Finnish agri-food sector outlook 2022

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Contents

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Summary

Economic development uncertain

The Finnish economy is expected to grow by 0.5-3% this year. The unusually broad range indicates that it is difficult at this stage to estimate the impact of the uncertainty caused by the war in Ukraine and any difficulties in foreign trade on the economy. In any case, the steep increase in oil and raw material prices will accelerate inflation and reduce consumers' purchasing power.

Food prices to increase by up to 10%

There are unusual pressures to increase food prices, as the prices of production inputs and various costs in the food chain have increased significantly. Food prices are expected to increase by as much as 10% in 2022. Food costs account for 12.5% of total consumption, and the percentage will increase this year when the increase in food prices exceeds the general inflation rate. The price increase may accelerate demand for the most affordable products.

Foreign trade of agricultural and food products increasing

The value of agricultural products and foodstuffs exported from Finland increased very moderately in 2021 compared with previous years. The value of exports reached EUR 1,787 million, up by 2.7% from the year before. In 2021, the value of agricultural products and foodstuffs imported into Finland was EUR 5,525 million, roughly 4% more than in 2020.

CAP reform proceeding

A consensus was reached on the reform of the EU Common Agricultural Policy (CAP) in June 2021. The aim of the reform is to allocate more agricultural subsidies to environmental and climate activities. The reform also requires the member states to prepare their national strategy plans to implement the policy. Finland's proposal for the national strategy was submitted to the European Commission in December 2021. In April 2022, the Commission made more than 200 observations regarding Finland's plan. Most of this feedback was related to needs of development in environmental and climate activities. The new rules and regulations of the CAP will be adopted by the member states at the beginning of 2023.

Steep price increases in the cereals market

The outlook for the cereals market is determined both by the steep increases in input prices and the changes in the price ratios between crops. The stocks of nearly all crops are lower than in many years due to the poor harvest year of 2021. This means the 2022 cereal harvest plays an unusually significant role not only for Finland's food supply, but also for the moderate development of food prices.

More oil and protein crop areas needed

Demand for oilseed and protein crops is higher than supply in Finland. In particular, protein feed supplements depend significantly on imports. In 2021, more than a third of total soybean-, rapeseed- and sunflower meal came from Russia. The suspended deliveries from Russia stopped at the beginning of March 2022. The production of turnip rape and rapeseed, pea and broad bean play a central role in replacing imports with domestic alternatives. Although the reliability of turnip rape, rapeseed and broad bean farming continues to decelerate the increase in production, the price situation in the spring motivated farmers to increase the area sown with oil crops and pea.

Poultry meat to leave pork behind in consumption

The structural development between different types of meat continues in Finnish meat production and consumption. Beef and pork production and consumption are decreasing, while the consumption of poultry meat is increasing. This year, poultry meat consumption will exceed pork consumption for the first time. Total meat production and consumption are expected to remain at the previous year's level. Production is facing a serious cost crisis due to the price level of production inputs. The profitability crisis, combined with the rising consumer prices of meat products towards the end of the year, may slightly reduce the level of both production and consumption from the current estimates. Producer price increases are a requirement for safeguarding the continuity of the production. The cost crisis is affecting meat production across Europe, and producer prices are rising in all EU member states.

Milk producer prices increased slightly

The situation was challenging in the Finnish dairy sector in 2021. The yield of the first grass silage cut of the summer of 2021 was quantitatively high, while digestibility remained low due to heat. The drought during the end of the summer had a negative impact on the following cuts subsequent harvesting of grass silage fodder and reduced the yield of cereals harvest to a historically low level. Milk production was down by 4% from the previous year, while the protein and fat content of the milk produced increased slightly. The percentage of imports from domestic consumption decreased slightly. The global market prices of dairy products increased to record-high levels towards the end of 2021 compared with the previous year. In Finland, the average producer price of milk was increased only slightly. The dramatic increase in the prices of purchased feed and other production inputs in late 2021 and early 2022 will continue to shake the dairy sector in 2022.

Egg markets in balance

Egg consumption and production are well balanced. A historic turn took place at the end of 2021, when the production of eggs in barn henhouses passed enriched battery cages, accounting for 47% of total production at the end of the year, while the number of eggs produced in enriched battery cages decreased to 42%. The number of eggs produced in free-range henhouses and organic henhouses accounted for 3% and 7 % of all eggs, respectively. Of the retail value of eggs, organic eggs already account for more than 20%. The production volume and the number of chickens in 2022 are difficult to estimate due to the cost crisis and the declining demand for eggs produced in enriched battery cages.

Increases in electricity prices test greenhouse production

The growing season is short in Finland, which is why stock vegetables play an important role in maintaining domestic supply. The cold storage of produce is also important for the maintenance of the security of supply in horticultural products. In addition, the storage of produce increases costs on horticultural farms through the construction of cold storage facilities and energy costs. In contrast, greenhouses produce yields round the year. The recent increase in electricity prices tests the profitability of greenhouse enterprises, as energy costs account for roughly 25% of their production costs.

The significance of hired labour increasing

In 2020, there were 45,600 agricultural and horticultural enterprises in total in Finland. The number of agricultural and horticultural farms and the workload have decreased. The workload of farmers and their family members has decreased, while that of employees has increased. At the same time, the significance of the foreign workforce has increased, particularly in horticultural production.

Cost pressures reflected in the low profitability of livestock farming

Low harvest levels and increased costs reduced the profitability of farms in 2021. According to estimates, profitability in agriculture in 2022 is expected to be as low as in the previous year. Farm expenses are fairly high relative to income, and their finances react strongly to changes in costs. If expenses continue to rise, and producer prices do not increase, the liquidity of farms and their ability to repay their loans will be at risk.

Dependence on imported energy increases costs in agriculture

According to Statistics Finland, purchase prices of agricultural production equipment were roughly 22% higher in January 2022 than in the previous year. The cost of agricultural production equipment and services was up to 29% and that of investments 8% higher than in the year before. The Russian invasion

of Ukraine caused the input markets to be reorganised in the spring of 2022. The key short-term impact involves the significant increase in agricultural production input prices and problems associated with the availability of certain inputs. The tightening situations in international production input and cereal markets are interlinked, which will be materialised in a significant increase in the prices of crops produced in fields.

Organic production increasing, still room for improvement in livestock production

The goal of Finland's national organic production programme is to increase the market share of organic foodstuffs to 5% by 2030. The market share of organic production is still quite low, especially in livestock production: only 0.4% of all pork and an even lower proportion of all chicken meat produced in Finland is organic. The PPILOW project identified several financial and legislative factors that prevented measures aimed to improve animal welfare being carried out. Based on a rough estimate, as the production cost of organic meat and eggs is at least two or three times higher than in regular production, consumers must be prepared to pay more for organic products.

Cellular agriculture challenges regular livestock production

The general interest in cellular agriculture is based on ethical, environmental and economic reasons which reflect the viewpoints of actors in the food system on the acceptability of food production methods, global sufficiency of food, the nutritional value of food, and the profitability of production. Applications of cellular agriculture help replace regular animal products, including meat, fish, milk and eggs, so that the composition of the nutrients contained by new products corresponds to animal-based products. In cellular agriculture, production is controlled in a closed system, allowing the environmental and climate impact of production to be monitored more closely and reduced more easily.

Operating environment in agriculture and food sector

General economic development

Jari Viitanen and Jyrki Niemi

The situation in Ukraine and its development are the most significant factors affecting the development of the global economy this year. Developing economies may still be facing the largest crisis, as their food supply is at risk due to the Russian invasion of Ukraine and high prices of energy. Suspended imports of energy would also present a short-term problem in Europe, where many countries depend on Russian oil and gas. The war and related economic sanctions are expected to reduce global economic growth by roughly one percentage point in 2022, and growth is expected to be slightly above 3%. The Finnish economy is expected to grow by 0.5-3% this year. The unusually broad range indicates that it is difficult at this stage to estimate the impact of the uncertainty caused by the war and any difficulties in foreign trade on the economy. In any case, the steep increase in oil and raw material prices will accelerate inflation and reduce consumers' purchasing power.

Russia's invasion of Ukraine to decelerate global economic growth

According to preliminary data, the global economy grew by 5.9% in 2021. Such a large increase can be explained by the low level in 2020 after the coronavirus pandemic reduced the global economy by 3.2%. At the beginning of this year, the recovery of the global economy and expectations of growth were still looking promising as the pandemic and the restrictions imposed to prevent its spread were slowly making a turn for the better. However, Russia's invasion of Ukraine at the end of February 2022 quickly reduced the outlook for global economic growth. The direct economic impact of the war is materialised in the sanctions imposed on Russia and Russia's countersanctions against the western countries, because trading with Russia will stop, and export income and production volumes will decrease. Currently, the impact can be felt in rising inflation rates.

Russia has been a significant exporter of energy and raw materials, and the aim of the western countries to reduce their dependence on Russia's energy and raw materials by restricting the import of natural gas and oil will increase the prices of energy products. Russia and Ukraine combined have accounted for roughly 30% of global exports of wheat and barley, and approximately 16% of global exports of maize and turnip rape. In addition, Russia has played a significant role in all three major fertiliser groups (nitrogen, potassium and phosphorus). Another major player in potassium especially has been Belarus, and the sanctions also affect trading with it. The decrease in supply will increase the already high prices of nutrients, which will have an impact on future yields and will cause global food inflation.

The situation is the most critical in Northern Africa and the Middle East, where weather conditions have been dry, and harvest levels low, and where countries have been heavily dependent on Ukrainian wheat. Among others, Egypt, Yemen and Lebanon have relied heavily on Ukrainian yields in feeding their people. The war will inevitably affect supply chains and cause a frenzy among importers to find other sources for deliveries. This will cause cereal prices to increase. Furthermore, supply chains across the world have depended on the import of other raw materials such as nickel and palladium from Russia and Ukraine. Rising prices of energy and food will reduce companies' profitability and consumers' purchasing power in real terms. The third factor reducing economic growth is the general increase in uncertainty, which will be reflected in demand for consumption and investment.

In March 2022, the Organisation for Economic Co-operation and Development (OECD) estimated that the war and related economic sanctions and measures would reduce global economic growth by approximately one percentage point this year, and growth is expected to remain at a little more than 3%. In the eurozone, the region most dependent on Russian energy, the impact will be more visible, and growth is expected to decrease by 1.4 percentage points to 3% in 2022 as a result of the war. In the USA, the peaking economic growth is also expected to decrease due to the significant increase in inflation. In China, the war has so far had a minor impact, but the strict coronavirus policy, problems in the real estate sector and the shortage of energy in industry will decelerate economic growth, which is expected to remain at 5% this year.

Monetary policy to be tightened to curb rising inflation

Prices of oil and raw materials already started to increase last year when economies opened up after the pandemic, and global demand increased. In the USA especially, inflation has accelerated since last spring. In March 2022, the increase in prices had already reached over 8% in the USA, the highest figure in 40 years. In the eurozone as well, inflation has slowly picked up the pace during the year, albeit more slowly than in the USA. However, consumer prices jumped by 8,1% in May 2022 measured at an annual level as a result of Russia's invasion of Ukraine. This is the highest monthly figure in the eurozone's measurement history. Although a significant part of inflation in the eurozone consists of the rising prices

of energy products, prices of food and services have also increased.

In March 2022, the food index of the United Nations' Food and Agriculture Organization (FAO) reached the highest level ever measured between 2004 and 2022. The global market prices of agricultural commodities had already increased steeply before the Russian invasion of Ukraine and have continued their rapid increase. During a single year, from March 2021 to March 2022, global prices for agricultural products increased by as much as a third on average. Prices increased by 56% in cooking oils, 37% in cereal products, 24% in dairy products, 23% in sugar, and 19% in meat.

The global market prices of agricultural products may remain high for a long period. Grain futures also hint at unusually high grain prices next autumn. The situation in European food markets will undergo a long-term change due to the Russian invasion of Ukraine, especially as the production input industry, which is heavily dependent on Russia, will be forced to rearrange its raw material supply. The tightening situation in the fertiliser markets concerns ammonia and potassium especially, and their import must be rearranged. In addition, Russian oil must be replaced by oil supplied from other producer countries, which will increase prices.

However, the European Central Bank (ECB) must find a balance in the eurozone between rising inflation and economic growth decelerated by the war. The former would require a stricter monetary policy, while the latter would require an extension to the recovery policy. In March, the ECB decided to discontinue the asset purchase programme (APP) started in the spring of 2020 during the third quarter of this year, which will tighten monetary policy. In Europe, the first hike of central bank interest rate is expected to to take place as early as summer 2022.

Instead, the Federal Reserve (Fed) already increased its interest rates in March 2022 to curb rising prices and the overheating economy - for the first time since 2018. At the beginning of May, the central bank interest rate was raised again by half a percentage point. Interest rates are expected to be further increased on several occasions during the rest of the year. Between June 2021 and April 2022, the US dollar strengthened in value by roughly 10% against the euro. The more rapid acceleration of monetary policy in the USA than in Europe, combined with decelerating economic growth in the eurozone, will create more pressure to reduce the value of the euro against the US dollar during the rest of the year.

Uncertainties associated with Russia, energy and rising prices

The situation in Ukraine and its development are the most significant factors affecting the development of the global economy this year. How long will the war continue, will it escalate into a larger international conflict, and how will the import of energy and raw materials from Russia be replaced in the short term? Developing economies may still be facing the largest crisis, as their food supply is at risk due to the Russian invasion of Ukraine and high prices of energy.

Suspended imports of energy would also present a short-term problem in Europe where many countries depend on Russian oil and gas. The situation is particularly dire in Central Europe, the region most tied to Russian energy. If the EU imposes significant additional sanctions on the import of Russian energy, or Russia suspends its energy deliveries, the eurozone will probably fall into a recession, and the value of the euro would decrease significantly. However, high inflation rates and stricter monetary policy also threaten economic growth and may lead to stagflation.

Geopolitically, the tensions between China and the USA are still simmering beneath the surface, and if China were to take Russia's side in the war, the economic situation would probably be exacerbated. Although the coronavirus situation is slowly improving, the pandemic has not completely disappeare, and the emergence of new variants remains possible.

Forecasts for Finland's economy adjusted downwards

Based on preliminary data, Finland's economy grew by 3.3% in 2021. The economic outlook remained positive at the beginning of the year, but the situation has quickly deteriorated due to Russia's invasion of Ukraine. Although Russia only accounts for some 5% of Finland's goods exports, the deteriorating outlook in other key export areas and the global markets will also cast a shadow on Finland's economic development this year. In March 2022, consumer confidence indicators crashed from the previous month. During April and May, gloom continued to increase slightly. Industry's confidence in the future is significantly decreasing.

Although the slow recovery of employment supports an increase in private consumption, accelerating inflation and decreasing purchasing power in real terms will reduce consumption opportunities. Machine and equipment investment are expected to increase. Growing uncertainty is also reflected in the most recent economic forecasts, in which the estimated range of 0.5-3% for an increase in Finland's gross domestic product (GDP) is unusually broad.

Food consumption and consumer prices

Terhi Latvala, Erja Mikkola, Hanna Karikallio, Jyrki Niemi

During the last five years, annual variation in food prices has remained at less than 2%. This year, there are unusual pressures to increase food prices, as the prices of the production inputs required for producing food and various costs in the food chain have increased significantly. Food prices are expected to increase by as much as 10% in 2022. Food costs account for 12.5% of total consumption, and the percentage will increase this year when the increase in food prices exceeds the general inflation rate. The price increase may accelerate demand for the most affordable products.

Consumption of red meat continued to decrease

According to the preliminary Balance Sheet for Food Commodities, meat consumption was roughly 78.9 kilograms per capita last year, nearly the same as in 2020 (79 kilograms). However, the total consumption of meat has decreased compared with the last few years. The consumption of red meat has decreased significantly, and the decrease continued last year. Pork especially has been consumed less than before. Poultry meat is still behind pork, but the gap is only narrow. According to preliminary calculations, the consumption of poultry meat was roughly 28.4 kilograms per capita in 2021, up by 3.3% from the previous year. Correspondingly, the consumption of pork was 28.9 kilograms, down by 2.7% from 2020. The consumption of beef decreased slightly, totalling approximately 18.4 kilograms per capita. The consumption of lamb remained unchanged at 0.5 kilograms.

According to the Finnish Grocery Trade Association's (PTY) sales data, the amount spent by households on beef was slightly higher in 2021 than in the previous year. The slight increase in sales can largely be explained by rising prices. Significantly less pork was purchased in 2021 than in the year before (-3.7%). However, pork consumption is not expected to follow the same rate of 3-4% in the near future, as part of meat consumption may shift to more affordable pork as a result of rising prices. Sales of poultry meat remained nearly unchanged in 2021. However, processed meat products account for nearly half of total sales of meat products, with their sales increasing by nearly 1% (0.92%).

The meat consumption figures have been calculated as carcass meat. The figures also include game. Typically, carcass meat contains 80% of boneless meat. In addition, the cooking loss of meat ranges from 10% to 30%. The weight of cooked meat is around 50% of the weight of carcass meat. The calculation does not indicate the exact amount of food consumption. The figures in the Balance Sheet for Food Commodities represent the amount available for consumption rather than actual consumption, because volumes of storage losses and other waste, among other things, are not available from all stages of the food chain. In fish statistics, the consumption of domestic fish has been converted into fillets, while the consumption of imported fish has primarily been calculated based on the product weight.

More wheat consumed than in the previous year, only slight decrease in the consumption of liquid milk

According to preliminary calculations, wheat consumption was approximately 82 kilograms per capita in 2020 and roughly 84 kilograms in 2021. Regarding our basic cereals, the consumption of wheat increased slightly from the previous year, while that of rye decreased a little, and that of oats remained at the previous year's high level. Last year, the consumption of oats was 10.1 kilograms per capita, significantly higher than a few years ago. In 2021, the consumption of wheat was 45.4, rye 14.3, barley 0.9 and rice 6.9 kilograms per capita. The consumption of other bread cereals (buckwheat, quinoa, etc.) increased from the previous year.

According to Finnish Bread Information, Finnish people ate a little more than 34 kilograms of soft domestic bread per capita in 2021, corresponding to roughly three slices of bread a day. This figure is slightly more than half a kilogram higher than in previous years. The consumption of light bread was roughly 19 kilograms and that of dark bread 15 kilograms. In retail, cereal products already make up the second largest product group in the grocery trade after dairy products with their share of 14.4%.

According to preliminary calculations, the consumption of liquid dairy products was roughly 142 kilograms per capita last year. In 2021, an average of 99 litres (approximately 102 kilograms) of liquid milk per capita was consumed. The consumption of liquid milk decreased only slightly from the previous year (roughly 1.5%). The shares of different types of milk remained nearly unchanged, with low-fat milk still accounting for roughly 58%. The consumption of sour milk, yoghurt, cream and curdled milk decreased a

little, whereas that of pudding and quark with additives increased slightly. Last year, cheese consumption in Finland was close to the previous year's figures. Instead, butter consumption decreased slightly.

Consumption of eggs returned to the normal level

The consumption of eggs was roughly 12.4 kilograms per capita in 2020, up by 0.5% from previous years. During the first months of the coronavirus pandemic, cooking and baking at home increased. According to preliminary figures for 2021, egg consumption was roughly 12 kilograms, i.e. close to the pre-pandemic level.

According to the Balance Sheet for Food Commodities, the consumption of fresh vegetables was 64 kilograms per capita in 2020, but this volume also includes any waste and is only indicative. In 2020, the consumption of fresh fruit was approximately 58 kilograms per capita, of which citrus fruit accounted for 14.4 kilograms.

Fish consumption dominated by farmed salmon and rainbow trout

According to Luke's statistics on fish consumption, the consumption of fish was approximately 13.3 kilograms per capita in 2020. Fish consumption has ranged between 13 and 15 kilograms throughout the 2000s. It started to decrease after the mid-2010s when the prices of imported salmon increased. Imported salmon is the most popular fish product on the Finnish market, and its price has a significant impact on the prices of domestic fish. Imported fish accounted for more than 70%, or about 9 kilograms, of total consumption. Regarding imported fish species, the consumption of farmed salmon (3.9 kilograms per capita), tuna (1.6), farmed rainbow trout (0.3), saithe (0.3) and Atlantic and Baltic herring (0.5) was the highest.

Consumption of certain foodstuffs per capita in Finland in 2016-2020, kg

Year	Fresh vegetables[1]	Cereals total	Sugar	Meat total[2]	Beef	Pork	Poultry	Eggs
2020*	64.1	81.6	32.1	79.2	18.6	29.7	27.5	12.4
2019	66.3	80.3	27.9	79.6	18.8	30.8	26.4	11.9
2018	63.5	79.1	29.2	81.3	19.3	32.5	25.6	11.8
2017	63.8	80.3	30.6	81	19.4	33.4	24.9	11.9
2016	63.7	79.7	29.1	81.1	19.2	34.7	23.5	11.9

[1]Including any wastage. [2]Including bones, i.e. carcass meat, including edible offal. Source: Natural Resources Institute Finland (Luke), Balance Sheet for Food Commodities

Of domestic fish species, farmed rainbow trout (1.5 kilograms per capita) was consumed most. Of wild-caught domestic fish, perch was consumed most (0.67 kilograms), followed by pike (0.47), Baltic herring (0.43), vendace (0.36), pikeperch (0.30), and European whitefish (0.26). Recreational fishery catches are included in the consumption figures.

The coronavirus pandemic caused disruptions in global salmon markets, due to which high volumes of affordable salmon and rainbow trout were imported into Finland in 2020. Demand for salmonids increased, while the profitability of domestic production decreased. Salmon prices returned to the previous years' high level in the spring of 2021. The war in Ukraine and the economic sanctions imposed on Russia will increase fish production costs, add pressure to increase prices, and reduce the profitability of fish farming and fishery. In 2022, global salmon production is expected to decrease, which will further increase prices, which were already at a record high at the beginning of the year. As consumer prices increase, consumption will probably shift to more affordable fish or other food products. In 2021, fish products accounted for 4.1% of total sales of food products.

In the spring of 2021, an EU27 study of the consumption of fish and fish products was published. Of all Finnish people, 73% say that they eat fish or fish products at least once a month. Two thirds of Finnish people eat fish at least twice a week. The goal of the programme for promoting the consumption of domestic fish is to increase the consumption of fish to 2.5 portions a week by 2035.

Finns enjoy drinking milk, Finland at the average level in meat consumption

According to the preliminary figures of the European Commission's meat balance sheet, meat consumption per capita in the EU in 2021 remained at the previous year's level. Measured by types of meat, consumption is expected to remain relatively unchanged. According to the European Commission's dairy products balance sheet, the consumption of liquid milk products per

capita is expected to decrease slightly from the 2020 level in the next few years.

Based on the European Commission's consumption figures, Finland was in seventh place in the consumption of beef per capita among the EU27 countries in 2021. Finland was 24th in terms of pork consumption and joint 13th in the consumption of poultry meat among the EU27 countries. The European Commission's consumption figures have been calculated based on production and foreign trade volumes. According to the EU's balance sheet and Sweden's food balance sheet, more beef and pork per capita are eaten in Sweden than in Finland, and Swedish people eat less poultry meat.

In the consumption of liquid milk, Finland is third in the EU's balance sheet in 2020. Only Ireland and Lithuania consume more liquid milk than Finland. In Sweden, liquid milk consumption is roughly 66 litres (68 kilograms) per capita, i.e. two thirds of the corresponding figure in Finland (99 litres).

However, Finland is only slightly above the EU average in the total consumption of dairy products. Currently, more dairy products are eaten (cheese, quark and yoghurt) than drunk in Finland as well. Dairy products and eggs also make up the largest product group, accounting for 16.5% of sales of food products.

Finland's self-sufficiency in production remains high

The ratio between domestic production and consumption in Luke's Balance Sheet for Food Commodities indicates that Finland's agriculture and food industry can respond well to the needs of domestic consumers. The production of basic foodstuffs such as dairy, meat and cereal products nearly matches their consumption in Finland. In recent years, the self-sufficiency rate for dairy products in Finland has been more than 100% and for meat products more than 90%. Finland is also self-sufficient in cereals, even though variation in yields naturally has some impact on production volumes in different years.

However, the self-sufficiency rate is not any official indicator of food security, as domestic production depends on various production inputs, particularly energy, raw materials for fertilisers, crop protection agents, seeds, machinery, and foreign seasonal workers. Therefore, the maintenance of production requires imports and effective international trade relations and supply chains.

Annual changes in foodstuffs and non-alcoholic beverages, 01/2017-03/2022.

	2017	2018	2019	2020	2021	2022
January	-2.4	1.5	2.1	1.8	0.4	3.2
February	-0.5	1.3	2.0	1.3	-0.2	4.5
March	-1.7	2.5	0.9	1.8	0.5	5.1
April	-1.7	1.7	2.0	1.0	0.8	6.0
May	-1.0	2.4	0.5	2.4	0.5	
June	-1.0	2.4	1.1	2.4	-0.4	
July	-1.5	2.0	0.7	2.9	0.0	
August	-0.1	1.8	1.7	0.9	0.5	
September	-0.4	2.8	0.3	2.0	0.6	
October	-0.3	2.6	0.4	1.7	1.0	
November	-0.3	1.1	1.1	1.5	1.5	
December	-0.1	1.1	1.8	0.2	1.7	
Yearly average (%)	**-0.9**	**1.9**	**1.2**	**1.7**	**0.6**	
Consumer price index	**97.9**	**99.8**	**101.0**	**102.7**	**103.3**	

Source: Statistics Finland.

Food security means that all people always have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life GFSI is used as an indicator of food security. It examines the affordability, availability, quality and safety of foodstuffs, as well as natural resources and change resilience, in a total of 113 countries. GFSI is a dynamic quantitative and qualitative comparative analysis built of 58 indicators to measure factors affecting food security in the developed and developing countries. Finland was ranked fourth in 2021, while it was rated as the country with the highest level of food security of the examined 113 countries in the previous year. Last year, food security was considered to have decreased especially due to lower agricultural production. This was measured by the indicator of instability in agricultural production.

Annual change in food prices per product group in 2017–2021, %.

Product group	2017	2018	2019	2020	2021
Food and non-alcoholic beverages	-0.9	1.9	1.2	1.7	0.6
Grain products and bread	-0.1	0.4	1.9	0.7	0.8
Meat	-1.2	1.6	4.4	2.0	0.6
Fish and shellfish	7.3	0.3	-0.1	-1.8	0.8
Milk products, cheese and eggs	-0.6	2.1	1.7	0.0	-0.3
Fats and oils	1.8	5.2	3.1	-0.7	0.4
Fruits and berries	1.3	3.8	-2.4	4.4	-2.5
Vegetables	-2.8	5.7	-1.8	1.6	2.1
Sugar, jams, honey, chocolate and candies	-10.5	1.3	0.6	1.9	0.2
Prepared food, other	-1.3	-0.2	0.0	0.0	0.3
Non-alcoholic beverages	2.4	-0.2	1.3	5.3	3.4

Source: Statistics Finland.

In the Global Food Security Index, Finland was ranked fourth in 2021. The percentage of food of total household consumption expenditure is an important indicator of food security, which effectively reveals the opportunities of different countries and their households to cope with high variation in food market prices. The percentage of foodstuffs and non-alcoholic beverages bought by households from total household consumption expenditure has decreased to roughly 12% in Finland, representing the average level in the EU.

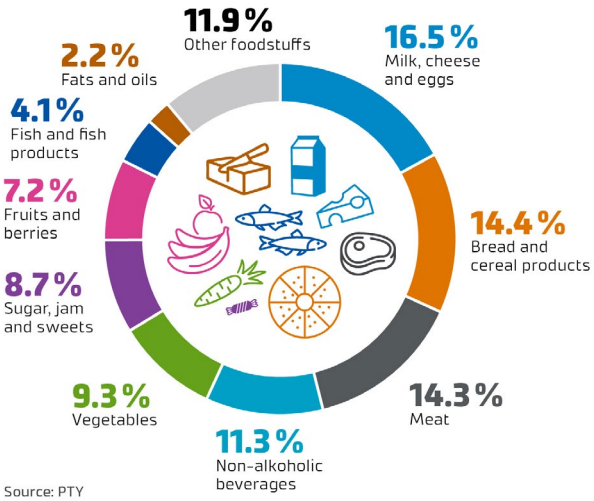
Food retail continued to increase

When the coronavirus pandemic continued in 2021, retail sales of foodstuffs and non-alcoholic beverages increased by 3%, and their turnover was EUR 14.7 billion. The euro-denominated increase in sales of various products can largely be explained by rising sales volumes, even though the prices of foodstuffs increased at the end of the year especially. The increase in sales of foodstuffs in 2021 was still based on restrictions imposed due to the pandemic and the stabilisation of remote work as part of the multilocational work culture.

In several food product groups, the increase in sales volumes evened out during 2021. In 2021, the increase was highest in convenience foods (16%) and non-alcoholic mineral waters and beverages (12.5%), and the increase in sales can largely be explained by growing sales volumes. Sales of non-alcoholic and low-alcohol beers continued to increase significantly (by 28% to EUR 57.1 million). Retail sales decreased most in such basic foodstuffs as butter (-7.6%), potato (-5.3%), sugar (-4.8%), frozen fish and fish products (-4.7%), flour (-4.1%), and pork (-3.7%). Sales of these basic products increased during 2020 driven by the coronavirus pandemic, while the decrease in sales in 2021 is partly an indication of recovery after the pandemic. According to the Finnish Organic Food Association (Pro Luomu), organic products accounted for roughly 2.5% of total sales in the grocery trade.

During 2022, the impact of the coronavirus pandemic will decrease, and the increase in sales volumes will even out. However, the steep increase in prices will be reflected in the 2022 statistics as a euro-denominated increase in sales. Wholesale foodservice has had ups

Euro-denominated retail sales of foodstuffs and non-alcoholic beverages per product group in 2021, %.



Source: PTY

and downs during the pandemic, and a recovery can be expected in the future. Changes in working life and online food shopping, two factors that affect the consumption of food, will remain partly permanent practices.

Unusual pressure to increase food prices

According to the 2021 consumer price index, the annual change in prices of foodstuffs was 0.6%. Domestic prices increased steeply towards the end of the year, with the increase accelerating even further at the beginning of 2022. The increase in prices at the end of the year was based on the rising prices of agricultural products and energy. During 2021, the most significant price increases concerned fish products (5.8%), margarine (4.8%) and coffee (13.7%). Coffee price increases have affected consumers most significantly. In February 2022, the price of coffee was as much as a third higher than the previous year's level. According to the International Coffee Organization (ICO), coffee consumption in Finland is 12 kilograms per capita, whereas the corresponding figure is 10 kilograms in Sweden and nine kilograms in Norway.

Food prices have increased more rapidly in Europe than in Finland. In February 2022, the European food consumer price index was 5.6% higher than in the previous year. Prices for raw materials for cooking fats and oils were up to 15% higher than in the year before. Prices of bread and cereal products increased by 6.6% year-on-year. The price of durum wheat, which is used to make pasta and macaroni, was as much as 80% higher than in the previous year in Italy and Spain. The increase is based on the previous year's low yields. Since February, wheat prices have also increased because of the uncertainty about the availability of wheat, because plant oils and wheat are imported into Europe from the war-ravaged Black Sea region. In addition, prices of milk, cheese and eggs were 5.4% and those of meat products 3.9% higher than in February 2021.

