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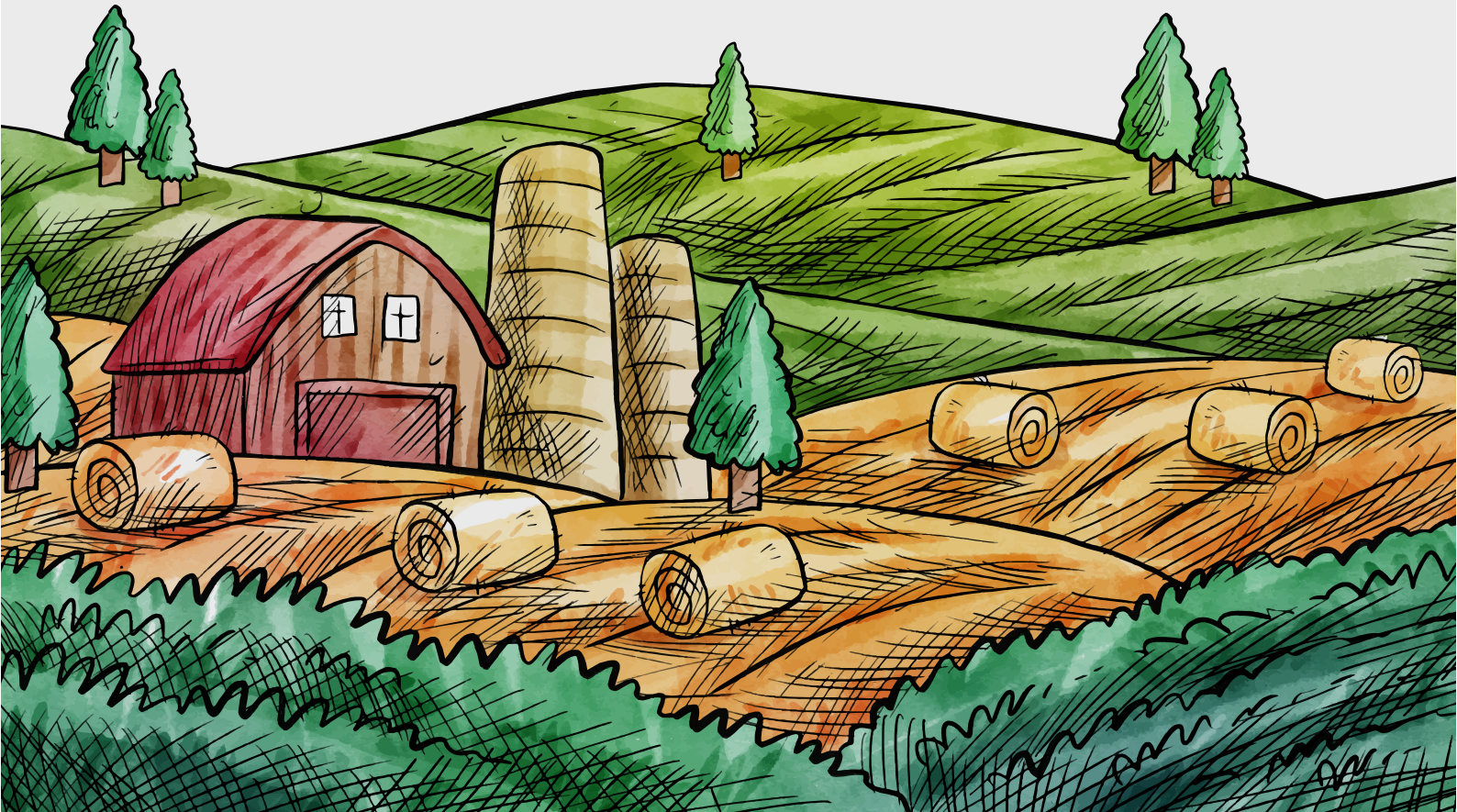
МРЕЖА ЗА РУРАЛНИ РАЗВОЈ СРБИЈЕ

NATIONAL POLICY ON SUSTAINABLE FOOD SYSTEMS AND LIVELIHOODS IN RURAL AREAS OF THE REPUBLIC OF SERBIA

- POLICY RECOMMENDATIONS –

SERBIA, JUNE 2025.

Prepared by Slobodan Ljubojević



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NATIONAL POLICY ON SUSTAINABLE FOOD SYSTEMS AND LIVELIHOODS IN RURAL AREAS OF THE REPUBLIC OF SERBIA
- Policy recommendations -

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Content

Use of Key Terms

The project "Farm to Fork Academy for a Green Western Balkans - Our Common European Future" - the project is being implemented in the Western Balkans region and is being implemented by six National Rural Development Networks (NRDNs) from the Western Balkans and Croatia. The project focuses on the EU integration and convergence processes of the Western Balkans in the agriculture and rural development sector, and through the promotion of a green and just transition in the region based on the contribution of civil society actors.

Farm to Fork Strategy - the European Union's plan for creating a sustainable food system that is fair, healthy and environmentally friendly, in line with the objectives of the European Green Deal. Launched in 2020, it aims to achieve climate neutrality by 2050 by ensuring food security and accessibility, while reducing the use of pesticides and fertilizers, increasing organic farming, promoting healthy diets and minimising food waste and waste.

European Green Deal - a set of policy initiatives by the European Commission with the overarching goal of making the European Union (EU) climate neutral by 2050. The plan is to review every existing law based on its climate benefits, and also to introduce new laws on the circular economy (CE), building renovation, biodiversity, agriculture and innovation.

EU Common Agricultural Policy - one of the oldest policies of the European Union, created in 1962. It aims to provide sufficient food, preserve natural resources, support rural development, ensure a decent standard of living for farmers and offer diverse and safe products to citizens.

Sustainable food value chain development (SFVCD) - a market-oriented, systemic approach to improving economic, social and environmental performance at all stages of food production and distribution.

National Expert (NExp) - an expert engaged within the project "Farm to Fork Academy for a Green Western Balkans - Our Common European Future" to prepare a national report and a national policy document.

National Report (NRep) - a report on the situation of smallholder farmers in two selected food value chains in Serbia prepared within the project "Farm to Fork Academy for a Green Western Balkans - Our Common European Future".

Food Value Chain (FVC) - an interconnected network of stakeholders and activities that add value and transform agricultural raw materials into food products for consumers, from agricultural production, through processing, distribution and retail, to consumption and disposal.

