



Government of the Netherlands

The Embassy of the Netherlands in the Republic of Serbia

Study on alternative protein sources in Serbia

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Table of contents

Table of contents.....	3
Introduction	4
Executive summary	5
1. Market scan.....	6
1.1. Oilseeds and protein crops-main characteristics and trends	7
1.2. Soybean	8
1.3. Sunflower.....	11
1.4. Rapeseed	13
1.5. Protein plants	15
1.6. Other protein plant sources	17
1.7. Animal based proteins.....	19
1.8. Expected market developments in medium term.....	21
2. Policy and legal framework	24
2.1. Non-GMO policy and market consequences.....	24
2.2. Legal status of other protein sources (insects, algae, PAPs) for feed and food	26
2.3. Trade regime for oilseeds, protein plants and PAPs	29
2.4. Other relevant policy and/or legal framework (subsidies, strategies, etc.).....	30
3. Stakeholder analysis.....	32
3.1. Overview of private sector participants in Serbia	32
3.2. Relevant farming organizations.....	36
3.3. Relevant research institutions in the field of protein for food and feed	37
3.4. Public authorities at national and (where relevant) regional level.....	38
4. Market opportunities	38
4.1. SWOT analysis protein sector Serbia.....	38
4.2. Market entry strategies and potential to improve production and/or processing for export market	40
References	44
Annex 1	46

Introduction

Global environmental and ethical consequences of ever growing consumption of animal products caused the need in the last decade, especially in the European Union, to speed up the process of discovering and using alternative sources of protein in human and animal diet, aiming to reduce these environmental impacts.

Diet rich with plants and seeds is expected to lead to the decrease of greenhouse gas emissions and can help combat climate change.

Alternative protein sources consist of proteins manufactured from animal cells, plants, or through fermentation. They require less inputs to produce, and they don't have as much negative effects as animal protein sources.

Some of the main expected benefits of embracing alternative protein sources, are reduction of negative environmental impacts, biodiversity restoration by freeing land and ocean ecosystems, preventing antibiotic resistance, and feeding more people with less resources.

As Europe aims to provide a more sustainable and locally supported protein supply, both plant and animal based, and reduce its dependency on protein imports, in 2018 the European Commission suggested to the member states that they should develop their national strategies for dealing with this issue.

After 2018 there has been some progress on EU level in broadening the spectre of protein alternatives, such as allowing insect protein for feed and grasshopper protein for food, as well as reallowing under strict conditions of processed animal protein for feed.

In accordance with the suggestions from the European Commission, in December 2020, Netherlands presented its National Protein Strategy regarding alternative protein sources, prevalently aiming to decrease import dependency from overseas markets and decrease the environmental footprint of Dutch demand for soy in feed.

Netherlands acknowledged that soy import will remain a significant source of protein in the future and is also looking to source more of its protein demands from Europe.

Having in mind that Serbia is the fourth largest soy producer in Europe and has a strict non-GMO policy, the aim of this study is to give answers to the questions of the possible role Serbia can play in the process of transition towards a more sustainable and closer to home sourced protein, as well as to unveil the potential for Serbia to substitute more expensive non-GMO soy with other protein sources such as algae, insects, and other leguminous to reduce feed costs for the livestock sector.

Executive summary

The Republic of Serbia has a total of 5,050,000 ha of agricultural land, of which 3,861,447 ha is arable land. The largest area of the total arable land is occupied by cereals, as much as 44.2%, while oilseeds are grown on about 12.5%.

Serbia is self-sufficient in production of plant-based protein sources, namely soybean which is placed on the world markets demanding the non-GMO products.

Production of beans and pulses is still not developed enough and uncompetitive to other markets due to low scale production and lower subsidies, and not enough research in the development of varieties adapted to Serbian climate conditions.

Protein forage plants represent an important segment in animals feed through which protein is obtained in the diet, while the market itself is relatively small, since majority of small livestock producers are producing their feed for internal needs don't exist.

There is high potential in production of the proteins from waste streams such as the brewing industry, etc.

The production of insects as alternative source of proteins for feed in Serbia is still in the scientific and piloting phase, while its regulation for human consumption is still to be fully completed and aligned with EU standards and practice.

Current legislative framework in Serbia regulating the fields of food safety, veterinary and phytosanitary policy is still inappropriate for the adoption of all the EU regulations in these areas, however a draft Strategy is being prepared to align with the EU.

Market strategies for growth of the animal and plant protein sources for Dutch companies and institutions include imports to Netherlands, company takeover through brownfield investments and greenfield investments, as well as potential for joint research and development. According to the conclusion of this Study, most promising entry options are presented below:

Market entry option				
Protein source	Imports to NL	Company takeover/Brown field investments	Green field investments	R&D
Soybean			✓	✓
Sunflower seeds			✓	✓
Rapeseeds				✓
Peas			✓	✓
Beans	✓	✓		

Protein of animal origin				✓
Insects for feed and food	✓		✓	✓
Protein from food industry waste streams			✓	✓

1. Market scan

Protein-rich plants are an important source of amino acids for livestock and important source of proteins for humans. Global demand for plant proteins rises, as human food consumption is increasing at a pace of 7% per year, with an expectation that retail sales of plant-based food alternatives might reach \$162 billion (around EUR 142 billion) by 2030, or 7.7% of the global protein market.

On the other side, meat consumption, although causing negative environmental print globally will continue to grow in the period 2021-2031, with different patterns in high- and low-income countries. The low-income countries are expected to increase meat consumption in their diets, while the demand in high income countries is expected to level off or go down due to aging populations and trends in seeking protein sources from other sources.

Generally, the meat consumption growth is expected to be lower than the previous decade.¹ These trends will continue to push demand for protein rich sources for feed, however with different trends worldwide.

Economic development affects animal output and protein meal consumption. High-income countries utilise more protein meals than low-income producers. As emerging countries urbanise and demand more animal products, protein meal consumption grows faster than animal output.² The growing demand for protein sources that exceeds the domestic production of certain plants, namely soybean, has put under the spotlight the need to secure adequate supply of protein sources on the EU market, being net importer of soybean.

One of the first steps in the process of securing adequate supply of soybean for the EU market was the preparation and signing of **the European Soya Declaration – Enhancing soya and other legumes cultivation** in 2017 and 2018 by 14 EU member states.

As a result of this declaration the European Commission prepared a “Report to the Council and the European Parliament on the development of plant proteins in the European Union” with measures aimed to promote protein crop production in the EU.

¹ OECD/FAO (2022), *OECD-FAO Agricultural Outlook 2022-2031*, OECD Publishing, Paris, <https://doi.org/10.1787/f1b0b29c-en>.

² Ibid

Since the adoption of this Declaration in March 2023, a draft EU Protein Strategy³ was presented in the European Parliament and it is awaiting the approval of the Committee on Agriculture and Rural Development.

Soybean balance sheet EU and Serbia

Out of all types of oilseeds, the **EU market is most dependent on imports of soybean in its total consumption.**

The following table represents the projected EU stock of oilseeds for the marketing year 2022/2023 compared with Serbian balance sheet of the same crops.

Projections 2022/23

	EU				Serbia			
	Rapeseed	Soya beans	Sunflower	TOTAL	Rapeseed *	Soya beans	Sunflower	TOTAL **
Beginning stocks	500	1.200	867	2.567	/	147,0	58	205,0
Usable production	19.417	2.559	9.319	31.295	73,50	398,0	643	1.041,0
Area (thousand ha)	5.858	1.118	5.153	12.129	22,71	235,0	251	486,0
Yield (tons/ha)	3	2	2	3	3,20	1,7	2,56	2,1
Imports (from third countries)	5.100	14.000	1.500	20.600	0,11	75,0	16	91,0
Total supply	25.017	17.759	11.686	54.462	/	620,0	717	1.337,0
Domestic use	24.003	16.318	10.514	50.835	/	539,0	589	1.128,0
of which crushing	23.161	14.379	9.315	46.855	/	470,0	560	1.030,0
Exports (to third countries)	514	241	305	1.060	67,55	65,0	80	145,0
Total use	24.517	16.559	10.819	51.895	/	604,0	669,0	1.273,0
Ending stocks	500	1.200	867	2.567	/	16,0	48	64,0
Import ratio	21%	85%	14%		/	12%	2%	

*2021

** excluding rapeseed

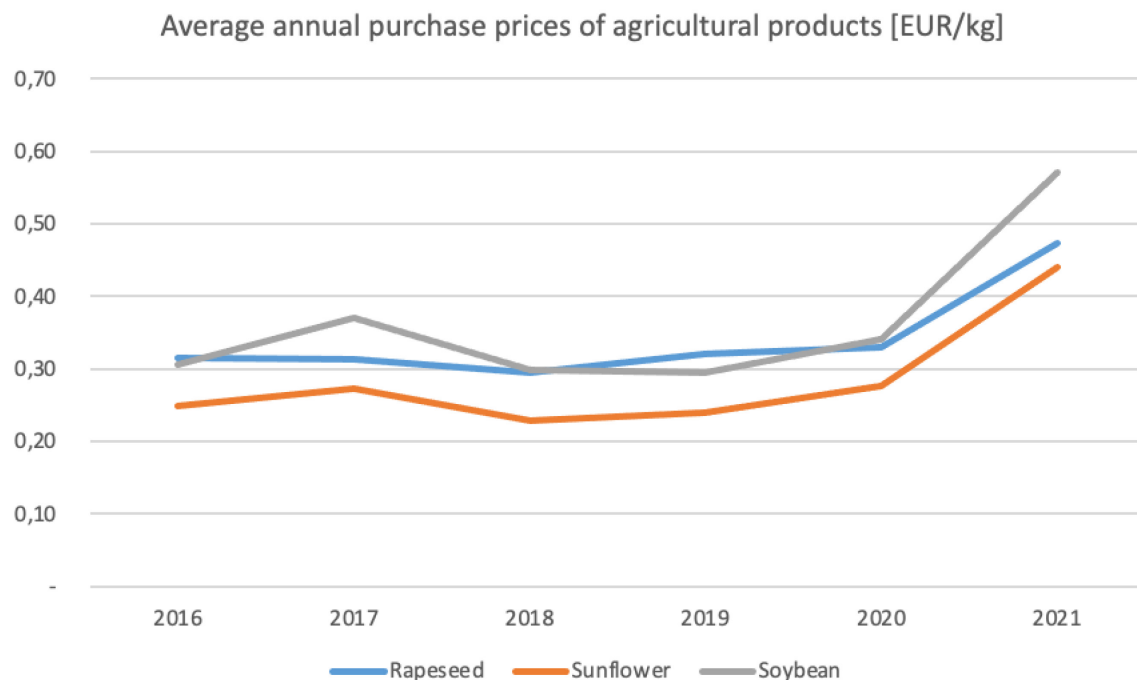
1.1.Oilseeds and protein crops-main characteristics and trends

The Republic of Serbia has a total of 5,050,000 ha of agricultural land, of which 3,861,447 ha is arable land. The largest area of the total arable land is occupied by cereals, as much as 44.2%, while oilseeds are grown on about 12.5%.

The composition of the oilseed's cultivation areas in the year 2021 was the following: soybean dominated oil crop cultivation with 50% of the area, followed by sunflower (45%) and rapeseed (5%).

³ https://www.europarl.europa.eu/doceo/document/AGRI-PR-742624_EN.pdf

All oilseeds are recording an increase in prices in the last years, with a note that both 2021 and 2022 had unfavourable weather conditions.



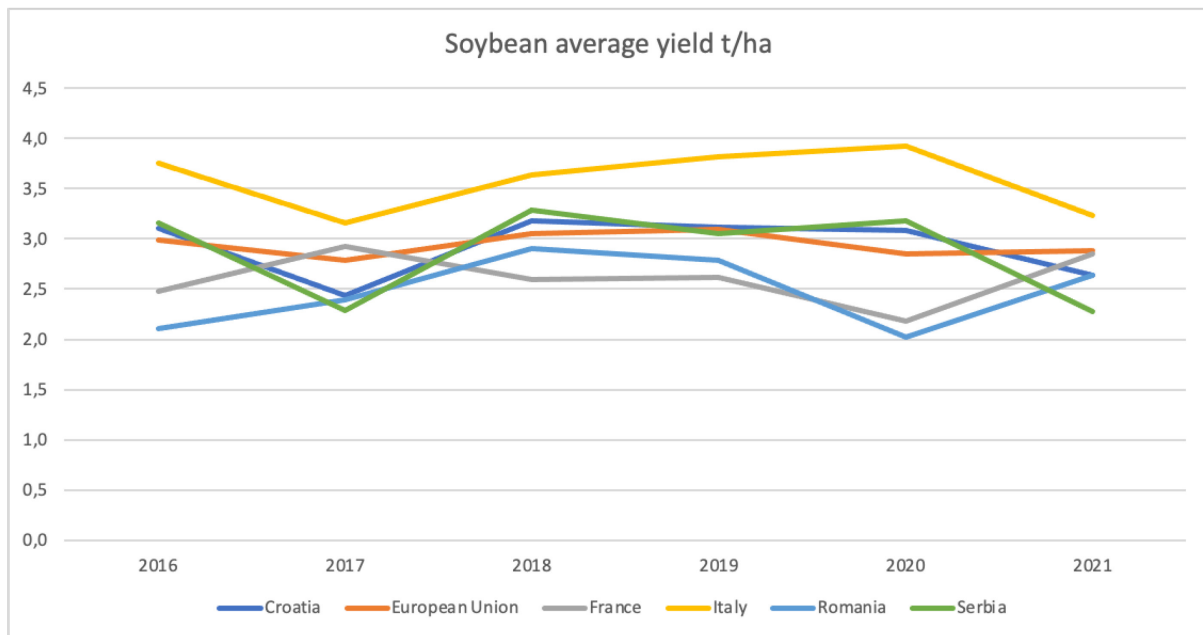
Source: Statistical Office of the Republic of Serbia

1.2.Soybean

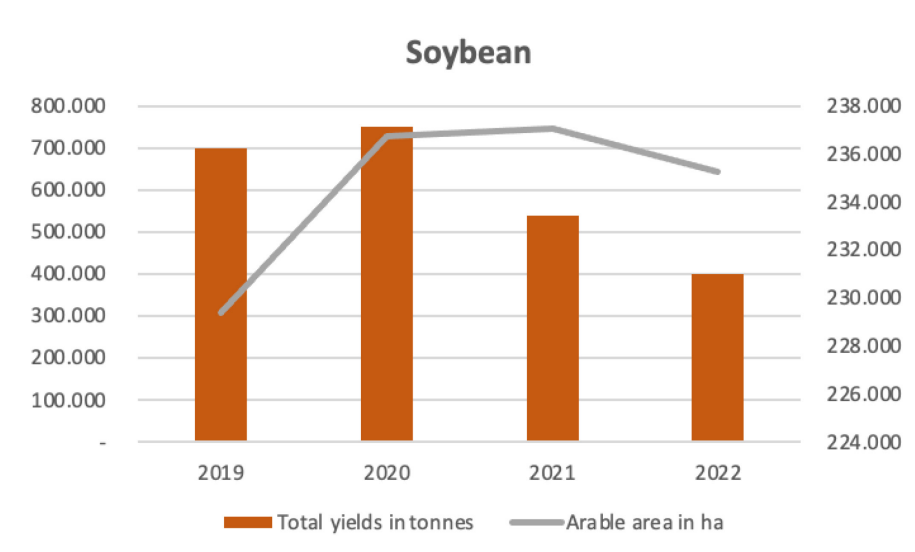
In Serbian production of industrial crops, soybean is the dominating oilseed. Vojvodina is the epicentre of production and processing.