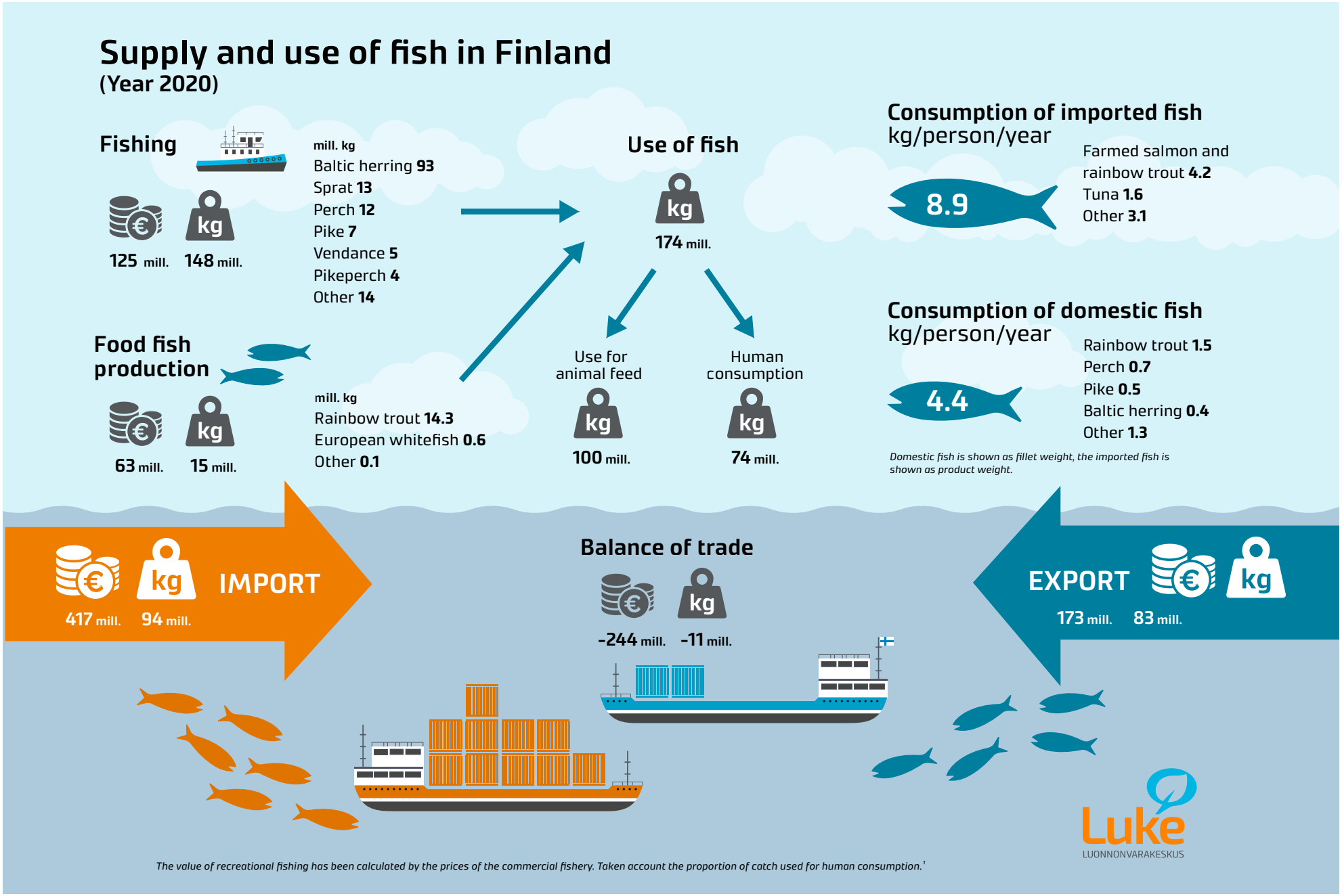
Consumer prices are expected to increase steeply in Finland in 2022. In March 2022, prices of foodstuffs and non-alcoholic beverages were 5.1% higher than in the previous year. Food prices are expected to increase by 10% in 2022, which is significantly higher than the expected inflation rate (5-7%). The increase in food prices is now based on several factors, including uncertainty about the availability and price of energy and fertilisers. If the crisis persists, it will have a serious impact on the global food chain, also reflected in Finland through long-term increases in food prices.

Currently, food costs account for 12.5% of available income, and the percentage is expected to increase. As raw materials make up some 15% of food prices, the impact on retail prices paid by consumers will be more moderate than the increase in raw material prices. Instead, high fuel prices and the pressure to increase logistics prices may even reduce the availability of individual food products. In 2023, cost pressures presented by agricultural production inputs and the global decrease in the availability of agricultural products and foodstuffs will further increase food prices.

Statistics

Luke, **Balance Sheet for Food Commodities**
Luke, **Fish consumption**
EU balance sheets
Jordbruksverket, **Konsumtion av livsmedel**
Global Food Security Index
Monitoring of agricultural products and consumer prices in the EU

Photo: Leipätiedotus ry


Supply and use of fish in Finland
(Year 2020)
Fishing
125 mill.
148 mill.
mill. kg
Baltic herring 93
Sprat 13
Perch 12
Pike 7
Vendance 5
Pikeperch 4
Other 14
Use of fish
174 mill.
Use for animal feed
100 mill.
Human consumption
74 mill.
Food fish production
63 mill.
15 mill.
mill. kg
Rainbow trout 14.3
European whitefish 0.6
Other 0.1
Consumption of imported fish
kg/person/year
8.9
Farmed salmon and rainbow trout 4.2
Tuna 1.6
Other 3.1
Consumption of domestic fish
kg/person/year
4.4
Rainbow trout 1.5
Perch 0.7
Pike 0.5
Baltic herring 0.4
Other 1.3
Domestic fish is shown as fillet weight, the imported fish is shown as product weight.
IMPORT
417 mill.
94 mill.
Balance of trade
-244 mill.
-11 mill.
EXPORT
173 mill.
83 mill.
Luke
LUONNONVARAKESKUS
The value of recreational fishing has been calculated by the prices of the commercial fishery. Taken account the proportion of catch used for human consumption.[1]

Foreign trade of agricultural and food products

Csaba Jansik and Irene Rosokivi

The value of agricultural products and foodstuffs exported from Finland increased very moderately in 2021 compared with previous years. The value of exports reached EUR 1,787 million, up by 2.7% from the year before. In 2021, the value of agricultural products and foodstuffs imported into Finland was EUR 5,525 million, roughly 4% more than in 2020. At the beginning of the millennium, foreign trade in the sector increased significantly in several years, after which the increase in imports decelerated between 2013 and 2016. The leap in 2017 was followed by three years of very slow growth. In 2021, the value of imports increased significantly yet again.

Trade deficit at a record level

The trade deficit in agricultural products and foodstuffs increased significantly in 2021 following the positive trend in 2019 and 2020 - by EUR 176 million, from EUR 3,562 million to EUR 3,738 million. As a result, the deficit returned almost to the record-high level of 2018. Traditionally, the trade deficit has mainly been due to the large import volumes of fruit, vegetables, raw coffee, and alcoholic beverages. Other important products imported into Finland include cheeses and cereal products. Finland's food production also needs to increasingly compete with imports in product groups in which domestic production is sufficient relative to consumption, including cereal, meat and dairy products.

The increase in the deficit in 2021 resulted largely from trade in plants or plant-based products. Challenging weather conditions and the record-low harvest levels in 2021 increased the deficit. The positive trade balance in cereals decreased by EUR 56 million. The trade deficit in oil crops and their fractions (rapeseed and soy) weakened by EUR 53 million. In addition, the deficit in cereal and bakery products increased by EUR 28 million. The trade balance in plant oil imported for energy purposes weakened the increase in the deficit significantly by EUR 71 million, which creates a need to analyse the development of the foreign trade balance separately regarding foodstuffs and the raw materials used in their production, and to exclude any items outside the food chain from the analysis.

The trade balance of foodstuffs and their raw materials is significantly lower than that of all plant- and animal-based products

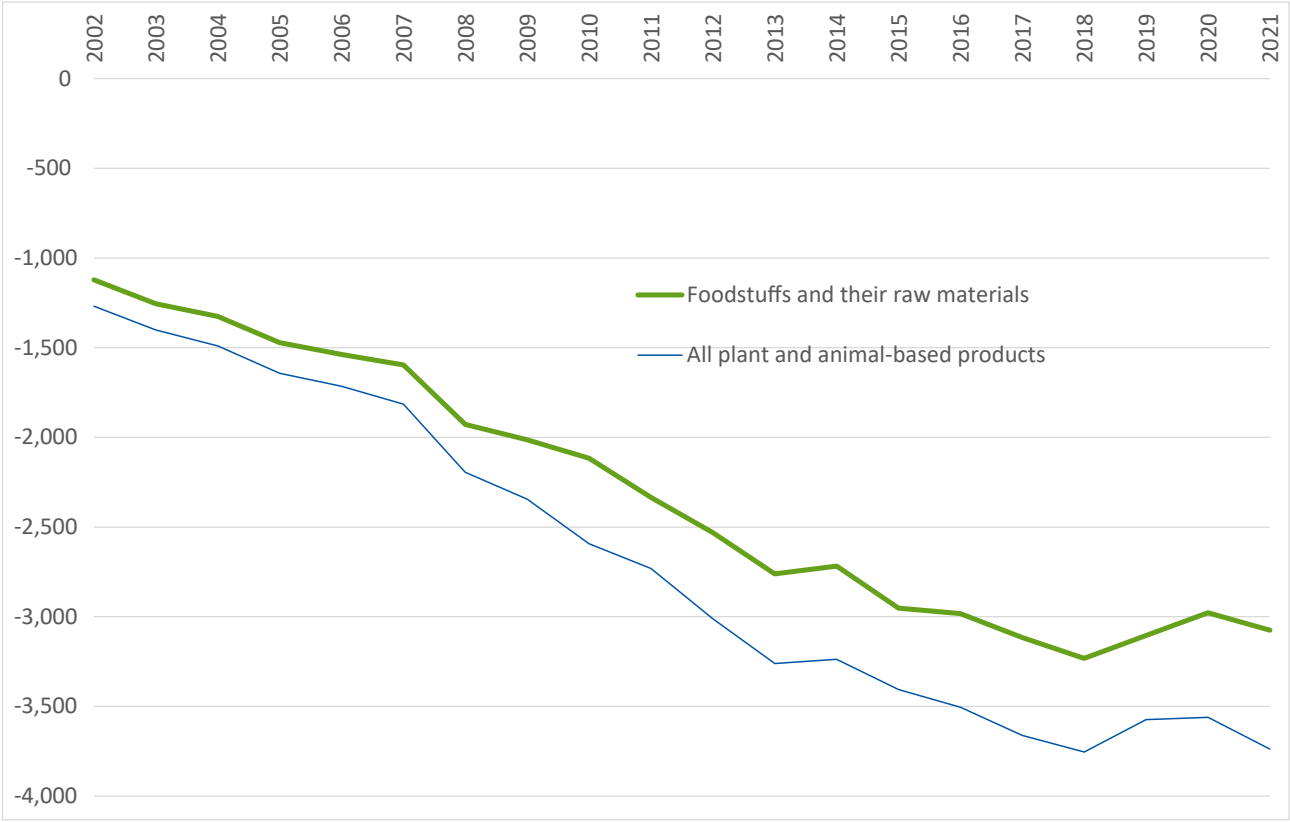
Combined Nomenclature (CN) codes 01-24 of the foreign trade statistics have normally been used to measure the import and export of agricultural products and foodstuffs. The use of a standard method facilitates an international comparison and the analysis of the countries of origin and destination especially. According to the definition, these codes include all plant- and animal-based items, regardless of whether they are used in food production. A few insignificant statistical codes consist of inedible items or items unsuitable for use as raw material for food. These are 05 (Products of animal origin, not elsewhere specified or included), 06 (Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage), 13 (Lac; gums, resins and other vegetable saps and extracts), and 14 (Vegetable plaiting materials; vegetable products not elsewhere specified or included).

In addition, individual larger items such as plant oils imported for fuel production and pet food are not foodstuffs. Instead, feed and fodder material used for feeding in the livestock sector are food production inputs, and they can be regarded as items included in the food chain. The transiting of Norwegian salmon does not affect the trade balance, because it is included in both imports and exports. However, its impact on the value of food imports and exports must be adjusted, because it is not imported for consumption in Finland, and it is not an export item achieved by the Finnish food chain.

The foreign trade balance of foodstuffs and their raw materials is significantly lower than that of all plant- and animal-based product items. The adjusted deficit has increased steadily from EUR 1 billion to EUR 3 billion since the beginning of the millennium, while its development stopped in the mid-2010s. In recent years, it has remained close to EUR 3 billion, showing some annual variation, and it was EUR 3,076 million in 2021. The adjusted deficit was as much as EUR 662 million lower than the deficit in all plant- and animal-based items.

The large difference is caused by inedible items or items unsuitable for use as raw material for food accounting for a significant part of imports. Their percentage increased relatively in 2020 and 2021 compared with previous years. When these items are deducted from the imports of all plant- and animal-based items (CN01-24), the value of imported foodstuffs and their raw materials was only EUR 4,634 million instead of EUR 5,525 million.

Trade balance of agricultural products and foodstuffs in 2002-2021, EUR million



Source: Finnish Customs, ULJAS database. Note: All plant- and animal-based items include CN codes 01-24. Foodstuffs and their raw materials cover CN codes 01-04, 07-12 and 15-24. In addition, plant oils imported for fuel use and pet food have been deducted from the codes mentioned last.

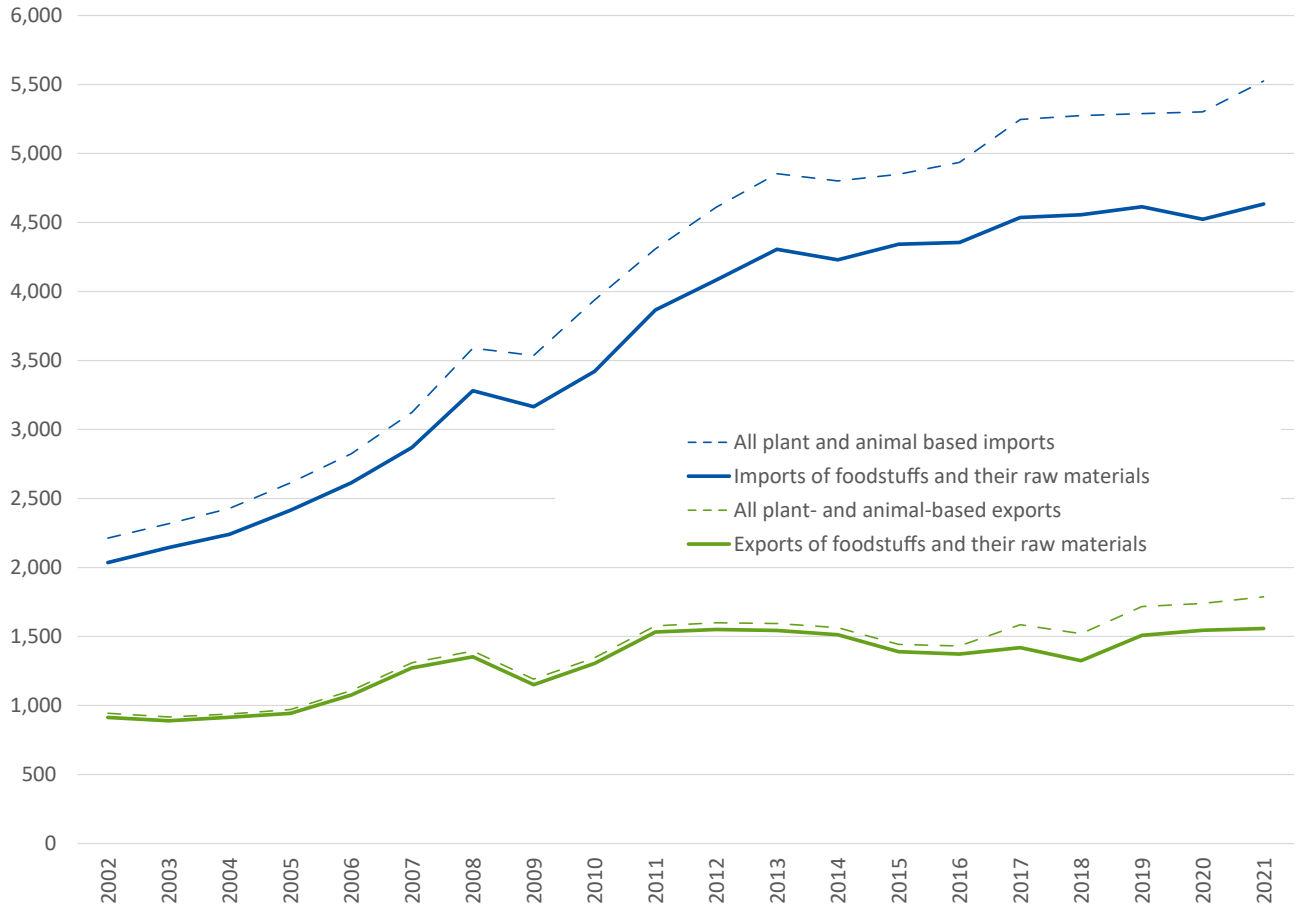
In food exports, inedible items are relatively small, while the impact of re-exported salmon within exports has been reasonably high since 2016. In 2021, Finland's adjusted food exports were EUR 1,558 million instead of EUR 1,787 million (CN01-24). The development of actual food exports has been fairly moderate, because the level of the years preceding the Russian import ban (2012-2013) was not reached until the early 2020s.

Exports and imports by country

The table below shows the value of imports according to CN codes 01-24 in 2020 and 2021 and the value adjusted as described above in 2021. The adjustment causes the most significant changes in the figures for the Netherlands and Norway. Imports from the Netherlands have halved, because as an international distribution hub, plant- and animal-based items not intended for use as food, including cut flowers, bulbs, and plant oils used in biodiesel production, are transited through it. Using adjusted figures, Germany has been the largest food import country for several years. Sweden's role as the second largest country of origin has increased.

The geographical distribution of food exports has varied considerably more than the structure of food imports. Until the beginning of the 2010s, Russia was the largest destination country for exports. As a result of the import ban imposed by Russia in 2014, Finland's exports there have fallen dramatically. In the peak year of 2013, the value of food exports to Russia totalled EUR 440 million (CN01-24). In 2016, Russian exports were only EUR 126 million, and in 2021 only EUR 113 million. The proportion of food exports to Russia has therefore fallen from the peak levels of 26-28% to less than 6%.

Imports and exports of agricultural products and foodstuffs in 2002-2021, EUR million.



Source: Finnish Customs, ULJAS database. Note: All plant- and animal-based items include CN codes 01-24. Foodstuffs and their raw materials cover CN codes 01-04, 07-12 and 15-24. In addition, plant oils imported for fuel use and pet food have been deducted from the codes mentioned last. The transiting of Norwegian salmon has been deducted from both imports and exports.

Traditionally, the neighbouring countries have been the key destinations for Finnish food exports, accounting for more than half of Finland's food exports, but their total share decreased dramatically following Russia's import ban. In 2021, the neighbouring countries accounted for slightly more than 40% of total food exports.

The sanctions imposed due to Russia's invasion of Ukraine concluded to the suspension of Finland's food exports to Russia and Belarus at the beginning of March 2022. It is very likely that the annual value of Finland's exports will remain at the level of January-February regarding these countries (approximately EUR 15-20 million). As a result, the value of exports from Finland to Russia will decrease by roughly EUR 100 million in 2022. In 2021, the value of exports to Ukraine was only EUR 12 million. Russia and Belarus only accounted for a small part of food imports (roughly 1.5%), while the value of imports from Ukraine amounted to EUR 8 million in 2021.

The largest countries of origin for food imports into Finland

	CN01-24		Adjusted import	
	2020, million EUR	**2021,** million EUR	**2021,** million EUR	**2021,** %
Germany	644	665	632	13,6
Sweden	557	595	572	12,4
Netherlands	808	858	432	9,3
Spain	337	330	320	6,9
Denmark	292	297	251	5,4
Italy	225	250	247	5,3
Norway	323	332	200	4,3
Estonia	176	185	181	3,9
France	184	193	178	3,8
Poland	187	223	168	3,6
Belgium	161	172	163	3,5
Brasil	108	103	103	2,2
USA	78	104	95	2,1
United Kingdom	137	112	85	1,8
Lithuania	106	78	75	1,6
Other countries	978	1026	929	20,1
Total	5,301	5,525	4,632	100

Source: own calculations based on the ULJAS database of Finnish Customs. Note: Adjusted imports and exports cover CN codes 01-04, 07-12 and 15-24. In addition, plant oils imported for fuel use, pet food and the transiting of Norwegian salmon have been deducted.

The largest destination countries for food exports from Finland

	CN01-24		Adjusted export	
	2020, million EUR	**2021,** million EUR	**2021,** million EUR	**2021,** %
Sweden	354	369	348	22,3
China	145	150	150	9,6
Estonia	147	155	142	9,1
Germany	121	121	109	7
Russia	99	113	83	5,3
Denmark	83	84	75	4,8
Nederlands	88	74	62	4,0
Norway	55	66	51	3,3
Poland	61	80	51	3,2
France	83	75	51	3,2
Belgium	35	44	43	2,8
USA	31	34	34	2,2
South-Korea	26	33	33	2,1
Lithuania	41	53	28	1,8
Latvia	27	32	25	1,6
Other countries	343	303	275	17,6
Total	1,740	1,787	1,558	100

Source: Luke's calculations based on the ULJAS database of Finnish Customs. Note: Adjusted imports and exports cover CN codes 01-04, 07-12 and 15-24. In addition, plant oils imported for fuel use, pet food and the transiting of Norwegian salmon have been deducted.

The steep increase in the global market prices for agricultural raw materials and foodstuffs will probably offset the falling share of Russia and Belarus. The roughly 10-20% price increase is expected to result in a significant increase in the value of exports. This price increase will also affect the value of imports. It is very likely that the value of imports in 2022 will exceed the limit of EUR 6 billion (CN01-24), and even the adjusted value of imports is expected to be more than EUR 5 billion.

Foreign trade by product group

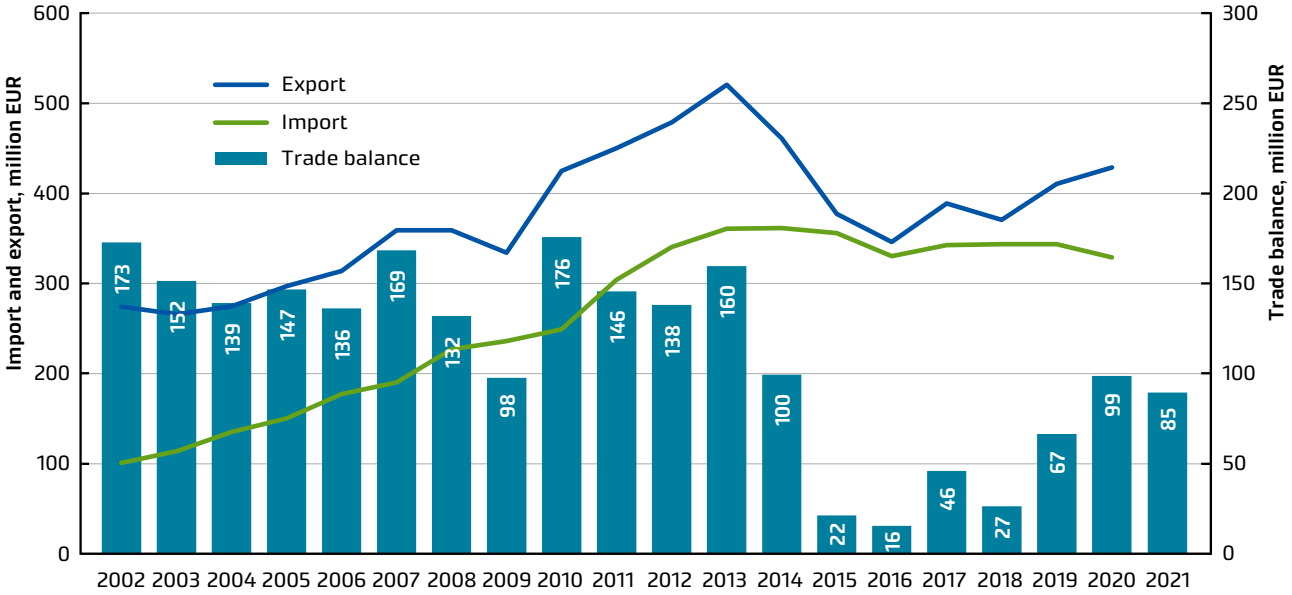
The main items of food imports into Finland are beverages (EUR 569 million), fruit (EUR 501 million), cereal and bakery products (EUR 464 million), miscellaneous edible preparations (EUR 421 million), vegetables (EUR 281 million), cheeses (EUR 270 million), coffee, tea and spices (EUR 267 million), and fish (EUR 231 million).

Dairy products continue to form the most significant single product group in food exports. However, exports of dairy products fell from EUR 521 million in the peak year of 2013 to a low point of EUR 346 million in 2016. Exports have since increased slowly. In 2021, the value of dairy products exported from Finland was EUR 414 million. In 2021, the sector made up less than a quarter of total food exports, while dairy products accounted for a third of all food exports (CN01-24) just a few years ago.

The dairy industry is the only industry in the Finnish food sector that has maintained a positive trade balance throughout Finland's EU membership. Nevertheless, the trade balance was barely positive following a dive from EUR 160 million in 2013 to under EUR 16 million in 2016. In 2021, the positive balance of dairy products decreased from EUR 99 million in the previous year to EUR 85 million. At the same time, the product structure of dairy exports has developed less favourably. For example, the dramatic decline in cheese exports to Russia had to be replaced by exports of butter and milk powder. The percentage of cheese in dairy exports between 2013 and 2021 fell from 32% to 12%, while the percentage of butter and milk powder increased from 32% to 59%.

In 2021, the largest product groups in exports following dairy products were beverages (EUR 179 million), meat (EUR 155 million), miscellaneous foodstuffs (EUR 149 million), and confectionery (EUR 104 million).

Trade balance of dairy products in Finland 2002-2021



Source: own calculations based on Finnish Customs' ULJAS dataset.

Agricultural policy

Jyrki Niemi, Timo Karhula and Olli Niskanen

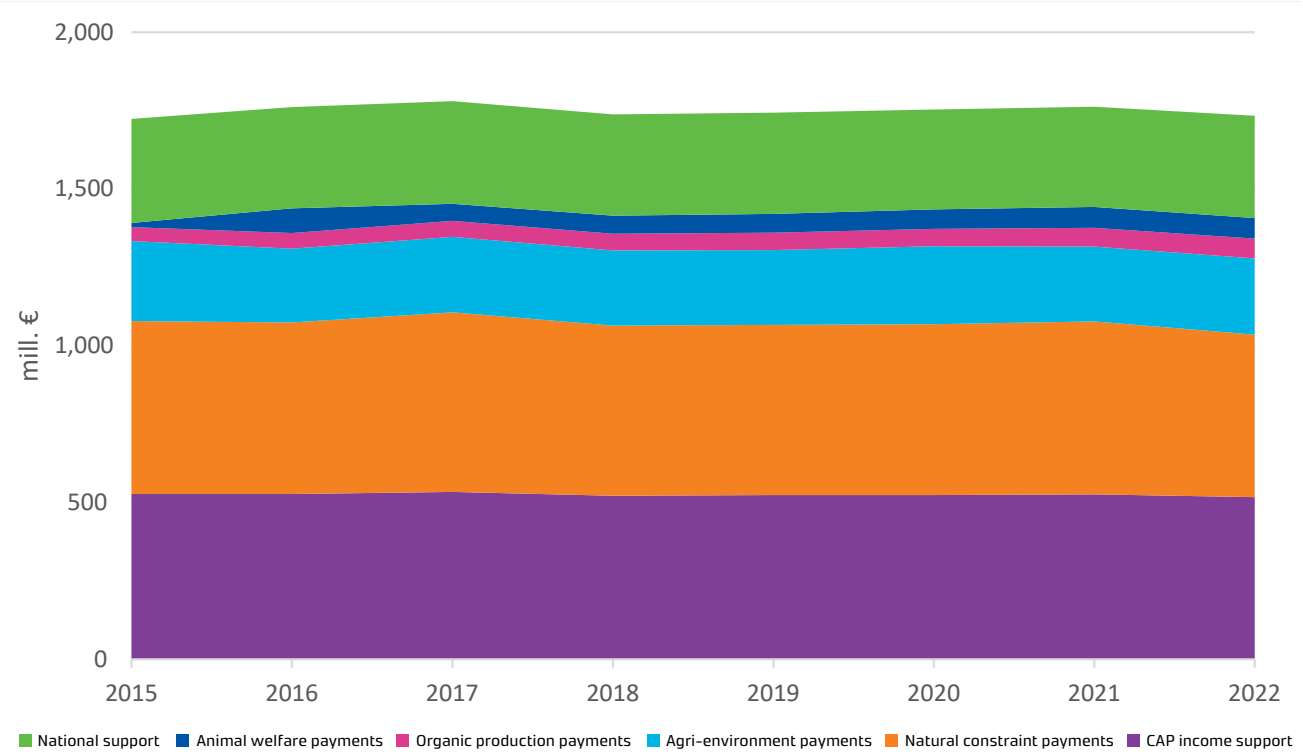
The European Parliament, the Council of the European Union and the European Commission reached a consensus on the reform of the EU Common Agricultural Policy (CAP) in Brussels in June 2021. It is a large package that was prepared for roughly three years. The legislative proposals were already presented during the term of the previous Commission in 2018 before the EU formulated the European Green Deal and the Farm to Fork Strategy. The CAP reform is very significant, because a third of the EU budget is spent on agriculture, and the CAP determines how subsidies are allocated. The aim of the reform is to allocate more subsidies to environmental and climate activities. The new rules and regulations of the CAP will be adopted at the beginning of 2023.

The basic structure of the CAP will remain unchanged during the 2023-2027 period. Activities will still be divided into two pillars: direct payments to farmers; and rural development policy. Measured by the amount of funding, the core of the policy is the direct payment system of pillar 1, accounting for some 75% of agricultural subsidies and providing farmers with subsidies paid mainly based on hectares.

The reform also includes the adoption of a new delivery model which shifts more power and responsibilities to the Member States and requires them to draw up national strategic plans to implement the policy. This means that the EU will only define the basic goals of the CAP, and the Member States will be increasingly responsible for the achievement of the goals.

The reform is therefore a response to subsidiary principle requirements, because the Member States will have more power to determine how they want to implement the CAP. At best, this can give the Member States much more flexibility in planning CAP measures according to their local conditions. However, there is the risk that unity in the single market will decrease, and the practical implementation of environmental and climate activities shows great variation between different Member States. Certainly, the Commission will still play a significant role in approving and evaluating strategy plans to achieve the targeted level of environmental and climate ambition in the Member States.

Composition of agricultural support in Finland in 2015-2022, EUR million (support allocated to production years; figures for 2022 are estimates).



The mandatory conditionality requirements set as criteria for access to EU subsidies, i.e. the requirements for a good agricultural and environmental policy, play a very important role in the reform. The stricter conditionality requirements enable the achievement of higher environmental and climate goals in such areas as the minimum protection of peatlands, more diverse crop rotations, and the level of plant cover outside the growing season. The details of the conditionality requirements will be refined in each Member State's national strategy plan.

According to the consensus reached in June 2021, each Member State must also allocate at least 25% of direct payments of pillar 1 to those farmers who are ready to commit to environmental and climate activities that go beyond the mandatory conditions. However, this eco-scheme will offer flexibility so that, if a Member State such as Finland carries out many environmental and climate activities using rural development payments of pillar 2, this will be taken into account in determining the minimum percentage.

Finland's proposal for the national strategy plan was submitted to the European Commission in December 2021. In April 2022, the Commission made more than 200 observations regarding Finland's plan. Most of these observations were related to needs of development in environmental and climate activities. In its comments, the Commission underlined the importance of accelerating the green transition but did not directly discuss the structure of Finland's CAP plan or the financial contributions of different activities.

Due to the Russian invasion of Ukraine, and climate and biodiversity crises, the Commission has paid special attention to the security of supply in agriculture during the spring of 2022 and requested all Member States to: (i) strengthen the crisis resilience of the agricultural sector; (ii) reduce dependence on synthetic fertilisers and increase the production of renewable energy such as biogas; and (iii) shift agricultural production to more sustainable

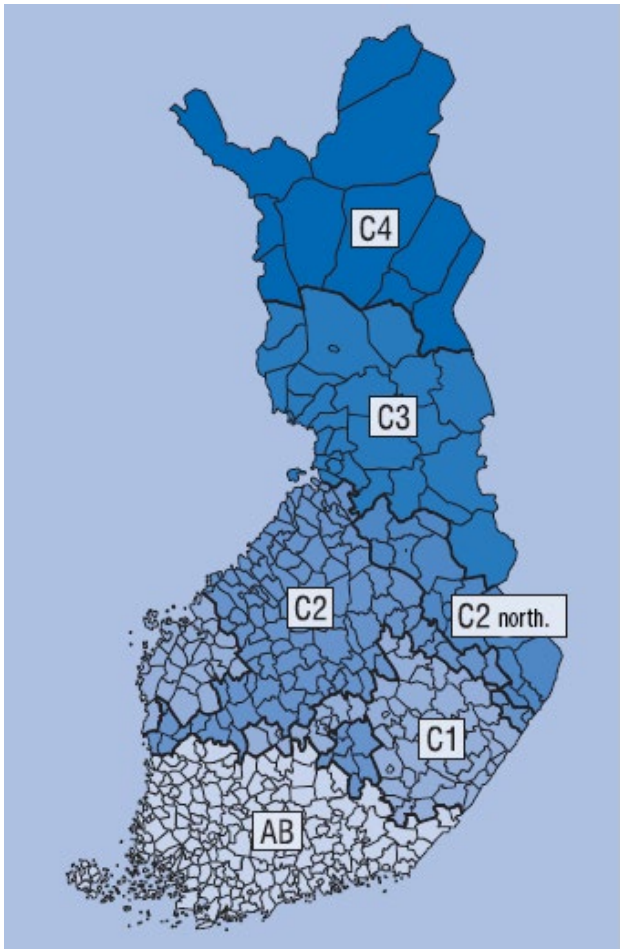
EU agricultural support in Finland

In Finland, the share of agriculture in government expenditure has remained stable at around 3,7 percent (or € 2 billion) on average over the years from 2014 to 2020. Most of the agricultural support (about 50%) in Finland is allocated to ensure the preconditions and competitiveness of domestic production and the strengthening of profitability.