Executive Summary

The policy paper was prepared within the framework of the regional initiative "Farm to Fork Academy for a Green Western Balkans – Our Common European Future", which supports the alignment of the Western Balkan countries with the objectives and policies of the European Union, primarily the Green Deal and the Common Agricultural Policy (CAP).

The paper represents a contribution to the process of policy-making and addressing the challenges of establishing sustainable food systems and creating strategic directions for the implementation of a green and just transition in the agricultural sector, and in particular in supporting the preservation of small farms. The purpose of the National Policy Paper on Sustainable Food Systems and Livelihoods in Rural Areas is to provide guidance for improving the paprika – Ajvar (aye-var) production value chain, in order to contribute to achieving better results for all actors within the value chain and to support the sustainability of small farms. The guidelines were developed through a participatory process with stakeholders, using internationally recognized methodologies.

In the first phase of the project, the "broader" sectors were analyzed: vegetable production and grape production/viticulture, while this document focuses on the specific value chain of red pepper production and its processing into Ajvar on small farms. It should be especially emphasized that during the preparation of the document, the traditional processing of peppers into Ajvar was considered, as well as the existence of protection of the geographical indication Leskovački domači Ajvar. The methodology for the preparation was the UN FAO document "Development

of Sustainable Food Value Chains - Guiding Principles", based on which the economic, social and environmental dimensions of the sustainability of the value chain were assessed.

A combined method was used to prepare this document:

- determining the numbers of participants from the consultative workshops;
- collecting data from semi-structured interviews with stakeholders;
- conducting desk research.

Although the document focuses on a specific value chain and provides guidelines for policy interventions to improve this sector, it can also serve as a template for other sectors. At the micro level, it can contribute to strengthening the resilience of the food system and can support rural livelihoods by applying an ecological sustainability model.

Traditional red pepper production based on and processed into Ajvar in the traditional way, represent significant potential for small producers and small farms in Serbia. This type of production provides diversification of household income and some flexibility in terms of selling raw materials and finalizing the product. Ajvar is prepared in a traditional way, so investments in the technological process are not too large, and revenues can be significant. Within this production chain, all gender and age categories of the population are represented, and especially socially vulnerable groups, which gives special value to this chain. Most of the income remains within the value chain in rural areas.

The market shows a constant demand for quality authentic rural products. The sector has potential for growth, but faces constant challenges such as: climate change, demanding production, variability of input prices, small processing capacities, depopulation of villages and lack of labor, insufficient association of producers and cooperation within the chain.

Part of the response to these challenges is given in policy recommendations that should contribute to improving the performance of the entire chain.

The policy recommendations for the red pepper-Ajvar value chain include institutional support at all stages, from the cultivation stage, through the processing stage, to the sales, marketing and distribution stages. The recommendations also include improving the legislative framework to support value chains, as well as training and capacity building of all actors within the value chain. The recommendations also take into account the creation of an enabling environment for smallholder farmers and producers of traditional food products, as well as the creation of a stimulating environment for the implementation of environmentally sustainable practices. The document provides insight into the current state of the sector, analyzes strengths, weaknesses and challenges, but also identifies opportunities for improving the sector. Using the FAO guidelines for assessing economic, social and environmental sustainability, the document defines specific national policy recommendations, with the aim of strengthening the resilience and sustainability of the red pepper-Ajvar value chain.

I. Introduction

The regional project "Farm to Table Academy for a Green Western Balkans – Our Common European Future" is being implemented as a regional project implemented in 6 Western Balkan countries by national rural development networks. The project aims to support the alignment of policies in the Western Balkan countries with the objectives of the European Union Green Deal and the Common Agricultural Policy (CAP). The overall objective of the project is: Strengthening the contribution of civil society organizations and networks of civil society organizations (and other stakeholders in rural areas) and their influence in implementing the EU integration and approximation process in the Western Balkans in the agriculture and rural development sector by promoting a green and just transition in the region.

The project implements a series of activities that contribute to the achievement of the project objective, and are aimed at supporting the participatory definition of recommendations for creating policies to support the red pepper - Ajvar value chain in Serbia.

The participatory process itself included consultations with stakeholders in the early phase, primarily small agricultural holdings in two value chains (grapes - wine and vegetables). In addition to the consultative process, both chains were analyzed through a comprehensive analysis of both the legislative framework and all other relevant data (statistical data, other analyses, etc.).

After a comprehensive analysis and organization of the consultative process related to the two aforementioned value chains, significant potential was identified in the vegetable production and processing sector. Based on the identified potential, the red pepper - Ajvar value chain was selected.

Using the UN FAO document "Development of Sustainable Food Value Chains - Guiding Principles" as a basis, a case study of the selected value chain was conducted. The analysis specifically addresses the measurement of three sustainability parameters, namely economic, social and environmental.

Serbia has good conditions for vegetable production (quality soil, climatic conditions, tradition in production, etc.) and in terms of the area under vegetable production, the Republic of Serbia ranks 67th in the world, or 10th in Europe. The share of vegetable production in total agricultural production is around 8%.

Small family farms engaged in "mixed" production predominate in Serbia. According to data, around 1.5% of family farms specialize in vegetable production, but this number is significantly higher, as a large number of households produce vegetables for their own needs with certain market surpluses. With better organization and innovative solutions in the production value chain, these surpluses can be increased and represent significant potential for growth both quantitatively and qualitatively.

In recent years, around 100 small producers have emerged, producing Ajvar in the traditional way. These are mainly family initiatives, although some of them hire a certain number of workers from the local community during the season. Most of them are primary producers of red pepper, which processes part of their production into Ajvar. On an annual basis, these farms process from 8,000 to 25,000 kilograms of red pepper and deliver between 2,500 and 8,000 kilograms of Ajvar to the market from their own production per farm (about 35 kg of Ajvar is obtained from

100 kg of pepper). They mainly sell Ajvar online and thus have regular customers.

The analysis of the red pepper-Ajvar production value chain was prepared by combining the national expert report from the previous phase, stakeholder consultations, discussions at national workshops, and the collection and analysis of secondary data.

The vegetable growing and processing sector has a strong potential for sustainable growth, especially in areas with traditional knowledge and good natural conditions, but it also faces ongoing challenges (variations in raw material production due to climate change, lack of labor and limited production capacities due to traditional production technology, to limited market access, low use of the protection of the Leskovac Home-made Ajvar designation of origin and weak producer organizations. Addressing these challenges requires a comprehensive approach that provides institutional support based on the policy instruments available to support its development. At its core, the document is focused on one value chain, but the methodological approach and findings have the potential to initiate the improvement of the national strategic framework for the development of sustainable food chains in the vegetable growing sector and other similar sectors (e.g. fruit growing, dairy sector...), through a developed model that can be replicated in other sectors.