Soybean cultivation areas are expanding overall, but yields fluctuate due to poor climatic conditions, which were most severe in 2021 and 2022. These trends are, however, present in other countries, as shown on the graph below.

Soybean is the most planted oilseed and majority of, nearly two-thirds of the produced soybeans is used by the domestic sector. Soybean production in Serbia places it on the 18th place in world production and on fourth in Europe, following Italy, Ukraine, and Russian Federation. Average yields are close to EU average, but performing better than other EU top producers, except Italy as the largest EU soybean producer.



Source: FAO stat



Source: Statistical Office of the Republic of Serbia

Soybean oil is the principal export product, and it is sold mainly to Bulgaria, Greece, Germany, Poland, and Slovenia, while imports cover some portion of soybean meal for domestic purposes, but these imports do not affect the general positive trade balance of this commodity in Serbia.

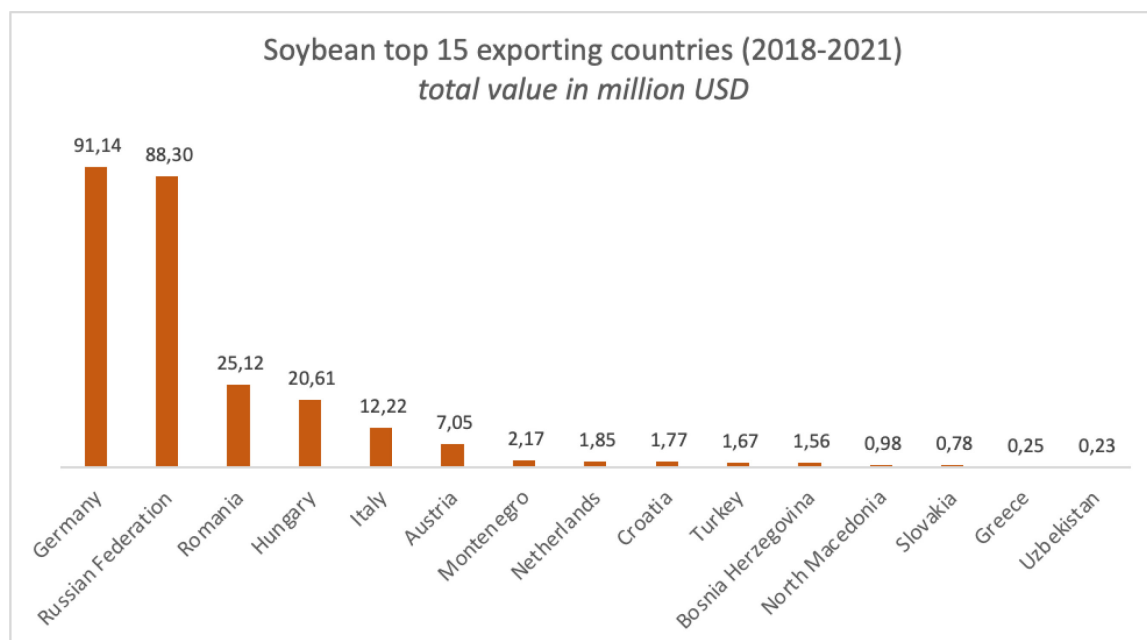
Serbia's ban on the import of GMO products, closed the market for competing soybeans and primarily soybean meal. The closure of the market for GMO soy has led to the paradox that Serbian meat producers can only purchase non-GMO soybean and soybean meal for feed which is more costly than the GMO while the import of the meat is liberalised and allowing

for imports of meat and other animal products from animals which had GMO soybean in their diet.

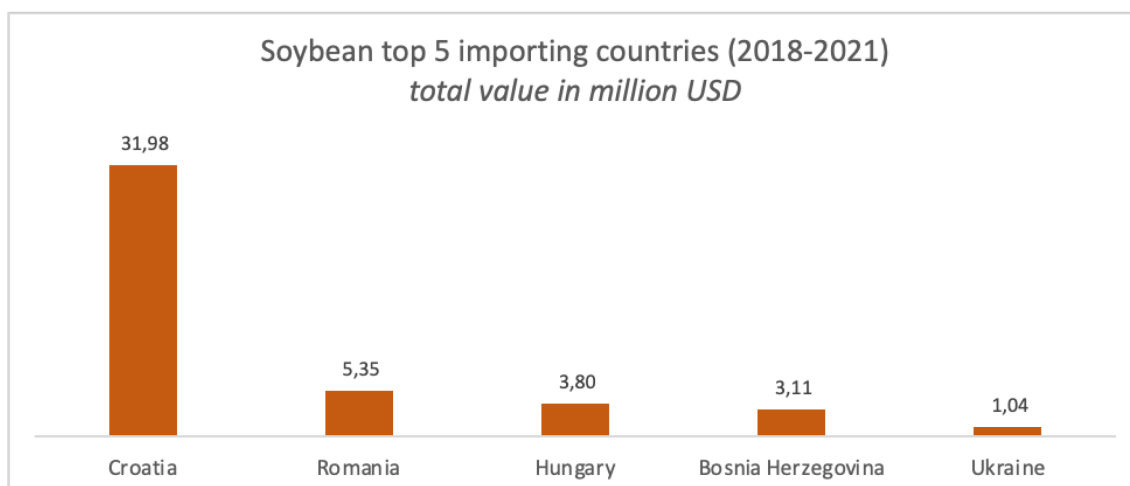
When it comes to processing, extruders in Serbia convert around 190,000 tons of soybean into-feed. Some soybeans are processed directly on farms owned by farmers or companies that raise pigs or poultry.

The company “Sojaprotein” (www.sojaprotein.rs) processes around 250,000 tonnes, some of which is converted into soybean meal and the remainder into a variety of human nutrition products. “Dijamant” (www.dijamant.rs) also produces soybean meal in quantities ranging from 20,000 to 25,000 tonnes per year, with a portion made from imported soy.

About one third of the produced soybeans are processed for human consumption and mostly end up in exports.



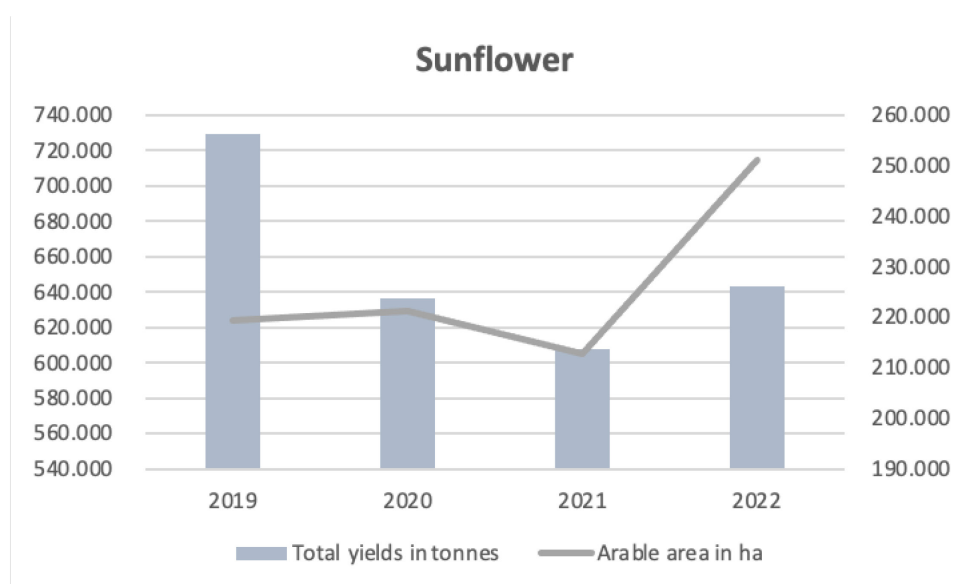
Source: COMTRADE data, own calculations



Source: COMTRADE data, own calculations

1.3.Sunflower

Sunflower production in Serbia is among the top 20 in the world. In terms of output, it ranks on the 15th place globally and 9th in Europe. Serbia has been growing at a pace of 5% per year, and it already accounts for 1% of global production.



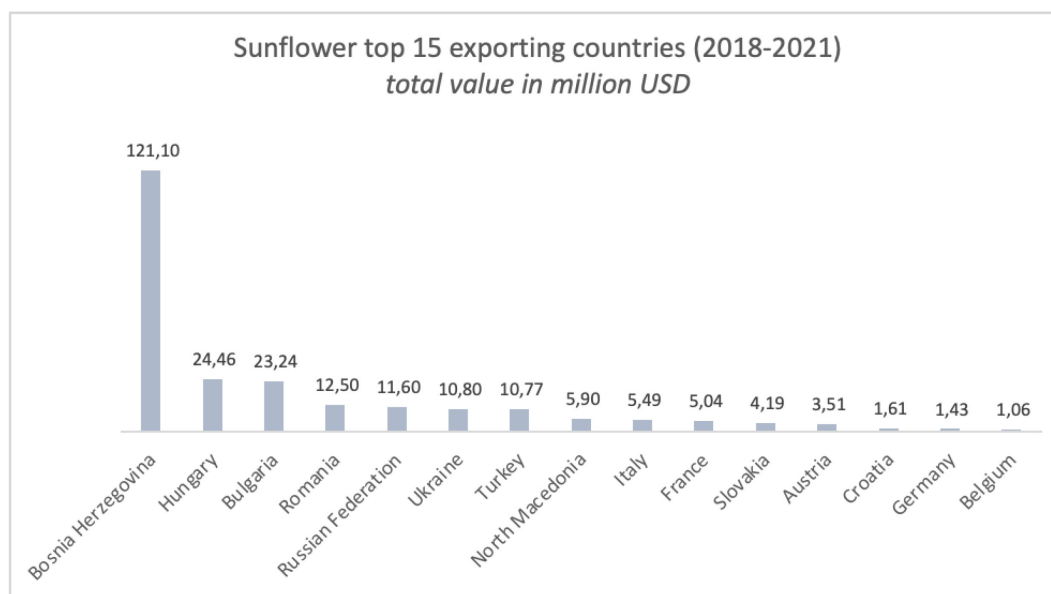
Source: Statistical Office of the Republic of Serbia

Growing sunflowers in Serbia is profitable due to the country's high yields. This is especially important in regions with fewer favourable conditions for other types of agriculture, such as the Banat region, which receives the least amount of precipitation on average.

Greater yields are recorded in Serbia than in other major European producers of sunflowers. Yields in Serbia range between 2.5 and 3 t/ha, whereas they hover around 2 t/ha in Romania, Bulgaria, and Ukraine.