In addition, a quarter of the budget support has been used for natural constraint payments, which are intended to ensure the continuity of the agriculture in less favoured areas and to keep rural areas populated. About 13 % of the funding during 2014-2020 has been used for specific agri-environmental support measures to compensate farmers that have committed to undertake measures aimed at reducing environmental loading or providing ecosystem services, and about 3% of the support has been used to improve animal welfare.

In 2022, according to the government budget proposal, a total of EUR 1,733 million will be paid in subsidies to farmers in Finland. The support consists of direct CAP income payments for arable crop and livestock farmers (EUR 518 million), natural constraint payments for less-favoured agricultural areas (EUR 518 million), agri-environment and organic production payments (EUR 306 million), and compensation for animal welfare is paid (EUR 64 million). In addition to these fully or partly EU-funded support, a total of EUR 326 million of nationally funded aid will be paid to farms in 2022.

Support areas in Finland



To allocate agricultural support, Finland has been divided into two main support areas: AB and C. Currently, support paid throughout the country includes CAP income payments, and agri-environment and natural constraint payments. National Nordic aid is paid in support area C, and national aid for farmers in Southern Finland is paid in support area AB.

To ease the acute cost crisis in agriculture and to prevent any disruptions in food supply caused by the Russian invasion of Ukraine, the Government quickly prepared an additional support package of 330 million euros for agriculture in March 2022. This security of supply package includes both fast-acting forms of support to support the liquidity of farms and actions that accelerate the increase in energy self-sufficiency and the transition away from fossil production inputs. In 2022, approximately EUR 213 million from the security of supply package will be paid, and some EUR 117 million will remain available for use in 2023-2026.

At the beginning of 2023, Finland will also start to adopt the reformed CAP. Between 2023 and 2027, a total of EUR 1,730 million will be paid annually for farmers. These include CAP direct payments (EUR 523 million), farmer payments paid through the European Agricultural Fund for Rural Development (EUR 587 million), and national support (EUR 350 million).

EU agricultural support in Finland in 2015–2022 (fully or partly financed by EU), million €

	2015	2016	2017	2018	2019	2020	2021	2022*
CAP income support	**527**	**527**	**534**	**522**	**524**	**524**	**516**	**518**
Natural constrain payments	**552**	**547**	**573**	**543**	**543**	**545**	**545**	**518**
EU contribution	97	97	103	95	95	48	192	113
National share	455	450	470	448	448	493	353	405
Agri-environment and organic payments	**300**	**286**	**291**	**292**	**294**	**292**	**310**	**306**
EU contribution	126	120	122	123	123	124	132	129
National share	174	166	169	169	171	171	178	177
Animal welfare payments	**13**	**79**	**55**	**58**	**60**	**62**	**65**	**65**
EU contribution	5	33	23	24	25	25	27	27
National share	8	46	32	34	35	25	38	38
Total	**1,392**	**1,439**	**1,453**	**1,415**	**1,421**	**1,419**	**1,436**	**1,407**
EU contribution, mill. €, total	769	765	780	762	767	721	867	787
National share, mill. €, total	637	662	671	651	654	689	569	620

*estimate

Direct CAP income payments

Currently, direct CAP support paid to farmers and funded fully from the EU budget, includes basic payments, greening payments, support for young farmers and coupled support. In 2022, the amount of direct CAP support in Finland will be roughly EUR 518 million. Basic payments account for about 50%, and greening payments 30%, while support for young farmers makes up 1%, and coupled support 20%.

Between 2023 and 2027, a total of EUR 523 million will be paid annually in direct support. The support will be divided into basic payments, the eco-scheme, redistributive payments, support for young farmers, and coupled support. Basic payments account for almost 58%, and redistributive payments 3% of direct support, while coupled support makes up 20%, the eco-scheme 17%, and support for young farmers 2.5%.

The basic payment scheme

The basic payment is an income support scheme for farmers engaging in agricultural activities and wholly funded by the EU. It secures the basic livelihood of farmers, and it will be paid annually based on the agricultural land area eligible for support and controlled by an active farmer. Income support will be divided between support areas AB and C. In future, it will be granted in Finland without any payment entitlements, because they will end on 31 December 2022.

Redistributive payments

To redistribute support to smaller farmers, EU countries may allocate up to 30% of their national income support budget to a redistributive payment. In Finland, redistributive payments will be only 3% of the total amount of CAP support, i.e. approximately EUR 16 million. The aim of the payments is to transfer support from large farms to small and medium-sized farms. The payments will be allocated to farms entitled to receive income support based on their first 50 hectares eligible for support; meaning that all hectares below this threshold receive additional support.

Voluntary coupled support

Part of the CAP support may be paid as coupled payments. It is a voluntary form of support for the Member States, and it is paid based on livestock or area. In Finland, coupled support will account for 20% of the total amount of CAP direct support, i.e. EUR 102 million. It will be allocated to dairy, cattle, sheep and goats, starch potato and other special crops. The support levels will be adjusted regionally, and the support will be coordinated with national Nordic aid.

Eco-scheme

The eco-scheme is a new instrument designed to reward farmers that choose to go one step further in terms of environmental care and climate action. In Finland, the eco-scheme will account for 17% of the total amount of CAP support, i.e. EUR 86 million, funded wholly by the EU. The aim of the eco-scheme is to improve the environment, climate and animal welfare. In Finland, eco-schemes include area-based support for plant cover during winter, nature management grasslands, grasslands for green manure, and biodiversity crops.

Support for young farmers

Support for young farmers encourages young people to engage in agriculture and makes it easier to start a farm. In Finland, this support will account for 2.5% of the total amount of direct support annually, i.e. EUR 13 million. It is an area-based income support for young farmers (age limit 40 years) decoupled from production.

Support paid through the European Agricultural Fund for Rural Development

Agri-environment support and support for organic production

The agri-environment support is intended to compensate farmers who commit to measures to reduce the environmental burden of agriculture for income losses resulting from reduced production and increased costs. Support for organic production and animal welfare aims to steer agricultural production in a more ethical and ecological direction.

The agri-environment and organic production payments budgeted for 2022 total EUR 306 million, of which the national contribution is EUR 177 million. The EU will cover the remaining amount.

In 2023-2027, activities under the agri-environment support will be coordinated with the eco-scheme for direct payments to ensure that the payments differ. A total of EUR 280 million will be paid annually in agri-environment support and support for organic production in 2023-2027, of which agri-environment support will account for EUR 203 million and support for organic production EUR 76 million.

Compensation for animal welfare budgeted for 2022 totals EUR 65 million, of which the national contribution is EUR 38 million. The EU will cover the remaining amount. Between 2023 and 2027, a total of EUR 74 million will be paid annually in compensation for animal welfare.

Natural constraint payments

Certain rural areas in the EU are classified as less-favoured areas. Natural constraint payments are intended to ensure the continuity of the rural economy in these areas and to keep rural areas populated. The whole of Finland is classified as a less favoured area.

The objective of the natural constraint payment is to maintain agricultural production despite the unfavourable climatic conditions, manage the number of farms and maintain economically viable farms, and thus to also maintain employment in rural areas and promote their economic development.

The budget for natural constraint payments for 2022 is EUR 552 million. Between 2023 and 2027, a total of EUR 504 million will be paid annually in natural constraint payments.

National aid

The national aid paid in Finland comprises nordic aid, national aid for Southern Finland and certain other payments. The aim is to to ensure the preconditions for Finnish agriculture in different parts of the country and in different production sectors. The basic principles for determining the level and regional distribution of national aid have been agreed with the EU. The aid must not increase production or exceed the total pre-accession aid level.

In 2022, the total amount of national aid will be EUR 326 million. During the upcoming support period of 2023-2027, the annual level of national aid is estimated to be approximately EUR 350 million a year.

Nordic aid

The Treaty of Accession of Finland (Article 142) includes the right to pay national Nordic aid in support area C. More than 1.4 million hectares, or 56%, of Finland's arable land has been defined as eligible area.

Nordic aid consists of milk production aid, aid paid on the basis of livestock numbers and aid paid on the basis of the arable area. The scheme also includes greenhouse production aid and storage aid for horticultural products, wild berries and mushrooms, as well as headage-based reindeer husbandry aid. In 2022, the total amount of Nordic aid will be EUR 303 million.

National agricultural aid in Finland in 2015-2022, EUR million (support allocated to the production year)

	2015	2016	2017	2018	2019	2020	2021	2022*
Nordic aid	296.5	285.7	296.3	294.5	297.3	293.8	302.6	303.2
National aid for Southern Finland	28.9	27.0	25.1	23.2	20.2	17.3	17.3	17.3
Other national aid	6.7	9.6	5.4	5.5	5.0	5.4	5.6	5.6
Total	**332.1**	**322.3**	**326.8**	**323.2**	**322.5**	**316.5**	**325.5**	**326.1**

*estimate

National aid for Southern Finland

In 2015, Finland transferred a significant proportion of the coupled support allocated to Southern Finland to the direct payments wholly funded by the EU. As a result, milk and beef production, sheep and goat husbandry, and cultivation of starch potato, as well as outdoor production of vegetables, in Southern Finland are now mainly supported by a scheme based on EU subsidies.

In 2022, a total of EUR 17 million in national aid for Southern Finland will still be paid for pig and poultry farming, as well as horticultural production.

Structural support

Structural support aims to develop the operating conditions and competitiveness of agriculture by improving the efficiency and quality of agricultural production following the principles of sustainable development. Agricultural investment payments aim to promote growing farm sizes and thus to reduce production costs.

In 2021, investment payments were granted for nearly 2,300 farms, totalling EUR 95 million. In addition, interest subsidy loans of EUR 111 million were granted for investment funding. The number of investments and the amount of support fell by more than a fifth from the previous year, as the increase in construction costs, restrictions on milk production, and restrictions on construction investments in beef production reduced the number of investments. The highest investment payments were still allocated to construction investments by dairy cow and cattle farms, approximately EUR 27 million, even though the amount halved from the previous year. Start-ups by young farmers were supported by EUR 7.3 million.

During the upcoming support period of 2023-2027, EUR 105 million will be allocated annually to structural support, EUR 102 million to business funding and the development of services, EUR 59 million to competence, digitalisation and innovation, and EUR 20 million to technical assistance. The amount allocated to structural support is lower than the average of the previous few years. If the investment pace recovers in the next few years, the shortage of funding will lead to a decrease in funded projects. To ensure funding for the best projects, they will be rated based on criteria for evaluating different perspectives.

The investment payment system will not undergo any significant changes as a result of the upcoming CAP reform. Investment payments will continue to consist of aid, interest rate subsidies and state guarantees. Certain companies operating in rural areas can also receive support for investments. Support for young farmers will be continued, and information services will also be supported in 2023-2027.

Agricultural and food markets

Cereals market

Csaba Jansik and Anneli Partala

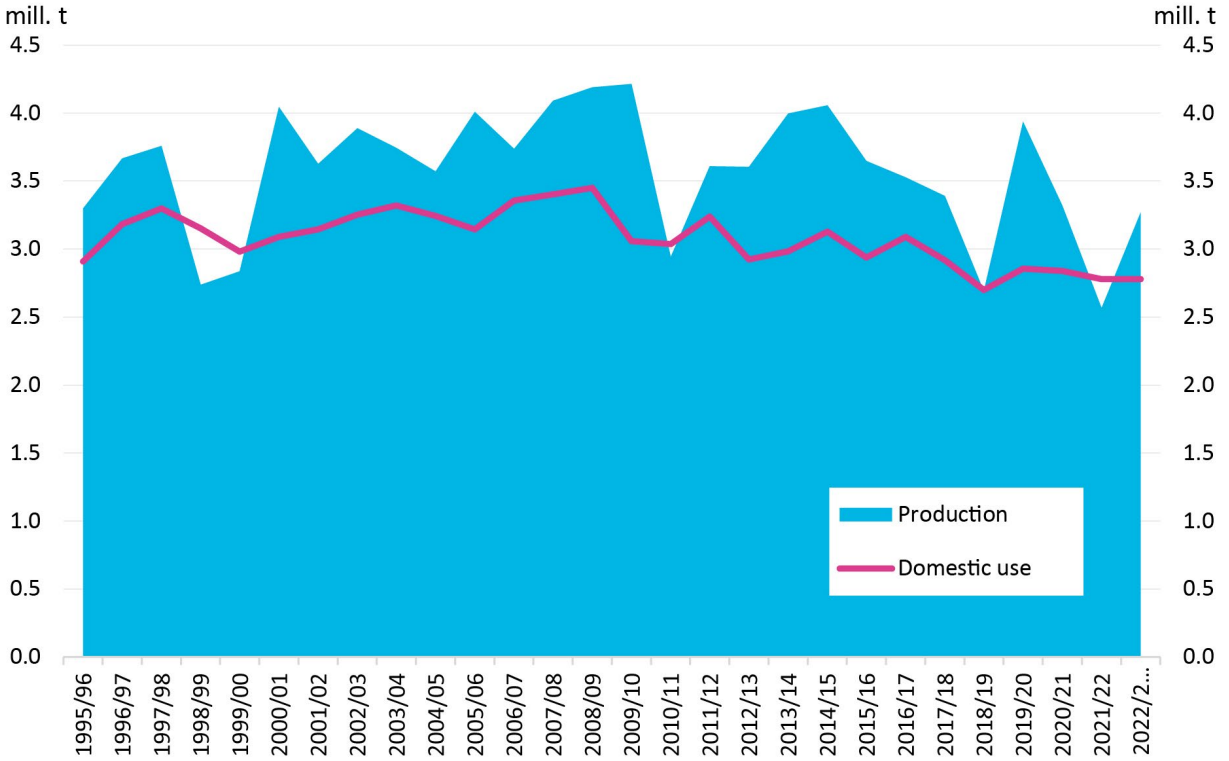
The outlook for the cereals market is determined both by the steep increases in input prices and the changes in the price ratios between crops. The stocks of nearly all crops are lower than in many years due to the poor harvest year of 2021. This means the 2022 cereal harvest plays an unusually significant role not only for Finland's food supply, but also for the moderate development of food prices.

The 2022 harvest depends on how the autumn-sown cereals grown over a record-high area survived the snow-packed winter. In nearly all parts of Europe, the proportion of autumn-sown cereals from the cultivation area is high or even dominant. In Finland, autumn-sown cereals have thus far been limited by the short time available for sowing and losses caused by the winter. In recent years, the area sown with winter crops has started to increase significantly, driven by higher average yields than with spring-sown cereals and the favourable sowing weather. The area sown with winter crops in the autumn of 2021 is the highest ever recorded in Finland, mostly consisting of wheat and rye, as well as a small barley area.

When the cultivation area forecasts were made in February, fertiliser prices were already high. In contrast, forward contract prices given for the new harvest in the autumn were low, significantly below EUR 300. This partly affected the responses given to the survey sent to farmers. The cultivation area forecasts show farmers' intentions to primarily use their farm's self-produced seeds in place of more expensive purchased seeds. The availability of self-produced seeds and the volumes of seeds and fertilisers purchased during the previous year are reflected in the more moderate cultivation area forecasts for barley and oats, for example. This was the first time when cost levels had a much more significant impact on the forecasts than any other factor. As a result of the rapidly changed market situation, cultivation areas may differ significantly from the forecasts made four months ago. Even though the prices of all crops will increase, their different growth rates keep changing the price ratios.

Autumn-sown crops survived winter varying notably across different regions. As a result of resowing over large areas and driven by the price ratios in effect in the spring, the area distribution has presumably changed between different cereals, as well as

Cereal supply and demand in Finland



Source: Luke, the Finnish Cereal Committee's domestic cereals balance sheets. Note: The calculations for the forecast for the 2022/2023 market period are based on Luke's statistics on autumn-sown cereals and harvest levels, as well as the Finnish Cereal Committee's survey of cultivation plans. In addition, the estimates are based on the ten-year average difference between the utilised agricultural area and actual harvesting area.

between oil crops and legumes. The barley and oat areas may have increased close to the previous years' levels, while significant unsown areas are also expected in Finland. A cultivation area that is as large as possible should be the common goal of Finland's food industry this year.

Cereals balance sheet forecast: low cereal stocks, rising prices

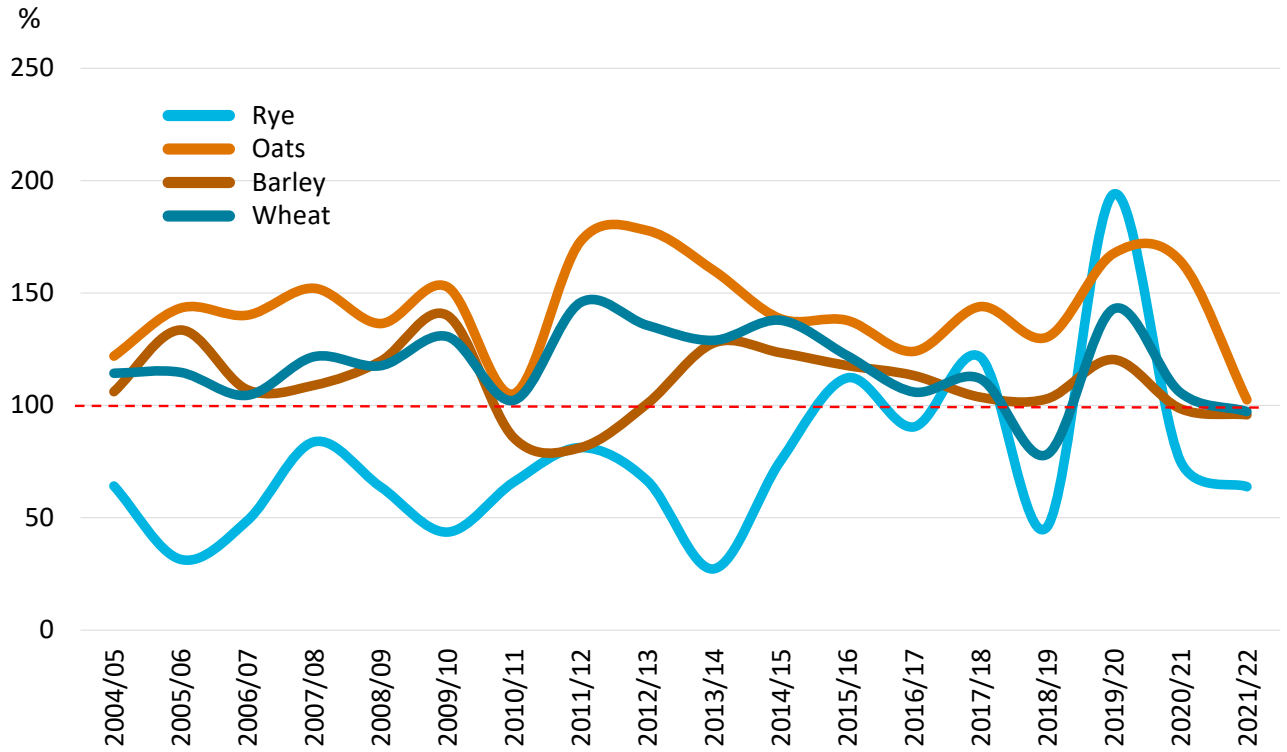
During the 2021/2022 market period, domestic production was unable to cover consumption - for the second time in the 2000s. The cereal supply forecasts for the 2022/2023 market period are based on the cultivation area forecasts made in February 2022 and the five-year average yields. The calculations assumed that the areas sown with winter crops would overwinter, or any failed plots will be fully replaced by newly sown parcels. Using these assumptions, wheat production would exceed the average production of the last ten years by 8%, and rye production would exceed it by 19%. Instead, the barley harvest would be 14% and oat production 12% below the average harvest level. According to the calculation method, the total cereal harvest would be 3.27 million tonnes, i.e. 6% lower than Finland's average cereal harvest. In the balance sheet forecast, total demand for cereals is assumed to remain at the previous year's level.

Finland's self-sufficiency has normally been more than 100% for barley and oats. Both have been exported in significant volumes. In recent decades, stable demand, well-established markets and standard buyers have been characterised the exports of Finnish oats, especially in European food markets. Occasional volumes of barley have been exported to various buyers, mainly in North Africa and the Middle East.

Regarding bread cereals, self-sufficiency in wheat did not rise permanently above 100% until the beginning of the 2010s. In contrast, self-sufficiency in rye was only achieved at the end of the 2010s. Imports have remained moderate, even during weaker harvest years, because cereal stocks have increased during better harvest years. In recent years, rye production has shown significant variation, and stocks accumulated during high-yield years have compensated for the production losses of weaker years.

During the 2021/2022 market period, self-sufficiency in all key crops decreased close to or even slightly below 100%. As a result of low yields in 2021, stocks have accounted for part of domestic consumption. The situation is somewhat unusual for oats, as self-

Development of the cereal self-sufficiency rates in Finland



Source: own calculations based on Luke's statistics. Calculation formula for the self-sufficiency rate: production / production + imports – exports – stock level change (Puma et al., 2015)

sufficiency has never before been as low as it is now (100%).

The stocks of wheat, barley and oats accumulated in previous years have been used so extensively that the stock levels of barley and wheat have dropped to a record-low level. Oat stocks decreased drastically from the previous year, roughly equalling the exported volume. What makes the shortage even worse in the markets is that farmers are reluctant to offer their stocks for sale due to constantly rising prices. Stock levels have not been this low in a long time in Finland's cereals markets.

Wheat cultivated for food and feed use

Wheat has maintained its position as the most used bread cereal in Finland, although its use for food has decreased steadily in the 2000s. However, during the 2021/2022 market period, the use of wheat for food increased from 223,000 to 239,000 tonnes. The long-term downward trend in the use of wheat for food is expected to continue in the next few years.

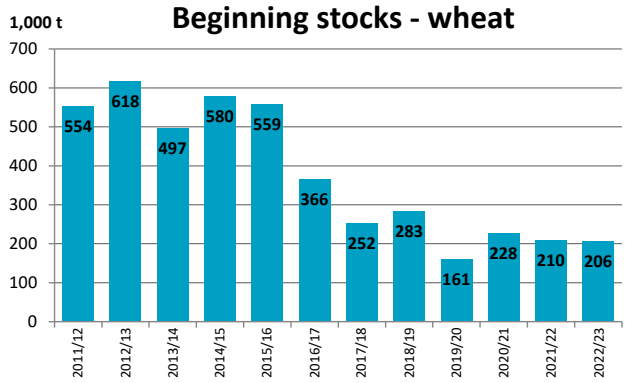
Varying volumes of bread wheat have also been available for exports, due to good yields both in terms of quantity and quality. However, exports have been irregular, because the primary goal of production has been to cover domestic needs.

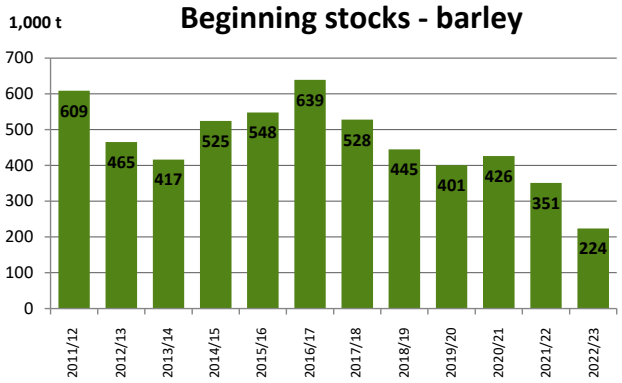
Wheat has also become the preferred feed material in the poultry sector. Wheat is now among the most important feed cereals alongside barley and oats, driven by the increased consumption of chicken meat.

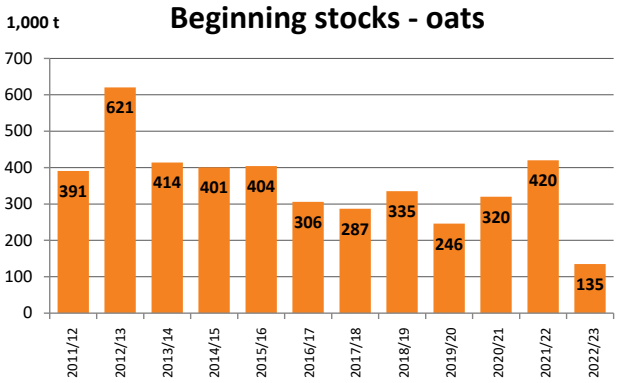
This year, the areas sown with summer and winter crops will be unprecedentedly close to one another. During the autumn of 2021, Finland's wheat area was more than 105,000 hectares, twice as high as in the previous autumn. Price quotations of grain processors are showing signs that the use of autumn-sown wheat for food will increase. New winter wheat varieties are already forming large homogenous batches regarding their volume and quality, enabling some of the flour to be made from winter wheat. The first harvesting of winter wheat takes place in August, featuring a more reliably even quality. Winter wheat varieties have an excellent falling number, while their low protein content limits their use in the milling industry.

Currently, spring wheat area is uncertain and its cultivation area may be smaller than estimated. The wintering of autumn-sown wheat determines the final spring wheat area. If wintering goes well, a smaller wheat area may be needed in the spring. The price level of inputs makes the cultivation of spring-sown wheat relatively challenging. If autumn-sown wheat survives the winter well, selling farms' self-produced seeds reserved for spring-sown wheat may be a more attractive option for farms at the current market prices. Regardless of the wintering of autumn-sown wheat, some of the spring wheat area

Development of wheat, barley and oat stocks in Finland, 2011-2022







Source: domestic cereals balance sheets, Finnish Cereal Committee and Luke.

may be replaced by rapeseed, which is much more attractive given the current price relations.

Hybrid rye varieties increasing

In Finland, rye is produced for food. It is used to make a broad range of different foodstuffs, and it plays a significant role in our cultural heritage. Nevertheless, the use of rye for food decreased steadily during the 2010s (between 2010/2011 and 2020/2021) from 99,000 to 84,000 tonnes.

In addition to foodstuffs, no other significant uses have been established for rye. In the southern parts of the Baltic Sea in Poland, Germany and Denmark, large volumes of rye are used as animal feed. In Finland, rye has not yet been used regularly in the feed industry, because self-sufficiency has only been achieved in recent years, and only small volumes have remained after its use as food. A volume of 16,000 tonnes is expected to use as feed during the ongoing market period of 2021/2022, much higher than the previous volumes of a few thousand tonnes. During the previous market period, a similar volume was exported.

Rye is almost completely an autumn-sown cereal, and its cultivation area depends on weather conditions during sowing, prices and agreements offered by food manufacturers. The 2021 rye harvest did not cover annual consumption which increases the extent of production contracts and the producers' motivation.

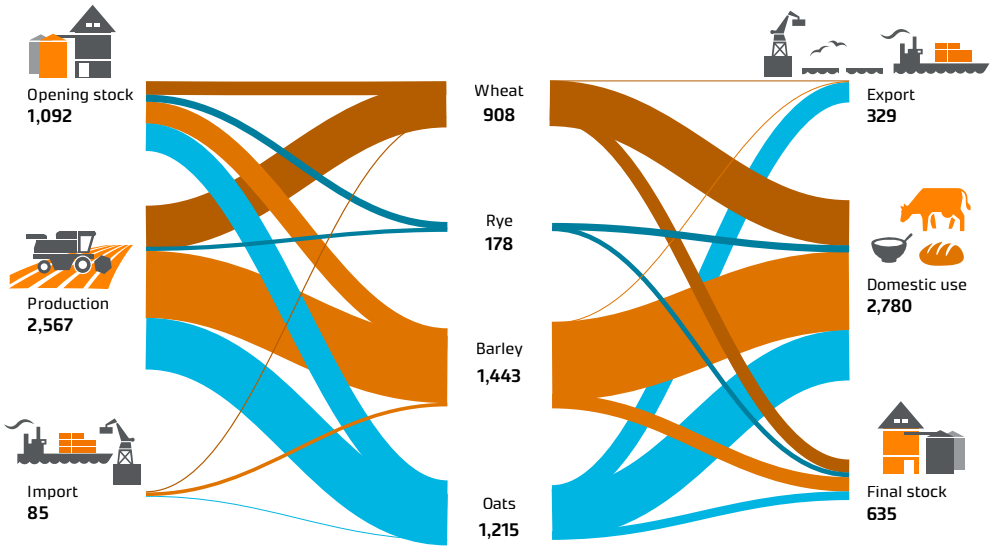
The favourable weather in the autumn of 2021 resulted in an increase in the rye area, with the area sown with winter rye more than 27,000 hectares, roughly 9,000 hectares larger than in the previous year. Rye buyers have adopted a policy according to which they open up the next autumn's forward contract prices before sowing to give a signal for sowing decisions and any last-minute changes between crops.

Rye is a good example of a potential harvest growth provided by crop breeding technology. The proportion of hybrid varieties in sowing has increased from 50% to roughly 70% in a few years, as a result of which rye yields have increased by an average of 2.8% a year. This rate of increase is more than three times higher than the increase in the average yields of other crops.

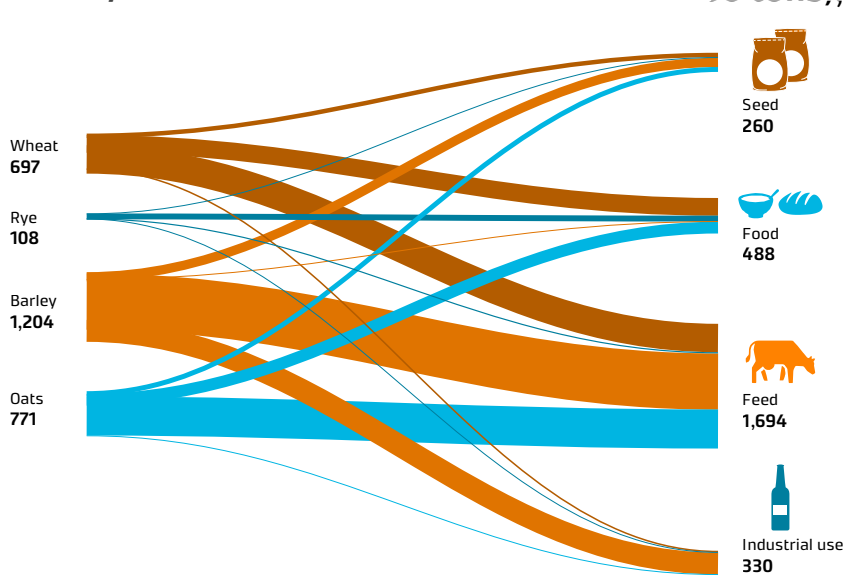
Barley to be unusually imported

Measured by volume, barley is Finland's largest crop, and it has the broadest range of uses. Food use is the smallest of all uses, as only a few thousand tonnes are annually processed to make flour and

Provisional Grain balance sheet for Finland, market year 1.7.2021–30.6.2022 (1,000 tons)



Estimated Use of the Grain in Finland (1,000 tons), market year 1.7.2021–30.6.2022



groats. Feed is the largest form of use. Two thirds of the barley volume have normally been used in feed production. Barley is largely considered a feed grain internationally. In the EU, 80% of the barley yield is used as feed.

In Finland, more than 200,000 tonnes of barley are used annually in starch and ethanol production. The high protein content of barley-based protein feed, a by-product of the process, makes it a very valuable component in the feed industry. Malting is another significant use, with malt the most important raw material in brewing.

Barley has suffered from drought in recent years, which has slightly decreased farmers' motivation to cultivate it. As a result of the very low barley harvest in 2021, Finland's stock levels have not been this low in a long time. No barley has been imported into Finland in more than 15 years, but during the last few months, it has been purchased from abroad for malting and feeding. The imported volume of roughly 60,000 tonnes is a sign of an unusual shortage.

The food use of oats increasing

Oat is the most competitive cereal in Finland, and it benefits from Finland's northern growing conditions. Oat has enjoyed international market hype. International markets have shown steady demand for Finland's high-quality oats. For decades, some 300,000-400,000 tonnes of oats have been exported annually. The challenge has been to replace grain exports with exports of processed products.