The document is structured in a way that provides insight into the comprehensive analysis and the resulting practical policy proposals for ensuring an enabling environment for the sustainable development of agriculture and rural areas. The document is structured as follows:

- an introduction containing the background and objectives of the document;
- the second section describes the methodological approach;
- the third section provides an overview of the context of the national food value chain, with a special emphasis on the red wig - Ajvar value chain.
- the fourth section presents an analysis across three dimensions of sustainability - economic, social and environmental;

- the fifth section consists of targeted national policy recommendations, with the aim of strengthening the resilience and sustainability of the red wig - Ajvar value chain.

- the final section presents the key findings.

II. Methodology

The methodology used to prepare this document is based on the principles developed by the Food and Agriculture Organization of the United Nations (FAO) published in the handbook "Developing Sustainable Food Value Chains – Guiding Principles". The handbook lists 10 principles as a paradigm for creating, analyzing or restructuring sustainable food value chains. The ten principles are:

1) Economic sustainability: SFVCD must begin with the identification of significant and realistic opportunities to add economic value ("profitability").

2) Social sustainability: SFVCD requires added value through broad-based benefits to society and does not have socially unacceptable costs ("inclusiveness").

3) Environmental sustainability: SFVCD depends on minimizing negative impacts on non-renewable or slowly renewable natural resources on which a given agri-food system critically depends ("greening").

4) Dynamic/systemic processes: SFVCD must be able to recognize and identify the root causes of poor performance and be ready to address and improve weak points.

5) Management-oriented principle: SFVCD must take into account behavioral and management mechanisms, thus recognizing the heterogeneity of the stakeholders involved.

6) End-market-oriented principle: SFVCD must be directly and clearly linked to growth opportunities in the end market (quantity, quality, environmental contribution...).

7) Vision/strategy-oriented principle: SFVCD must have a core strategy to target realistic goals/points/stakeholders in order to be effective.

8) Upgrade-oriented principle: SFVCD must have room for innovation and upgrade, in order to improve performance/competitiveness.

9) Scalability: SFVCD must have room for growth or for transposition into the wider community/society, in order to facilitate the development of an increasing number of jobs around and within it.

10) Multilaterality: SFVCD is multilateral, meaning that both the private sector, as the driver of the process, and the public sector, donors and civil society, as feedback partners, intermediaries; all must be involved in SFVCD, addressing challenges such as system resilience, together with socio-ecological challenges.

These ten illustrated principles support continuous performance improvement across the three phases of the venture capital development cycle:

- The first phase, measuring performance, assesses venture capital in terms of the economic, social and environmental outcomes it delivers relative to its potential (Principles 1, 2 and 3).

- The second phase, understanding performance, uncovers the root causes of poor performance by considering how venture capital stakeholders and their activities are connected to each other and to their economic, social and natural environments in the system (Principle 4); how these connections drive the behavior of individual stakeholders in terms of their commercial behavior (Principle 5); and how value determination in end markets drives system dynamics (Principle 6).

- The third phase, Performance Improvement, follows a logical sequence of execution of the basic venture capital development strategy based on the analysis conducted in the second phase and the vision agreed upon by stakeholders (Principle 7) and selects upscaling activities and multilateral partnerships that can realistically achieve the envisaged scope of impact (Principles 8, 9 and 10).

For the current phase in which project partners define national proposals for policy improvement, the methodology primarily focuses on Phase 1 Performance Measurement and the three principles that belong to it.

Using the three principles of the SFVCD, it has been possible to measure the performance of the value chain through the prism of economic, social and environmental sustainability (FAO, 2014). These dimensions follow a natural order of priority:

- Economically, the value chain must provide sustainable profitability for all stakeholders while ensuring short-term sustainability.

- Social, promotes inclusiveness and fair distribution of value, while avoiding unacceptable practices (e.g. unsafe working conditions), which is necessary for medium-term sustainability.

- Environmental, the chain must add value without overexploitation of natural resources, thus ensuring long-term sustainability.

Although these elements are applied separately, in practice they often overlap, all with the aim of ensuring the achievement of market standards that encompass all three elements.

In this document, in order to support the establishment of national policies related to the development of sustainable food chains, a structured multi-stage process has been implemented:

Step 1) Verification of the report "National Report on the Position of Farmers in the Value Chain in Serbia" against the elements of phase 1 "Measuring Performance" (in accordance with the proposed UN FAO manual).

The National Expert (NExp) reviewed their National Report (NRep) and conducted a performance measurement for the described Food Value Chain (FVC): economic, social and environmental impacts.

Step 2) Rearrangement of the required elements for the National Policy proposals for a Sustainable Food Chain, where the principles of the phased performance measurement (economic, social and environmental) are the backbone of the proposal.

Step 3) Evaluation of each element within the principles of the phased performance measurement (economic, social and environmental), based on the criteria/scale:

- Minimum score: the element does not ensure, or even reduces, sustainability;

- Medium score: the element is neither harmful nor supportive of sustainability;

- Maximum score: the element improves sustainability.

The proposed scale ranged from 1 to 3, i.e. between minimum, medium and maximum scores (it is up to NExp to determine whether there is enough information for a more precise assessment of the elements!).

Step 4) Revision of the final National Policy for a Sustainable Food Chain for Serbia, in order to be ready for presentation in the form of a National Strategy "From Farm to Fork" (according to EC, 2020), which accounts for the contribution of each element of sustainability to the value of the national food chain:

- Ensuring that the food chain, which includes food production, transport, distribution, marketing and consumption, has a neutral or positive impact on the environment; NExp summarized the conclusions based on the assessment of the economic impact elements, along with possible recommendations for improving the elements with the minimum number of points.

- eversing biodiversity loss; NExp summarized the opportunities for biodiversity improvement found through the review of the environmental elements.

- Helping to mitigate climate change and adapt to its impacts; NExp recommended possible responses related to this segment of environmental protection.

- Ensuring food security, nutrition and public health; NExp provided a proposed response for a proposed national food value chain based on all elements, as a synthesis of sustainable levels and proposed improvements based on the NRep.

- Preserving food accessibility, while generating more equitable economic returns in the supply chain, so that ultimately the most sustainable food also becomes the most accessible.

Step 5) The final step, the creation of the final National Policy for a Sustainable Food Chain, where the NExp has linked the proposal to existing national policies, strategies and laws that are legally binding and mandatory for the topic of this proposal.