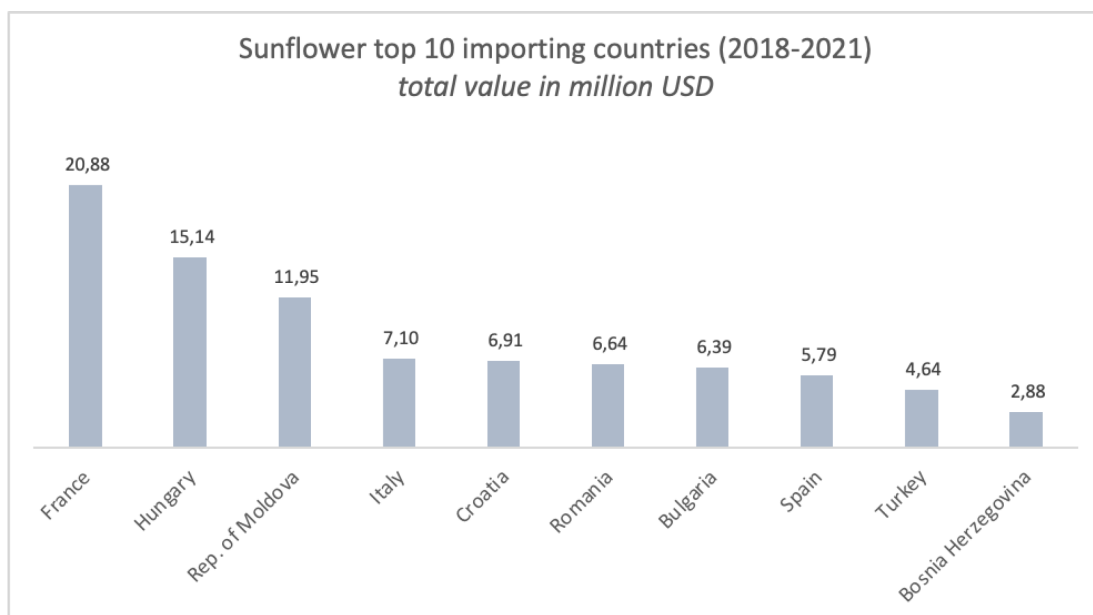
The vast majority of Serbia's sunflower crop is shipped to neighbouring countries like Bosnia and Herzegovina and Hungary, as well as other regions of Europe. The remaining portion is purchased and converted into crude or refined oil to provide Serbia's home market.

Sunflower oil, both in its raw and processed forms, is another major export for Serbia. More than half of all exports go to Bosnia and Herzegovina and further to the Turkish market as sunflower oil, as a result of this country's advantageous trade arrangement with Turkey. This, however, can lead to uncertainties in the trade of these products since it is unknown how long this preferential agreement will remain open⁴.



Source: COMTRADE data, own calculations

⁴ On 26 June 2018, the government of Turkey announced a gradual increase in the tariff rates on sunflower seed oil originating in Bosnia & Herzegovina. The revision in the import duty is made through an explanatory note in the tariff lines. According to the explanatory note, in the period from 1 July 2018 to 31 July 2018, the tariff rate will be 23%. Previously, the tariff rate on sunflower seed oil from Bosnia and Herzegovina was 0%. Current tariff rate, however according to the data of the Turkish Ministry of trade is 0%. <https://ticaret.gov.tr/data/61fa2fa713b876b6b4e12af1/2023%20Yılı%20ithalat%20Rejimi%20ve%20Ekleri.zip>

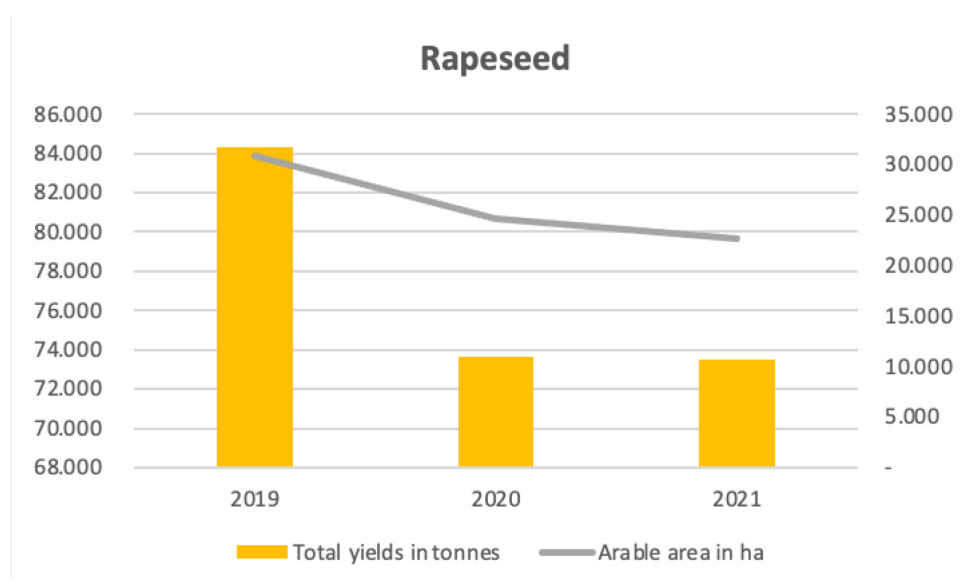


COMTRADE data, own calculations

1.4. Rapeseed

Rapeseed, northern Europe's best-performing culture, isn't a traditional crop in Serbia, although the increased demand for renewable energy has boosted rapeseed cultivation.

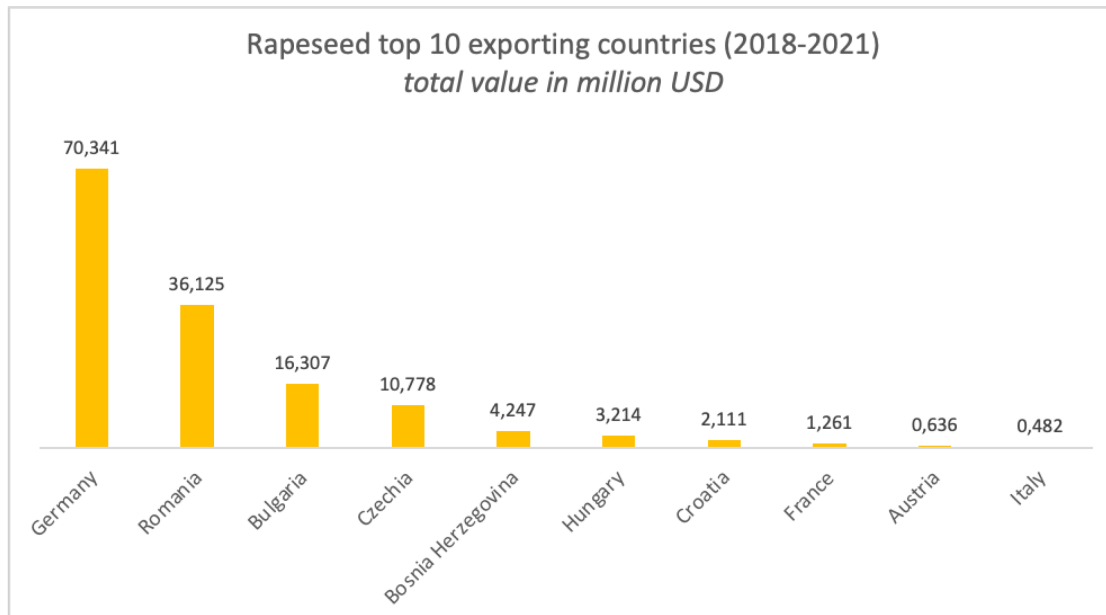
The demand, attractive increase of prices and consequent earnings have led to increased interest among producers to produce this crop, mainly producers of wheat, one of the main rapeseed's competitors.



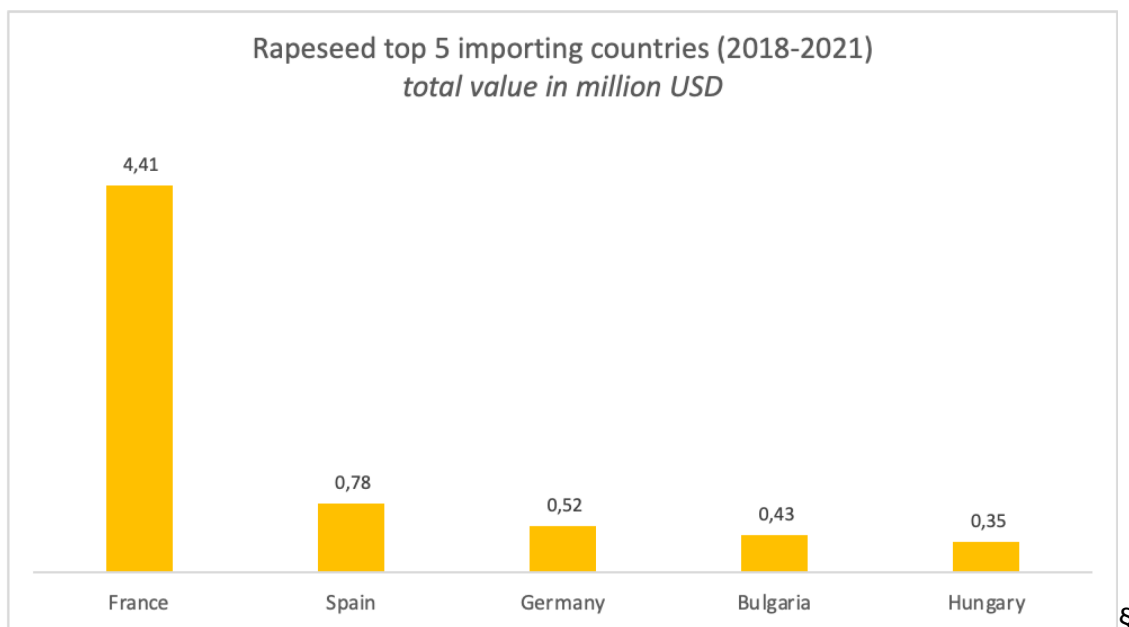
Source: Statistical Office of the Republic of Serbia

Serbia produces more rapeseed than countries with more experience in rapeseed production. Producers obtain 4-5 t/ha (in years with favourable weather conditions), which is less than wheat, rapeseed's primary competitor, but the price is better.

Good yields are ensured mainly because only a small number of the top experienced producers with high-quality equipment chooses to produce them.



COMTRADE data, own calculations



COMTRADE data, own calculations

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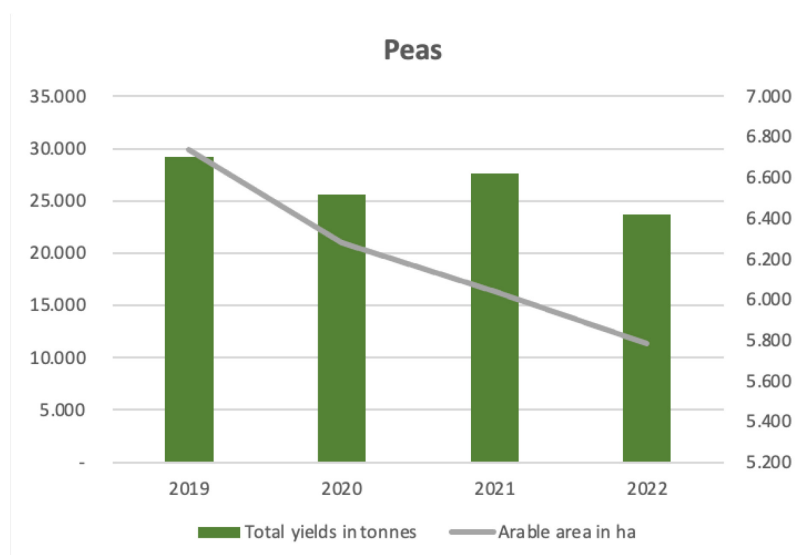
1.5. Protein plants

When it comes to other protein plants in Serbia this market is considerably smaller than the market for main oilseeds plants, however it is still large in the total vegetable external trade.

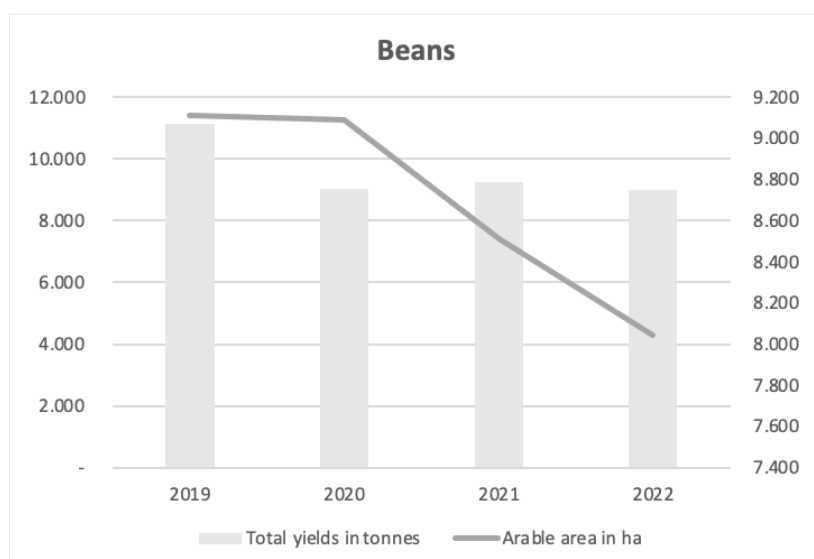
The Statistical Office of Serbia is only recording the estimates on the production and yields for peas and beans from this category of protein plants.

The share of production of peas and beans in the total vegetable production of Serbia in the last ten years is relatively stable with a slight decrease of planted areas in the last three years.

Peas are dominantly produced in Vojvodina region, while beans are produced more in the central and southern part of the country.