In recent years, the milling industry's capacity has been increased significantly. According to estimates, some 158,000 tonnes of oats will be used in food production during the 2021/2022 market period. If the new oat mill capacity to be introduced this year starts to operate as expected, the use of oats as food will increase to roughly 270,000-280,000 tonnes a year in the next few years.

The expanding use requires either an increase in oat production or a decrease in exports. Finnish food companies will compete more directly with large German and UK-based mills in oat product markets. Promoting oat production contracts could offer one way to secure a sufficient production volume.

In recent years, Finland's oat yield has been low, and the grain size has been smaller than average. The need for varieties that withstand drought is clear. Domestic variety breeding plays a significant role in Finnish markets. Oat is a small cereal in Europe, and its largest producers have been Poland, Spain and Sweden, alongside Finland. Production has also increased in other countries, including Germany, but mainly due to the subsidy policy, according to which farms are required to grow three different crops.

Oat stocks are at a record low in Finland. The oat area will probably increase from the estimates based on the February cultivation survey. Currently, oat agreements are signed not only in the milling but also in the feed industry. Large-grained oats are ideal in both industries' peeling processes.

Cereal prices reacted to cost pressures and the changed market situation

In the autumn of 2021 and the spring of 2022, the development of cereal prices has been unusual. According to the International Grains Council (IGC), wheat export prices increased to EUR 410-465 per tonne (USD 440-500) in April. In Finland too, wheat prices were close to EUR 400 per tonne at the

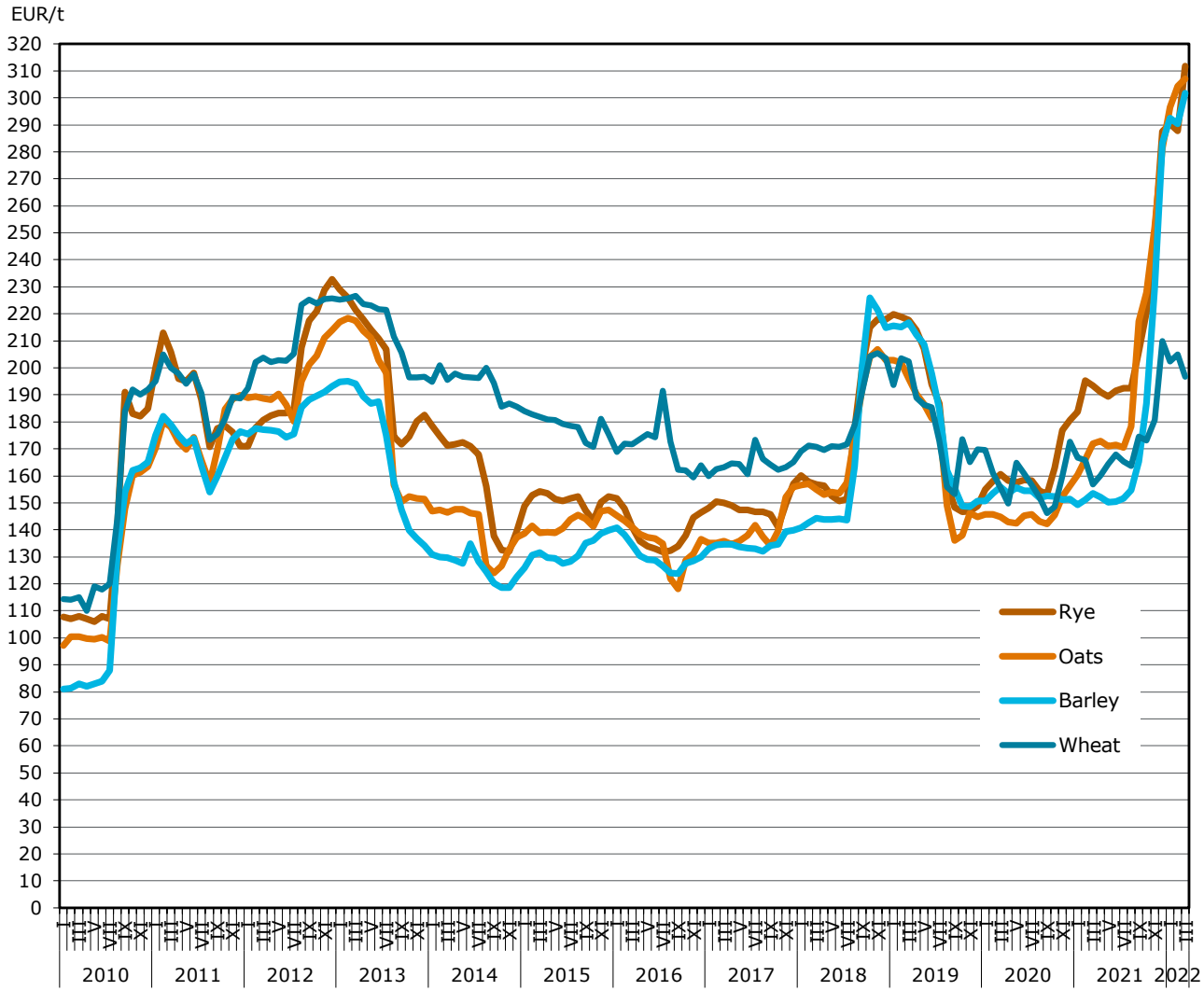
beginning of April (price monitoring by the Finnish Cereal Committee).

This exceptional increase in prices is based on cost increases and scarcity in the crop markets. Fertiliser market prices started their steep increase in the autumn of 2021 when the price of natural gas, the most important raw material for nitrogen fertilisers, skyrocketed. The price increase coincided with low global cereal stock levels. Globally, cereal production has not kept up with the growing demand for most crops, reducing cereal stocks for a few years now. Most alarmingly, cereal stock levels are unusually low in exporting countries, specifically regarding wheat and maize, the most important cereals.

Russia's invasion of Ukraine in February 2022 has made the market situation even more difficult. Supply decreased dramatically when one of the most important cereal production areas became closed. The war has also caused turmoil in global and especially European energy and fuel markets, and it has therefore reduced the availability of raw materials significant for agricultural and food production and increased their prices. The impact of the war will also extend to future harvest seasons, which will be reflected in prices of futures in global cereal markets and in Finnish prices of forward contracts. They will remain high above the long-term price level, indicating that even the next expected regular harvest will not return the global or European cereals balance sheets to normal status, and cost pressures are expected to continue.

This also applies to Finland: the autumn prices of forward contracts will be significantly above the long-term price level. When costs are high, high prices of forward contracts are the only factors that

Development of cereal prices in Finland in 2010-2022



Source: Luke, price statistics. Note: Basic price without any quality adjustments.

motivate farmers to buy fertilisers. The fertiliser market is experiencing high uncertainty about the availability of raw materials. It appears clearer and clearer that sanctions on Russia will remain in force in the autumn, and they have recently also covered oil. Similarly, Russia has reduced the export volumes and imposed an export ban on natural gas in several countries. This further increases the price levels of ammonia and therefore nitrogen fertilisers.

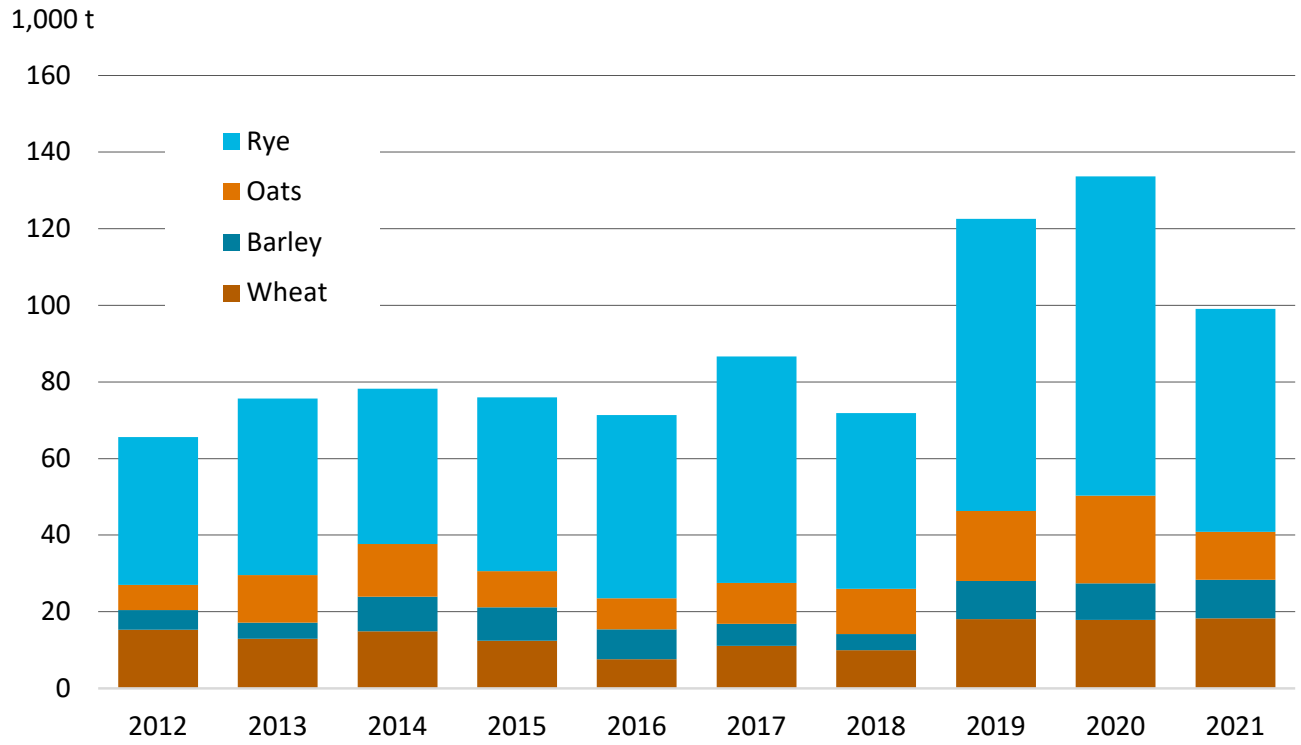
Sufficiently high prices of forward contracts are the only factors that will encourage farmers to take risks and buy fertilisers at the current high prices to ensure high yields of spring- and winter cereals during the next harvest season of 2022-2023. The more fertiliser purchases are postponed, the more probable it is that they will be susceptible to future market disruptions. At the same time, the risk of a lower cultivation area and/or production inputs is increasing.

Organic cereals account for 4% of total cereal production

In 2021, organic cereal production totalled roughly 100,000 tonnes, calculated as the total of all four key crops. This accounts for some 4% of Finland's total cereal harvest. Oat makes up more than half of organic cereal production. The organic cereal harvest remained unchanged for a long time, at roughly 70,000-80,000 tonnes from 2011 all the way to 2018. In 2019, the organic cereal harvest nearly doubled, and its growth continued in 2020, being more than 130,000 tonnes. Last year, the upward trend took a downturn when drought reduced the yields of all crops.

The percentage of organic rye from Finland's rye production has ranged from 5% to 16%. The annual volume of Finland's organic rye production has been 4,000-10,000 tonnes. Oat production is much higher at an annual level. The organic oat harvest has increased in under ten years from less than 40,000 tonnes to more than 80,000 tonnes in 2020. Last year, the oat harvest decreased to less than 60,000 tonnes. Organic oat accounted for 4% of Finland's oat production a decade ago, being more than 7% today. The percentage of organic wheat and barley from total cereal production has remained at 0.5-3%.

Organic cereal harvest in 2012-2021

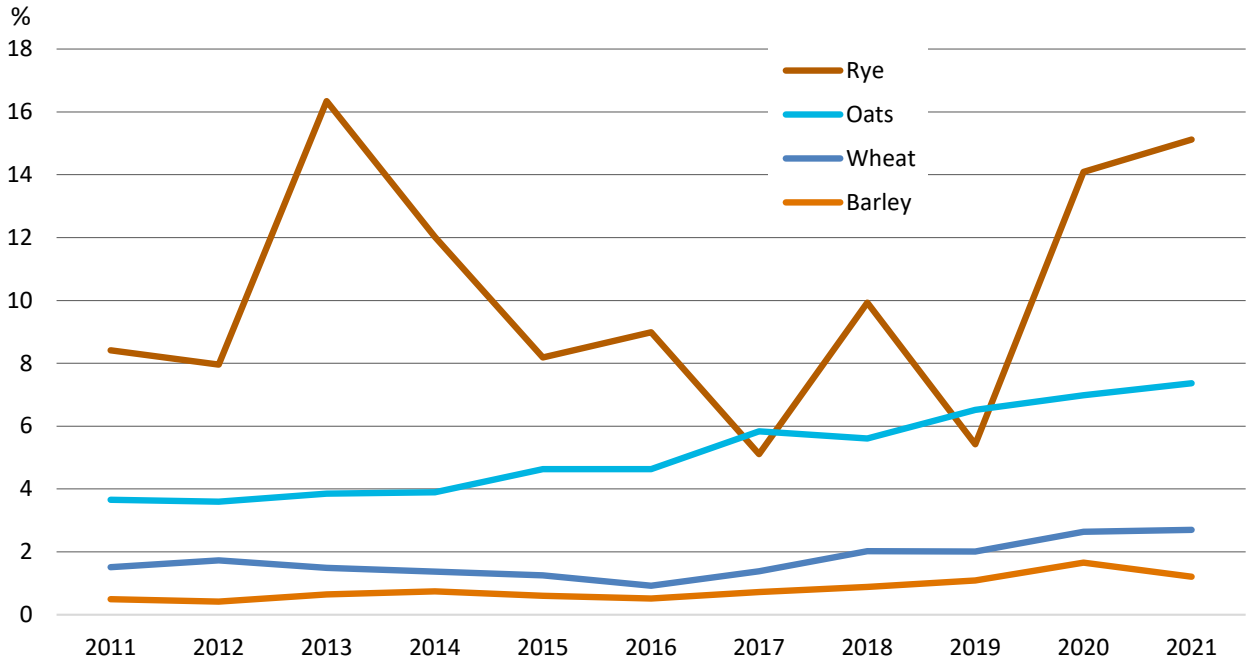


Source: Luke, crop production statistics.

Organic oat production driven by oat product exports

Organic cereals, like all other cereals, are mostly used as feed - mainly for organic livestock. Finland's cereal processing industries purchased roughly a quarter of the last autumn's harvest, nearly 27,000 tonnes. Of this, barley and wheat accounted for nearly 5,000 tonnes. The remaining 22,000 tonnes consisted of rye and oats. In recent years, it has been estimated that some 5,000 tonnes of organic rye have been ground for food per year. The use of organic oats in the food industry has probably increased in recent years. Five years ago, less than 30,000 tonnes of organic oats were used as food. The corresponding figure last year is estimated to be roughly 45,000 tonnes.

Percentage of organic cereals from the total harvest in 2011-2021



Source: Luke, crop production statistics.

Oilseed and protein crops markets

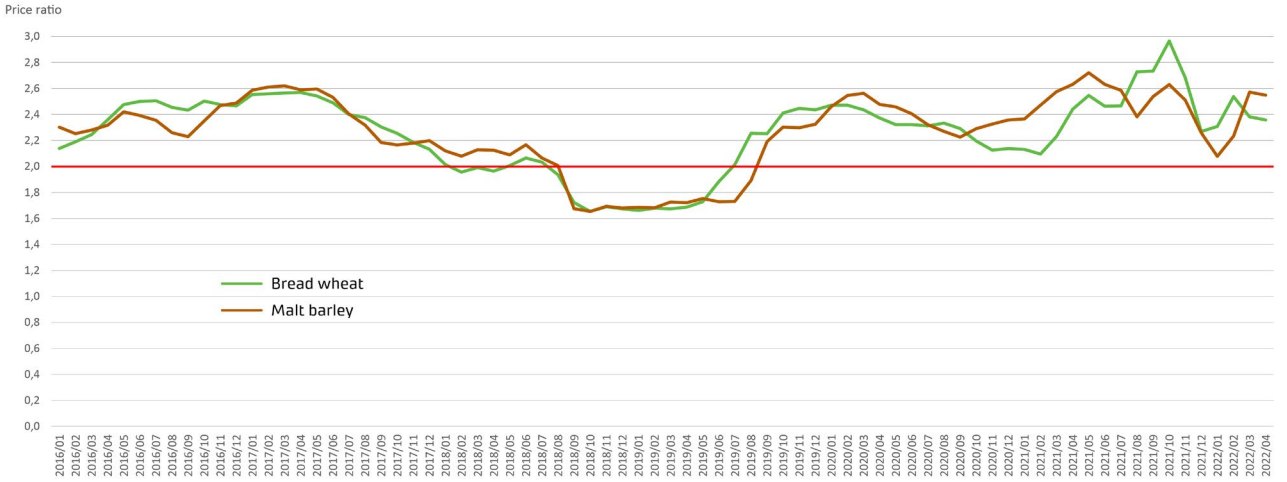
Csaba Jansik

Demand for oilseed and protein crops is higher than supply in Finland. In particular, protein feed supplements depend significantly on imports. In 2021, more than a third of total soybean-, rapeseed- and sunflower meal came from Russia. The suspended deliveries from Russia at the beginning of 2022 has caused a significant gap to be filled. The production of turnip rape and rapeseed, pea and broad bean play a central role in replacing imports with domestic alternatives. Although rapeseed and broad bean farming continues to the price situation in the spring motivated farmers to increase the area sown with oilseeds and pea.

Oilseed crops

The autumn of 2021 marked a new record in the popularity of autumn-sown oilseed crops. Having doubled in the previous autumn, the area doubled yet again to 10,000 hectares. The popularity of autumn-sown oilseed crops is based on several cultivation-related benefits. After wintering, autumn-sown turnip rape and rapeseed can use the accumulated heat sum from the beginning of the growing season. They bloom in May or June, which means that pests cause fewer challenges, because the early growing season makes autumn-sown oilseed crops more resistant to pests in the spring. Furthermore, autumn-sown oilseed crops also offer better harvest potential. Over three years, the average harvest level of spring-sown turnip rape and rapeseed was only 1.23 tonnes per hectare, while the corresponding figure for autumn-sown oil crops was 1.62 tonnes per hectare.

The price of turnip rape and rapeseed relative to bread wheat and malting barley in 2016-2022



Source: own calculations. Luke, crop production statistics - cereal prices in 01/2016-02/2022, apart from malting barley in 06-08/2021, turnip rape/rapeseed prices in 01/2016-06/2021. Other months are based on Maaseudun Tulevaisuus, price quotations of cereal buyers.

The coast has been the most popular region for growing autumn-sown oil crops. In the autumn of 2021, two thirds of all autumn-sown oil crops were grown in the fields of Uusimaa, Southwest Finland, Satakunta, Pirkanmaa and Tavastia. Wintering presents the single highest risk associated with autumn-sown oilseed crops. In the spring of 2022, regional differences could be identified, with massive losses in some southern coastal areas, whereas wintering succeeded much better in inland areas.

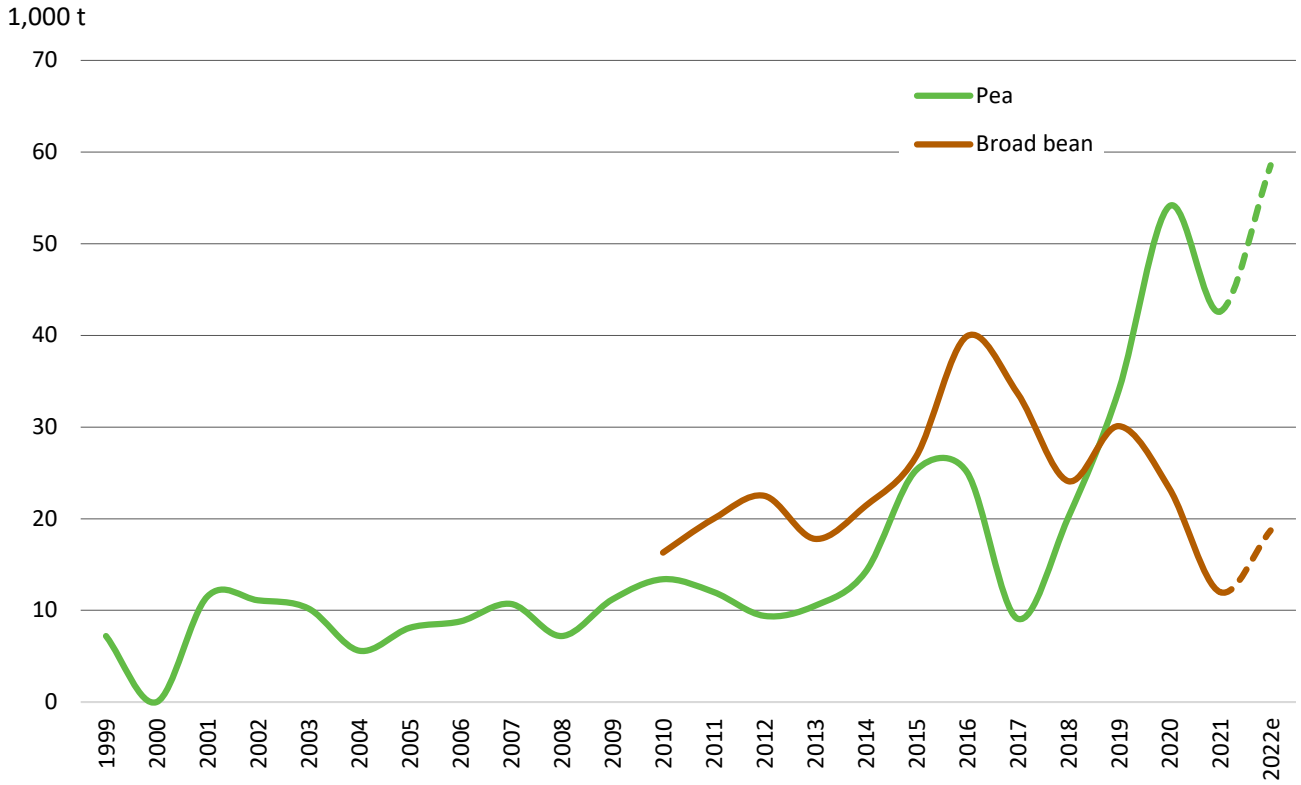
Europe has long depended significantly on imported oil crops, but due to the recent market development, their scarcity has become a hot topic (see the special theme). Euronext's price ratios between cereals and oilseed crops reflect the situation, with the futures prices of rapeseed having been more than twice those of bread cereals for the last 12 months. Following the moderate ratio of 2.3 at the beginning of the year, the price ratio started to increase in March and April, ending up at 2.5-2.6.

This price ratio is also monitored in Finnish markets, and the price levels for turnip rape and rapeseed are compared with bread wheat and malting barley, the two cereals that compete over the same areas. The price ratio of 2.0 is deemed a threshold value that offers motivation for oil crop cultivation. Finland's prices follow Europe, and the difference in the price ratio between oilseed crops and bread cereals started to increase steeply during the spring. In Finland, the April price quotation for turnip rape and rapeseed

was up to EUR 950 per tonne, with the price ratio 2.4 relative to bread wheat and 2.6 compared to malting barley.

The price trend is expected to increase the popularity of oilseed crops when deciding on spring sowing. Spring-sown oil crops offer good alternatives for resowing, and they may take over part of the area sown with winter cereals. At the end of April, the supply of spring-sown oil crop seeds, turnip rape especially, increased. This was affected by the good price of oil crops and the low costs of seeds per hectare. Despite the positive outlook, the oil crop area is not expected to exceed the previous year's level of 40,000 hectares.

Production volumes of pea and broad bean in Finland



Source: Luke's crop production statistics. Note: The 2022 figures are estimates. Pea, excluding garden pea and pea silage fodder. Broad bean, excluding silage fodder.

Legumes

Domestic legumes, pea and broad bean, are noteworthy alternatives for replacing imported soybean and soymeal, particularly in pig and poultry feeding. In addition to improving the security of food supply, this would have other beneficial outcomes. Besides reducing imports from areas sensitive in terms of biodiversity and environmental sustainability, Finland's field crop production and crop rotation would be diversified. This would have a positive impact on the use of nutrients and the structure and fertility of the soil, and it would reduce the risk of plant diseases and pests.

Pea is the more reliable option, which partly explains its increased area and production during the last five years. Pea produces higher yields than broad bean and withstands dry conditions better. Buyers recommend the cultivation of high-yield varieties that also have a higher average protein content.

The pea area and pea production have increased over the years, while the decline in 2017 and 2021 is an indication of the impact of weather conditions even on reliable pea yields. Based on the cultivation area, the yield in 2021 was expected to be nearly 60,000 tonnes, but the harvest was only 42,600 tonnes due to drought and extreme heat. Of this, nearly 7,000 tonnes were used in food production, and the rest was used as feed. In 2021, a total of 6,000 tonnes of freshly harvested garden peas was grown as raw material for frozen products. In addition to harvested pea, around one thousand hectares of land were dedicated to producing silage pea for cattle feed.

In the spring of 2022, buyers of food and feed peas encouraged farmers to increase their pea production through production contracts at basic purchase

prices and various bonuses. Production contracts on feed peas have increased over the years, except for the summer of 2021. In the spring of 2022, they returned to the previous level, driven by the positive price trend. In April 2022, feed pea quotations were as high as EUR 430 per tonne. Farmers have access to a fixed price or guaranteed price model, the latter of which has gained more popularity.

Pea has also become a financially significant alternative alongside cereals. The best parcels produce pea yields that almost equal cereal yields. In the spring of 2022, prices increased to the bread wheat level, and the resulting market income is currently at the level of the best cereals, while the cost inputs required by pea offer opportunities for more affordable solutions. Pea needs a significantly lower amount of nitrogen fertilisers than cereals. It also binds nitrogen in the soil, bringing more financial benefits as a pre-crop. For example, pea can reduce nitrogen fertilisation for autumn-sown wheat or rye by approximately 25-30 kg per hectare.

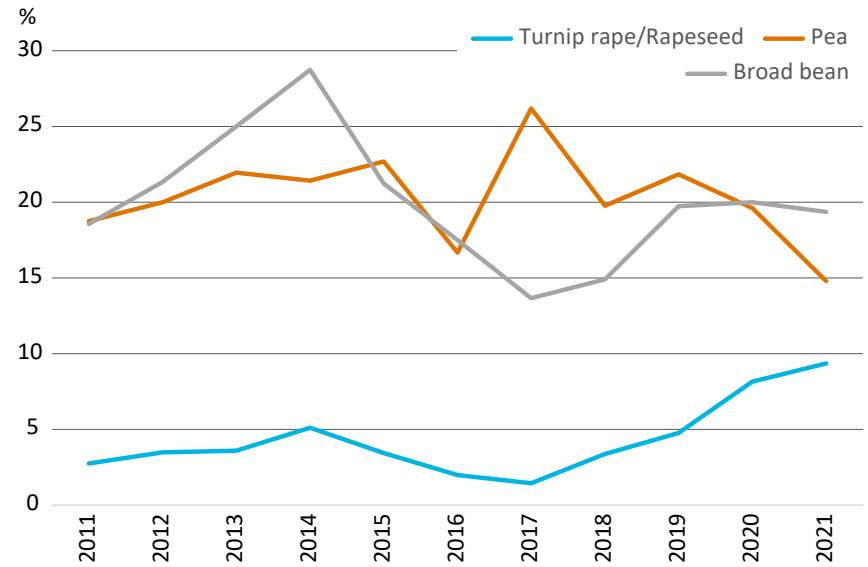
The development of broad bean production has been adverse following the peak in 2016, which can largely be explained by the unreliability of its cultivation and its restricted use as feed. The most significant problem with broad bean is its poor resistance to dry conditions; it needs water during the growing season. Compared with pea, broad bean requires a higher heat sum to ripen (105-110 days). In 2017, for example, broad bean did not have time to ripen in many places due to extended rainfall during the harvest season, and part of the crop was left in fields.

Antinutrients limit the use of broad bean. For example, chicken farms can only use a certain amount as feed. Due to antinutrients, broad bean is better suited as feed for cattle than monogastric animals. However, upcoming varieties without antinutritional components may increase the use of broad bean on pig and poultry farms.

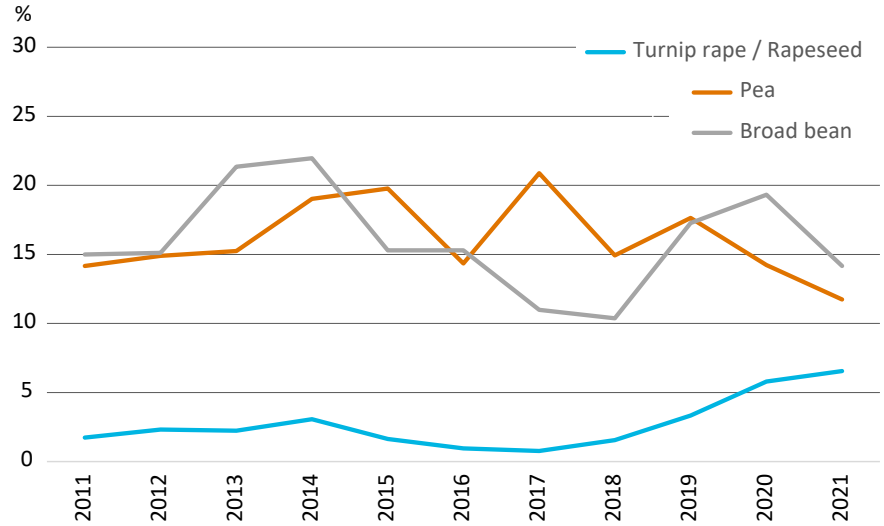
In the spring of 2022, the price of broad bean was the same as that of pea, but its yield levels were roughly 30% lower. Studies of the need for fertilisation for broad bean have yet to be completed. Its cultivation will probably not increase significantly until drought resistant varieties are introduced. These properties are not expected in the new varieties during the upcoming seasons.

Total broad bean production can increase to nearly 19,000 tonnes in 2022 if weather conditions are

Share of organic oilseed crop and legume area



Organic share in the production of oilseed crops and legumes



Source: Luke's crop production statistics.

favourable in the summer. Nearly all this volume can be used in the feed industry. The use of broad bean as food is estimated to account for only a few percent of the annual yield.

Organic production

Organic oil crops have increased their percentage steadily since hitting the bottom in 2017. Organic turnip rape and rapeseed are especially important for cattle farms and above all, for organic milk production. In 2021, the production of autumn-sown oil crops reached 2,700 tonnes, marking the highest level during the entire statistical period.

Organic production represents a significant part of legume production, but a considerable percentage of the organic harvest is used conventionally. In 2021, organic pea production was 5,000 tonnes, of which food pea accounted for 16%. The production of organic broad bean decreased steeply from the previous level of 4,000-5,000 tonnes to 1,700 tonnes in 2021.

Finland's protein self-sufficiency

Finland's self-sufficiency in cereals has been more than 100%, and even the previous year's cereal harvest, the lowest of the century, secured a self-sufficiency of nearly 100%. However, the situation is quite different for oil and protein crops, in which self-sufficiency has long been very low. In 2021, some 111,000 tonnes of turnip rape and rapeseed were imported for crushing, significantly more than in the previous year (79,000 tonnes). Of this, nearly 90% came from the Baltic countries. Of all seeds intended for crushing, 27% were of Finnish origin in 2021.

In addition to rapeseed, increasing volumes of rapeseed meal have been imported into Finland. The imported volume has decreased slightly from the peak year of 2016, stabilising at around 270,000-286,000 tonnes during the last four years.