III. National Food Value Chain Analysis

Serbia has good conditions for growing red pepper (quality soil, favorable climate, tradition in production, etc.). It is used fresh, as well as for preparing Ajvar and other products in a traditional and industrial way. Red pepper is mostly produced in the lowland region of Vojvodina and in the Morava region (the area of the Morava River with all its tributaries). Red pepper is grown in open fields, in gardens and on fields, as well as in various forms and types of greenhouses. In the production of red pepper, the conventional production method prevails, but in recent years organic producers have also appeared. Production significantly exceeds domestic needs, so significant quantities are exported, mainly as processed products. In addition to high-quality raw materials, Serbia has a deep-rooted tradition of preparing Ajvar and other types of preserved vegetable

for winter. Ajvar is prepared during the autumn months according to a traditional recipe and a well-established technological process that is characteristic of this climate (the best quality red pepper is roasted on a wood-fired stove, peeled and ground by hand, and then stewed on a wood-fired stove; variations include the addition of roasted eggplant, hot pepper, or some other natural ingredients). This way, a long-lasting and high-quality product is obtained, which is mostly consumed until the next season. Ajvar is prepared in this way in rural areas, but since in the Republic of Serbia the largest number of inhabitants live in urban areas (62.1%) where the possibilities for preparing Ajvar in the described way are limited, it has opened up the possibility for enterprising rural households to expand their production and produce larger quantities of Ajvar for sale. In recent years, around 100 small producers have emerged who produce Ajvar in the traditional way. These are mostly family initiatives, although some of them hire a certain number of workers from the local community during the season. Most of them are primary producers of red pepper, who process part of their production into Ajvar. On an annual basis, these farms process from 8,000 to 25,000 kilograms of red pepper and deliver from 2,500 to 8,000 kilograms of Ajvar to the market from their own production per farm (about 35 kg of Ajvar is obtained from 100 kg of pepper). They mainly sell Ajvar online and thus have regular customers. Most farms have their own social media pages through which they establish contact with customers, and there are also several web platforms that bring together small food producers in Serbia and enable them to advertise, market and sell their products in larger cities. Customers on the platform have the opportunity to access higher-quality food products, as well as to share their impressions of the producers with others. Of course, the safest sales method is to sell to existing customers who directly recommend the product to people in their immediate environment.

Since 2020, the Regulation on the Production and Trade of Small Quantities of Food of Plant Origin has been in force in Serbia, which prescribes the conditions for placing small quantities of food on the market, types of food, areas where small quantities of food can be placed on the market, adjustments or deviations from food hygiene requirements that apply to facilities where small quantities of food are produced and where traditional methods are applied in certain stages of food production, processing and trade, and where food with traditional characteristics is handled, as well as in facilities located in areas where there are special geographical restrictions.

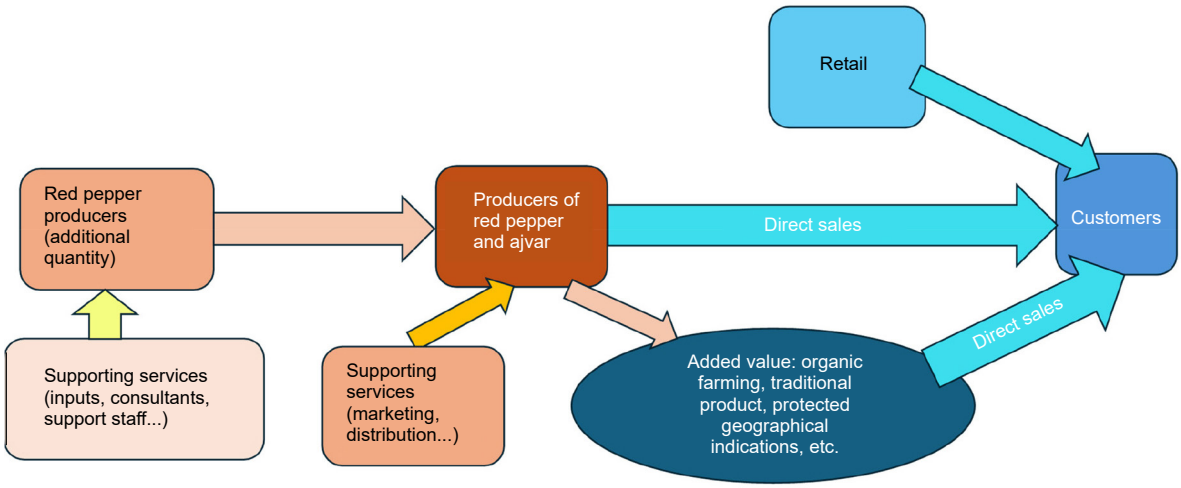
According to the aforementioned regulation, the production and trade of heat-treated vegetable products – cooking/pasteurization, such as Ajvar produced on the farm in a maximum quantity of 8,000 kg per year is permitted. It is prescribed that the product be traded and packaged on the local market, and the following places of trade are envisaged: farm (uncluding rural tourism), home kitchen, green market, retail facility, home delivery ("door-to-door") and events on the territory of the Republic of Serbia.

The regulation also permits the production and trade of heat-treated vegetable products – cooking/pasteurization, such as Ajvar produced in a small-capacity facility in a maximum quantity of 16,000 kg per year. It is prescribed that the product be traded packaged on the local market, and the following places of trade are envisaged: the territory of the Republic of Serbia. A small-capacity facility is a facility in which at least 50% of the food produced and processed comes from the farm itself, and food with traditional characteristics is food that has been historically recognized as a traditional product or produced according to technical specifications in a traditional manner or according to traditional production methods, or protected as a traditional food in accordance with the regulation governing the protection of the geographical origin of agricultural and food products.

There are several large processing companies in Serbia that, among other things, are also engaged in the production of Ajvar. Some produce premium quality Ajvar, while others produce industrial Ajvar, which is made from lower quality peppers that are not peeled, but cooked and ground industrially. In any case, the offer is diverse and can meet the needs of customers in Serbia.

Scheme 1 provides an overview of the red pepper – Ajvar value chain, taking into account the production of small-scale Ajvar producers in the traditional way.

Scheme 1 Value chain of traditional Ajvar production



A presentation of direct participants in the red pepper - Ajvar value chain related to small producers/processors is given in Table 1.