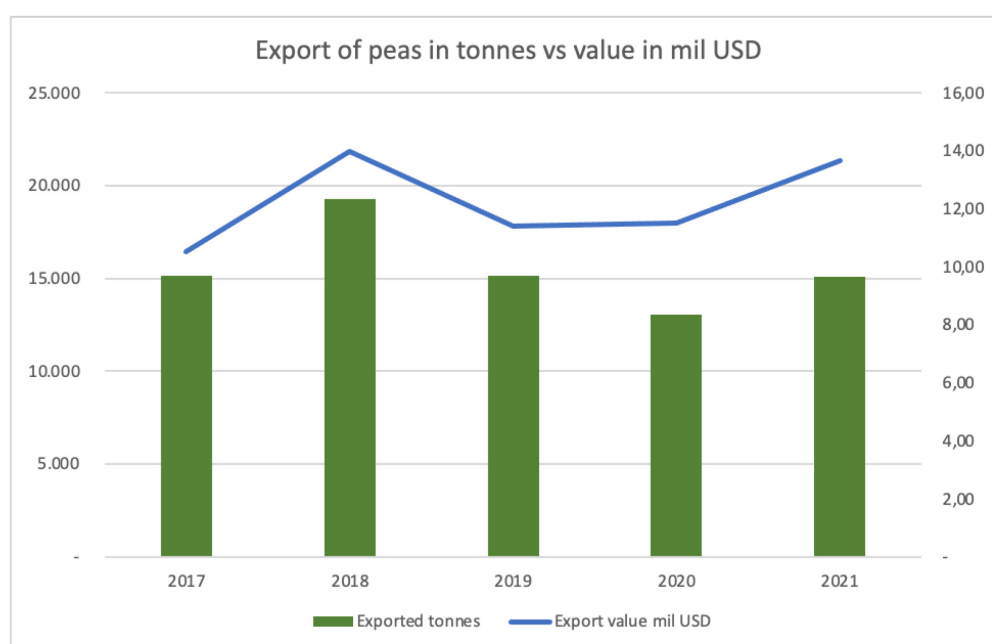


Source: Statistical Office of the Republic of Serbia



Source: Statistical Office of the Republic of Serbia

Peas are among the top Serbian export products in the vegetable category and majority of exports are frozen peas.



COMTRADE data, own calculations

Observed in the period 2018-2021 the main export markets for peas⁵ with the highest value of exports were the Russian Federation market and the neighbouring countries, namely Hungary, North-Macedonia, and Croatia. The Russian Federation market is nearly three times larger than the other mentioned individual markets.

⁵ HS codes 70810; 71021; 71310 and 200540

Serbia also imports peas; however, the total trade balance is positive and for the period 2018-2021 the coverage rate (import/export ratio) was only around 25%.

Peas are typically transformed into sterile or frozen peas. In Serbia, the companies "Flora" Bečej (www.pikbecej.rs/flora-5/), "Frikom" Belgrade (www.frikom.rs), "Aretol" Novi Sad, and "Higlo" Horgoš (www.higlo.rs), "Friglo" Beograd, (www.friglo.rs), "Polar food" Beograd (www.polarfood.rs) possess peas processing facilities.

Serbian farmers typically cultivate their beans on small, unirrigated parcels of land. Beans used to be grown alongside corn but lately they are grown almost exclusively as a single crop and increasingly alongside other fruits in orchards.

Since production levels fall short of domestic consumption, substantial quantities are imported. Beans are sensitive to dry weather conditions and currently they are typically grown in areas which are not irrigated thus impacting the annual yields.

As it is the case for peas, most produced beans are exported to the Russian Federation and neighbouring countries, while main import countries are Kyrgyzstan, Poland, Bulgaria, Egypt, Canada, and Argentina.

Serbia imports more beans than it produces, which is why the total trade balance is negative and for the period 2018-2021 the coverage rate (import/export ratio) was around 132%.

1.6. Other protein plant sources

Protein forage plants represent an important segment in feed through which protein is obtained in their diet, especially in the spring and summer when other protein sources are less available. The most common protein forage plants used as feed in Serbia are:

Red clover (*Trifolium pratense*) and Alfalfa (*Medicago sativa*) which are both nitrogen-fixing legumes that are often used as a forage crop because they have a high protein content. Official data on the production and trade are collected by the Republican Statistical Office under the category forage plants, along with the corn for fodder.

Forage plants in Serbia are produced on the 9% of the surface in the structure of arable land (making up 75% of the used agricultural land in Serbia). The following table shows the total production and yield of forage plants in Serbia.

Year	Alfalfa		Clover		Corn for fodder	
	Total Yield tonnes	t/ha	Total Yield tonnes	t/ha	Total Yield tonnes	t/ha
2017	475.580	4,20	213.543	3,00	534.521	16,10
2018	513.316	5,00	240.910	3,80	588.178	19,70
2019	594.981	5,60	283.503	4,60	763.354	20,40

2020	650.360	6,20	305.271	5,10	746.926	20,90
2021	539.995	5,10	223.160	3,90	524.654	15,80

Serbia has a trade balance surplus in the forage plants, with main exporting product being bran and other residues from cereals and leguminous plants with an average export value of 10 million EUR in the period 2019-2020, while the only deficit is in the category of alfalfa flour and pellets, which are imported in the average amount of 360.000 EUR per year in the same period.

Production of **lupins** in Republic of Serbia is not officially recorded, although there are examples of its production for the purpose of green manure.

Currently there are not registered varieties of lupins on the Official list of recognized varieties of agricultural plants.

Another potential source of plant proteins is production of protein isolates from potatoes and fava beans. Recent investments in the neighbouring Croatia⁶ are showing a market interest in developing new sources of proteins from these plants.

The Association Donau Soja (see chapter 3.2) is making a progress in expanding protein sources in Serbia through developing experimental production fields of fava beans in Serbia.

Proteins from plant processing by-products

Brewer's spent grain (BSG) or draff is the most abundant by-product of the brewing industry. For every 100 litres of beer brewed, around 20 kilograms of BSG are collected. Brewer's spent grain is generated in vast amounts throughout the year, is inexpensive, and can be used as a raw material in biotechnology due to its high protein and carbohydrate content. In Serbia, spent grain is collected from breweries and distributed to farmers and livestock owners for use as a feed supplement. It can be fed fresh or dried, depending on the preference of the producer and the availability of storage facilities.

In addition to its nutritional value, spent grain is also an environmentally friendly way to dispose of brewery waste. By using spent grain as a feed ingredient, breweries can reduce the amount of waste they produce, while also providing a valuable source of nutrition for livestock.

Overall, the use of spent grain as a feed ingredient in Serbia is a common practice in the livestock industry and is valued for its nutritional benefits and environmental sustainability.

Amount of brewer's spent grain can only be assessed based on the amount of beer produced in Serbia. Around 500 million litres of beer are produced in Serbia annually. According to the

⁶ <https://pulsepod.globalpulses.com/pod-feed/post/making-food-better-together-nutris-opens-europe-first-fava-protein-isolate-manufacturing-facility>

Eurostat, beer production in 2021 in Serbia was 548.995.500 litres. Based on this fact, it can be concluded that around 100,000 tons of beer spent grains are produced annually in Serbia.

1.7. Animal based proteins

The production of animal-based protein sources is a highly regulated area of protein production in Serbia. This is mainly related to the proteins produced from animal by-products from the meat industry.

The production of animal-based protein sources is not officially tracked by the Statistical office of the Republic of Serbia.

The largest quantities of animal by-products produced in the Republic of Serbia are processed in facilities that apply basic processing methods, such as facilities that produce meat and bone meal and rendered fats, facilities for technical products, compost and biogas, facilities for the production of processed protein of animal origin, facilities for the production of food for pets, etc.

There are currently six processing plants in the Republic of Serbia that use basic processing methods. Two of these six facilities are privately owned and are only approved to make rendered fat. The other five facilities⁷ are approved to make either meat and bone meal or processed animal protein and rendered fat.

If not adequately treated, materials of animal by-products pose a threat of transmitting diseases to humans or animals. In contrast, they are primarily of high nutritional and energy value and should be utilised in the most efficient manner possible to conserve resources.

Therefore, animal by-products are categorised into three groups: Category 1 - with the highest risk, Category 2 - with intermediate risk, and Category 3 - with the lowest risk.⁸

The installed capacities for the processing of Category 1 materials are 200,000 t annually, of which only the company “Energo-zelena” d.o.o. Inđija can process 150,000 t annually. This is a state-owned company 100%.

The installed capacities for the processing of Category 3 materials are 78,000 t annually, including the processing of blood and feathers.

List of all establishments Category 1, 2 and 3 can be found on the EU TRACES database:

⁷ AIK „Žibel” Bačka Topola (www.aikbt.rs/firme/zibel/)

VU „Napredak” Čuprija (n/a)

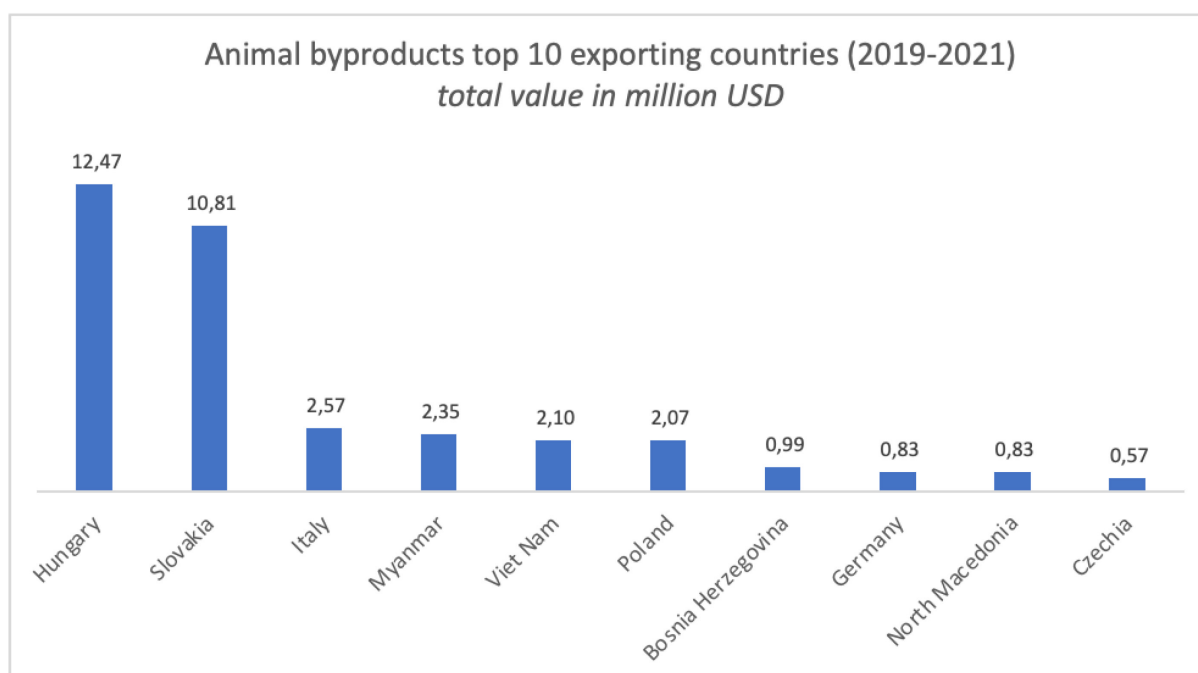
„Prekon” d.o.o. Zrenjanin (www.prekon.rs)

„Energo-zelena” d.o.o. Inđija (www.energozelena.rs/)

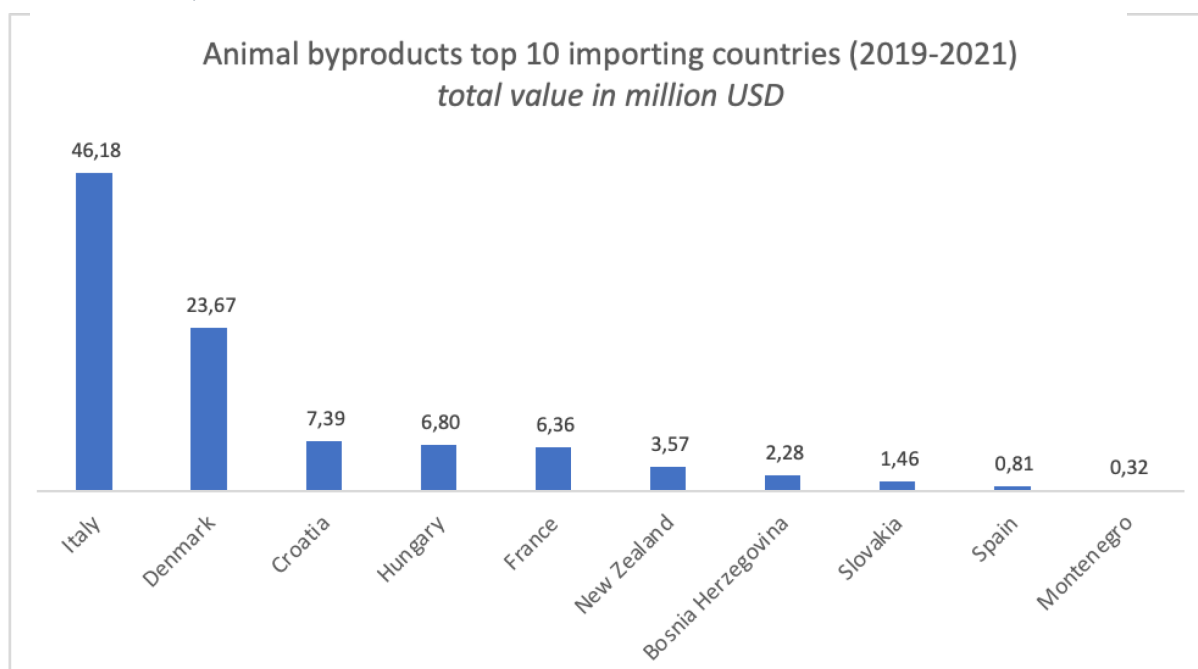
⁸ Category 2 is also the default status of any animal by-product not defined in Regulation (EC) 1069/2009 as either category 1 or category 3 material.

https://webgate.ec.europa.eu/tracesnt/directory/publication/establishment/index#!/search?classificationSectionChapter=animal_byproducts&countryCode=RS&sort=country.translation

Serbia is a net importer of animal by-products. The total trade balance is negative and for the period 2019-2021 the coverage rate (import/export ratio) was around 263%.



