
Gross margin_ 2019	5 939	1 178	3 562	7 397

Source: Authors based on survey data.

Gross margin per full time worker: vineyard

	Mean	Q1	Median	Q3
Gross_margin_2023	1 018	-271	67	827
Gross margin_ 2022	971	-148	277	1 012
Gross margin_ 2019	1 457	96	475	1 613

Source: Authors based on survey data.

Gross margin per full time worker: raspberry

	Mean	Q1	Median	Q3
Gross_margin_2023	1 813	243	737	1 275
Gross margin_ 2022	7 841	1 566	2 909	5 091
Gross margin_ 2019	3 492	380	901	2 048

Source: Authors based on survey data.

Gross margin per full time worker: dairy

	Mean	Q1	Median	Q3
Gross_margin_2023	9 310	3 615	7 199	14 456
Gross margin_ 2022	5 472	872	4 243	8 402
Gross margin_ 2019	4 955	139	3 521	7 072

Source: Authors based on survey data.

11.6. Cross compliance measures to be considered

1. Soil testing frequency

- **Condition:** Farmers must conduct soil testing at least every three years to monitor nutrient levels, pH, and organic matter.
- **Verification:** Farmers would need to submit soil test results from a certified laboratory or an approved local agricultural extension service. The records would show the date, field location, and results, verifying compliance.

2. Fertilizer application records

- **Condition:** Farmers must maintain detailed records of fertilizer type, application rates, and dates for each field.
- **Verification:** Regular on-site inspections and submission of fertilizer purchase receipts, along with logbooks or digital records, would allow authorities to verify compliance. Additionally, random soil nutrient tests could be used to check for excess application.

3. Water use monitoring (for irrigated fields)

- **Condition:** Farmers using irrigation must record water usage and, where feasible, employ water-saving techniques like drip or sprinkler systems.
- **Verification:** Water use can be verified through records from irrigation meters or, if unavailable, estimated based on field inspections and documented usage patterns. Farmers can also be required to report water-saving equipment purchases.

4. Cover crop or residue management during off-season

- **Condition:** Farmers must ensure that at least 30 percent of the soil surface is covered by either cover crops or crop residues during the non-growing season.
- **Verification:** Field inspections can verify cover crops or crop residues, and remote sensing technology (e.g., satellite or drone imagery) could periodically monitor compliance for larger fields. Documentation of cover crop seed purchases also provides proof.

5. Buffer zones near water bodies

- **Condition:** A buffer strip of at least 3-5 meters must be maintained along rivers, streams, or lakes, where no fertilizer or pesticides are applied.
- **Verification:** Buffer zones can be verified through field inspections, especially during the growing season when fertilizer and pesticide application are common. Aerial or satellite imagery can also help confirm buffer zone compliance.

6. Integrated Pest Management (IPM) Adoption

- **Condition:** Farmers must implement at least one IPM practice, such as crop rotation, biological pest control, or restricted pesticide use.
- **Verification:** Documentation of crop rotation plans, biological control agents purchased, or pesticide application records can be requested. Inspections can confirm these practices are in place, especially in the case of crop rotation and biological control presence in fields.

7. Manure Storage and Composting for Organic Waste

- **Condition:** Manure must be stored in a designated, covered area to prevent leaching, and organic waste should be composted properly if applied to fields.
- **Verification:** Inspectors can verify compliance by checking the designated storage and composting areas during site visits. Receipts for storage equipment or compost bins also serve as proof.

8. Hedgerows or Agroforestry on Field Boundaries

- **Condition:** Farmers must maintain hedgerows, tree rows, or flower strips along field boundaries to support biodiversity.
- **Verification:** Field visits and remote sensing can confirm the presence of these biodiversity supporting features. Records of tree or plant purchases could also support compliance.

9. Digital or Paper Records for Crop and Input Usage

- **Condition:** Farmers must keep records of crop types, pesticide and fertilizer applications, and irrigation dates.
- **Verification:** Inspectors can review records during field visits or request submission of copies. Records should be detailed, showing quantities, dates, and application methods.

These verifiable conditions balance sustainability with practicality, providing Kosovo farmers with achievable steps towards responsible land use. Adopting these measures could also aid in preparing Kosovo's agricultural sector for potential future alignment with EU standards and regulations.



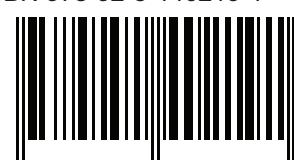
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