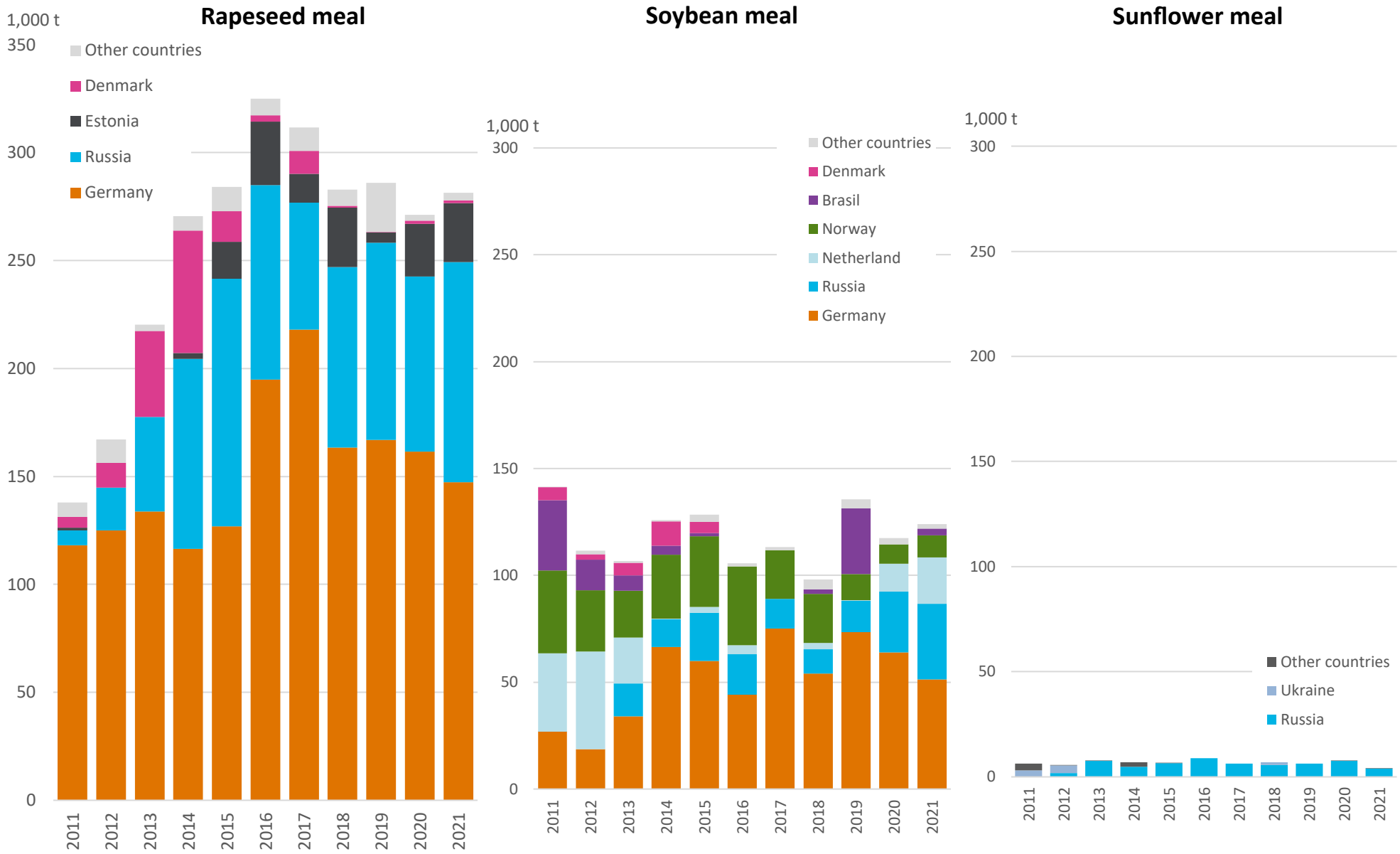
Finland also has a soybean crushing capacity based on imported raw materials to produce high-protein feed additives. In 2021, soybean imports totalled 28,000 tonnes, in addition to which 124,000 tonnes of soybean meal were imported. At the same time, exports of oilseed meal amounted to 47,000 tonnes.

Since the beginning of the 2010s, sunflower seed imports have totalled more than 10,000 tonnes a year, being 12,500 tonnes in 2021. Of this, 28% came from Ukraine, and the rest from the EU member states. In 2021, imports of sunflower meal nearly halved from the previous 6,000-8,000 tonnes to 3,800 tonnes.

Russia's role in the imports of oilseed meal has increased steadily in recent years. In 2021, Russia accounted for more than 36% of imported rapeseed meal, 29% of soybean meal, and 100% of sunflower meal. All in all, 141,000 tonnes of the total 409,000 tonnes of oilseed meal were imported from Russia. Logistics-related benefits, including transport through the Kaliningrad region, have favoured imports.

Given the demand for protein feed supplements, the key question in 2022 is how the oil crop meal imports from Russia can be replaced. One solution would be to reduce domestic use. On cattle farms, a growing use of silage may enable decreases in compound feed and therefore also rapeseed meal volumes, provided farms can produce high-quality silage with a high protein content. However, no similar flexibility exists in pig and poultry feeding. In dairy production as well, such a solution would lead to a decrease in average milk productivity and the protein content of milk. Dairy farms are also concerned about the potential impact of a simplified feeding on cow health.

Finnish imports of oilseed meals by country of origin, 2011-2021



Lähde: Tulli, ULJAS tietokanta.

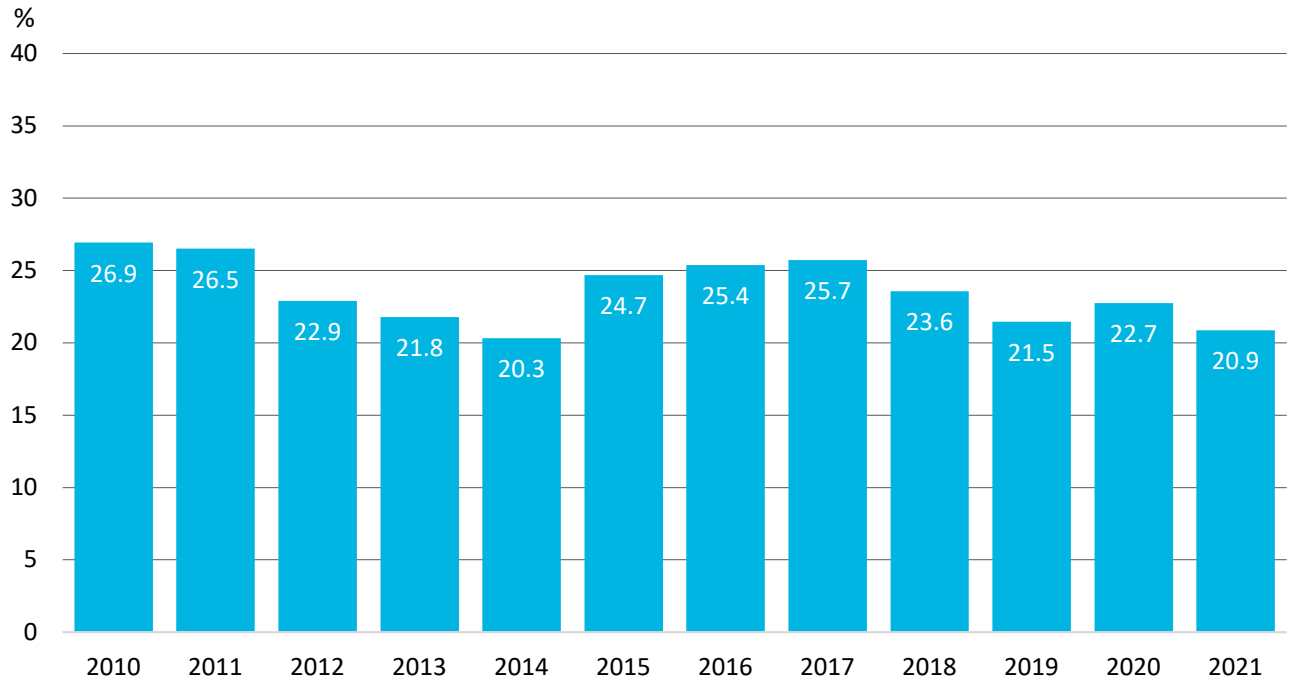
Increasing the domestic production of raw proteins would be another option. Although legume areas are increasing, turnip rape and rapeseed areas are still fairly modest relative to the need in Finland. Higher average yields of oilseed and protein crops can partly improve the situation. The third solution would be to replace the meal imported from Russia by importing the same volume from other parts of the world. The problem is that demand in the oilseed crop meal market - both globally and in Europe - is significantly higher than supply (see the special theme on page 73), which increases prices even further.

In reality, Finland must rely on all three solutions at the same time. Although the overall impact of a decreased use on cattle farms and the increase in domestic oil crop and legume production will probably be low, they will still determine how much we need to import. It is expected that most imports from Russia need to be replaced by imports from other countries.

Self-sufficiency in protein feed is calculated from oilseed meal, legumes, and their international trade flows. This year, the calculations were amended for the first time by industrial by-products, of which barley-based protein feed from starch and ethanol production is the most important one. In addition, the calculations include distillers' grains produced in ethanol fuel processes made from the food industry's various side streams and residues. The level of self-sufficiency is higher than in previous years' calculations, especially as a result of the raw protein volume included by barley-based proteins. In 2021, a fifth of the use of complementary proteins was covered by domestic crops and feed made from domestic raw materials.

In recent years, the self-sufficiency rate has decreased especially due to the decrease in domestic turnip rape and rapeseed production. Increasing the domestic production of oil crops and legumes and their self-sufficiency rate is one of the most significant goals in our agricultural sector in the next few years.

Self-sufficiency in protein feed supplements, 2010-2021



Source: Luke's calculations based on the statistics of Luke and Finnish Customs, and companies' volume data.

Meat market

Csaba Jansik & Timo Karhula

The structural development between different types of meat continues in Finnish meat production and consumption. Beef and pork production and consumption are decreasing, while the consumption of poultry meat is increasing. This year, poultry meat consumption will exceed pork consumption for the first time. Total meat production and consumption are expected to remain at the previous year's level. Production is facing a serious cost crisis due to the price level of production inputs. The profitability crisis, combined with the rising prices of meat products towards the end of the year, may slightly reduce the level of both production and consumption from the current estimates. Meat price increases are a requirement for safeguarding the continuity of production. The cost crisis is testing the whole of Europe, and producer prices are rising in all EU member states.

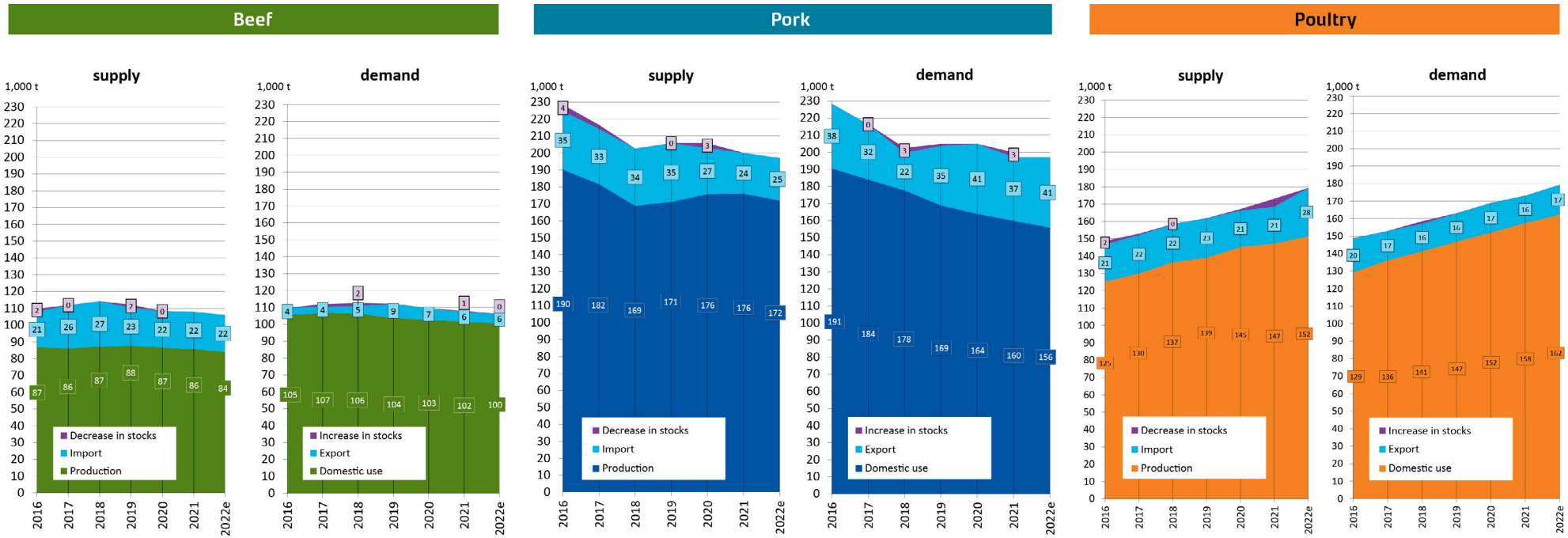
The increase in poultry meat consumption replaces the decrease in red meat

The production of and total demand for beef are expected to decrease by roughly 2% in 2022. This translates to a production of 84,000 tonnes, but due to various reasons inside the chain, production may decrease by as much as 5%. Price increases may reduce demand in more expensive product categories, including beef.

This year, pork production is estimated to be 170,000-172,000 tonnes, and it may fall to 163,000-164,000 tonnes next year. The decrease in production results from general unprofitability. Demand is expected to continue its decrease according to the trend experienced in previous years, with total pork demand expected to descend below 156,000 tonnes. Expectations are moderate even for exports, which have developed positively in recent years.

Poultry meat production is also expected to compensate for the decreasing production of beef and pork, even though chicken farms are also facing cost pressures. Ease and affordability continue to guarantee the popularity of chicken meat. Even after rising prices, chicken meat will maintain its popularity among consumers. The pricing of different parts of chicken ranges between more affordable parts, including the legs and wings, and the more expensive chicken breast. There are also price differences between processed meat products such as cold cuts, frankfurters and sausages. Price increases may shift chicken meat consumption to more affordable categories. The total consumption of poultry, including turkey, is however expected to rise to 162,000 tonnes in 2022.

Finland's meat balance sheets by meat type



Source: Luke, Finnish Customs, Uljas dataset. Projections for 2022: Luke and Kantar.

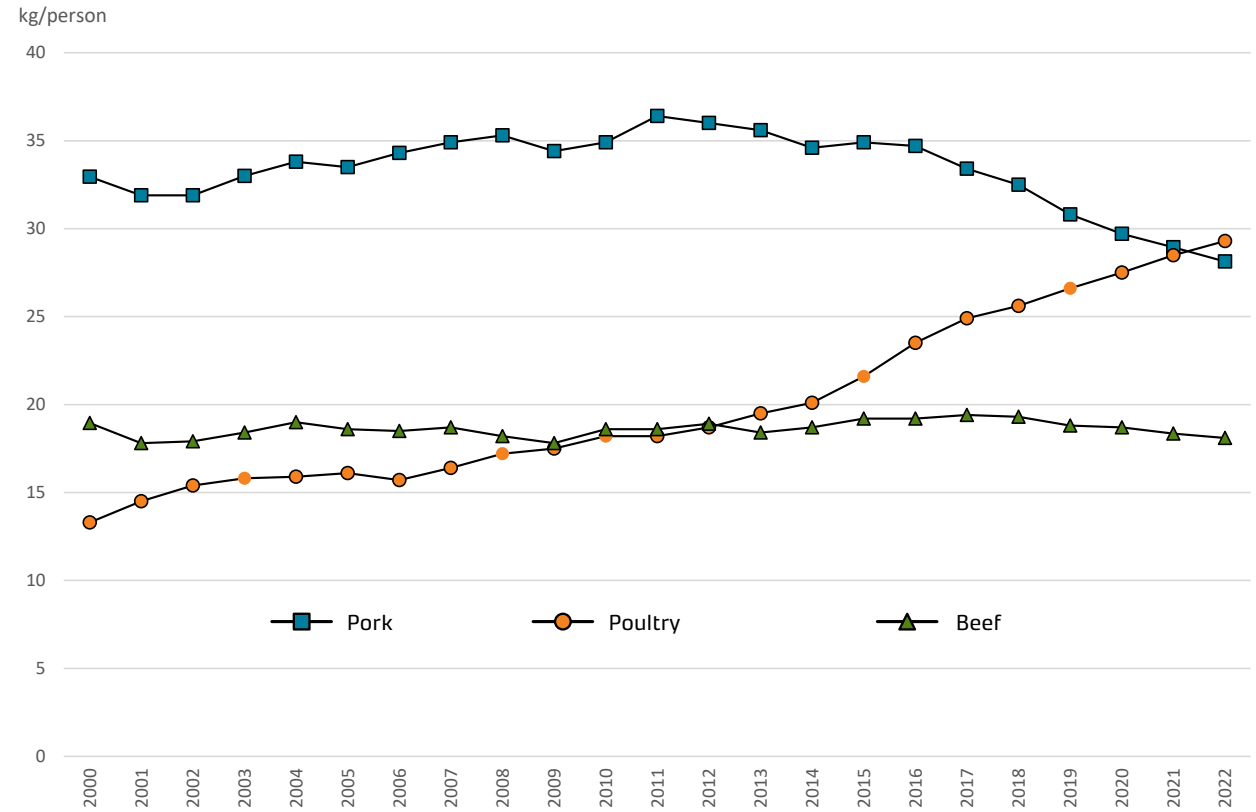
Poultry meat will leave pork consumption behind this year

Only slight changes have taken place in the total consumption of meat. In the middle of the last decade, the 6-9% annual increase in poultry meat consumption made up for the decreasing consumption of pork, maintaining the total consumption of meat at more than 81 kilograms per capita in 2016-2018. Since then, poultry meat consumption has increased only by 3% a year, as a result of which the total consumption of meat decreased to less than 80 kilograms per capita in 2019. In 2021, total meat consumption was 79.1 kilograms, and provided that the consumption of other types of meat, including game, reindeer etc., does not change significantly, it will decrease by 0.3 kilograms to 78.8 kilograms per capita in 2022.

Finland will experience a turning point in meat consumption this year, as poultry consumption will overtake pork consumption for the first time. Poultry consumption will increase from 28.5 to 29.3 kilograms per capita, while pork consumption will decrease from 28.9 to 28.1 kilograms per capita.

Beef and pork consumption will decrease as a whole in Europe, but no rapid change is expected for total meat consumption. According to the European Commission's most recent forecast (December 2021), total meat consumption will only decrease by 1% during the next decade, from 67.7 kilograms per capita in 2021 to 66.9 kilograms per capita by 2031 (EC 2021). These EU figures are calculated as retail weight per capita. Converted into the Finnish system of carcass weight per capita, the figures are 84.5 kilograms per capita in 2021 and 83.2 kilograms per capita by 2031. Finland is not among the EU member states with high meat consumption figures, even at present, as our meat consumption in 2021 was 5.5 kilograms, or 7%, lower than the average in the EU.

Meat consumption in Finland from 2000-2022e



Source: Luke, Balance Sheet for Food Commodities, 2022 forecast Kantar TNS.

Beef production to decrease

Beef production is expected to decrease by 2% to roughly 84,000 tonnes in 2022, but the decrease may be as much as 4-5%, depending on the development of several factors affecting production. Production depends on the development of the dairy sector, because 80% of calves come from dairy farms. In other words, the level of production is determined by what impact the current cost crisis has on milk production and the downward trend in dairy cows. If the number of dairy cows decreased according to the rapid scenario, this would have a more significant impact on the production forecast.

Then again, if the number of dairy cows decreased more conservatively, rearing places on cattle farms could become a bottleneck of production. Two years ago, fewer calves were added to the chain than could have been reared. This winter, a balance was achieved in supply and demand. Recently, rearing places have been removed from the beef chain after farms have discontinued their operations. The active farms cannot compensate for the market share of discontinued farms, because they currently cannot expand to or invest in rearing for slaughtering. If there were not enough rearing places for calves received from the dairy chain, they would need to be slaughtered at a younger age, as a result of which production would decrease more than originally estimated.

Calves are sent from dairy farms to calf farms at the age of 2-3 weeks, from where they are forwarded to final rearing farms at the age of six months. Half of Finland's calves intended for slaughtering pass through rearing stages. A single animal is reared at three stages by three different types of farms. The effectiveness of the chain requires each stage to be profitable. Farms receive income from the sale of animals to the next stage and from support. For example, the prices of calves rose to quite a high level when their supply was limited, putting a strain on the entire chain. In addition to profitability, another key factor is the distribution of income between the chain, i.e. between different stages.

Subsidy schemes have their own impact on the beef production stages among which the content and amount of subsidies vary. Compensation for animal welfare is the only noteworthy support element for calf rearing, but its relative significance decreases during final rearing. Within the new Common Agricultural Policy (CAP) period the terms and conditions of the compensation regarding the rearing area will be stricter. If calf farmers adopted the compensation for animal welfare extensively, they would be able

to receive 20% fewer calves in the same production facilities, and calf rearing would become a bottleneck in the production chain.

The current support system motivates farmers to use the available 20-month rearing period in full. On the other hand calves do grow regularly until the slaughtering age through proper feeding. As a result, no changes in the rearing age of dairy breed bulls have been seen in recent years. Farms would only consider lowering the slaughtering age if they were forced to do so due to cash flows. No large-scale premature sales of animals of a smaller size have yet taken place, except for a few individual farms that have faced financial difficulties.

The price of cereals used in ruminant feeding has long been low, and Finnish cows have been bred to produce high average outputs. However, alternative feeding is based on silage fodder, which means that the significance of green fodder is great. Compound feed has accounted for roughly 40-50% of dairy cow feeding. At the beginning of 2022, the role of industrial feed had to be lowered in rearing for slaughtering due to high prices. The consumption of silage fodder has already been relatively higher, as a result of which silage fodder stocks may be low on some farms. The key question is how farms can survive until the summer and the next harvest if feeding needs to be based on green silage fodder for cost reasons. Cattle farms have not been instructed to secure their supply through significantly larger silage fodder stocks differing from the normal silage/compound feed ratio. Larger silage stocks would also have an impact on costs.

The ongoing crisis affects the price and availability of proteins in the whole of Europe. No large amounts of ready-to-use plant-based protein foodstuffs are available in international or Finland's domestic markets that would compensate for large quantities of meat or dairy products in the short term. The current crisis has underlined the security of food supply in an entirely new way. In this situation, food production fragmented across Finland will increase in significance, and grassland farming and the dairy and beef sectors on which it depends will be a significant part of it. This crisis will certainly force Finland's meat sector to adapt and adjust production according to the new situation regarding the most expensive and rarest complementary feed. Finland's beef production based on silage fodder is ideal for production conditions in the northern regions, and this is also significant for food self-sufficiency.

Cost pressures increase in pork and poultry meat production chains

On pig and poultry farms, feeding is fully based on cereals and complementary protein feed and increases in their prices have already had a serious impact on farms' finances. From the banking perspective, farms should demonstrate good leadership skills and openness to achieve special arrangements. For example, young producers who have recently made major investments and have not yet stabilised their production face a difficult situation. However, effective and professionally led farms seem to do better, even during bad times. Professional entrepreneurs know how to prepare and define their budgets accordingly.

Individual farms, especially those that already faced payment difficulties before this year, are now in a serious financial situation. Different state-guaranteed crisis loans may bring only slight improvements to farms' finances, because some of the farms cannot afford to pay their current loans.

Cost pressures have already piled up since last autumn. Farms that produce their own feed are performing relatively well in the current situation, because last summer's harvest was still produced at former input prices. The problem was that the previous harvest was the weakest during Finland's EU membership, and cereal production on farms fell significantly short of the regular level. As a result of the poor harvest, even farms that normally produce cereals for their own operations started to increasingly use purchased feed. Those farms that mainly depend on purchased feed are the most vulnerable in the current market situation, as feed is only purchased for short periods at a time. The increase in cereal market prices has already affected cost levels on these farms since the autumn.

The significance of subsidies in the formation of income in pig and poultry farming is lower than in cattle farming, for example. Decoupled subsidies to livestock production is available for monogastric animals based on production volumes dating back more than 15 years and is now only a fraction of net sales. This makes pig and poultry farming more vulnerable and dependent on market income, i.e. producer prices.

The cost crisis has affected each stage in the pork production in different ways. There has been a momentary over-production of piglets after pig farms stopped receiving piglets. The imbalance inside the chain has been seen in an increased price for

pigs intended for slaughtering whereas piglet prices remained on the same level.

Most pig farms continue full steam ahead despite the cost pressures, while a few per cent of all farms have faced a crisis due to the shortage of feed, funds or both. Some producers are also facing mental pressures. The smallest farms are now discontinuing their operations. Some entrepreneurs give up production before their due time. Production decreases may also partly result from discontinuing piglet farms.

Like beef and pork production, chicken meat production takes place in a chain of specialised farms. Parent farms produce eggs for breeding, and hatched chicks are delivered to chicken rearing farms. At the beginning of 2022, costs increased in the entire production chain, but no significant changes yet took place in producer prices, and the price of poultry meat even decreased in retail sales. Currently, chicken rearing farms are facing the pressure of increased costs and unchanged income. Turkey meat production is experiencing the same profitability challenges as chicken meat production.

The ratio between self-produced and purchased feed varies on chicken farms. On average, whole cereals account for 20% of chicken feeding, while the remainder consists of compound feed. The field area on some farms is fully or partly sufficient for producing the feed cereals they need. Corporate production units that do now own any fields are the other extreme. The percentage of self-produced and purchased feed is a significant factor affecting costs on poultry farms.

Due to the low harvest in 2021, chicken farms that have previously been self-sufficient may have run out of feed cereals. Until the end of the spring of 2022, chicken farms were increasingly forced to purchase feed, the price of which increased rapidly. During the spring of 2022, dozens of farms facing financial difficulties or becoming fully dependent on purchased feed had to suspend their operations until the next harvest. This adds to the pressure on other producers, as the aim is to maintain the total production level in the chicken chain by intensifying the production of other farms through shorter technical breaks.

Production cycles in chicken farming are very short, and each production batch has straightforward costs, ranging from chicks and bedding to feed, cleaning and disinfection. In the current situation, cost and producer price levels have caused a solvency crisis throughout the chain. Farms that have high variable costs and those that carry a large debt burden are in the worst situation. Producer prices paid for chicken meat should be increased urgently.

Meat farms facing financial difficulties

During the last two years, meat production costs have increased by a total of EUR 170 million. Pork production costs have experienced the highest increase, at roughly EUR 70 million. Beef and poultry meat production costs have each increased by some EUR 50 million between 2020 and 2022.

Recently, production costs have increased much more rapidly than before. Between 2021 and 2022, total costs amounted to EUR 110 million. During the preceding 2020-2021 review period, costs increased by roughly EUR 60 million.

The production cost calculations are based on Luke's market margins for pork and poultry meat. While no market margins are available for beef, beef production has been estimated using the same method.

The production cost figures represent changes in costs in primary production and mainly regular production. The assumption is that this year's meat production volumes will remain at the 2021 level in each production line. It is also assumed that the cost level in effect in January this year (1/2022) represents the average production cost level in 2022.

The increase in feed and cereal prices tests the finances of meat production farms most significantly. Energy prices have also increased considerably. Income has not evened out the increase in costs, as the difference between income and production costs is increasing rapidly, causing more and more losses. Only an increase in producer prices would improve the situation, but such an increase in beef production alone should be EUR 1-2 per kg to compensate for the increased costs.

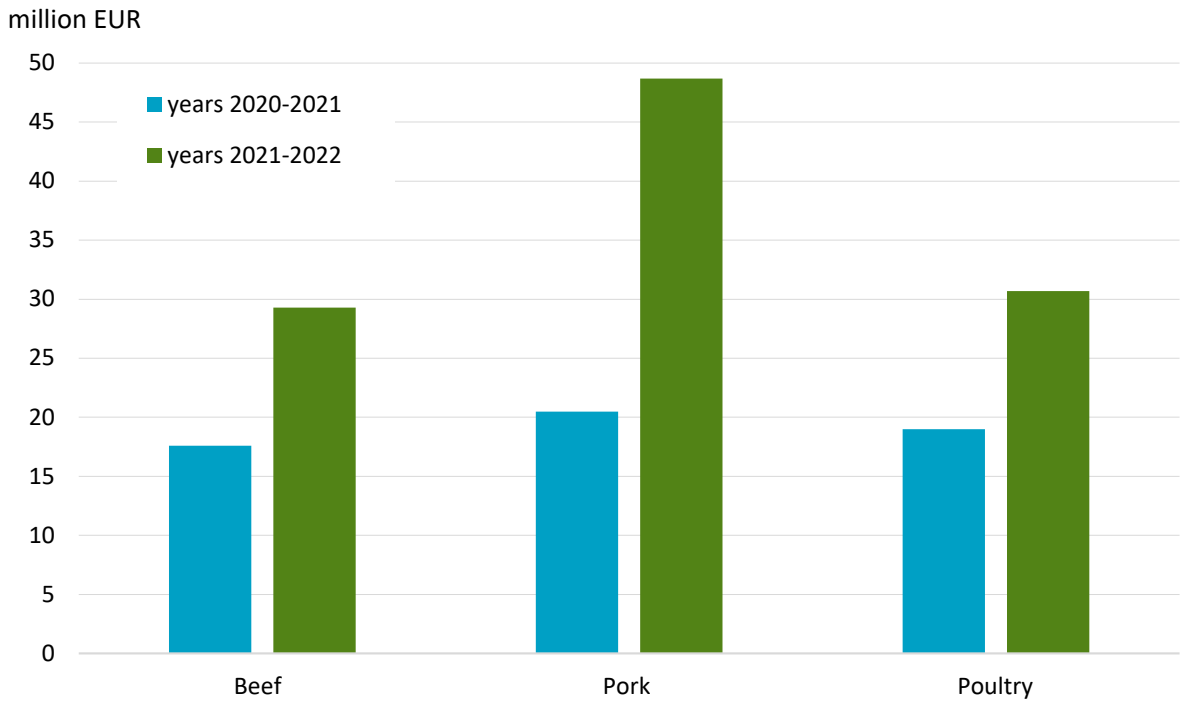
Problems with solvency and cash flows have increased, and the shortage of funds has darkened the mood of producers. We have estimated the development of solvency by meat farm type in 2020-2022 based on the results of agricultural profitability accounting. In our estimates, we have only addressed price changes in key production inputs, including fertilisers, energy and feed. The estimates are not exhaustive, as it has been impossible to address all the price changes in production inputs, and the estimates also include assumptions of the volumes of production inputs used, for example.

The cash surplus represents solvency before taxes paid and loan repayments. In 2020, the cash surplus was positive on average on all meat farms, but it became negative in 2021 and 2022. During 2022, the situation has deteriorated further since 2021.

The solvency of meat farms has decreased significantly during the last two years. As solvency decreases, meat farms will face a shortage of funds, and it may become difficult to fulfil financial obligations - for example, invoices may remain unpaid.

Chicken meat production, the most profitable of all meat types so far, will have to bear the increased costs in full, which will weakens the farms' ability to pay. Beef farms have identified the opportunities available for increased flexibility, and cost pressures have been reduced through feeding based on more grass-based feed (self-produced silage fodder and hay) and by rearing bulls for longer.

Increases in production costs by meat farm type in 2020-2022 (*estimate).



We interviewed a few people working in the agricultural sector. According to them, farms were facing a difficult situation due to the steep increase in production costs. Increases in producer prices are regarded as the most significant solution for the current financial crisis.

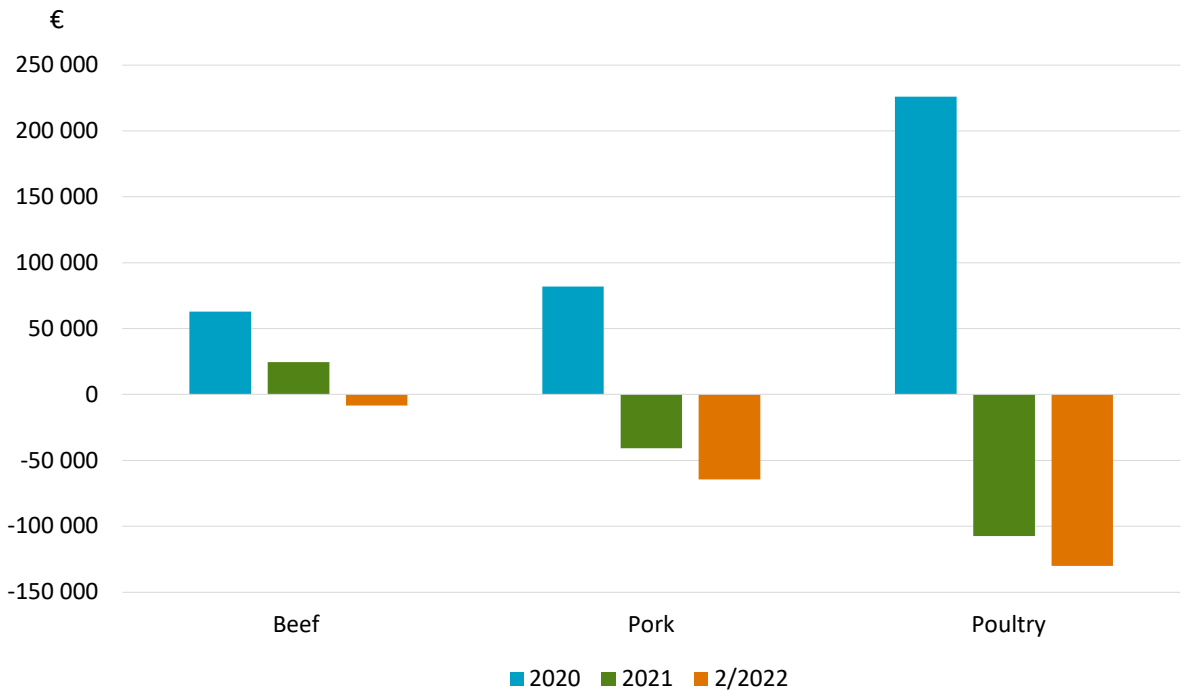
Pressures to increase prices throughout the meat chain

Pressures to increase prices have been identified broadly, and it is vital to cover the increased costs by the prices of end products, especially in primary production. In addition to primary producers, costs have increased in slaughtering and meat processing, as well as in wholesale and retail, due to higher energy, fuel, packaging and logistics costs.