Table 1 Participants in the value chain of traditional Ajvar production

Part of the value chain	Stakeholders
Vegetable production – red pepper	• Farmers – red pepper producers • Nurseries • Producers (sellers) of artificial fertilizers • Producers (sellers) of pesticides and other protective agents • Producers (sellers) of processing machinery • Producers (sellers) of equipment • Seasonal labor • Agricultural pharmacies • Warehouse workers • Consultants
Vegetable processors – Ajvar	• Labor (own and externally hired) • Manufacturers of equipment for traditional technological processes
Packaging	• Packaging manufacturers
Sales and distribution	• Carriers and courier services • Distributors of vegetables and processed products
Marketing	• Marketing companies • Web portals • Media (TV companies, print and electronic media) • Social networks (food bloggers) • Printing houses
Tourism	• Tourist organizations (thematic routes) • Events • Rural tourist households
Consumers	• Individuals - buyers • Retail • Hotels, restaurants and other catering establishments

IV. Analysis of Performance

The detailed National Report on the Position of Farmers in Value Chains (RDN, 2024), together with other available data, served as the basis for the analysis of the "red pepper - Ajvar" value chain with an assessment of the level of sustainability (short-term, medium-term or long-term sustainability). The evaluation of the performance measurement was done with three sustainability ratings based on observations from the consultation process and additional literature according to the following scale:

- Minimum rating (1): The element reduces or harms sustainability;
- Medium rating (2): The element has a neutral or mixed effect on sustainability;
- Maximum rating (3): The element clearly supports or improves sustainability.

1) Economic impact – short-term sustainability

Red pepper is mainly grown in open areas and yields are highly dependent on climatic conditions, which greatly affects the availability of raw materials and their market price in unfavorable years. At the same time, input costs are constantly increasing, which affects the price of raw materials.

Ajvar producers are in most cases also producers of red pepper. This fact allows them flexibility in their business because they can control their production and, depending on the assessment, decide whether it is more profitable to sell the raw material or produce Ajvar, as well as on what scale to do so.

The technological process of producing Ajvar in the traditional way is demanding and slow and involves a large amount of manual labor, and in rural areas there is a shortage of labor, which often prevents plans for expanding processing capacity. All household members are employed in the production process, along with a certain number of seasonal workers.

Seasonal labor is scarce and expensive, and household members are engaged in other jobs in addition to producing Ajvar (svaštarska production).

Access to financing is limited due to complicated procedures and unfavorable credit conditions. Producers lack information about the skills needed for product development, advanced technologies, marketing, opportunities for using public funds, as well as compliance with legal regulations. Investments in the sector are limited and innovations that can facilitate and accelerate the process are not used.

Small producers are mostly independent players in the market (the exception is Leskovac Ajvar) and are not united in the process of adding value to their product. There is also a lack of cooperation with colleagues and other actors in the value chain, as well as a lack of cooperation with other complementary value chains in order to act together and achieve economic benefits.

Market access is limited, as the sale of Ajvar is mainly carried out directly (sales to known buyers and sales via the Internet) without developed marketing and distribution channels. Unfair competition from cheaper industrial Ajvar as well as imported Ajvar further weakens the position of local producers. Ajvar production is conceived as a seasonal business (autumn), so it often happens that finished products are unavailable during the rest of the year, which affects customer confidence.

Sustainability assessment (short term): partially sustainable.

The value chain is partially sustainable. Most producers are not narrowly specialized in this business and see it as an additional source of income. With systemic measures, this production value chain can generate significant income for all participants in the value chain, especially for rural residents.

Table 2. Evaluation of economic sustainability performance

Element	Evaluation	Assessment
Income generation	Income is variable and largely dependent on input prices.	②
Income level	Income level is variable and depends on the volume of production and processing.	②
Profitability	Profitability is solid due to product finalization. Problems are high input prices.	②
Access to finance	Access to finance is difficult due to complicated conditions and lack of creditworthiness.	①
Market access	Limited market access. Products are sold directly to customers locally and online.	②
Value addition (e.g. branding)	Products have potential, but only Leskovac Ajvar has had a certificate of registration of geographical indication of origin since 2012.	②
Employment/job stability	Red pepper production and Ajvar processing are small family businesses that employ household members seasonally along with a certain number of seasonal workers. Seasonal labor is scarce and expensive.	②

Analysis of economic parameters in the red pepper-Ajvar value chain was carried out for a small family farm (3 able-bodied persons), which owns 1 tractor and accompanying machinery, and cultivates 1 hectare of area under red pepper. The economic analysis is given in Appendix 1.

The analysis shows that a good part of the profit remains within the agricultural farm. This type of processing gives the producer the flexibility to control the process, depending on the yield of the year and the price of the raw material on the market, and to independently decide whether to sell a larger or smaller part of the primary production or process it into Ajvar. In addition to better prices and higher margins, therefore, obvious economic advantages, producers also gain greater business certainty and security - especially when implementing the community-supported agriculture model. However, if we ignore these economic benefits and recognition, social recognition and a sense of belonging to a community are the most important sources of self-esteem and personal satisfaction. Other important aspects are empowerment in terms of independence and freedom in setting prices and organizing work, as well as managing the entire value chain.

2) Social impact – medium-term sustainability

The paprika-Ajvar production chain contributes to improving the living conditions of residents in rural areas. Within this production chain, all gender and age categories of the population are represented, especially socially vulnerable groups (unemployed women from rural areas), which gives special value to this chain. The problem is the depopulation of rural areas and the decreasing number of young people who want to engage in agriculture and live in the countryside. Depopulation leads to a lack of able-bodied people and the loss of traditional knowledge.

The distribution of value within the chain is fair due to the short nature of the chain and control of the entire process from raw materials to direct sale to the end customer. From the producer's point of view, the main advantages of this chain are a direct connection with consumers, control over their own product from the beginning to the end of the value chain, as well as the personal satisfaction of being able to produce and successfully market their product to customers at a good price within their own family farm.

Working conditions within this production chain are extremely demanding, both in the process of growing and harvesting red peppers and in the process of producing Ajvar. In addition to household members, seasonal workers are hired, who in this way provide additional income. There are

good examples of social enterprises and cooperatives, but they are still not sufficiently represented.

The quality of life in rural areas is unsatisfactory in terms of the development of infrastructure, healthcare, education and facilities for young and old. Institutional support is insufficiently developed and there is distrust in public institutions.

Agricultural producers generally apply good agricultural practices, but there is a need for training and improvement of knowledge in the cultivation sector (indoor production, new varieties, gradual planting, development of organic production, adaptation to climate change) and processing (technological innovations, waste utilization, etc.). Education is also needed to encourage associations, networking and cooperation, certification of geographical indications, marketing and better market positioning of products.