COMTRADE data, own calculations



COMTRADE data, own calculations

According to the existing **Rulebook on feed quality**, insects are currently not allowed in Serbia as a source of protein for feed.

Production of insects as alternative source of proteins for feed in Serbia is still in the scientific and piloting phase. Pilot production of insects namely flour worm (*Tenebrio molitor*) is conducted in the National Research and Education Center of Innovative Technologies in Agriculture, AGRO CAMPUS – Temerin under the leadership of the Department of Plant and Environmental Protection, Faculty of Agriculture, University of Novi Sad, Serbia. Further financing for the trials and piloting is expected to be secured from the Science Fund of the Republic of Serbia, though the PRIZMA programme⁹.

Additionally, it's important for companies to educate farmers and the public about the benefits of using insects in feed and to work on dispelling any misconceptions that may exist.

1.8.Expected market developments in medium term

The following market developments are defined based on the historical data regarding the production of selected commodities, the situation on their export markets and the expected growth, published in international outlooks such as the EU agricultural outlook for markets, income, and environment, 2022-2032 published by the European Commission.

Soybean

The initial increase of the prices of oilseeds caused by the war in Ukraine is likely to stabilize, having in mind the actions taken by the other global market players including the EU, which allowed the temporary derogation and the use of fallow land to ensure food security in the EU.

According to **EU agricultural outlook**¹⁰, the demand for soybean from external sources (outside of EU) will continue to grow despite the fact that major EU member states will increase their areas under this commodity, having in mind that there will still remain a gap in EU self-sufficiency for soybean. After China, the European Union is now the second largest importer of soya from South America. While the European Union's agricultural system as a whole is 71% self-sufficient in tradable plant protein, 86% of the plant protein which is imported to meet the 29% deficit is soya.¹¹

In general, the increase of the soybean market is a consequence of the supportive EU policies for protein crops, changing agricultural practices (crop rotation), feed needs for the still-expanding organic dairy herd, the increase in labelled soya products (GMO-free), the push for deforestation-free soya beans and, especially for pulses, the move to more plant-based diets.

Uncertainties related to selling soybeans to the Russian Federation, the second-largest market for Serbian export of soybeans, may increase the export potential to the EU market.

⁹ <http://fondzanauku.gov.rs/calls/?lang=en>

¹⁰ agriculture.ec.europa.eu/data-and-analysis/markets/outlook/medium-term_en

¹¹ www.donausoja.org/organisation/donau-soja-protein-strategy/

The shift to the EU can be facilitated by the provision of alternatives to the Russian market and the selection of more secure and reliable purchasers to minimize risk of potential loss.

Having in mind that the main export market for Serbian soy in the EU (Germany) is expected to grow especially due to the demand of the retailer to sell meat produced using non-GMO soy, this might give an additional boost to the production in Serbia.

Furthermore, the efforts which the Government of Serbia plan to do in the future and which foresees promotion and financing (from IPARD III) crop rotation will provide additional incentive for the growth of soybean production. All legumes, through their sustainable production improve soil fertility and reduce fertiliser consumption. This contributes to agricultural biodiversity and mitigates climate change.

These scenarios for Serbia are, however, based on the assumption that the producers will continue to invest in irrigation systems to respond to volatile production trends affected by adverse weather conditions which are becoming more frequent in recent years.

Another important aspect which will affect the market developments is the non-GMO status of soybean production in Serbia. Currently livestock producers in Serbia are faced with higher prices of soybean meal, due to unavailability of access to GMO soybean meal which other EU countries are importing from US and Latin America. On the other hand, there is no system in place in Serbia for non-GMO certification and labelling of local and imported non-GMO products, while Serbia imports meat, milk, and other animal-based products from GMO fed animals, denying the opportunity to add value to local production and distinguish it from imported GMO produced products. This makes local animal keepers who use non-GMO feed from the area less competitive on the market.

Sunflower

Serbia as one of the top world producers of sunflower will certainly continue to exploit its competitive advantage in this commodity production in the future.

However, the current structure of exports is exposing the producers and traders to a certain degree of risk, having in mind that most exports end on the Bosnia Herzegovina market to exploit a more favourable Free Trade Agreement with Turkey than those which Serbia¹² has with the same country.

Sunflower oil was Turkey's third largest food import in 2021, according to the Federation of Turkish Food Associations and the main source for this commodity was Russia and Ukraine.

The instability of these markets has led to an increase of areas under production and along with favourable weather conditions in Turkey, it is expected that they will harvest a record sunflower seed crop in marketing year 2022-23, according to a Global Agricultural Information Network report from the Foreign Agricultural Service of the US Department of Agriculture (USDA).

¹² Quotas for Serbia: 25,000 tons of raw sunflower oil, 10,000 tons of refined sunflower oil and 15,000 tons of sunflower seeds. Bosnia and Herzegovina do not have quotas.

These global changes and efforts of the countries to be more oriented to food security of the main agricultural commodities should push to more diversification of the exporting markets including EU member states, having in mind, again, the need to have more stable markets.

Another potential which might lead to the growth of the sunflower oil production is the expected change of the composition of the EU consumption of vegetable oils, through the substitution of the use of palm oil with sunflower oil, due to the sustainability and ethical concerns surrounding palm oil production among environmentalists and consumers.

Rapeseed

According to EU agricultural outlook, market areas used for rapeseed in the EU are expected to decline in the future (by -2.5 % for both crops between 2020-2022 and 2032).

Due to substitution effects between vegetable oils for biodiesel use, rapeseed oil is projected to increase slightly in Germany (main export market for Serbian rapeseed) and France and only slightly decrease in the other EU countries. In general, the rapeseed market is expected to stay stable with no major increases.

Pulses

One of the most significant growths on the EU market are expected to be the market of pulses, as EU goal is to become largely self-sufficient for these commodities with an expected growth of 54,7%. This may lead to less imports including from Serbia, but this should also provide an opportunity of Serbian producers to tap this potential and expand processing options, as the EU has a growing plant-based food market, and pea-based products are likely to expand in demand. Pulses and peas are considered a sustainable crop, favoured by EU laws. This, together with an increasing focus on sustainable agriculture and food production, may boost the pulses industry. Demand for pea-based products is expected to continue to increase in the coming years, while in Serbia processing is simple and with lower value added (frozen and canned).

As already noted, most exports of peas (main pulses commodity in Serbian context) find their way to the Russian Federation market, which in the upcoming period can cause problems, if Serbia aligns its foreign and trade policies with the EU, meaning that alternative markets need to be found.

Animal based proteins

The growth of production of animal-based proteins in Serbia under the current circumstances is not promising, having in mind a sharp decline in cattle breeding in Serbia.

Major players in the field are already well-established companies in the meat industry or highly specialized processing facilities with their capacities already underused.

Despite that, it is expected that some growth is possible due to the fact that the outreach of the small producers is not achieved fully and that the state is planning to subsidize the collection process for raw materials for animal by-products collection.

Novel food proteins

The area of novel food proteins is still being regulated and harmonised with EU laws. Once these preconditions are met and the use of novel food is fully regulated it can be expected that this market segment will have a significant growth. This should be followed with some strategies to overcome the potential obstacles regarding the consumption of novel foods, including engagement in robust scientific research to demonstrate their safety and effectiveness.

2. Policy and legal framework

2.1. Non-GMO policy and market consequences

Non – GMO policy in Serbia

In Serbia, the production, granting permissions to use, traffic, and monitoring of such organisms is mainly regulated by the **“Law on genetically modified organisms”**¹³, and the **“Rulebook on placing genetically modified organisms and products from genetically modified organisms on the market”**¹⁴.

According to the **Law on genetically modified organisms**, a genetically modified organism is an organism whose genetic material is altered through methods of modern biotechnology. Agricultural product of plant origin containing less than 0,9% impurities of GMO or less than 0,9% impurities originating from GMO is not considered genetically modified.

Seed and reproductive material are not considered genetically modified if they contain less than 0,1% impurities of GMO or less than 0,1% impurities originating from GMO.

GMO and products made from GMO can be used in closed systems and can be deliberately introduced into the environment based on official approval issued by the Ministry of agriculture, forestry, and water management.

The traffic or production for commercial purposes of any genetically modified organisms as well as organisms produced with the use of GMO is prohibited on the territory of the Republic of Serbia.

¹³ “Law on genetically modified organisms” (Official Gazette of the Republic of Serbia no. 41/2009)

¹⁴ “Rulebook on placing genetically modified organisms and products from genetically modified organisms on the market” (Official Gazette of the Republic of Serbia no. 62/2002 and 29/2009)

GMO and GMO products can be placed on the market, but only those which contain less than 0.9% impurities of GMO or less than 0,9% impurities originating from GMO (calculating the percentage relative to the net mass of the product).

Illegal production, use and traffic of GMO and GMO products is a criminal offense. The Ministry of Agriculture and the Ministry of health and their inspections act as supervisory organs to monitor food safety (including genetically modified food, and genetically modified food for animals) during all phases of production, processing, wholesale, and retail trade, as well as their import and export.

Market consequences of non-GMO policy in Serbia

All the above-mentioned facts imply that Serbia currently supports a strong non – GMO policy.

The market consequences of a non-GMO policy in Serbia can vary and have both positive and negative impacts.

Implementing a non-GMO policy may benefit the integral and organic farming sector because it aligns with consumer preferences for non-GMO food products. However, it may also limit the options for conventional farmers to benefit from GMO production.

Serbia's non-GMO policy is affecting its trade relationships, especially because this policy has become one of the main obstacles to Serbia's accession to the World Trade Organization (WTO), thus disabling the possibility of Serbia using the benefits of this membership.

Non-GMO policies can influence the food processing industry in a beneficial way. Companies which specialize in non-GMO food products may experience increased demand domestically and in export markets that value non-GMO products, for example soybean.

The non-GMO policy can influence the research and development efforts in Serbia through improvements in non-GMO varieties, crop management techniques, as well as sustainable agriculture practices.

A non-GMO policy can accommodate consumer preferences for natural products, enhancing the reputation of Serbian agricultural products. Domestic and international consumers who wish to avoid GMOs for health, environmental, or ethical reasons can be attracted by non-GMO policies. This could create opportunities for local producers and food companies to expand their markets.

The most obvious market consequences of such policy are much higher costs of production, but also higher costs of products, deterrence of potential EU buyers from buying Serbian products, and instead buying cheaper GMO products from other countries.

2.2. Legal status of other protein sources (insects, algae, PAPs) for feed and food

Protein sources from plant origin

In Serbia, protein sources from plant origin are generally regulated by the “Law on Plant Health”¹⁵, “Law on Seed”¹⁶, “Law on Protection of Plant Breeders’ Rights”, “Law on Acceptance of Agricultural Plant Varieties”, and the “Law on Plant Protection Products”¹⁷.

Other protein sources from animal origin

Other protein sources from animal origin, such as PAPs, or processed animal proteins are used in feed in Serbia.

PAP-s are mainly regulated by the “Law on Veterinary Matters”¹⁸, “Law on animal husbandry”¹⁹, “Rulebook on feed quality”²⁰, and the “Rulebook on registration and approval of establishments for the collection, processing, and destruction of by-products of animal origin”.²¹

According to the Rulebook on feed quality, feed of animal origin are products obtained by processing of parts of animals and their products, such as: fish meal, whale meal, fish processing products, by-products of poultry slaughtering and processing, meat meal, meat and bone meal, leather and meat meal, blood meal, liver flour, crackers, lard, fish oil, skimmed milk, whey, albumin, and casein.

This rulebook prescribes restrictions on use of feed of animal origin only for cattle, sheep, and goats.

“Law on Veterinary Matters” regulates the traffic of animals and products and food of animal origin, feed, by-products of animal origin and processed by-products of animal origin, as well as their import and export, transit, storage, sale, etc.

The safety of food and products of animal origin, as well as feed is a subject of veterinary control, performed by authorized inspectors of the Ministry - Veterinary Directorate. The control is performed in the objects of production and sale of these products, but also during their transit, import and export.

15 “Law on Plant Health” (Official Gazette of the Republic of Serbia no. 41/2009, 17/2019)

16 “Law on Seed” (Official Gazette of the Republic of Serbia no. 45/2005, 30/2010)

17 “Law on Plant Protection Products” (Official Gazette of the Republic of Serbia no. 41/2009, 17/2019)

18 “Law on Veterinary Matters” (Official Gazette of the Republic of Serbia no. 91/2005, 30/2010, 93/2012, 17/2019)

19 “Law on animal husbandry” (Official Gazette of the Republic of Serbia no. 41/2009, 93/2012, 14/2016)

20 “Rulebook on feed quality” (Official Gazette of the Republic of Serbia no. 4/2010, 113/2012, 27/2014, 25/2015, 39/2016, 54/2017)

21 “Rulebook on registration and approval of establishments for the collection, processing, and destruction of by-products of animal origin” (Official Gazette of the Republic of Serbia no. 12/2019)

The Ministry gives approval for the import and transit of products, food and feed from animal origin, feed, as well as by-products of animal origin. They are subject to obligatory veterinary inspections on the borders.

For the export of products of animal origin, an original international veterinary certificate is required confirming that they are safe for use in the country of import.

“Law on animal husbandry” regulates the primary production of feed for domestic animals and products of animal origin.

In Serbia, only authorized breeders, and specialized organizations can be engaged in animal husbandry.

The **“Rulebook on feed quality”** regulates the prerequisites for the quality of feed.

According to this rulebook, PAPs or food of animal origin used in feed in Serbia are products obtained by processing parts of animals and their products, such as: fish meal, whale meal, products from fish processing, by-products of slaughtering and processing of poultry, meat meal, meat-bone meal, skin-meat meal, blood meal, liver meal, crackers, fat, fish oil, skimmed milk, whey, albumin and casein.