Meat companies and retail chains have opened their long-term agreements to negotiate prices and secure the availability of domestic meat. Profitability should be improved most urgently. Prices will probably be corrected during the summer, provided that the corrections pass through the entire chain. A single correction will probably be insufficient, as the impact of costs must also extend to agreements regarding the autumn. According to regular practices, this would be the time to set prices for shops for the next autumn, but fixed prices cannot be set in the current situation. The situation and price levels are changing every week, depending on factors like the war. The next harvest will also have a significant impact on prices.

Negotiations are still in progress, and new operating models are being sought for the future. The disruptions have required changes in the established long-term frameworks for goods supply agreements, and deviations have increased uncertainties. This is a new situation for all the involved parties, and it is unclear how long the exceptional market situation will continue. The war has caused long-term changes in foreign trade relations regarding energy and other agricultural production inputs, forcing everyone to prepare for permanently higher prices.

Estimates for meat production farms' solvency meat types in 2020-2022.



Meat producer prices are rising across Europe

The price of beef has increased to a record-high level in Europe due to higher demand and a shortage of supply. On one hand, the recovering foodservice sector has increased demand; on the other, the cost crisis has created an unusual chain of events. Beef producers have aimed to avoid the rising costs by slaughtering animals prematurely. As a joint effect of increased slaughtering and the simultaneously

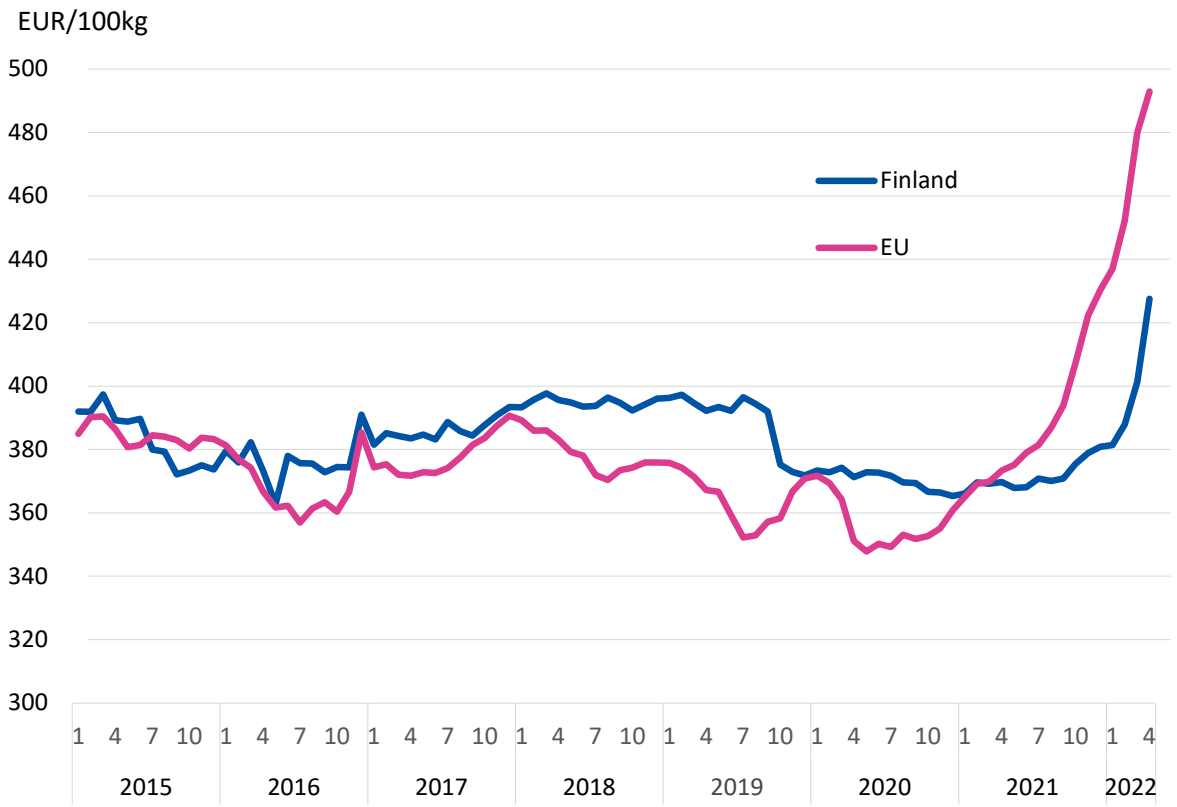
decreasing carcass weight, the shortage of supply has worsened.

As a result of the events in Ukraine, prices of feed raw materials have continued to rise, which has strengthened this phenomenon even further. The final rearing of bulls based on compound feed is especially being shortened on European beef farms to save costs.

The variation in pork prices continues to be more moderate in Finland than in Denmark and Germany. However, price levels have undergone a notable change in all countries. According to estimates, prices will increase significantly from the current level during the summer.

The current price per kg of more than EUR 2 in Germany is based on the decrease in the number of animals due to African swine fever (ASF). The decline has been steeper than previously estimated. When ASF broke out, producer prices fell, which has reduced German producers' faith in the future. As supply has decreased, the recent intense demand took Germany by surprise, resulting in a significant increase in prices. It remains unclear how German markets and thereby the European single market will be balanced. The average pork price in the EU was also close to the two-euro mark in April 2022.

Development of average producer prices of beef (ACZR3) in the EU and Finland in 2018-2022

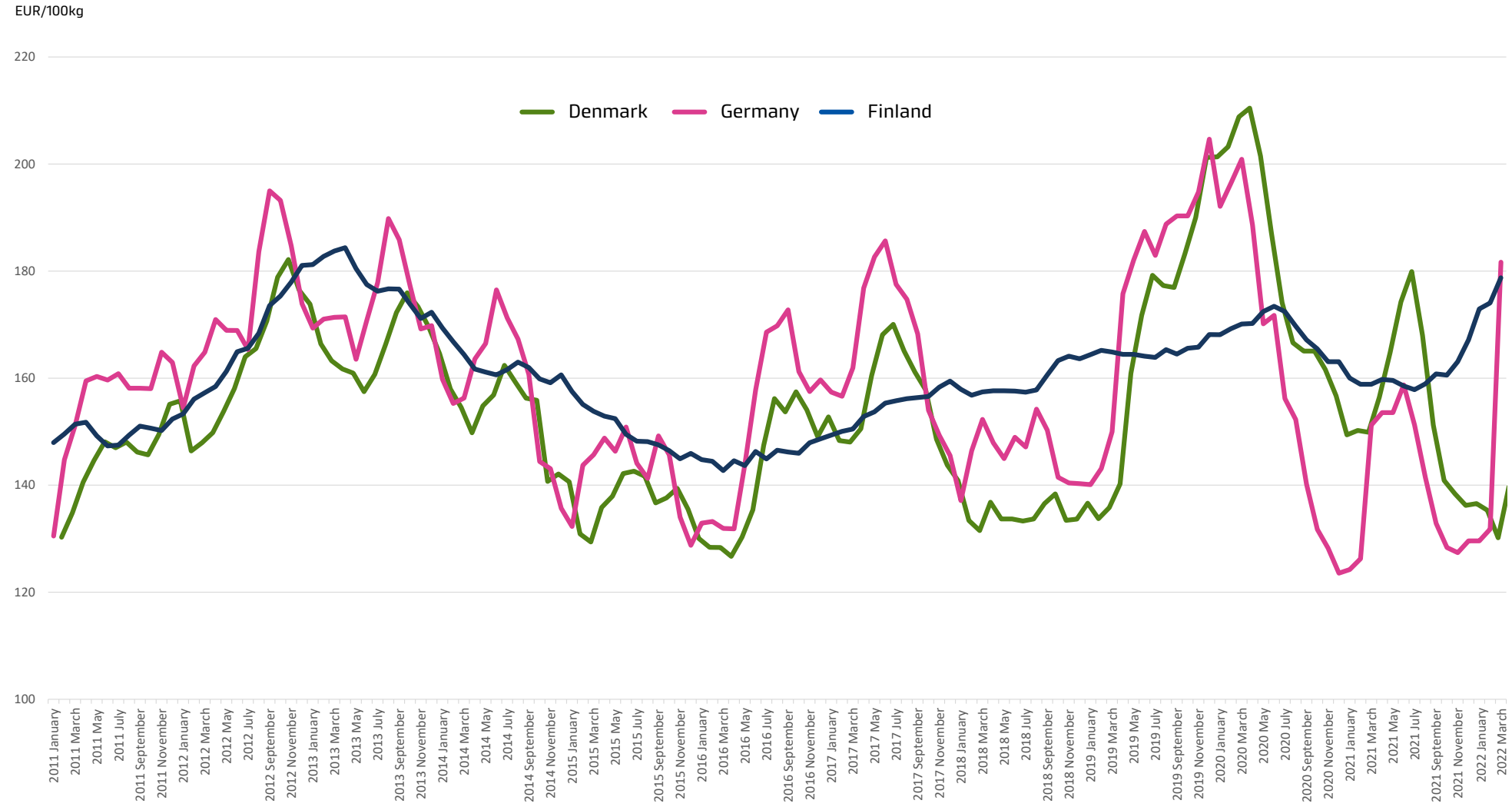


Source: The European Commission

According to the EU forecast, the supply of pork will decrease by 0.7 million tonnes, or 3% in 2022. Germany has mainly operated in the European single market, while Spain's export figures have been higher. If Spain's exports stop, or it must rapidly reduce its production due to the shortage of feed and slaughter more animals than normal, these production volumes may end up in European markets. Spain has depended heavily on Ukrainian maize, and it has faced short-term difficulties in finding raw materials for pig feed. This is another market disruption in the EU that will probably mean higher price levels in the long term.

Finland's prices follow the general price development in the EU. In this uncertain EU market situation, it is even more important to hold on to domestic supply and find a solution for profitability and cash-flow crisis in the chain.

Development of producer prices of pork (CLASS E) in Denmark, Germany and Finland in 2011-2022



Source: The European Commission

Self-sufficiency

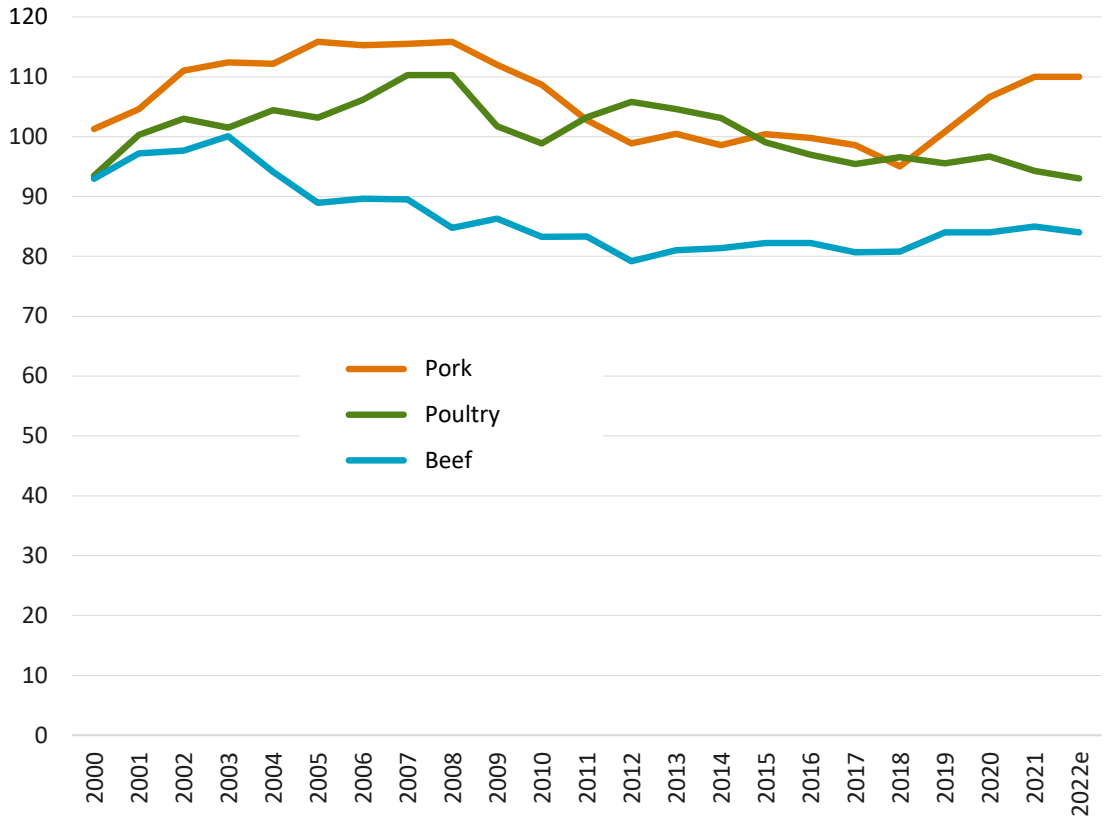
The self-sufficiency rate for meat is calculated using the figures of the meat balance sheets, and the volumes for production, imports, exports, and stock level changes. The self-sufficiency rate for meat was 97% in 2020 and 2021 considering all types of meat, and it is also expected to remain at the same level in 2022.

The self-sufficiency rate for beef improved slightly in 2021 from the previous year. In 2022, it is expected to slightly decrease from 85% to 84% due to the roughly equal reduction in domestic production and consumption.

The self-sufficiency rate for pork improved significantly, driven by export volumes based on production increases in 2019. At the same time, domestic consumption continued to decrease. In 2022, the self-sufficiency rate for pork is expected to remain at a level of 110%.

The self-sufficiency rate for poultry meat decreased in 2021 to 94% from 97% in the previous year. According to forecasts, domestic production cannot quite keep up with the increase in consumption in 2022, as a result of which the self-sufficiency rate will decrease to 93%.

Meat self-sufficiency rates in Finland in 2000-2022e



Source: calculations based on the meat balance sheet, Luke and Kantar TNS.

Source

EU Agricultural Outlook

Dairy market

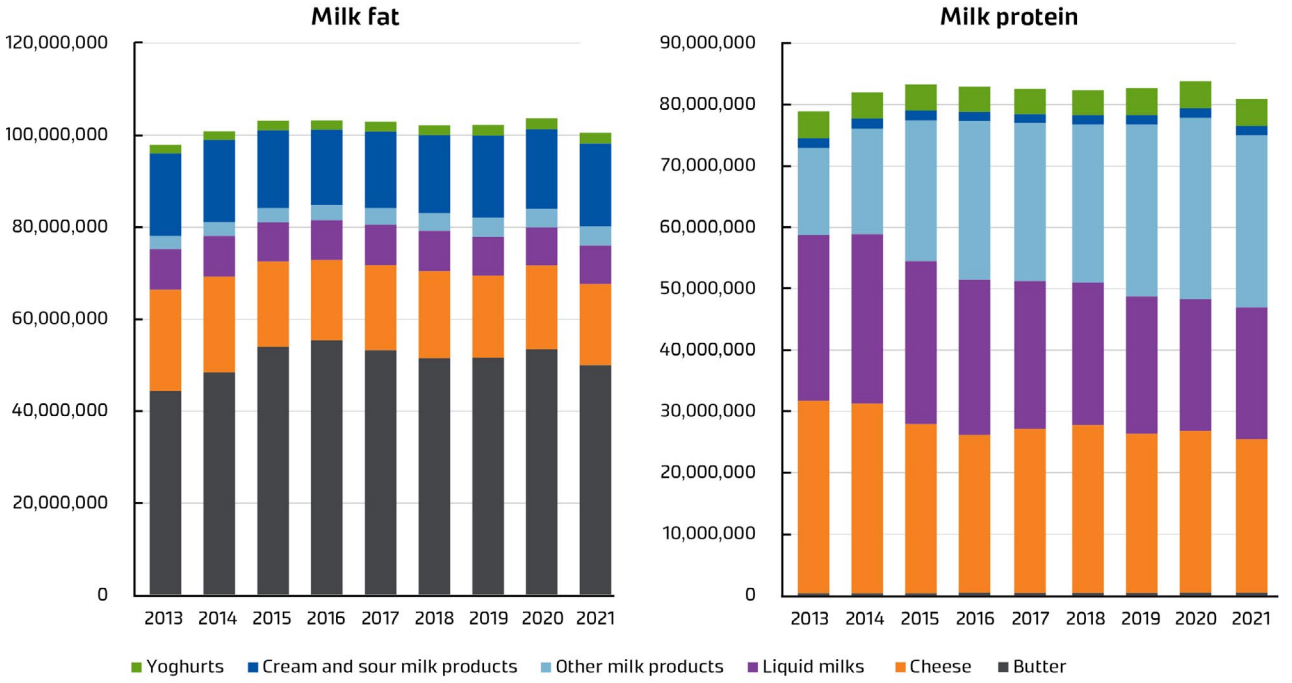
Olli Niskanen and Sanna Vuorisalo

The situation was challenging in the dairy sector in 2021. The yield of the first grass silage cut of the summer of 2021 was quantitatively high, while digestibility remained low due to heat. The drought during the end of the summer had a negative impact on the following cuts of grass silage and reduced the yield of cereals to a historically low level. Milk production was down by 4% from the previous year, while the protein and fat content of the milk produced increased slightly. The average producer price of milk was increased slightly. The global market prices of dairy products increased to record-high levels towards the end of the year, but unit prices in Finland's exports did not yet increase in 2021 compared with the previous year. The percentage of imports from domestic consumption decreased slightly. The dramatic increase in the prices of purchased feed and other production inputs at the end of the year will also shake the dairy sector in 2022.

Little investments

Fewer than 5,000 dairy farms produced milk at the end of 2021. Many farms discontinued their production: compared with the previous year, there were nearly 8% fewer producers, as 416 dairy farms discontinued their production operations. At the same time, the amount of investment aid provided for dairy cattle farming was the lowest since 2015. As Valio Group's contractual production limited new investments and increased construction costs postponed investment decisions, investment aid only totalled EUR 20.8 million. This amount was less than half the aid paid in the previous year (EUR 41.9 million). During the record year of 2019, the amount of aid was up to EUR 59 million. The average farm-specific milk amount increased by 4.2% after the previous years' investments started to become productive, and production stoppages focused on farms with fewer cows. As a result of the structural development and the rapid investment rate in the previous years, up to 65% of cows in Finland were already kept in loose housing. The increase in loose housing has reduced the nutritional significance of pastures, but the majority of dairy farms (72.5%) still kept their cows on pastures in 2020.

Use of milk protein and milk fat in different product categories in 2013-2021.



Production and manufacturing in Finland

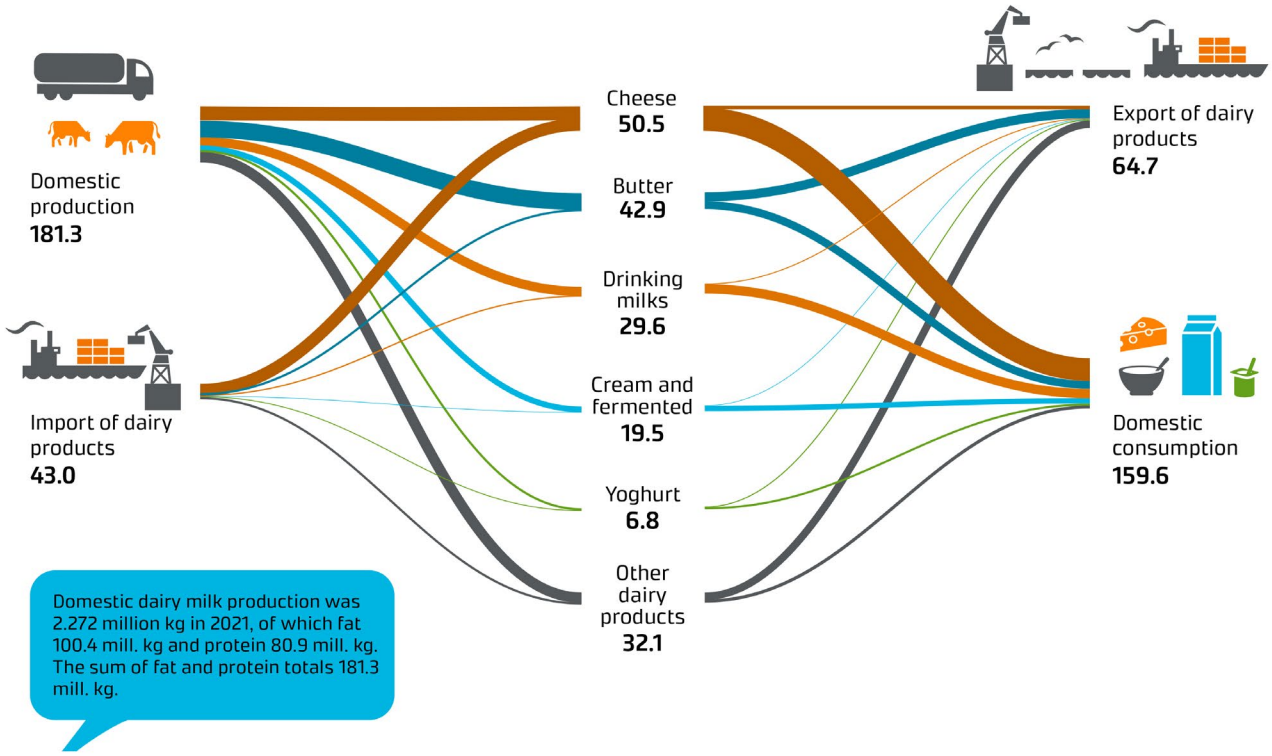
Of the total consumption of milk in Finland, a significantly larger share is consumed by eating than drinking. In 2021, a total of 550 million litres of liquid milk was packed. The long-term rapid decrease in the consumption of liquid milk started to even out, and the production of liquid dairy products measured in litres decreased by only 0.8%. The production volume of buttermilk was 41.7 million litres (-4%), while the corresponding figure for cream was 44.2 million litres (+2.4%), for yoghurt 108 million kg (-2.2%) and for cheese 83.6 million kg (-2.4%). The butter production volume decreased by as much as -7.2% to 49.1 million kg as a result of the decreased total production of milk fat.

Export unit values remained stagnant in 2021

The trade balance for dairy products decreased slightly in 2021. The export volume decreased by roughly six million kg, causing export income also to decrease by EUR 413 million (EUR 429 million in 2020). The import volume fell by roughly four million kg, but the import value remained nearly unchanged as a result of the increase in unit prices. Instead, the unit price of exports measured as the full-year average did not yet increase in 2021, regardless of higher global market prices. However, at the beginning of 2022, export unit prices were showing signs of an increase, which also supported the domestic producer price paid for milk.

In 2021, Sweden remained the most significant export country for dairy products with its export value of EUR 109 million. It was followed by China at more than EUR 90 million. The third most significant export country was France, at EUR 40 million. The most significant countries for imports were Denmark, with a total import value of EUR 86 million, Germany with EUR 82 million, Sweden with EUR 35 million, and the Netherlands with EUR 30 million.

Allocation of fat and protein of delivered milk to different dairy products, and their domestic use including imports and exports in 2021 (million kg)



In 2021, the role of imports in domestic consumption decreased slightly for proteins, being 28.7% (29% in 2020), and increased slightly for fat, being 25.4% (25.3%). Cheese accounts for more than 90% of imports. The self-sufficiency rates for milk protein and milk fat have increased in recent years as the structure of domestic demand has changed, and the protein and fat content has improved in primary production. The ratio between domestic production and domestic consumption decreased in 2021, being 109% (111%) for milk protein and 118% (119%) for milk fat.

Impact of 2021 on production

As a result of the low digestibility of the silage fodder harvest and the increase in purchased feed costs in the summer of 2021, feeding costs increased. The average output of cows decreased across Finland. Contractual production adopted by Valio Group, in which price steering has aimed to control production volumes especially during production peaks, has also helped control the average output. The average output of milk has usually been a little higher in northern regions, with the exception of the C4 region. Dairy cattle compensation based on the number of animals and applied in Southern Finland (AB region) offers more financial leeway to adapt production to rising feeding costs than the litre-based support paid in the C region, in which no support is received when the output decreases.

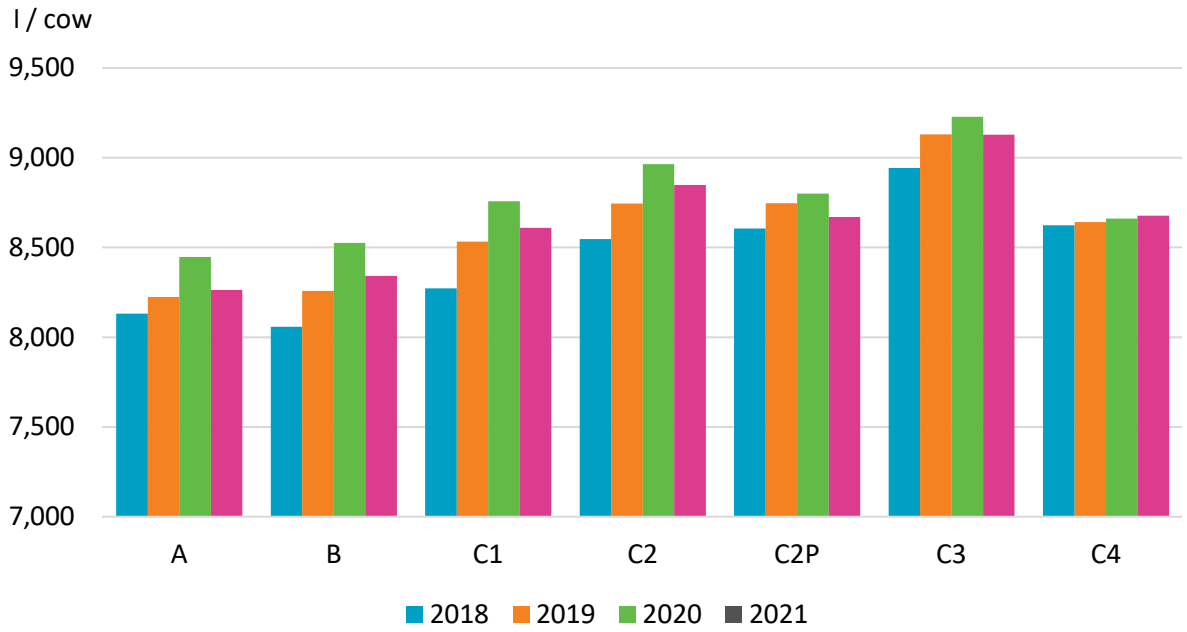
Financial and market situation in milk production in 2022

In the global milk market, 2022 started with declining production, mainly affected by the global increase in production costs and challenging production conditions in certain key export countries. Declining production is a rare situation in the global milk market. Usually, both global demand and production increase year-on-year, and the price balance depends on which grows more quickly. Prices of futures at auctions closed during the previous year predicted high prices for the beginning of the year.

The increase in the export prices of dairy products makes higher milk producer prices possible in 2022. However, more significant factors are the changes in consumer prices in domestic markets and their transfer to producer prices. Dairy products account for EUR 2.3 billion (16.5%) of total food sales of EUR 13 billion in the grocery trade. The percentage of imported products from this amount varies from one product group to the next, but calculated with a rough percentage of Finnish dairy products (73%), an increase of 10% in consumer prices would translate to more than EUR 165 million if transferred directly to producer prices.

Relative to the production volume, primary production for milk would need an additional income flow of more than EUR 200 million from the 2021 level to compensate for the increased costs. This is based on Luke's Market Margins (**www.luke.fi/markkinamarginaalit**) service, which measures the difference between producer prices and production costs in livestock farming. In 2022, production costs per litre of milk are expected to settle slightly less than ten cents above the 2021 level, provided that the highest price peaks lower at least slightly during the second half of the year. It should also be noted that a large part of the cost increases was already realised on dairy farms in 2021, and that production costs increased by more than EUR 90 million between 2020 and 2021. As a result, part of the realised increase in producer prices only compensates for previous cost increases.

Average production of dairy cows by support areas 2018–2021



However, an increase in export income and in consumer and foodservice prices can account for a significant part of the funding deficit. In practice, farms will also have to adapt to the situation regarding the amount of purchased feed used, for example. Each farm needs to decide the optimum level of adaptation. The calculation is also affected by the support region, as dairy cattle compensation in Southern Finland depends on the number of animals, not the volume of production. In northern regions, production support is based on litres, which also supports the maintenance of production volumes and affects the optimal level of feeding and production. Based on the current forecast of feed costs, complementary proteins and energy in industrial feed will decrease to some extent, reducing the average output. Overall, production volumes may decrease by several per cent in 2022, based on the decrease in average outputs and discontinued production operations.

Egg market

Jukka Markkanen

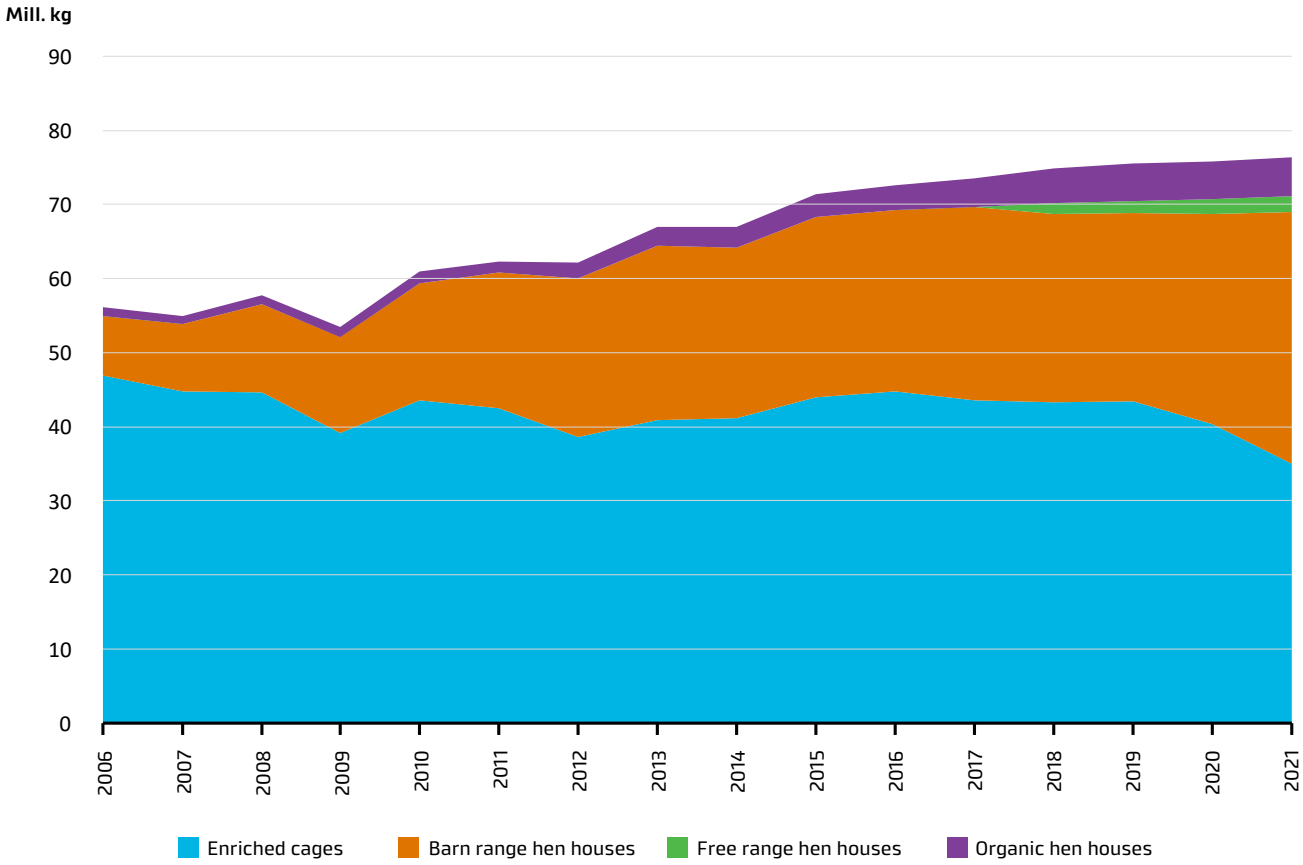
In 2021, the consumption of eggs decreased to 12.3 kilograms per consumer after the previous year's leap. Egg consumption and production are well balanced, and any price changes are minor. Producer prices for eggs produced in enriched battery cages and barn henhouses remained unchanged, while those for free-range and organic eggs decreased slightly. The number of producers and the amount of production in enriched battery cages continue to decrease, while the average farm size is increasing. Estimating this year's production and egg volumes is challenging due to the cost crisis and lower demand of shop chains for eggs produced in enriched battery cages. Organic eggs already account for more than 20% of the market value of eggs sold in shops.