The production of Ajvar is traditional and respects local cultural and social norms. The average finalization of the product contributes to the added value of the product and helps producers to do business better while improving their own well-being, as well as the well-being of other people who are part of short chains: workers, participants in the value chain, local communities and society.

Sustainability assessment (medium term): partially sustainable.

The sustainability of the value chain requires greater investment in human capital and involves active institutional measures to improve living conditions in rural areas. In addition to improving general living conditions (infrastructure, healthcare, education and social amenities), it is necessary to provide advisory support for actors in the red pepper-Ajvar value chain with specific expert solutions in the growing and processing phases. Expert support is also needed to create formal and informal association models, encourage cooperation within the value chain, as well as cooperation with complementary sectors. Working conditions can also be improved thanks to innovative technological solutions. The red pepper-Ajvar production chain is primarily represented by small family farms operating in local areas. With some institutional and advisory support, these farms can significantly improve their operations and contribute to socio-economic development. Systemic support for young producers is key to solving the problem of depopulation in rural areas.

Table 3. Evaluation of social sustainability performance

Element	Evaluation	Assessment
Inclusiveness (youth, women)	All gender and age groups (especially women and socially vulnerable groups) participate in this production chain. The problem is the depopulation of rural areas.	②
Equity / value distribution	Due to the short value chain and direct sales, the value distribution is fair.	②
Working conditions	Working conditions are difficult due to the manual type of production.	①
Social institutions and cooperatives	There are good examples of social enterprises and cooperatives, but they are still not sufficiently represented.	②
Harmful practices	There are no major unacceptable practices.	③
Access to social infrastructure	The quality of life in rural areas is unsatisfactory in terms of infrastructure, healthcare, education, facilities for young and old...; relatively good internet in rural areas.	②
Compatibility of cultural and social norms	The production of Ajvar is traditional and respects local cultural and social norms.	③

3) Environmental impact - long-term sustainability

The red pepper - Ajvar value chain has several environmental challenges that affect its sustainability. In the cultivation phase, climate change has a visible impact (droughts and frosts) and significantly reduces yields. The solution may be indoor cultivation under controlled conditions. Indoor production has exceptional agrotechnical, biological, ecological and economic importance. The agrotechnical importance is also reflected in the fact that it is possible to change more than one species during the year, because the protected area provides the possibility of controlling microclimatic conditions. Predatory species are used to protect against harmful insects, and biological preparations are used against disease pathogens. The biological importance of greenhouse vegetables is that they enable year-round production, which, together with outdoor production, closes the year-round cycle of supply and production of fresh vegetables. The ecological importance is reflected in the drastically reduced consumption of pesticides, so the vegetables are safe for health, and the economic importance is that these vegetables have a significantly higher price and bring higher profits throughout the year.

Growing red peppers is very complex because the soil must be fertilized and the plants protected from pests. As with most agricultural crops, carbon emissions occur from the energy used in the production of fertilizers and for processing and transport. Also, in the production of red peppers, larger amounts of water are used for irrigation. The positive thing is that peppers are grown in crop rotation and not as a monoculture, which reduces the presence of soil pests and diseases. Changing crops on one plot reduces the negative impact on the soil and biodiversity. As for indoor cultivation - the negative impacts are even smaller. The fruits are mostly picked by hand, and the rest of the plant remains in the ground.

There are certain positive environmental practices in the sector, such as organic production methods, but others such as sustainable land management strategies and climate change adaptation strategies are still not systematically implemented. Currently, there is no measurable evidence of systematic monitoring or mitigation or adaptation measures. This requires the development of expert studies with specific measures on species selection, cultivation methods and production diversification in response to the negative impact of climate change on red pepper cultivation.

Regarding the processing and preparation of ajavar, the most negative aspects are related to the use of wood for roasting peppers, which can be improved by using gas or other more environmentally friendly fuels.

Pepper waste generated during processing is not toxic and can be used to make cosmetic products. Expert studies on the possibilities of waste utilization and treatment are also needed here.

Sustainability assessment (long-term): not sustainable.

The sector is not sustainable in the long term. Climate change poses great challenges to the already demanding production of red pepper. Mitigation and adaptation strategies exist but are not implemented and producers are not aware of them. Expert analyses on the use of new varieties, crop diversification, soil improvement, sustainable irrigation models, pest control... are lacking and, if they exist, are not accessible to small producers. Data collection on environmental factors in agricultural production is limited and unsystematic. There is significant room for improving environmental sustainability within this value chain, especially in terms of mitigating negative impacts.

Table 4. Environmental sustainability performance evaluation

Element	Evaluation	Assessment
Soil quality	Red pepper cultivation has a negative impact on the soil. Peppers are grown in crop rotation, not as a monoculture, which reduces the negative impact on the soil.	②
Water availability and quality	Large amounts of water are used for irrigation in agriculture.	①
Air pollution	Negative impact during the processing phase due to the use of fossil fuels.	②
Biodiversity (flora/fauna)	Some impact.	②
Climate change adaptation / resilience	Visible impact on yield reduction. Indoor cultivation may be a solution. Mitigation and adaptation strategies exist, but are not implemented in practice.	①
Waste management	Waste generated during processing is non-toxic and can be reused. No expert studies.	②
Green practices (e.g. organic)	There are sporadic green practices such as the production of organic Ajvar and the creation of cosmetic products from processing residues in social cooperatives. Undeveloped market.	②

The following table presents a comprehensive assessment of the economic, social and environmental sustainability of the red pepper – Ajvar value chain. The scoring reflects how well each dimension contributes to the overall sustainability and resilience of the value chain in the short, medium and long term.

Table 5. Summary evaluation of the sustainability of the value chain in economic, social and environmental aspects

Element	Evaluation	Assessment
Economic	2 (medium)	The value chain shows economic resilience, mainly among households that are both producers and processors. Additional measures are needed to improve capacity and profitability.
Social	2 (medium)	The chain is short and socially balanced. Institutional and advisory support is needed for improvement.
Environmental	1-2 (minimal to moderate)	Sustainability is threatened by the negative impact of climate change. Clearly defined mitigation measures are needed.

The economic dimension shows a medium score, which indicates the elasticity of this chain. This especially applies to households that are both producers of red pepper and processors of Ajvar. The value chain is maximally shortened so that most of the income remains in the local environment. Producers are mostly small "solo" players and are not united, which prevents brand expansion and better positioning in the market. For now, they are more oriented towards quality and exclusivity, not quantity. Additional investments are needed to expand production, and a major problem is the shortage of seasonal labor. In this way, these producers are partially sustainable, generating certain incomes, but they do not manage to "grow" and become serious players in the market.