The **“Rulebook on registration and approval of establishments for the collection, processing, and destruction of by-products of animal origin”** regulates the procedure for registration and approval of establishments for animal by-products. These establishments are registered in the Register of establishments and approved establishments.

Novel food

Some protein sources fall into the category of so-called **“novel food.”** According to the current **EU Regulation on novel food 2015/2283** from 2015 (Regulation), novel food is considered food that had not been in significant consumption by humans in the EU before 1997, the year when the first Regulation on novel food came into force.

Due to changes which happened as a result of scientific and technological developments since 1997, this Regulation updated the categories of novel foods in comparison to those from 1997 by including new categories, such as whole insects and their parts, food from microorganisms, fungi or algae, food from cell culture or tissue culture derived from animals, plants, etc.

According to the Regulation, only novel foods that are included in the **Union list of novel foods (EU) 2017/2470**, can be placed on the EU market and used in food for human consumption. This list is updated by newly authorized and approved novel foods, but also novel foods that are removed from the List.

In Serbia, novel food is regulated by the **“Law on food safety”** and the **“Rulebook on novel food”²²**.

²² “Rulebook on novel food” Official Gazette of the Republic of Serbia no. 88/2018 (Rulebook)

The **Law on food safety** includes novel food in the list of foods by their origin. This law gives the base rules for regulating this category of food, and the details are further regulated by the Rulebook on novel food.

The **Rulebook on novel food** regulates the process of approval for placing novel foods on the market of Serbia, the process of monitoring of novel food, as well as the conditions for traceability and labelling novel food.

Placing food that falls into the category of novel foods for the first time on the market in Serbia is preconditioned by obtaining a permit from the Ministry of health. The minister of health gives the permit based on a previously requested scientific opinion given by the Serbian Food safety council.

This rulebook uses the definition of novel food given in the Regulation on novel food 2015/2283 from 2015, as well as many of its other provisions. Article 9. of the Rulebook decrees that only novel food which has been approved by the EU Commission for placing on the EU market can be placed on the market of the Republic of Serbia.

Annex 1 of the Rulebook is the List of approved novel foods. This list contains only novel food from the Union list of novel foods and all the authorized amendments of the List made until this Rulebook was adopted in November 2018.

The amendments and novel foods approved in the EU after this period which are currently a part of the Union list of novel foods are not a part of this list, and the Rulebook did not prescribe the mechanism of adjusting the Rulebook's list accordingly with the amendments made in the Union list of novel foods.

Specifically, after the adoption of the Rulebook on novel food, the EU authorized the placing on the EU market of frozen, dried, and powdered forms of the migratory locust, yellow mealworm, house cricket, and the lesser mealworm, and they are not on the Rulebook's list of novel foods.

The draft Strategy for the transposition, implementation, and enforcement of the EU regulations in the field of food safety, veterinary and phytosanitary policies, whose adoption is expected soon, confirms that the Rulebook on novel foods has been harmonized with the Regulation 2015/2283, Regulation 2017/2470 and all legislation for its implementation published by 30 November 2018.

This draft strategy states that all novel foods approved on the EU market may also be marketed in the Republic of Serbia. It also states that the List will be regularly updated in line with the changes in European legislation.

The draft strategy clarifies that because of limited institutional resources if a manufacturer in the Republic of Serbia wishes to market some novel food in Serbia, they must first undergo the procedure for the approval of novel foods in one of the EU members states.

Having in mind the provision of the Rulebook which states that ***only novel food approved by the EU Commission for placing on the EU market can be placed on the market of the Republic of Serbia*** and the fact that ***there are novel foods which are currently approved in the EU but are not a part of the Rulebook's list of novel foods***, but also ***the content of the draft Strategy***, it is unclear whether currently only the foods that are on the Annex 1 Rulebook List can be placed on the market in Serbia, or the criteria for approval are the foods that have been approved by the EU Commission in the moment when the approval is sought and are in the Union list of novel foods.

To clarify this contradiction, it is necessary to ask for a clarification of the Rulebook from the Ministry of health whether only the foods that are on the Annex 1 Rulebook List can be placed on the market in Serbia, or the criteria for approval are foods that have been approved by the EU Commission in the moment when the approval is sought.

Therefore, due to this discrepancy in Serbian regulations, the status of the migratory locust, yellow mealworm, house cricket and lesser mealworm as food for human consumption is currently unclear.

Having in mind that novel food is still in the process of further regulation in Serbia, it can be expected that once the contradictions in the regulations are clarified, all EU approved food for human consumption to be accepted as food in Serbia, and accordingly regulated.

2.3. Trade regime for oilseeds, protein plants and PAPs

Harmonized System code	Tariff (RS to EU)	Trade regime (RS to EU) ²³
1201 - Soya beans, whether or not broken	0% Erga omnes	Health control of feeding stuffs of non-animal origin Plant health control Other
120510 - Rape or colza seeds, whether or not broken: Low erucic acid rape or colza seeds	0% Erga omnes	Health control of feeding stuffs of non-animal origin Plant health control Other
120600 - Sunflower seeds, whether or not broken	0% Erga omnes	Health control of feeding stuffs of non-animal origin Plant health control Other
070810 - Leguminous vegetables, shelled or unshelled, fresh or chilled: Peas (<i>Pisum sativum</i>) 070820 - Leguminous vegetables, shelled or unshelled, fresh or chilled: Beans (<i>Vigna</i> spp., <i>Phaseolus</i> spp.)	0% Serbia	Health control of feeding stuffs of non-animal origin Plant health control Other

²³ Based on the EU Access2Markets database which contain information on trade with third countries including tariffs, taxes, procedures, formalities and requirements, rules of origin, export measures, statistics, trade barriers, etc. trade.ec.europa.eu/access-to-markets/en/home

071310 - Dried leguminous vegetables, shelled, whether or not skinned or split: Peas (<i>Pisum sativum</i>)		
050510 - Skins and other parts of birds, with their feathers or down, feathers and parts of feathers (whether or not with trimmed edges) and down, not further worked than cleaned, disinfected or treated for preservation; powder and waste of feathers or parts of feathers: Feathers of a kind used for stuffing; down	0% Erga omnes	Health control of products of animal origin not intended for human consumption Waste control Other
230110 - Flours, meals and pellets, of meat or meat offal, of fish or of crustaceans, molluscs or other aquatic invertebrates, unfit for human consumption; greaves: Flours, meals and pellets, of meat or meat offal; greaves	0% Erga omnes Import control – CITES if applicable ²⁴	Health control of products of animal origin not intended for human consumption Waste control Other
041010 - Insects and other edible products of animal origin, not elsewhere specified or included: Insects	0% Serbia	Control of contaminants in foodstuffs Health control of Genetically Modified (GM) food and novel food Traceability, compliance and responsibility in food and feed Labelling of foodstuffs Other

Export of animal-by products to the EU is regulated by specific rules which require placement of the establishments on Lists for export. Details of the establishments are held in the TRACES platform of the European Commission that is managed and maintained by DG SANTE (TRACES-NT).

Exports to other countries are regulated by individual conditions of those countries, which are determined through the international cooperation of the competent authorities of the Republic of Serbia and the country to which the export is planned.

2.4. Other relevant policy and/or legal framework (subsidies, strategies, etc.)

Agriculture strategies in Serbia

There isn't a Strategy in Serbia regulating incentives for the production, use or consumption of alternative proteins.

Serbian regulations still don't recognize alternative proteins as a specific subject that should be regulated.

In Serbia, currently effective is the **Strategy for agriculture and rural development for the period 2014 – 2024**²⁵. which determines long-term plans and goals for agriculture development in Serbia.

²⁴ CITES controls: import and export of protected species, requires check if the import or export needs a permit under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

²⁵ Strategy for agriculture and rural development for the period 2014 – 2024²⁵ (Official Gazette no. 85/2014)

One of the most important goals of this Strategy is the harmonization of national legislation with EU legislation. Serbia has harmonized many of its laws in the field of agriculture with EU legislation, but the process is still ongoing.

According to the **European Commission Serbia 2022 progress report** from October 2022 for the Chapter 12 - Food safety, veterinary and phytosanitary policy, the conclusion was that Serbia is moderately prepared in these areas.

One of the most important recommendations of the Report for the upcoming year is for Serbia to adopt a **national strategy and action plan to align its regulations with EU regulations regarding food safety, veterinary, and phytosanitary policy.**

In alignment with this, a draft of this **Strategy** is being prepared and discussed by the Serbian authorities.

The EU Commission Serbia 2022. Progress report also concluded that there still isn't progress on adopting the framework legislation on genetically modified organisms that should be aligned with the EU legislation. According to the draft Strategy. Serbia is preparing to adopt a new Law on Genetically Modified Organisms.

Having in mind the recommendations of the EU Commission Serbia 2022 Report, and the consequences of not aligning the framework legislation on GMO with the EU legislation, as well as the content of the draft Strategy regarding GMO regulations in Serbia, it can be expected that Serbia will harmonise its legislation as requested.

Agricultural subsidies in Serbia

In Serbia, the production, processing, and subsidies for agricultural products are regulated by the "Law on agriculture and rural development"²⁶, "Law on subsidies in agriculture and rural development"²⁷ and the valid rulebooks adopted based on these laws.

According to these laws, the right for subsidies can be granted to agricultural holdings (natural persons, entrepreneurs, or legal entities) which are enlisted in the Register of agricultural holdings and are in an active status.

The "**Rulebook on Registration in the Register of Agricultural Holdings and Renewal of Registration and Conditions for Passive Status of Agricultural Holdings**"²⁸, prescribes the preconditions for enlisting in the Register.

²⁶ "Law on agriculture and rural development" (Official Gazette of the Republic of Serbia no. 41/2009, 10/2013, 101/2016, 67/2021, 114/2021)

²⁷ "Law on subsidies in agriculture and rural development" (Official Gazette of the Republic of Serbia no. 10/2013, 142/2014, 103/2015, 101/2016)

²⁸ "Rulebook on Registration in the Register of Agricultural Holdings and Renewal of Registration and Conditions for Passive Status of Agricultural Holdings" (Official Gazette of the Republic of Serbia no. 17/2013, 102/2015, 6/2016, 46/2017, 44/2018, 102/2018, 6/2019)

According to the Law on Subsidies in Agriculture and Rural Development, subsidies can be awarded from funds provided in the Budget of the Republic of Serbia, but also funds provided from other sources, such as EU funds dedicated for agricultural and rural development – IPARD programme.

The subsidies and monetary amounts of subsidies in agriculture are determined yearly in the “**Budget Law of the Republic of Serbia**” and the “**Regulation on the Distribution of Incentives in Agriculture and Rural Development**”.

3. Stakeholder analysis

3.1. Overview of private sector participants in Serbia

The consolidation and decline in the number of small producers are the traits of the structural changes taking place in Serbia’s agricultural sector, especially the sector of oilseeds.

Since the revenues of the companies are low and substantial production (and thus land) is required to generate sufficient total revenues, this is the industry where the average size of producers is the highest.

In general, producers of oil seeds and main protein plant producers can be classified into four main categories²⁹:

Type of manufacturer	Features
Large companies	- Have integrated processing in more than one company - Own/lease several thousand, even tens of thousands of hectares, as well as significant infrastructure in silos, irrigation systems, buildings, and other facilities. - Most often they do co-operation and purchase of other crops - Have above average yields, but also higher costs compared to family farms - Produce the largest number of seeds of other crops
Aggregators	- Divided in three groups: (1) have large land areas that bring them a larger share of the yield than cooperation; (2) have small areas of their own and cooperation is the basic income; (3) they work exclusively in cooperation. - Registered as a cooperative or LLC and managed by cooperatives or company owners - A good number of the largest aggregators are united in the Association Vojvodina Agrar - Small aggregators at the village level find it increasingly difficult to survive in the competition of large aggregators
Large manufacturers	- Own/lease several hundred to several thousand hectares of agricultural land. - As a rule, they are specialized in the production of other crops - Have stable and good yields – over 12 tons of corn and 10 tons of wheat - Are well equipped with machinery, with the ability to irrigate and use quality inputs and GPS systems - Registered as a family farm and/or company; Often have a few farms.

²⁹ Sector Analysis of Production and Processing of other crops in the Republic of Serbia-For IPARD III programming purposes, SEEDEV, January 2020.