In 2021, the total consumption of eggs decreased by 2.4%, and the consumption of eggs in shells by 3.8%. This means that the increase of more than 5% in the previous year was reversed. Consumption decreased to 12.3 kilograms per capita, and it is expected to remain unchanged in 2023. This equals roughly four eggs a week and 208 eggs a year per capita. The domestic content of consumption was approximately 97%.

In 2021, around 66.9 million eggs were consumed in Finland, including imports. Imports of eggs in shells and processed egg products decreased by 16.3% to 2.1 million kg. Consumption of imported eggs in shells is low. The changes in nutrition recommendations in 2016 and the increased use of eggs in households in recent years affected the previous increase in egg consumption. Although direct sales and other schemes for distributing locally produced goods directly to consumers have become more popular, only a little more than one million kg of eggs are sold directly to consumers by the producers.

In 2021, slightly more than 77.5 million kg of eggs were produced, up by roughly 2% from the previous year. Of this, 54.0 million kg were supplied to packaging plants, which is 3.8% lower than in the previous year. Production increased by 1% during the first half of 2022. In early 2022, there were slightly more egg-

Egg production per production method in 2005-2021



Source: Luke

laying hens than in the previous year. Last year, the self-sufficiency rate for eggs increased to 116%. This is expected to decrease to 114% in 2022.

In 2021, the producer price for eggs varied from one production line to the next. Producer prices remained relatively stable throughout the year. The average producer price was EUR 0.9 per kg for eggs produced in enriched battery cages, EUR 1.10 per kg for eggs produced in barn henhouses, EUR 1.36 per kg for free-range eggs, and EUR 2.48 per kg for organic eggs. Costs have also increased in egg production, while producer prices have not yet kept up with the pace.

Profitability problems in production are expected to continue in 2022, as a result of which some farms will discontinue their operations. The production shift from enriched battery cages to other production forms is rapid. New capacity will be created to produce free-range eggs.

The number of eggs produced in enriched battery cages decreased by 12.5%. Of class A eggs, 46% were produced in enriched battery cages regarding the whole year, and 42% at the end of the year. The number of eggs produced in barn henhouses increased by 25%, accounting for as much as 44% of all eggs produced during the year. A historic turn took place at the end of 2021, when the production of eggs in barn henhouses passed enriched battery cages, accounting for 46.7% of total production. The number of eggs produced in free-range henhouses increased by 8%, accounting for 3.3% of all eggs. There are roughly ten farms producing free-range eggs. The proportion of organic henhouses increased slightly, accounting for 7% of production. Organic eggs are produced on around 55 chicken farms, with an average henhouse size of 6,000 chickens. To qualify as organic, eggs must be produced in henhouses with at most 3,000 chickens.

Egg exports totalled 3.6 million kg. Eggs were mainly exported in shells, which accounted for 3.1 million kg of total exports. The volume of exported eggs in shells increased by 21.6%. Some 0.5 million kg of processed egg products were exported, showing an increase of 34.8%. In 2021, eggs were mainly exported to Denmark (33%), Sweden (29%), Latvia (11% each), and Germany (10%).

At the beginning of 2022, the number of egg-laying hens was slightly higher than in the previous year - nearly four million. In the spring, the number of hens is expected to increase slightly, decrease during the summer, and then return close to the situation at the beginning of 2022. Due to the cost crisis, farms engaged in egg production in enriched battery cages may especially take production breaks during the summer and reconsider the situation in the autumn.

The average number of chickens per farm was 15,800 at the end of 2021, and the number is expected to increase by 10% to 17,400 this year. There are still quite a lot of small-scale non-professional henhouses in Finland, while 86% of egg-laying hens were in henhouses of more than 10,000 chickens, numbering only 130. More than a quarter of all chickens are grown on farms of more than 50,000 chickens.

New investments will again increase the average size of henhouses in 2022. Large henhouse units owned by packaging plants is a new trend. Of the 254 farms in operation at the beginning of 2021, 5% discontinued their operations, and there were 244 farms at the end of the year. It is expected that there will be around 230 farms at the end of 2022. Production in enriched battery cages especially will be discontinued due to the cost crisis and uncertain demand.

Statistics

Luke, Total egg production
https://statdb.luke.fi/PXWeb/pxweb/en/LUKE/LUKE__02%20Maatalous__04%20Tuotanto__10%20Kananmunien%20tuotanto/02_Kananmunien_kokonaistuotanto.px/

Horticultural market

Anna-Kaisa Jaakkonen and Anu Koivisto

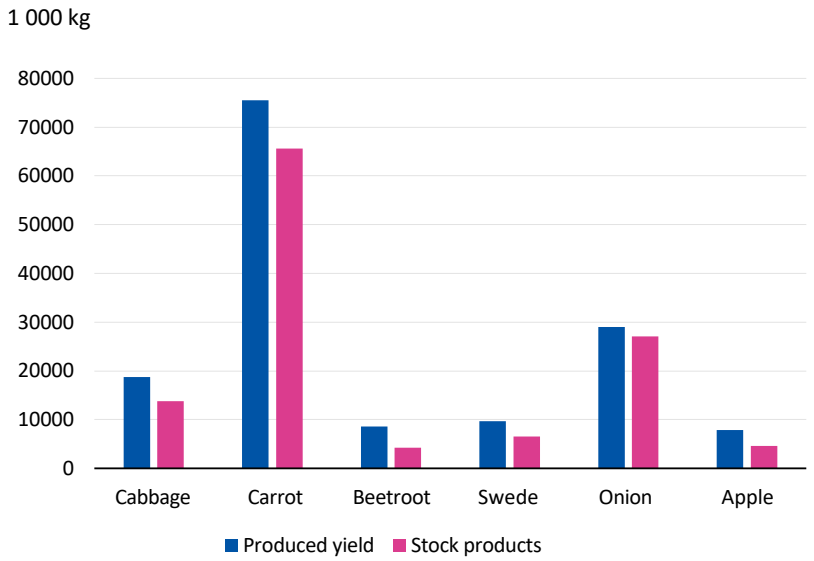
The growing season is short in Finland, which is why stock vegetables play an important role in maintaining domestic supply. The cold storage of produce is also important for the maintenance of the security of supply in horticultural products. In addition, the storage of produce increases costs on horticultural farms through the construction of cold storage facilities and energy costs. In contrast, greenhouses produce yields round the year. The recent increase in electricity prices tests the profitability of greenhouse enterprises, as energy costs account for roughly 25% of their production costs.

The produce season is extended through storage

According to the Balance Sheet for Food Commodities, Finnish people consume some 409 million kg of fresh produce annually, of which domestic production accounts for 270 million kg, or 66%. In 2021, 173 million kg of produce were produced outdoors, and 97 million kg in greenhouses.

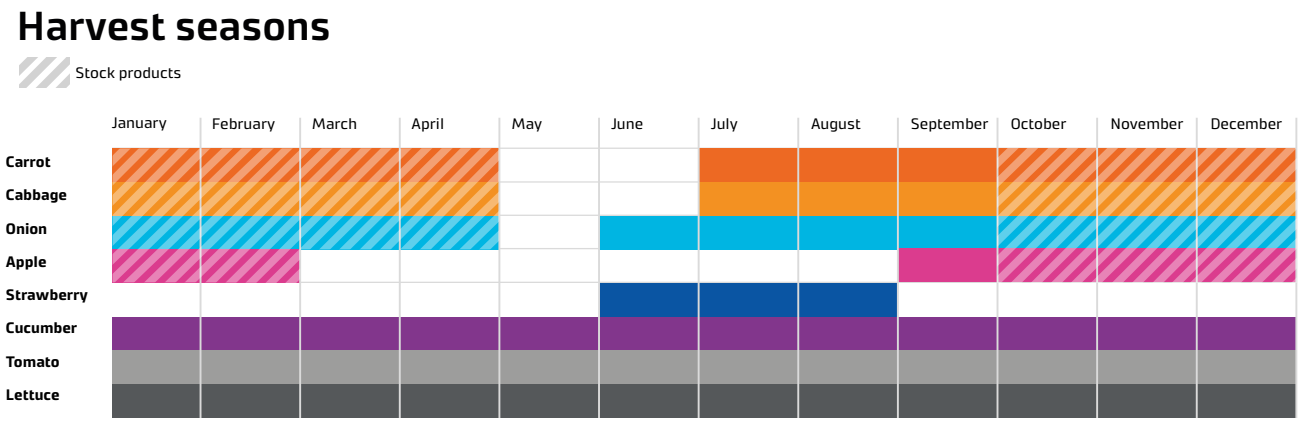
In outdoor production, the harvest season is typically quite short due to Finland's cold climate and short growing season. Some outdoor vegetables, including cabbages, carrots and onions, withstand storage well. This means the availability of Finnish vegetables and apples can be significantly extended through storage. Stocks therefore play a very significant role in the total harvest of vegetables and apples.

Production and storage volume of key stock produce in 2021



Source: Luke

Supply of domestic vegetables and apples



The cold storage of produce is also important in maintaining the security of supply regarding horticultural products. Produce, berries and vegetables are also frozen to some extent, but their volume is much lower than the cold storage volume.

The storage of produce naturally increases costs on horticultural farms through the construction of cold storage facilities and storage-related energy costs. In principle, the longer a product is kept in storage, the higher the production costs, and the higher the product price should be. In the light of price statistics, produce prices react relatively little to the duration of the storage period and the resulting additional costs.

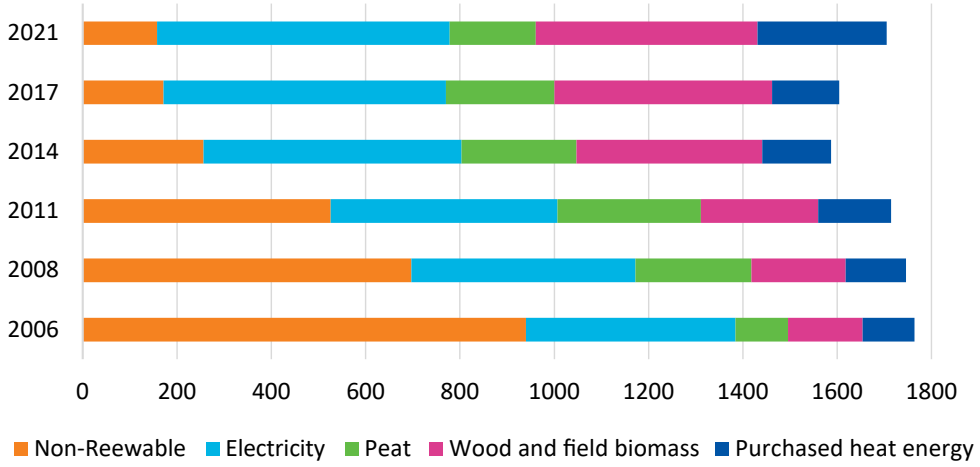
The increase in electricity prices tests greenhouse production

According to Luke's agricultural profitability accounting, energy costs account for roughly 25% of greenhouse enterprises' production costs. The energy forms used in greenhouse production have changed drastically during the last 20 years. At the beginning of the 2000s, non-renewable imported energy, mainly light and heavy fuel oil, still accounted for a large part of the energy used by greenhouse enterprises. During the last ten years, imported energy has largely been replaced by domestic wood- and field-based energy, and its share of total energy consumption has increased significantly.

Electricity consumption in greenhouse production has increased in the last 20 years since the production of edible greenhouse crops shifted to year-round production using artificial light. The use of artificial light requires large amounts of electricity, although electricity consumption per 100 kg of production has decreased steadily as a result of technological development and LEDs in particular.

The electricity consumption of large greenhouse enterprises equals that of medium-sized industrial companies. The recent increase in electricity prices tests the profitability of greenhouse enterprises especially because electricity accounts for such a large part of production costs.

Energy consumption in greenhouse production per year



Lähde: OSF: Natural Resources Institute Finland, Horticultural Statistics.

Statistics

Luke's **horticultural statistics**
Luke's **Economy Doctor**

Structural development and economic situation of agriculture

Agricultural and horticultural labour force

Jaana Kyyrä, Pasi Mattila, Anna-Kaisa Jaakkonen, Anu Koivisto, Minna Väre, Tiina Mattila

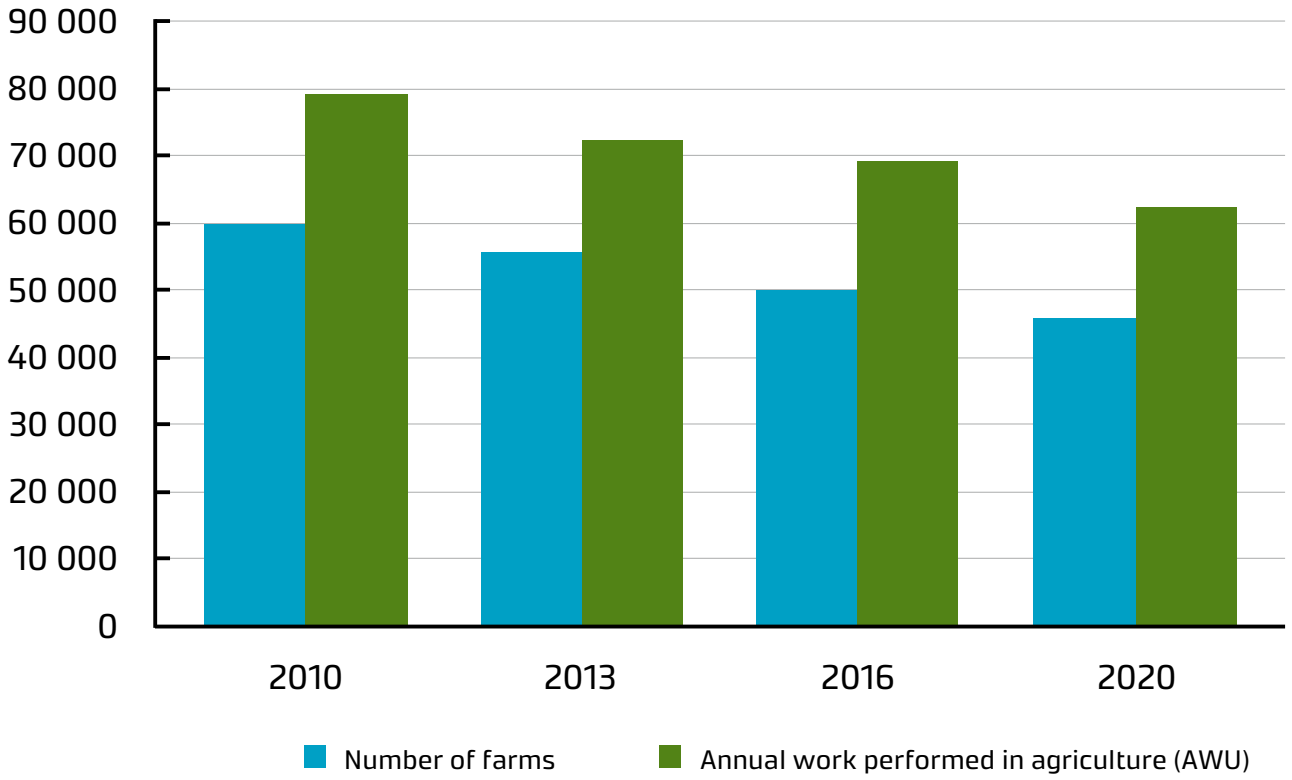
The number of agricultural and horticultural farms decreased by 23%, and the workload by 20%, between 2010 and 2020. The workload of farmers and their family members has decreased by 30%. In contrast, the workload of employees has increased: the workload of full-time employees by 20%, and that of short-term seasonal employees by more than 60%. At the same time, the significance of the foreign workforce has increased, particularly in horticultural production. The foreign workforce accounted for nearly 70% of all employees in outdoor production and more than 60% in greenhouse production.

Workload of employees increased

In 2020, there were 45,600 agricultural and horticultural enterprises in Finland, employing 134,000 people. This figure does not include contractors or farm relief workers. Measured in annual work units, the workload was 62,600 AWUs. This figure also includes the workload of contractors and holiday relief staff, which totalled 3,800 AWUs.

Farmers and their family members accounted for nearly 70% of the workforce in agriculture and horticulture, totalling more than 90,000 people. There were more than 10,000 permanent employees and 33,000 short-term seasonal employees. Farmers and their family members accounted for slightly more than 70% of the workload in agriculture and horticulture, while permanent employees and seasonal employees each accounted for 10%.

Number of farms and amount of annual work performed in agriculture 2010-2020.



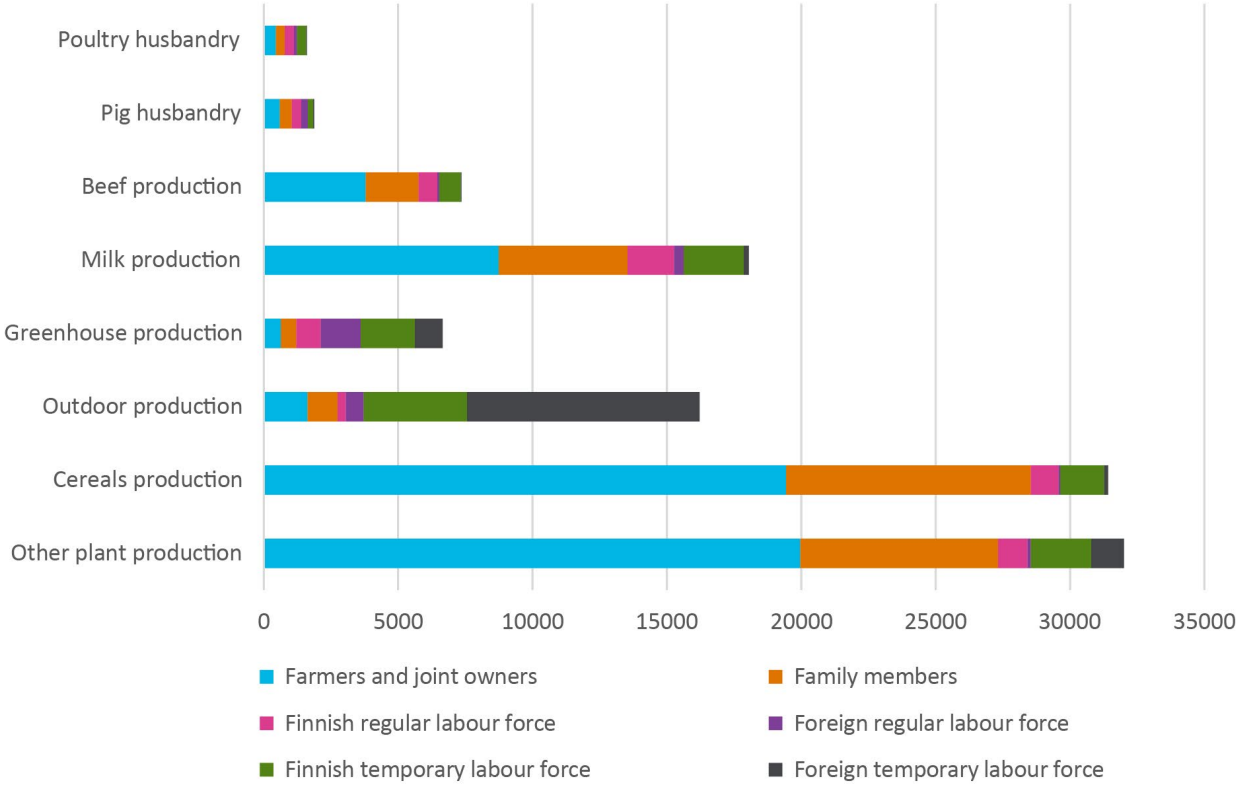
Source: Luke

Since 2010, the workload of farmers and their family members has decreased, while that of employees has increased. Some 4,300 farms had permanent employees, and 4,800 farms had seasonal employees. Permanent employees mostly worked in greenhouse production and on dairy farms, while seasonal employees mostly worked on outdoor horticultural farms.

One farm in ten recruits permanent employees

The majority of the agricultural and horticultural labour force worked in cereals and other plant production. These are also the largest production lines. Other plant production was the main production line on 15,600, and cereals production on 14,700,

Distribution of annual work performed in agriculture (AWUs) in 2020.



Source: Luke

farms in 2020. Farms engaged in these production lines employed more than 30,000 people. Milk production requires employees on every day of the year. Finland's 5,400 milk production employed 18,000 people. Outdoor horticultural production requires many hands during the season. In 2020, there were 1,271 outdoor horticultural farms, employing more than 16,000 people.

Some 10% of all farms had permanent employees in 2020. Permanent employment relationships were more common in greenhouse production, with every other company having full-time employees. In addition, nearly every other poultry and pig farm had permanent employees. A single farm usually has one or two to five permanent employees.

Nearly 70% of greenhouse enterprises and almost 60% of outdoor horticultural farms had seasonal employees. A single farm usually had two to five employees, while a few outdoor horticultural farms even had more than 100 seasonal employees. The use of a seasonal workforce was less common in other production lines: slightly more than 10% of farms engaged in other production lines had seasonal employees - typically, one seasonal employee.

The significance of foreign labour is increasing

The significance of foreign labour in Finland's agriculture and horticulture has increased in recent years. While every tenth person employed by

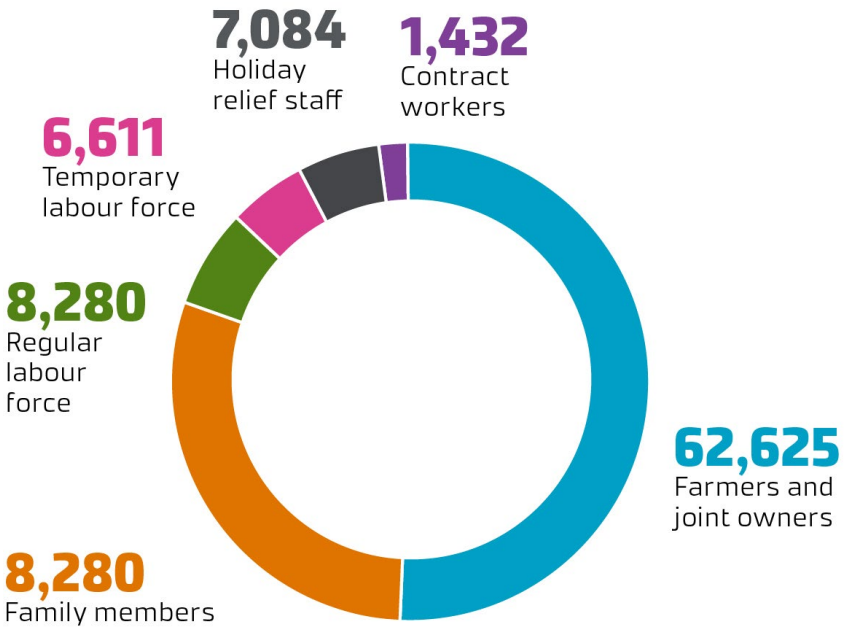
The number of people employed in agriculture and horticulture includes farmers, shareholders of enterprises and their family members, and permanent and short-term employees. Data on the number of people were collected during the 2020 Agricultural Census. The annual workload is indicated in AWUs, with one AWU corresponding to the workload of a single full-time person during a year. One AWU equals 1,800 hours. The annual workload also includes the work carried out by contractors and holiday relief staff. Data on the annual workload, apart from the workload of permanent employees, were collected during the 2020 Agricultural Census. Data on the number of permanent employees were requested during the data collection, and their workload was calculated based on the Incomes Register's data.

agricultural and horticultural enterprises came from outside Finland in 2013, the corresponding figure had increased to 14% in 2020. The majority of the foreign workforce, some 16,000 people, consisted of short-term employees, while a sixth, or 3,300 people, were permanent employees. The foreign workforce accounted for 31% of all permanent employees and 49% of short-term employees on farms.

In 2020, the largest number of foreign employees worked on outdoor horticultural farms (9,300 people) and in greenhouse enterprises (2,500). The number of foreign employees has increased especially in greenhouse enterprises, in which their number and percentage of the total workforce (52%) have doubled since 2013. In greenhouse enterprises, the foreign workforce accounted for 62% of full-time employees and 34% of short-term employees. In outdoor production, the foreign workforce accounted for nearly 70% of both full-time and short-term employees.

The role of the foreign workforce has also increased on livestock farms. On pig farms, the foreign workforce

Number of employees in agricultural and horticultural enterprises 2020



Source: Luke

The number of agricultural and horticultural enterprises which have used salaried workforce by the number of employees.

Number of employees per enterprise	Number of enterprises which have used regular employees (st)	Number of enterprises which have used temporary employeees
0	40,787	39,559
1	2,853	2,987
2-5	1,761	2,210
6-10	160	383
11-20	51	228
21-50	25	161
51-100	1	78
>100	0	34

already accounted for 16% of all employees and 42% of full-time employees in 2020. The corresponding figures were 8% and 23% on poultry farms and 3% and 17% on dairy farms.

The large proportion of the foreign workforce, especially among seasonal employees in horticulture, is a very common phenomenon in Europe. Employees come from eastern EU countries to western countries, but a significant proportion of the workforce also comes from outside the EU. In Finland, the foreign workforce in agriculture has largely come from outside the EU, while there has been some variation in the countries of departure. According to the Finnish Immigration Service (Migri), the majority (more than 90%) of seasonal work permits were granted to Ukrainians in 2020 and 2021.

The availability of foreign seasonal employees and problems associated with arrival in the country have become significant issues in recent years, first due to the coronavirus restrictions and more recently, the outbreak of the war in Ukraine in the spring of 2022. In practice, replacing experienced employees quickly with new employees is very challenging. The sensitivity of horticulture is increased by the large proportion of labour costs from total production costs. The effectiveness and productivity of work, and employee welfare, have a direct and significant link with the financial success of farms.

Luke, Agricultural and horticultural labour force

https://www.luke.fi/en/statistics/agricultural-and-horticultural-labour-force

Financial development in agriculture

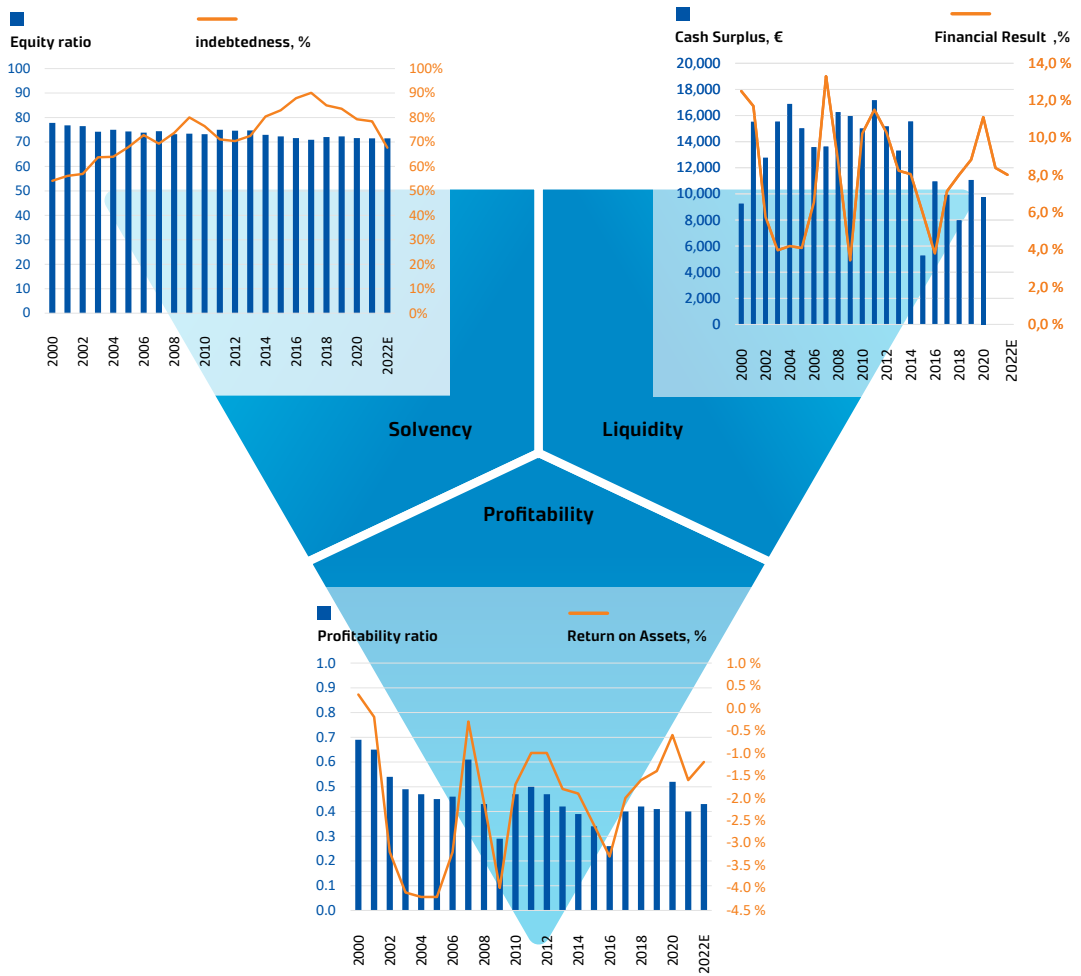
Jukka Tauriainen

Low harvest levels and increased costs reduced the profitability of farms in 2021. According to estimates, profitability in agriculture in 2022 is expected to be as low as in the previous year. Farm expenses are fairly high relative to income, and their finances react strongly to changes in costs. If expenses continue to rise, and producer prices do not increase, the liquidity of farms and their ability to repay their loans will be at risk.

Profitability

Recently, the low profitability of agriculture has been a cause of national concern. According to Luke's most recent estimate, profitability in 2022 will be as low as in 2021, when low harvest levels and high costs reduced profitability. Any increase in producer prices in 2022 will not cover the increase in costs. The security of supply package for agriculture will have a positive impact on results.

Return on assets has been lower than interest on long-term state loans throughout the 2000s. As a result, agricultural enterprises have been unable to produce added value for the capital invested in them. In calculating the return on assets, the pay adjustment



for the unpaid work input of the entrepreneur family is deducted as an expense.

This year, the average profitability ratio in agriculture will remain around 0.4, meaning that only 40% of the target pay for the entrepreneur's work input and target equity interest can be achieved. Agricultural entrepreneurs receive EUR 7.1 per working hour, with a return on equity of 1.6%.

Cost pressures are especially reflected in the low profitability of livestock farming. High cereal prices especially affect pig and poultry farming. The profitability of cereal and oil and protein crop farming will increase from the previous year.

Return on assets % = (net result + interest) / average total assets

Profitability ratio = entrepreneurial income / (pay adjustment for entrepreneur family + target return on equity)

Solvency

On average, Finnish farms have a high self-sufficiency rate, with more than 70% of capital committed to the business as equity. Averages indicating a satisfactory self-sufficiency rate (<40%) are only found in dairy, beef and greenhouse production.

Low profitability and the weak ability to produce income also affect the loan servicing ability. During the 2000s, relative indebtedness has reached a high of 90%. According to the estimate, relative indebtedness will continue the improvement started in 2018. Indebtedness in agriculture is an alarming trend, as growing unit sizes take up more and more loan capital. The loan servicing ability will decrease or remain weak if producer prices do not increase more quickly, and costs continue to rise.

Self-sufficiency rate = equity on 31 December / (total assets - received advance payments)

Debt ratio = total liabilities on 31 December / gross revenue

Gross revenue = sales revenue + subsidies + other revenue

Liquidity

An enterprise must be able to cover all the ordinary expenses related to its operations. Luke's profitability accounting monitors the liquidity of agricultural enterprises with dynamic cash flow indicators.