The social dimension is rated medium. The key problem is the general living conditions in the countryside and depopulation. The red pepper - Ajvar value chain is short and socially balanced. Insufficient institutional and advisory support threatens the long-term social sustainability of the value chain. However, some new successful practices and innovations implemented by young producers show that the value chain can be significantly strengthened through social inclusion, networking and joint thinking and action.

Sustainability is particularly threatened by the negative impact of climate change. There are no precise measurements of environmental factors in agricultural production. Expert analyses on mitigating the consequences and adapting crop production to climate change are lacking. Producers are aware of the problem but lack the knowledge and systemic support to mitigate the negative consequences.

V. National Policy Recommendations for Sustainable Food Chain

The paprika-Ajvar value chain is aligned with the main requirements for sustainable food systems contained in the EU Farm to Fork Strategy.

During the consultation process, the following weaknesses in the business were identified:

- Red paprika is mainly grown in open areas and yields are significantly dependent on climatic conditions, which greatly affects the availability of raw materials and its market price in unfavorable years;

- The technological process of producing Ajvar in the traditional way is demanding and slow and involves a large share of manual labor, and in rural areas there is a shortage of labor, which often prevents plans for expanding processing capacity;

- Seasonal nature of production - the business is designed as seasonal (autumn), so finished products are often unavailable during the rest of the year;

- Disunity of small producers - all are independent players (the exception is Leskovački Ajvar);

- Lack of cooperation with colleagues and other members of short food supply chains;

- Weak negotiating power in communication with retailers, large service providers, large buyers, intermediaries, municipal authorities;

- Weak ability to adapt to competitive prices (industrial Ajvar, as well as imported Ajvar);

- Lack of information and knowledge about the skills needed for product development, advanced technologies, marketing, awareness of the possibilities for using public funds, as well as understanding and compliance with legal regulations.

In order to further improve the value chain, systemic solutions are needed in terms of institutional and advisory support to small farms. The chain is particularly vulnerable at the stage of primary crop production. Climate change causes great difficulties in the already demanding production of red pepper and expert studies on mitigation and adaptation are needed. In the cultivation phase, it is necessary to promote the application of professional cultivation practices such as: indoor cultivation, cultivation of more resistant varieties, crop diversification, introduction of staggered planting... and to familiarize farmers with them. It is also necessary to adopt agro-ecological measures such as the development of organic production, reducing the use of chemicals, more rational irrigation systems and soil conservation. Training and public campaigns can raise awareness of the importance of ecological production, but it is also necessary to continuously and systematically collect data on all environmental factors in primary crop production. Farmers need best practices and specific support measures. The red pepper - Ajvar value chain can contribute to improving the living conditions of rural residents because it represents all gender and age categories of the population (especially socially

vulnerable categories) and the distribution of value within the chain is fair. In addition to improving the general living conditions in rural areas, advisory support is needed on formal and informal models of association and cooperation, as well as concrete support for introducing technological innovations into the processing process to facilitate working conditions. Ajvar production is traditional and respects local cultural and social norms, and the value chain is quite elastic and maximally shortened so that most of the income remains in the local environment. Actors within the chain generate certain incomes but fail to "grow" and become serious players in the market. From an economic perspective, the sector needs to address opportunities for increasing production, better access to financing and product development in terms of branding, marketing and distribution. It is also necessary to monitor consumer habits and capabilities and respond to challenges such as cheaper prices of industrial Ajvar and the availability of Ajvar on the market throughout the year. With systemic measures, this production value chain can generate significant income for all participants in the value chain, especially for residents of rural areas.

The red pepper-Ajvar value chain has significant potential for development, but interventions are needed at all its stages: from the cultivation and climate change adaptation phase, through the processing process improvement phase to the sales, marketing and distribution phase, and institutional support is needed for this. The above recommendations should contribute to improving the performance of the value chain and greater economic, social and environmental sustainability of all actors within it.

Economic sustainability (short-term sustainability)

- Improve support measures for indoor vegetable production (e.g. red peppers);

- Cooperation with institutes and innovation in red pepper production systems through the development of the most profitable and resistant varieties, the introduction of staggered planting and crop diversification;

- Support for better market positioning of traditional products based on the good reputation of individual regions for protection as geographical indications;

- Support measures for product certification (organic, traceability systems) and product diversification (chipped peppers, "pinđur" or aubergine-based Ajvar, dried spices, cosmetics, etc.);

- Encourage networking and cooperation through good association practices (e.g. producer organizations);

- Improve cooperation with other producers of traditional products (cheese, dried meat, wines, etc.) with the aim of joint marketing in the form of a "product basket";

- Improving marketing and promotional activities of small producers and young people, including support for joint marketing;

- Supporting the diversification of sales channels (tourism, events, joint sales, online sales, doorstep sales, etc.);

- Establishing support measures for short value chains at national and local levels;

- Effective implementation of IPARD III programme measures that enable support for small farms in processing and production.

Social sustainability (medium-term sustainability)

- Encouraging networking and cooperation (advisory support on formal and informal models of association and cooperation – Local Action Groups, clusters, social enterprises and cooperatives... small producers face significant challenges from raw material production, through processing, to the placement of the final product, while dealing with all elements of the business from mechanization, through human resource management, to marketing and placement. Given the limited resources they have, good association practices should certainly be considered and implemented, whether through cooperatives, business associations or producer organizations according to EU principles);

- Establishing monitoring of the level of education and skills, digital literacy, access to advisory services, public funds, training

programs of household members by age and gender in order to establish support based on verified data;

- Developing expert studies on the traditional production of Ajvar and similar products (e.g. income of household members engaged in Ajvar production, working hours of family members, division of labor, hiring of seasonal labor, property ownership, etc.) in order to adjust policies and multi-sectoral support;

- Support measures for the introduction of technological innovations in the processing process, in order to facilitate working conditions (technological solutions that replace manual labor and facilitate and accelerate the processing process such as mechanized systems for washing, baking, peeling, grinding, mixing Ajvar, etc.);

- Monitoring of social acceptability, safety and labor standards based on conducted analyses;

- Tax incentives for engaging socially vulnerable categories of the population.