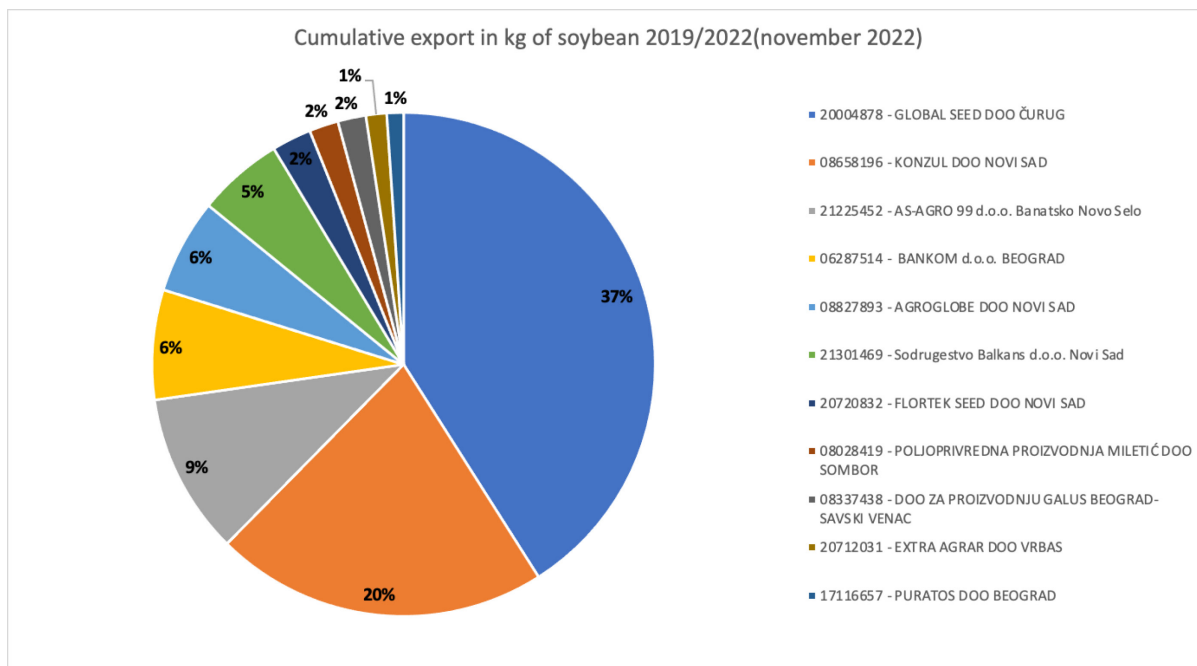
	- Are the largest rentiers of agricultural land and most often this accounts for over 50% of the land they cultivate
Medium manufacturers	- Ranging from about 5 to 50 hectares of production of other crops - Related to livestock breeding and the production of fruit and vegetables for their own needs and/or sale through a short chain of markets - Use every opportunity to reduce investments (uncertified seeds, poorer fertilizers, saving on protection, natural drying of corn, etc.) so they do not achieve stable and high yields (at the level of average or slightly higher) - Agriculture is often not their only income.
Small manufacturers	- Have a couple of hectares and do other crops, along with other crops for their own consumption - Don't have their own machinery, or they own just a small tractor - Tied to their land and do not want to sell or rent it - Have other incomes - If they don't increase the area, it will be difficult for them to stay on the manufacturer's map

The analysis of the trade of the main oilseeds and protein products shows that **trading is mostly done by trading companies and on a smaller scale the producers themselves**. Listed companies contain the registration number and **their contacts and business details can be obtained through the Business Registry Agency at**

<https://pretraga2.apr.gov.rs/unifiedentitysearch>

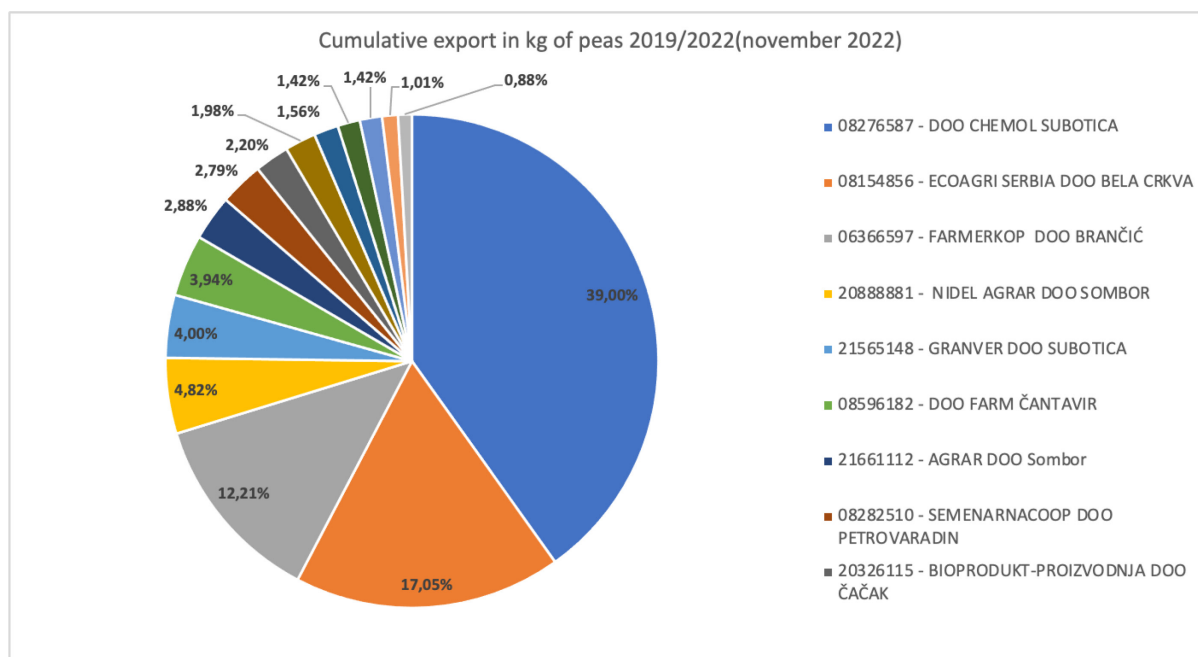
The following charts present the main actors on the export markets per commodity from 2019 until the first 11 months of 2022 (cumulative)

The top 15 soybean exporters account for 91% of total export quantities in the given period.



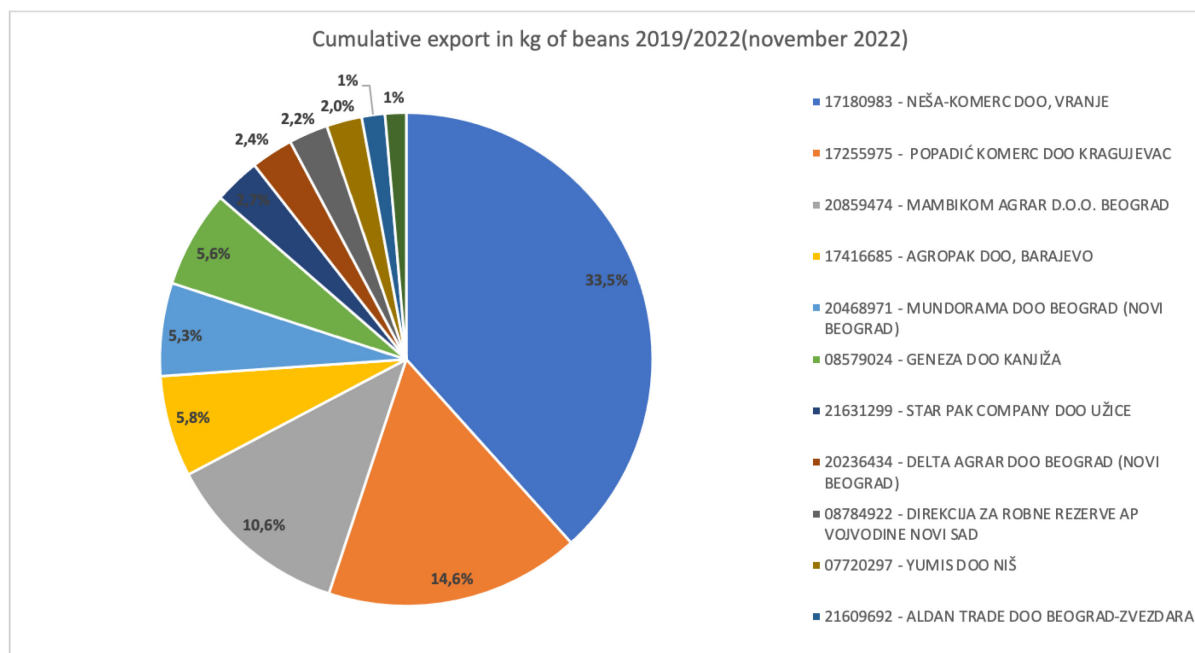
TRADEMAP data, official data, own calculations

The top 15 peas seed exporters account for 97,16% of total export qualities in the given period.



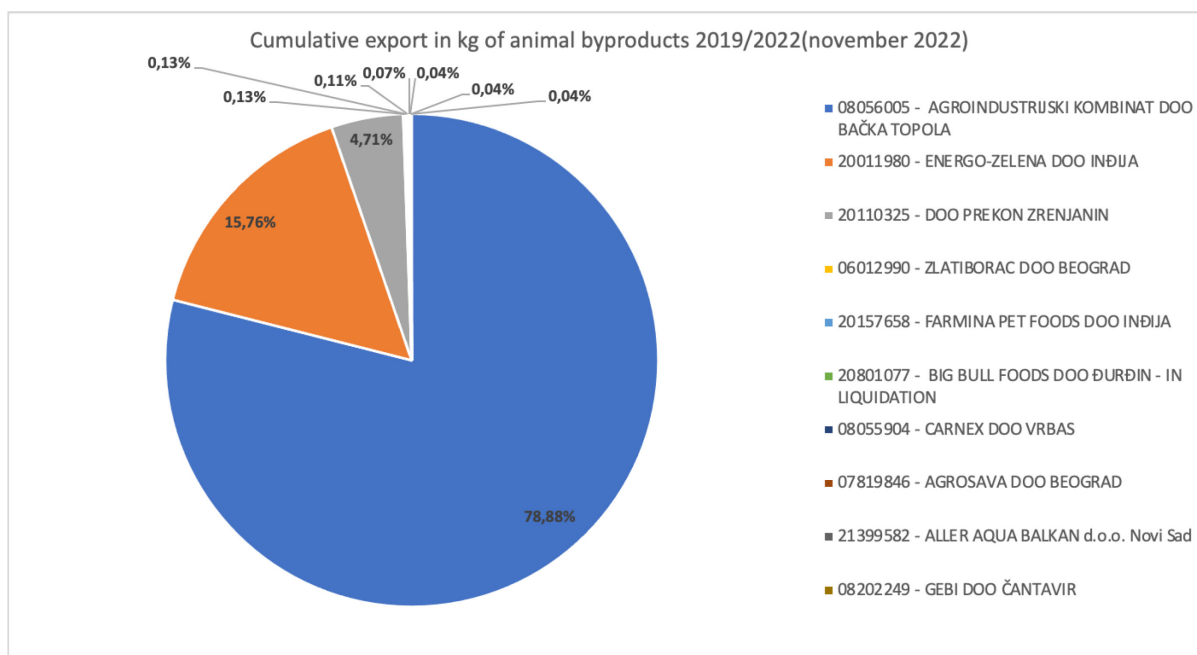
TRADEMAP data, official data, own calculations

The top 12 beans exporters account for 87% of total export qualities in the given period.



TRADEMAP data, official data, own calculations

Top 10 animal by-products exporters account 99,91% of total export quantities in the given period.



TRADEMAP data, official data, own calculations

3.2. Relevant farming organizations

There are not many organisations in this field apart from those which are formed under the umbrella of the national Chamber of Commerce.

In this institution, two associations are relevant for the production, processing, and trade of protein sources of plant and animal origin.

First is the **Association for Plant Production and Food Industry** which has different groups of producers, specialized for different commodities. Relevant for the production of protein sources are the Group for vegetable oils and Group of producers of cereals, industrial and fodder crops.

Second association is the **Association for Livestock Breeding and Processing of Livestock Products** and its Group of animal feed producers and Group of industries of secondary products of animal origin.

Other associations include these:

“Zita Srbije”³⁰ is the association for improving the production and export of cereals and oilseeds which was founded in 2009 and is based on the long tradition of the Yugoslav Grain Fund, which existed since 1978 as an association of grain producers and exporters.

³⁰ www.zitasrbije.rs

Another association is **Business Association for Industrial Plants**³¹ and it has a long tradition gathering factories for oilseed processing and production of oil and others, sugar beet processing and production of sugar and others, production, and processing of tobacco.

Many Serbian producers are also participating in the **Donau Soja** which is a European, multi-stakeholder, not-for profit membership organisation supporting the European Protein Transition with a particular emphasis on sustainable European Non-GMO soya production. It is based in Vienna, with regional offices in Serbia, Ukraine, and Moldova.

3.3. Relevant research institutions in the field of protein for food and feed

In Serbia, the most relevant accredited research institutions in the field of protein for food and feed are:

Institute	Website	Relevance
Faculty of Agriculture in Belgrade	www.agrif.bg.ac.rs/	Research related to new varieties of plants and seeds, entomology, genetics, plant breeding and seed production, animal feed, etc.
Faculty of Agriculture in Novi Sad	polj.uns.ac.rs/	Research related to new varieties of plants and seeds, entomology, genetics, plant breeding and seed production, animal feed, leguminous plants, etc.
Institute for the Application of Science in Agriculture in Belgrade	www.ipn.bg.ac.rs/sr/37institut-za-primenu-nauke-u-poljoprivredi/	Acting as national advisory service in agriculture. They can have a significant role in promoting alternative protein sources.
BioSense Institute in Novi Sad	biosens.rs/	Research related to alternative protein sources.
Institute for Vegetable Growing in Smederevska Palanka	institut-palanka.rs/rs	Research related to new varieties of plants and seeds.
Institute of Agriculture and Vegetable Growing in Novi Sad	ifvcns.rs/	Research related to new varieties of plants and seeds, leguminous plants, sunflower,

³¹ www.indbilje.co.rs

		climate crops, and alternative plant varieties.
Institute for Animal Husbandry in Belgrade	istocar.bg.ac.rs/en/	Research related to feed and animal products technology.
Scientific Institute for Food Technologies in Novi Sad (Faculty of Agriculture Novi Sad)	fins.uns.ac.rs/	Research related to feed and food safety, grain crops for human and animal nutrition.
Institute for fodder plants in Kruševac	www.ikbks.com/	Research related to fodder plants.

3.4. Public authorities at national and (where relevant) regional level

The Ministry of Agriculture, Forestry and Water Management and the Ministry of Health are responsible institutions in the areas of food safety, veterinary and phytosanitary policies.