Environmental sustainability (long-term sustainability)

- Support measures for the development of organic production;

- Support measures and expert studies for the introduction of farming practices that contribute to climate change mitigation and adaptation;

- Support measures and expert studies for the application of expert practices for reducing the use of chemicals, rational irrigation systems, water, soil and biodiversity conservation;

- Continuously and systematically collect data on all environmental factors in primary plant production;

- Support measures for the introduction of sustainable technologies in processing (possibility of using solar energy and gas where possible);

- Support measures and expert studies for the processing of Ajvar pepper residues in the processing process (after producing one kilogram of Ajvar in the traditional way, up to a kilogram of waste remains, consisting of seeds, stems and other parts of the pepper. The women's entrepreneurial workshop for the production of homemade Ajvar "Homeland in a Jar" from Medvedja has devised how to use this waste to make new products - solid soaps and dry bio-face masks).

VI. Conclusion

The red pepper – Ajvar value chain includes a diverse set of actors in all stages of the chain (growing, processing, packaging, distribution, marketing, sales...). The specificity of the chain is reflected in the fact that it is maximally shortened and that the primary producers of red pepper are in most cases also processors, sellers and distributors and deal with all aspects of the business. This type of business has its advantages and disadvantages, but in any case it allows for flexibility in business, control of the entire process and independence in decision-making. Therefore, this value chain is an opportunity for small producers, because with good organization and relatively small investments they can achieve good economic results.

The problems are productivity and long-term sustainability of the chain (economic, social and environmental). Therefore, it is necessary to work on eliminating the identified weaknesses and strengthening the value chain in all its segments:

- increasing production;
- improving the institutional framework;
- networking;
- capacity building;
- technological innovation;
- joint performance and better market positioning.

The proposed recommendations provide guidelines for improving the red pepper - Ajvar production chain, but can also serve as a model for other production chains, especially those in the traditional fruit and vegetable processing sector.

Thus, this document contributes to the efforts of Serbia and regional partners to strengthen the resilience of the food system, support livelihoods in rural areas and accelerate the green transition in line with European integration priorities.

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VIII. Appendix

Economic analysis of red perika production and processing into Ajvar

The analysis was conducted for a small family farm (3 able-bodied persons), which owns 1 tractor and accompanying machinery, and cultivates 1 hectare of red pepper. The average yield ranges from 40,000 to 60,000 kg per hectare.

Table 1: Analysis of crop production costs for farmers

	Unit type price	Price per hectare (EUR)	Unit x Price (EUR)
Fixed costs			
a) land rent cost	Per hectare	300	300
b) mechanization cost	Per piece	300	300
c) fix labor cost	Per person	4.000	12.000
d) living cost	Per person	3.000	9.000
e) retirement & health insurance cost	Per person	1.000	3.000
f) insurance cost	Per insured item	600	600
g) miscellaneous fixed cost	Per farm	3.000	3.000
		SUM FIXED:	**28.200**
Variable costs			
a) transport cost	Per km	500	500
b) soil tillage operation cost	Per hectare	600	600
c) crop management cost	Per hectare	500	500
d) seed cost	Per hectare	500	500
e) crop fertilizers cost	Per hectare	3.000	3.000
f) crop protection cost	Per hectare	3.000	3.000
g) seasonal workers cost	Per person	4.000	4.000
h) insurance cost	Per hectare	1.000	1.000
i) post-harvest costs	Per item	500	500
j) miscellaneous var. costs	Per event	3.000	3.000
		SUM VAR.:	**16.600**
		SUM FIXED + SUM VAR.:	**44.800**
Cost per produced unit = (SUM FIXED + SUM VAR.) / TOTAL yield **44.800 EUR / 50.000 kg = 0,896 EUR/kg**			

From 100 kg of red pepper, about 35 kg of Ajvar is obtained, depending on the quality of the raw material. The analysis was carried out for a small family farm (3 able-bodied people), which owns facilities and other supporting equipment (stoves, pots, etc.) for the production of Ajvar and which hires additional seasonal workers (200 per diems) in the processing process and processes about 15,000 kg of pepper into 5,000 kilograms of Ajvar. It uses its own pepper as raw material.

Table 2: Cost analysis for processors

	Unit type price	Price per unit (EUR)	Unit x Price (EUR)
Fixed costs			
a) site cost	Per enterprise	300	300
b) equipment cost	Per piece	400	400
c) maintenance/repair cost	Per enterprise	200	200
d) building/storage cost	Per piece	300	300
e) insurance for equipment	Per enterprise	100	100
f) salaries	Per enterprise	0	0
g) miscellaneous fixed cost	Per enterprise	1.000	1.000
		SUM FIXED:	**2.300**
Variable costs			
a) intake field goods cost	Per unit	13.440	13.440
b) energy cost	Per enterprise	1.000	1.000
c) working maintenance cost	Per piece	400	400
d) manipulative transport. cost	Per goods	600	600
e) packaging materials	Per goods	4.000	4.000
f) additional seasonal workers	Per enterprise	8.000	8.000
g) marketing and advertising	Per unit	200	200
h) quality and control costs	Per unit	200	200
		SUM VAR.:	**27.840**
		SUM FIXED + SUM VAR.:	**30.140**
Cost per produced unit = (SUM FIXED + SUM VAR.) / TOTAL yield **30.140 EUR / 5.000 kg = 6,03 EUR / kg**			

The analysis determined that the processing price of Ajvar is around 6.03 euros per kilogram (if the processor is also the producer of the raw material). A kilogram of "domestic" Ajvar is sold at a price of around 10 euros per kilogram to the end customer. If there is no intermediary in the sale (with all additional costs), the profit is around 3.5 – 4 euros per kilogram of produced Ajvar. In this way, a household earns around 17,500 – 20,000 euros for 15 tons of processed peppers (around 5,000 kg of Ajvar), while the sale of 15,000 kg of peppers, if sold as raw material, would earn around 5,000 euros.

As can be seen from the analysis, the profit achieved by processing peppers into Ajvar is significantly higher but requires additional work and investment. What is important to note is that this production chain is maximally shortened, but it brings great benefits to the local community in terms of hiring seasonal workers (the analysis shows that the largest amounts in primary production go to hiring seasonal workers in harvesting and preparing Ajvar). Also, larger amounts are spent on fertilizer and protective equipment in agricultural pharmacies.

The analysis also shows that a good part of the profit remains within the agricultural holding. This type of processing gives the producer the flexibility to control the process and independently decide whether to sell a larger or smaller part of the primary production or process it into Ajvar, depending on the yield of the year and the price of the raw material on the market. In addition to better prices and higher margins, therefore, obvious economic advantages, producers also gain greater business certainty and security - especially when implementing the community-supported agriculture model. However, if we ignore these economic benefits, social recognition and a sense of belonging to a community are the most important sources of self-esteem and personal satisfaction. Other important aspects are empowerment in terms of independence and freedom in setting prices and organizing work, as well as managing the entire value chain.