Competent authorities in the Ministry of Agriculture, Forestry and Water Management are the Veterinary Directorate, Plant Protection Directorate, Sector of Agricultural Inspection within the Ministry, Sector of Agricultural Policy within the Ministry, and the Directorate for National Reference Laboratories.

Competent authorities in the Ministry of Health are the Inspection Sector within the Ministry of Health (Sanitary Inspection and Border Sanitary Inspection), Sector for sanitary supervision and public health.

In the Autonomous Province of Vojvodina inspection and supervision is carried out by the Autonomous Province Healthcare Secretariat.

Agricultural subsidies are in the competency of Directorate for Agrarian Payments within the Ministry of Agriculture, Forestry and Water Management.

4. Market opportunities

4.1. SWOT analysis protein sector Serbia

Strengths	Weaknesses
Soy – self-sufficiency in production, non-GMO soy, increase of agricultural areas under soy, diversified export markets, high competitiveness in production compared to	Soy – non – GMO soy is more expensive, yields dependency on weather conditions, almost monopolized soy market (production, processing, and trade of soy).

Europe's, ensured sale for the produced quantities of soy. Sunflower – Serbia is among top countries of the world in production of sunflower seeds, higher yields per hectare compared to other countries. Rapeseed – stable production of rapeseed, the most experienced and equipped producers are in the business of production of rapeseeds, diversified export markets Peas – stable growth of production, stable growth of exports, well established processing facilities, Beans – / Other animal proteins – Policy and legal framework is in place, growing number of private companies entering the business, introduction of subsidies for collection of animal by-products. Insects for feed and food – availability of researchers and research institutions active in this field. Proteins from food processing waste streams – good resource base and available specialists in the field.	Sunflower – undiversified export market. Rapeseed – increase of agricultural areas under rapeseed in the EU. Peas – majority of export is aimed for the Russian market. Beans – large number of small producers, lack of production areas under single crop production, unprotective production. Other animal proteins – low raw material base due to decreasing production of cattle in Serbia, some facilities still did not reach relevant EU standards in production, impact on the environment. Insects for feed and food – misconception by wider community on the benefits and uses of insects in food and feed. Proteins from food processing waste streams – initial costs in developing processing facilities and lack of wider knowledge on the benefits.
Opportunities	Threats
Soy – increased EU demand for non-GMO soy, the expected frequent crop rotation is likely to lead to the increase in soy production. Sunflower - / Rapeseed – the use of rapeseed oil as renewable source of energy. Peas – high demand for legumes in EU and globally, crop rotation can likely to lead to the increase in production.	Soy – instability of soy yields, instability of the global soy market, instability of the Russian market which is the second largest export market for Serbian soy. Sunflower – possible loss of markets as result of harmonization with EU rules, increase of agricultural areas under sunflower in the EU. Rapeseed – lack of competitiveness in production of rapeseeds in comparison to EU countries. Peas – losing existing exporting markets, increase of areas under legumes in EU which are more subsidized than Serbia.

Beans – high demand for legumes in EU and globally, crop rotation can likely to lead to the increase in production. Other animal proteins – local self-governments still need to resolve management of the animal by-products from small animal producers which are not included in the system (potential for growth). Insects for feed and food – currently not penetrated market in this field with good resource base in terms of knowledge and resources for this protein production. Proteins from food processing waste streams – more efficient waste management practices minimizing environmental impact and creating a more sustainable food processing industry.	Beans – lack of support can lead to further decline in the production and more increased dependence on imports. Other animal proteins – possible resistance of the local population to the building of new processing facilities due to environmental problems from the past. Insects for feed and food – slow adoption of the relevant legislation as the results of potentially sensitive topic for decision makers. Proteins from food processing waste streams – Food waste streams may vary in composition, quality, and nutritional content, which can make it challenging to develop proteins with consistent quality. Introducing protein products derived from food waste streams may face challenges regarding consumer acceptance. Developing proteins from food waste may require adherence to specific regulations and standards which may not be in place.
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4.2. Market entry strategies and potential to improve production and/or processing for export market

The following table is based on the relevant potential market entry options, in line with the primary objectives of the Netherlands National Protein Strategy for alternate protein sources, which primarily aim to lower reliance on overseas markets and lessen the environmental footprint of Dutch demand for soy in feed, meaning that the potential protein sources can be obtained from the Serbian market.

Market strategy alternatives are combined with the potential for growth of the animal and plant protein sources as described above the text of the study and rely on the SWOT analysis and the outlooks for the particular protein source.

Presented market entry options include imports to Netherlands, company takeover through brownfield investments and greenfield investments.

Another potential market entry option could be exploring the possibilities for joint research and development. According to the latest data of the Republic Statistics Office, the total expenditures for scientific research and research and development activity in 2021 was at the level of 0,99% of GDP, at the same time EU accounted 2,27%. In the Republic of Serbia private sector accounts around 52% of those investments.

These options are ranked using a scale from 1 to 3, where 3 is the most preferred option, 2 is less preferred, and 1 is the least preferred.

Potential for growth is ranked using two categories which include growth of the external demand and growth of the market based on the export's values.

Potential for growth is ranked using a semaphore approach providing visual presentation for selected products. Red colour indicates the low level of potential for growth, yellow indicates medium level of potential for growth and green indicates high level of potential for growth.

Protein source	Market entry option				Potential for growth
	Imports to NL	Company takeover/Brown field investments	Green field investments	R&D	
Soybean	3 Offering cooperation to alternate Russian market	2 Market is close to being monopolized. Significant efforts needed to enter	1 Subsidies are provided for green field investments but this strategy is feasible in medium run because it is time consuming and full diligence is needed to enter the market.	1 Serbia has still not fully used potential for shifting to greening of agricultural production and focusing on the lower use of artificial fertilizers. Processing of soybean has also potential for R&D.	External demand is growing Areas under production are increasing Crop rotation promotion
Sunflower seeds	3 Offering cooperation to alternate export to Bosnia and Herzegovina market	2 Sunflower processing market is lively as there is a consolidation ongoing towards mergers and takeovers.	1 Processing facilities are exceeding the needs for domestic market.	1 Processing of sunflower into innovative products is still not fully developed in Serbia. (proteins, milk, bars, flour, etc.)	External demand is stable Areas under production are stable Potential for R&D is high
Rapeseeds	3 Establishing cooperation is easy because of small number of producers	2 Current producers are highly specialized and have right production technologies	2 This commodity is usually seen as an alternative to wheat, so there is potential for growth	1 Processing of rapeseed into innovative products is still not fully developed in Serbia.	External demand is stable Areas under production are stable Potential for R&D is high
Peas	3 Offering cooperation to alternate Russian market	3 Major players for processing are well established companies	1 Processing facilities are over the needs for domestic market.	1 Processing of peas into innovative products is still not fully developed in Serbia. (proteins, milk, bars, flour, etc.)	External demand will decrease Areas under production are stable High potential for alternative processing due high demand for pea protein

Beans	1 Production is not competitive to other global producers	1 Producers are small and significant investments will be needed	2 Subsidies are provided for green field investments but this strategy is feasible in medium run because it is time consuming and full diligence is needed to enter the market.	2 Production of beans in Serbia is not sufficiently competitive, but there is a potential to improve production since yield per unit area is twice as low as some other European countries	Production is not competitive to global producers Areas under production are small
Protein of animal origin	3 Quantities are limited	3 Major players are linked to the meat processing industry	3 Problems in securing raw materials	2 These alternative protein sources are becoming an important source of nutrients as part of a growing circular economy	Production is not competitive to global producers Areas under production are small
Insects for feed and food	1 Production is not existing	3 Production is in piloting phase	1 There are no market players in the production	1 underdeveloped area, with room for further collaboration. Some pilot research is underway.	Potential for growth is high due to zero starting point High potential for research and development, especially in terms of assessing alternatives to plant proteins
Proteins from food processing waste streams	2 Current production levels are not economically relevant	2 Existing market players still need to develop these production lines	1 Market is underdeveloped and open to investments	1 Existing research institutions are engaged in these fields	Potential for growth is high due to zero starting point High potential for research and development

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25. 28 Sector Analysis of Production and Processing of other crops in the Republic of Serbia-For IPARD III programming purposes, SEEDEV, January 2020.

Annex 1

Table of jurisdictions review per fields in Chapter 12 (Draft Strategy on Chapter 12)

FIELD OF COMPETENCE	COMPETENT AUTHORITY	DESCRIPTION
FOOD SAFETY POLICY		
Food	Veterinary Directorate / Veterinary Inspection	Food of animal origin and composite food*: • Primary production, • All stages of production, processing and trade (wholesale, retail) • Export
	Veterinary Directorate/ Border Veterinary Inspection	Food of animal origin and composite food* • Import and transit
	Plant Protection Directorate/ Phytosanitary Inspection	Food of plant origin: • Primary production including the production of sprouts for human consumption • Storage of primary products (cereals) • Wholesale and retail of primary products • Export of primary products
	Plant Protection Directorate/ Border Phytosanitary Inspection	Food of plant origin: • Import and transit Composite food* • Import and transit Wine, alcoholic and non-alcoholic beverages: • Import and transit
	Sector of Agricultural Inspection /Agricultural inspection Department for the safety of food of plant origin Agricultural inspection department for wine, spirits, alcoholic and non-alcoholic beverages and control of tobacco processors and producers of tobacco products	Food of plant origin: • Processing of food of plant origin • Organic production • Food with protected designations of origin, protected geographical indications and traditional specialties guaranteed; Composite food*: • All stages of production, processing and trade (wholesale, retail) • Export Wine, alcoholic and non-alcoholic beverages: • All stages of production, processing and trade (wholesale, retail) • Export
Feed	Veterinary Directorate / Veterinary Inspection	Feed of animal origin Composite feed containing ingredients of animal origin Medicated feed Feed containing ingredients that are neither of plant, nor of animal origin: • All stages of production, processing and trade • Export
	Veterinary Directorate/ Border Veterinary Inspection	Feed: • Import or transit, except for feed of animal origin
	Plant Protection Directorate/ Phytosanitary Inspection	Feed of plant origin: • Primary production and storage of primary products (cereals)
	Plant Protection Directorate/ Border Phytosanitary Inspection	Feed of plant origin: • Feed containing ingredients that are neither of plant, nor of animal origin: • Import and transit
	Sector of Agricultural Inspection /Agricultural inspection Department for the safety of food of plant origin and composite food	Feed of plant origin: • Feed/cereals stored in mills/bakeries/processing establishments
Animal By-Products	Veterinary Directorate / Veterinary Inspection Border Veterinary Inspection	Full competence: • All stages of production, processing and trade • Import and transit • Export

1) novel foods, 2) food for specific population groups (food for infants and young children, food for special medical purposes, replacement for a complete daily diet for people on a weight loss diet), 3) food supplements (dietary supplements), 4) foods with altered nutritional composition (food for gluten-intolerant people, salt substitutes for human consumption, foods enriched with vitamins, minerals and other substances with nutritional or physiological effects), 5) salt for human consumption and food production, 6) food additives, 7) food flavourings, 8) food enzymes, 9) appurtenances for food production, 10) drinking water: supplied to the consumers via a public water supply system or in original packaging (natural mineral, spring and table water), as well as water used, or added during food treatment, processing or production, 11) materials and objects intended to come into contact with food	Ministry of Health (Autonomous Province Healthcare Secretariat)	Inspection Sector/ Sanitary Inspection Border Sanitary Inspection (Sector for sanitary supervision and public health/ Sanitary Inspection)	Full competence: • All stages of production, processing and trade • Import (at the point of customs clearance) • Export
VETERINARY POLICY			
Animal Health	Ministry of Agriculture, Forestry and Water Management	Veterinary Directorate/ Veterinary Inspection Border Veterinary Inspection	Full competence: • Internal market • Import and transit • Export
Animal Welfare		Veterinary Directorate / Veterinary Inspection	• Full competence
Identification and Registration of Animals		Veterinary Directorate / Veterinary Inspection	• Full competence
Zootechnics		Agricultural Policy Sector Sector of Agricultural Inspection /Department for agricultural inspection and control of incentives in agriculture, organic production and animal husbandry	• Full competence
PHYTOSANITARY POLICY			
Plant Health	Ministry of Agriculture, Forestry and Water Management	Plant Protection Directorate / Phytosanitary Inspection / Border Phytosanitary Inspection Forestry Directorate/Forestry inspection*	Full competence: • Internal market • Import and transit • Export
Plant Protection Products		Plant Protection Directorate / Phytosanitary Inspection	Full competence: • Internal market • Import and transit
Quality of seed and propagation material		Plant Protection Directorate/ Phytosanitary Inspection	Full competence: • Internal market • Import and transit • Export
Protection of Plant Variety Breeders' Rights		Plant Protection Directorate/ Phytosanitary Inspection	• Full competence

Pesticide Residues		Plant Protection Directorate/ <i>Phytosanitary Inspection</i> Veterinary Directorate / <i>Veterinary Inspection</i> Sector of Agricultural Inspection <i>/Agricultural inspection</i>	Full competence: • Internal market • Import and transit • Export
	Ministry of Health (Autonomous Province Health Secretariat)	Inspection Sector / Sanitary Inspection <i>Border Sanitary Inspection</i> (Sector for sanitary supervision and public health/ <i>Sanitary Inspection</i>)	Full competence: • Internal market • Import and transit • Export
GMO			
Genetically modified organisms (GMO)	Ministry of Agriculture, Forestry and Water	Plant Protection Directorate/ <i>Phytosanitary Inspection</i> Veterinary Directorate / <i>Veterinary Inspection</i>	• Intentional introduction of GMOs into the environment • Production of genetically modified food and feed