In practice, a cash flow surplus is any amount left of a farm's cash flow that is available for private expenses. In determining cash flow surplus, all expenses, including taxes and investments, are deducted from the income received and loans taken out by the enterprise. On average, farms can cover their liabilities, but the level of surplus is low. Combined with the large deviation in the key figure, it can be concluded that for some farms in some years, no cash flow surplus is accumulated at all.

According to the liquidity calculation, the average cash flow surplus of farms remained at EUR 8,000-11,000 between 2016 and 2020. In 2021-2022, the liquidity of many farms has faced major setbacks due to rising costs, which is why some farms have been forced to discontinue their production operations.

The financial result rate indicates how large a part of financial results remain available for repaying loans, making investments, and sharing profit to the entrepreneur. There has been considerable deviation in the 2000s, but the financial result rate has remained positive. In addition to ordinary expenses, entrepreneur families have been able to meet their targets for paying themselves income.

Cash flow surplus = income - expenses - net loans taken out - net investments - taxes

Financial result % = (net result + depreciations) / gross revenue

Sensitivity of the income level

In recent years, farmer subsidies have accounted for roughly 30% of total agricultural income, ranging from 5% among greenhouse enterprises to 50% among sheep farms. The financial status of farms with production lines dependent on subsidies is

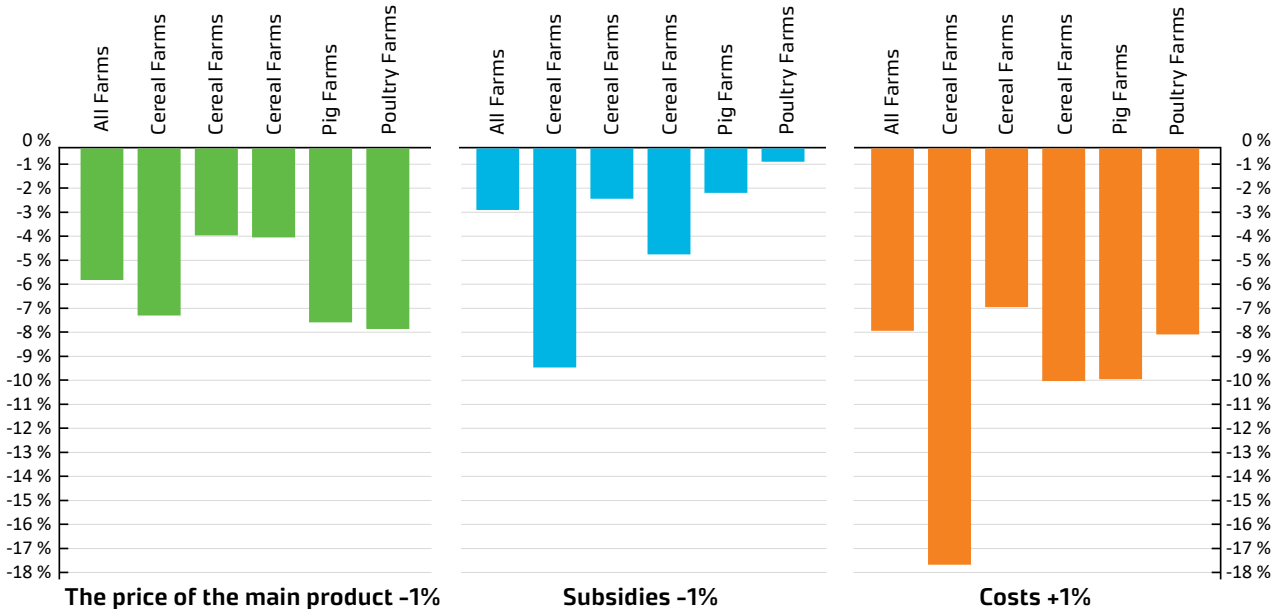
sensitive to changes in policies. According to the 2020 results, entrepreneurial income will decrease by 9% on cereal farms and 1-5% on livestock farms if subsidies are reduced by 1%.

The larger the share of a farm's primary product sales from the farm's gross revenue is, the more sensitive its financial status will be to changes in producer prices or production volume. A change of 1% in the producer price or production volume on cereal, pig or poultry farms results in a more than 7% change in entrepreneuri-al income.

Farm expenses are fairly high relative to income. Here, 'expenses' refers to production costs, excluding the calculated pay adjustment for the entrepreneur's own work input and the target return on equity. Entrepreneurial income reacts strongly to changes in costs. If all costs increase by 1%, the average entrepreneurial income of farms will decrease by nearly 8%. Cereal farms are the production lines most sensitive to changes in costs.

Entrepreneurial income = gross revenue – production costs, excluding the pay adjustment for the entrepreneur's own work input and the target return on equity

Changes in entrepreneurial income if the price of the farm's primary product, the amount of subsidies paid to farmers, or the amount of expenses change by 1%, calculated by weighted averages from 2020.



Special themes

Can Finland produce more food grains instead of feed grains?

Csaba Jansik

In Finland, there was an animated public debate on the food and feed use of grains in the past year. The current structure of the production and use of grains and especially the justification and appropriateness of use of feed were questioned. The same question was frequently asked in the debate: Can Finnish production and use of feed grains be partially or totally replaced by food grains? The answer to this question requires a comprehensive discussion.

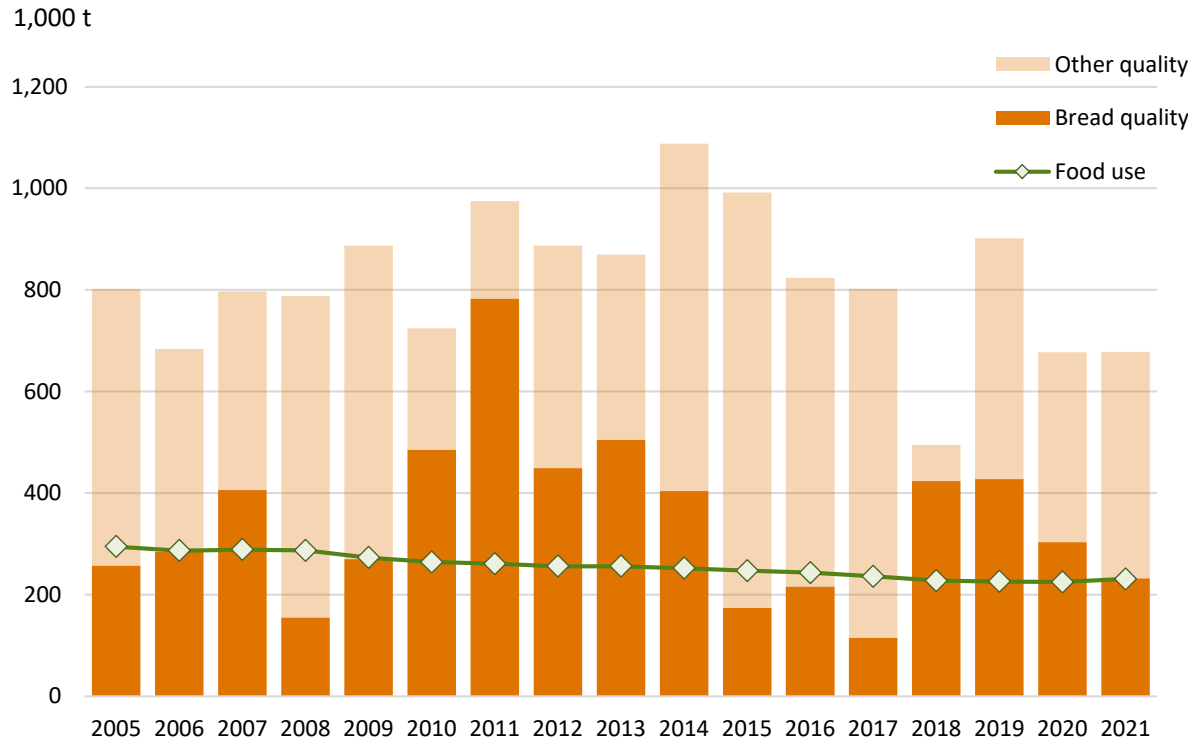
Only part of wheat suitable for bread

The first important factor is the quality of grains. Each cereal has its own quality criteria defined by its users. The strictest quality specifications relate to bread grains. There are slightly lower but still considerably strict quality requirements for feed grains. Other processing industries, such as starch and ethanol industry or malting, have varying requirements for grains depending on the final purpose of use. There are basic quality standards for litter, diseases or moulds in effect for all forms of use.

Wheat is the most common bread grain in the world and, also in Finland, the largest bread grain by its volume of use. Total self-sufficiency in wheat was not achieved in Finland until the end of 2000s. Until then, part of demand for bread wheat - mostly batches to improve the quality - had to be met by imports from abroad. Self-sufficiency refers to a production level at which the bread wheat requirement in Finland can be totally met by domestic wheat despite the annual variation in quality. Finnish Food Authority defined the quality requirements of bread wheat as follows: hectolitre weight at least 78 kg, protein content at least 12.5% and falling number at least 180. The quality of Finnish wheat has varied drastically, at the worst only 14% and at the best 80% of wheat harvest met the bread quality requirements. (Figure).

The short growing season and northern weather conditions in Finland affect the harvest quality significantly. A prolonged cool and rainy harvest can lower falling numbers and, through that, the portion of wheat suitable for bread use considerably. The weather affects the quality also in Central Europe, and nowhere the whole wheat harvest meets the requirements of food-grade quality. Comparisons are a bit difficult due to different quality standards between countries but, in the largest Central

Quality classification and food use of Finnish wheat



Source: Natural Resources Institute Finland, Crop production statistics and grain balance sheet; Finnish Food Authority, grain quality survey

European producer countries, quality variation in wheat is generally smaller than in Finland.

The Finnish Food Authority's quality definition is representative information because it is, in reality, possible to also use batches which fall short in one or several quality characteristics, if the quality range is extensive and there are top batches of good-quality grains. The mill industry mixes batches of various protein or falling number levels to obtain wheat of consistent quality for milling. Hence, the process can partially utilise quality weaker than the specifications. By mixing, it is possible to meet the minimum requirements of products.

In order to ensure the volume of annually required bread wheat, Finland has to maintain the current production level (Figure). The volume of food-quality wheat exceeding the domestic need can be exported. After 2007, Finland exported bread wheat in several years for 75,000-260,000 tonnes especially to Northern Africa and Middle East. In some years, however, the volume or quality of wheat did not enable export.

In both Finland and Europe, the quality of wheat is only determined after harvesting, which settles the final purpose of use. Therefore, it is very important that there always is another possible use for grains not suitable for bread. In the past decade, an average of 46% of domestic use ended up as feed. In the same period, the feed use ratio in the whole EU - where there are more quality-reliable producers than Finland - was 43%.

Rye used almost totally for food preparation

The second most important Finnish bread grain after wheat is rye. Its self-sufficiency was not achieved until the end of 2010s. Falling numbers are without exception good, which is important because the significance of the falling number in the quality specifications of rye is highlighted. Both the newest hybrid and population varieties give harvest which is largely suitable for use as food.

Rye has always been used primarily for foodstuffs in Finland. Most of it goes directly to baking bread. Even though the 83,000 tonnes of rye used as food seems modest next to the 239,000 tonnes of bread wheat used, rye has an important role in the Finnish food culture and identity. Besides bread, rye is used for various products, such as Karelian pasties, rye crispbread, Finnish Easter pudding, and malt, which require different quality specifications. These alternative forms facilitate the use of grain batches with weaker baking characteristics.

Feed as alternative use also for non-food-grade barley and oats

Barley is primarily classified as feed grain in the world. In Finland, barley - the largest grain in terms of volume for decades - has been used in versatile ways for many purposes. The mill use of barley is so small that the portion meeting the quality requirements is easily found every year. The brewery industry brews beer from malt prepared from barley. Additionally, spirits are made from barley ethyl alcohol. These food and beverage products use about a fourth of the barley harvest.

The quality requirements of direct consumer products primarily determine the division of the harvest to different forms of use. On average 80% of malt barley cultivated particularly to the needs of the malting industry meets the limiting values of germinability and protein content. Batches not suitable for malting are conveyed either for starch and ethyl alcohol production or for feed. Self-sufficiency in barley has been high in Finland. In good years, Finland exported 10,000-30,000 tonnes of malting barley to countries such as Russia, Germany, Belgium, and the Netherlands. However, the poor harvest in 2021 led to imports of malting barley, the first time in 15 years.

There are no distinct differences in the quality requirements of oats. The milling and feed industries compete over the same quality. The most important characteristic of oats for food and feed companies and exporters is its yield, that is, everyone tries to obtain large-grained and even-sized oats. Weight per hectolitre and screening percentage are the two most important quality indicators. Companies adapt their own quality requirements based on overall quality of the harvest, their own needs and competitive situation by adjusting the limits of the weight per hectolitre and the screening percentage (between 58-52 and 5-15%).

However, the quality requirements set for food oats are stricter in three characteristics: the values of mycotoxin (DON) must be significantly lower (limit set by the EU for food-grade oats is 1,250, for feed-grade oats 8,000), and the use of chlormequat chloride (CCC) as well as municipal solid waste in cultivating food-grade oats is forbidden. The DON values have had no practical significance since 2016, which is due

to favourable weather conditions and better oats varieties.

Competition always finally determines how much oats are sold for food use or feed use or are exported. Due to weather conditions, a situation can occur from time to time that a significant part of oats harvest is not suitable for any other purpose than feed because of moulds. Therefore, the existence of feed, an alternative use as a guarantee for utilising the harvest is also essential for oats.

Can Finland specialise in producing food grains?

Can Finland produce more bread grains and participate in for example satisfying the global need for bread grains?

Even though Finland was able to produce more bread quality grains, there would be various challenges in the international competition. Finland has at times been able to export occasional batches of food wheat but it would be difficult to convert the grains currently going to feed even partially to systematic exports of food grains. The fact that we cannot guarantee a specific quantity of bread grade beforehand rules out Finland from larger-volume foreign trade ensured by prior agreements.

Countries with intensive production are able to produce grains more cheaply already due to their higher average yield levels. Additionally, we have significant logistic cost disadvantages due to higher freight costs compared with the largest European grain exporters, such as France, Germany or Poland. We lose even to the Baltic countries - being at the same sea distance from the buyer markets as Finland - due to efficiency of grain loading, harbour and shipping route fees or drawbacks created by ice conditions. The systematic production of bread wheat to the world market is thus not a realistic alternative for Finland due to extensive variation in quality and both logistic and other disadvantages in the competition.

Livestock sector as vital part of circular economy

Crop farming and the livestock sector interlace in a complicated way into an entity. Animal feed consists of grains not suitable for food and by-products of the food industry. Hence, batches that are otherwise useless, such as bran, mash from breweries, molasses chips from sugar production, and barley protein feed

from ethanol production, are utilised. Oilseed meals created in the production of cooking oil pressed from sunflower or rapeseed are valuable protein-rich feed supplements. It is also possible to return a part of food waste back to the food production chain as feed. In Finland, a good example of this is the use of by-products of fuel ethanol produced from food industry waste or bakery products.

Manure of the livestock sector is a useful source of nutrients for arable crops. The economic significance of manure as an input is further highlighted with the current record high prices of fertilizers. In addition, all organic nutrients which can replace fertilizers manufactured of fossil raw materials are important for the environmental impact of agriculture.

The world's northernmost production areas not suitable for food grain production

In addition to circular economy, the production of feed grains is determined by geographical factors, climate and farming conditions. Finland has some of the northernmost agricultural production areas in the world. Even though arable land is available almost everywhere in Finland, the production of food grains is only successful in certain parts of the country.

In some Finnish areas, there are much more favourable conditions for the production of feed crops than bread crops. A large part of the current "dairy-Finland" is an area dominated by grass and its weather conditions are not suitable for the competitive production of bread grains or food crops. Grass-based animal husbandry can most efficiently utilise the potential of these areas. Specific feed grains, such as barley and oats, are quite well off in these areas. Rapeseed as well as legumes like pea and broad bean are successful but e.g. legumes are also primarily produced for feed use in these areas.

Use ratios of grains ultimately determined by consumption

Even though a part of feed use consists of batches intended for food grains but unsuitable for it due to their quality, it is beyond dispute that considerable quantities of grains are produced for feed to start with. Ultimately, consumption of dairy and meat products and eggs is the most important single factor which determines the annual total requirement of feed grains. Animal-based products have an important role in energy and protein intake for both European and Finnish consumers.

There is a discernible shift between the uses of grains, but it is extremely slow by nature. Even though the proportion of feed use of the total use in the EU's Cereal Balance Sheets decreased in 2005-2022 from 59% to 53%, the absolute volumes of feed use remained almost unchanged, above 160 million tonnes. The relative change was caused by an increase in the exports of grains in the same time period, which was as a matter of fact mostly food-grade. In Finland, the proportion of feed in the total use of grains remained between 50-55% but the absolute feed volumes decreased from the long-term 2 million tonnes to 1.7 million tonnes in the past few years.

At the same time, the food use of traditional bread grains did not increase in Finland either. On the contrary, the food use of wheat decreased between 2007 and 2022 by 18% from 291,000 tonnes to 239,000 tonnes and the food use of rye by 16% from 99,000 tonnes to 83,000 tonnes. The fall in the consumption of bread grains is a long-term trend which is also expected to continue in the future. Oats is the only grain with increasing food use. In the past 15 years, its use grew from 60,000 tonnes to 160,000 tonnes. A large part of this growth comes from the export market because the Finnish mill companies have increased their processing capacity and exported more and more flakes and flours. The new capacity currently under construction also targets the export market, which will most probably increase the food use of oats to almost 280,000 tonnes in the coming years.

In the domestic consumption, plant-based alternatives of animal-protein products is gaining foothold and growing steadily but the level of consumption is still moderate compared with dairy or meat products. For example in 2021, the consumption of plant-based drinks was just under 6 litres per capita and the consumption is expected to increase to 8.4 litres by 2026 (Euromonitor). As a comparison, the consumption of milk was 101 litres per person in 2020, albeit constantly decreasing in the past five years at an annual rate of 4% (Luke, Balance Sheets for Food Commodities). Correspondingly, the consumption of meat in 2020 in Finland was 79.2 kg per person - only 40-55 kg when bones and cooking loss are eliminated - whereas the consumption of meat alternatives in the

same year was 705 grams per person (Euromonitor). The consumption of meat alternatives is expected to increase to 1.6 kilograms by 2026 but it should be remembered that grains only make a part of their raw material besides soy, legumes and cells.

Based on the consumption volumes, it is easy to understand the large requirement of feed grains. Domestic feed grains are at the same time a considerable factor in our food security. Their utilisation volumes are precisely as much as the annual consumption of animal-based products requires.

In the future, plant-protein products will gain more ground in our diet but the shift in the consumption structure will take time. It is also good to remember that even the new equilibrium will simultaneously necessitate both food processed directly from grains and animal-based foodstuffs via feed use. The new ratio of use between the plant-protein and animal-based protein products will not be decided by public comments or social media but by consumers' choices at the shops.

Exceptional scarcity on the oilseed markets

Csaba Jansik

The EU's degree of self-sufficiency has been high for almost all important agricultural products, but protein-rich feed supplements have been a sort of Achilles' heel in the EU's food security. They have suffered from a heavy import dependence already for decades.

Oil plants form a necessary part of EU's food security

Meals crushed from oilseeds - soybean, rapeseed and sunflower – are necessary inputs in the EU's livestock sector. The production of milk, meat and eggs again has an important role in the Union's food supply. In 2020, the EU's livestock sector constituted over 38% of the agricultural output of €414 billion (Eurostat 2021). Correspondingly, food industries that use products of the livestock sector as their raw materials, that is, the meat and dairy industry, made 41% of the turnover of €967 billion in the EU's food industry in 2019 (Eurostat, SBS dataset). Animal-based foodstuffs also have a large role in food consumption in the EU (European Commission, 2021).

Feed makes the largest input as for its value in the livestock sector. In 2020, the EU's (including Great Britain) livestock production used over 827 million tonnes of feed, of which, the main part (549 million tonnes) was coarse feed produced by livestock farms themselves and 287 million tonnes were feed mixes. Of these feed mixes, 137 million tonnes were grain, oilseed and legume batches grown on the livestock farms themselves or bought from the other farms, and about 150 million tonnes were ready-made concentrated feed.

The feed industry uses over 100 million tonnes of grains and about 50 million tonnes of various protein feeds for producing feed mixes. Protein feed supplements are mostly meals pressed from oilseeds and they are in a lesser extent legumes. Grains include about 10-18% of protein but oilseeds and legumes make an essential part of feed recipes. Supplementary feeds ensure that the animals receive the necessary amino acids and protein which again ensure the high quality and protein content of animal-based foodstuffs.

The EU has been self-sufficient for most grains and other field crops. Of bread crops, the EU's production has substantially exceeded its own needs. The production of feed grains has been at a sufficient level, except for maize. In the past few years, about 20% of maize required were imported outside of the EU. A half of it was imported from Ukraine. The EU's degree of self-sufficiency for feed grains is still on the whole reasonably good, because setting it in proportion with the total volumes of barley, oats, rye and feed wheat, the significance of imported maize is minor. Compared with feed grains, imports play a considerably higher role in the supplementary proteins processed from oilseeds.

Strong dependence on import of oilseeds and meals

In terms of volume, soybean is the most significant protein plant which is imported to the EU mostly from South and North America. A part of the EU's imports is soybean to be crushed in European factories, another part is ready-made soybean meal.

Even though the global production of soybean increased from 270 million tonnes to 350 million tonnes in 2012-2022, the dominance of South and North America remained unchanged. In the past decade, the share of the three largest soybean producing countries, the USA, Brazil and Argentine, was 82%. With Canada and Paraguay, the share of the American continent of the global soybean production increases to 86%.

The EU's soybean production increased in the past decade from 0.4% to 0.8% of the world production but its share is still quite insignificant in relation to the volumes used. The EU's own 2.6 million tonne in 2020 was produced by Italy (37%), France (15%), Romania (13%), Croatia (10%), and the Danubian countries Austria, Germany, Hungary and Slovakia.

As for oil plants, the EU's agriculture has focused on the production of rapeseed and sunflower. The EU is one of the main production areas of rapeseed besides Canada and China. In the 1960s and 1970s, rapeseed was still a marginal oil plant globally, and its production was under 10 million tonnes. The growth did not start until the 1980s and it continued evenly for four decades. Worldwide production exceeded the level of 70 million tonnes at the beginning of the 2020s. The share of the four largest production areas in the total production of 73 million tonnes in 2021 was 80% - Canada 27%, the EU 22%, China 19%, and India 12%. Canada is the world's largest rapeseed producer and, at the same time, the largest exporter by a huge margin. The EU, China and India produce their rapeseed almost solely to their domestic market.

The global production of sunflower seeds started to grow at the end of the 1970s and rose from the level of 10 million tonnes to 25 million tonnes by

the millennium. After that, the growth quickened and global production exceeded 57 million tonnes in 2021 when the largest producers were Ukraine (31%), Russia (27%) and the EU (18%).

When processed, oilseeds become meals and oil. Meals have a high protein content and they are utilised in animal feeding. Oil can be used as food, feed or fuel (biodiesel).

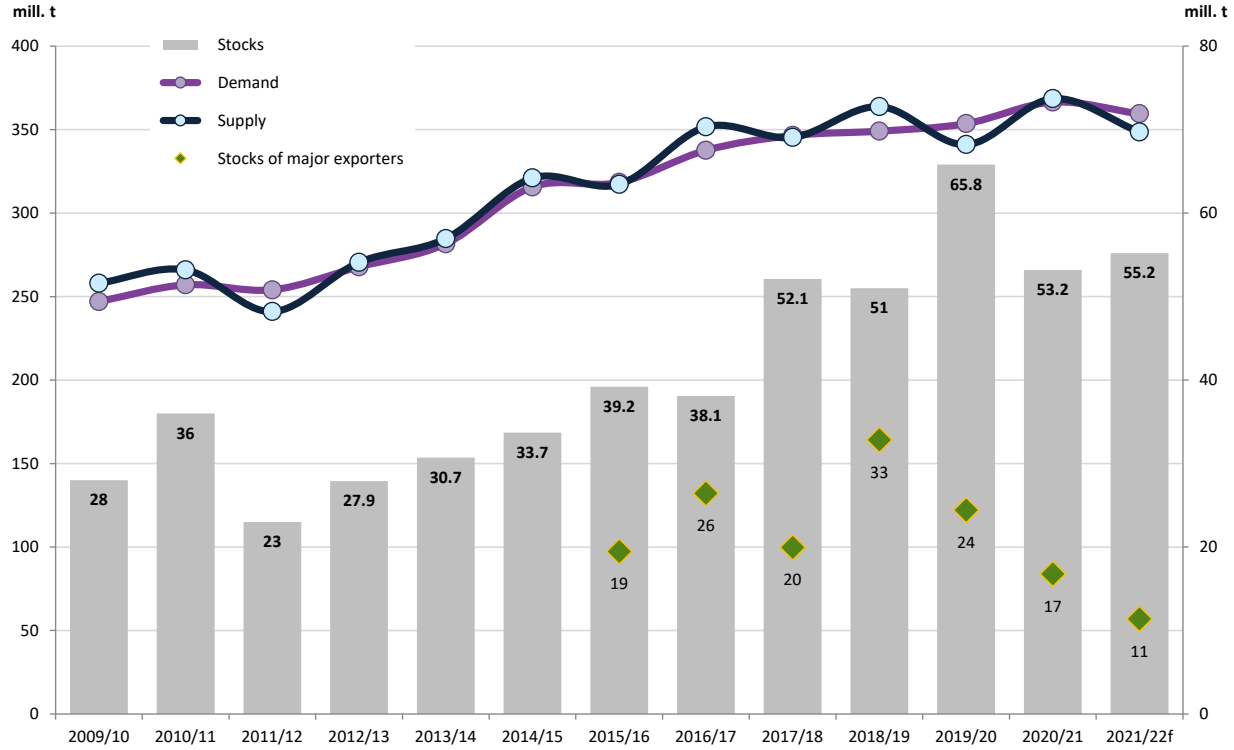
The EU's demand of protein feed supplements exceed its own production considerably. Oilseeds are imported to the EU both as seeds and meals. The EU's processing capacity of oilseeds is sufficient to crush its own soybean, rapeseed, and sunflower seeds. Additionally, there are large volumes of imported seeds crushed in the EU. The processing of imported batches improves the utilisation rate of the EU's industrial capacity.

War having direct impacts on global oilseed supply

Input prices started to increase as early as autumn 2021. Particularly, the prices of fertilizers rose higher than ever before. The price increase was pushed further by the Russian invasion of Ukraine, and the war paralysed imports of grains and oilseeds via the Black Sea ports. Russia and Ukraine have together been responsible for a quarter of wheat and a fifth of maize imports in the world. In addition to grains, both Ukraine and Russia are large producers of oilseeds, and their share is significant especially in the production of rapeseed and sunflower. Both countries also have considerable sunflower pressing capacity.

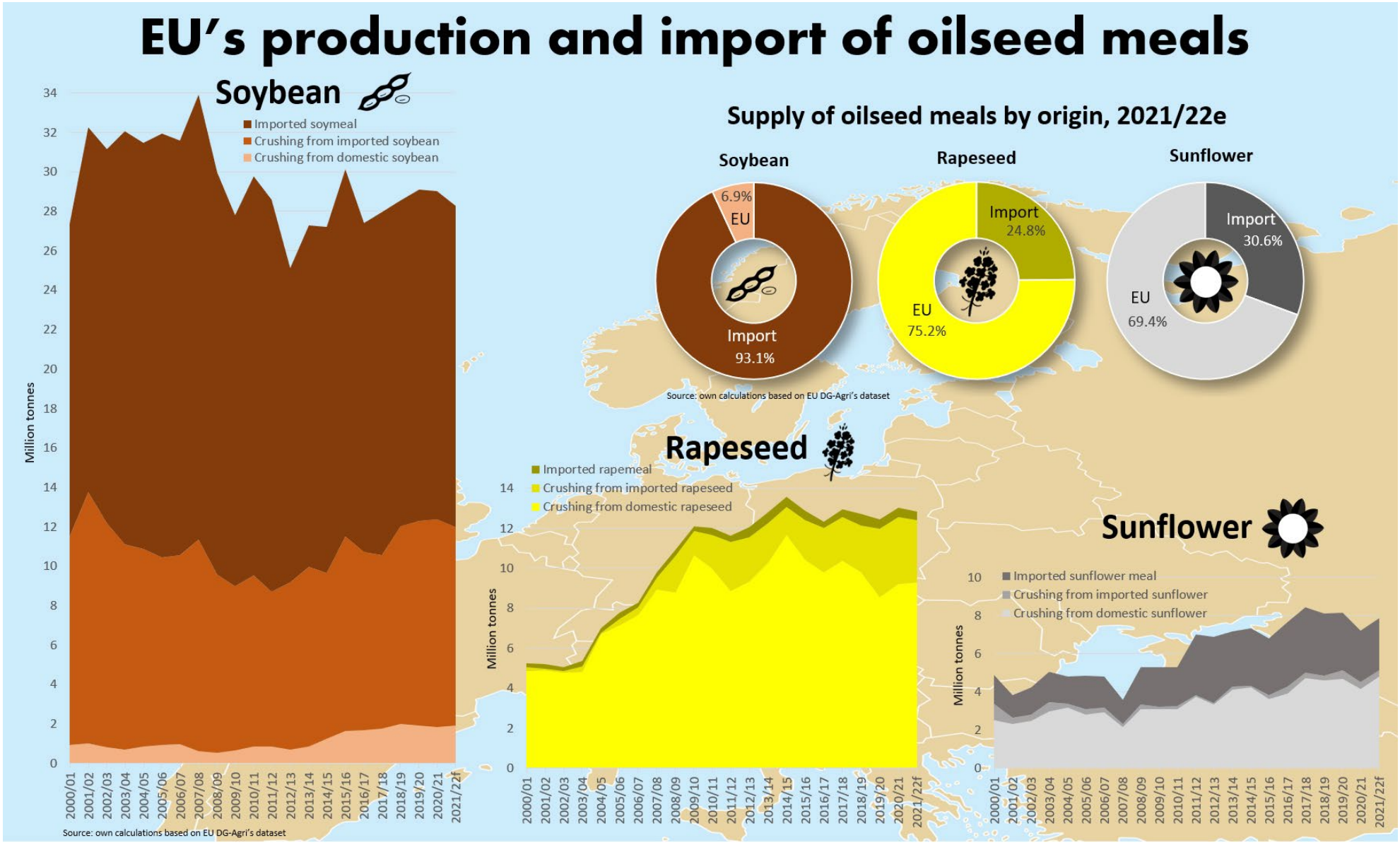
As a result of the war, exports of grain and oilseeds stopped almost immediately. A part of the Ukrainian port infrastructure was destroyed and, after commercial ships were under military attacks, shipping companies were not willing to send their ships to Ukrainian ports. Grain ships were able to make it to some Russian ports, but insurance companies are only willing to grant so expensive insurance policies that trading is not profitable. The almost total disappearance of one of the largest grain export areas in the global trade caused an immense vacuum which rose the grain prices record high. The prices of oilseeds also started a sharp rise.

Global soybean supply and demand, total stocks and stocks of major exporters



Source: Author's calculations based on International Grain Council's (IGC) dataset

High agricultural input prices caused by raw material price development and exacerbated by the war coincided with an exceptionally scarce market situation of oilseeds. For many years, the production of both soybean and rapeseed fell behind the development of demand, which ate up the global storages. Total stocks were partially accumulated to countries which will use them on their own and thus ensure their supply. Therefore, it is more important to monitor the stocks of exporter countries because


EU's production and import of oilseed meals
Soybean
Imported soymeal
Crushing from imported soybean
Crushing from domestic soybean
Million tonnes
Source: own calculations based on EU DG-Agri's dataset
Supply of oilseed meals by origin, 2021/22e
Soybean
6.9%
EU
Import
93.1%
Rapeseed
Import
24.8%
EU
75.2%
Sunflower
Import
30.6%
EU
69.4%
Source: own calculations based on EU DG-Agri's dataset
Rapeseed
Imported rapemeal
Crushing from imported rapeseed
Crushing from domestic rapeseed
Million tonnes
Sunflower
Imported sunflower meal
Crushing from imported sunflower
Crushing from domestic sunflower
Million tonnes

only they have batches that are freely mobilizable for world trade. The stocks of the main exporter countries decreased to an alarmingly low level in the past few years, and the world is heading the harvest of summer 2022 with an extremely delicate balance in the global oilseed supply and demand.

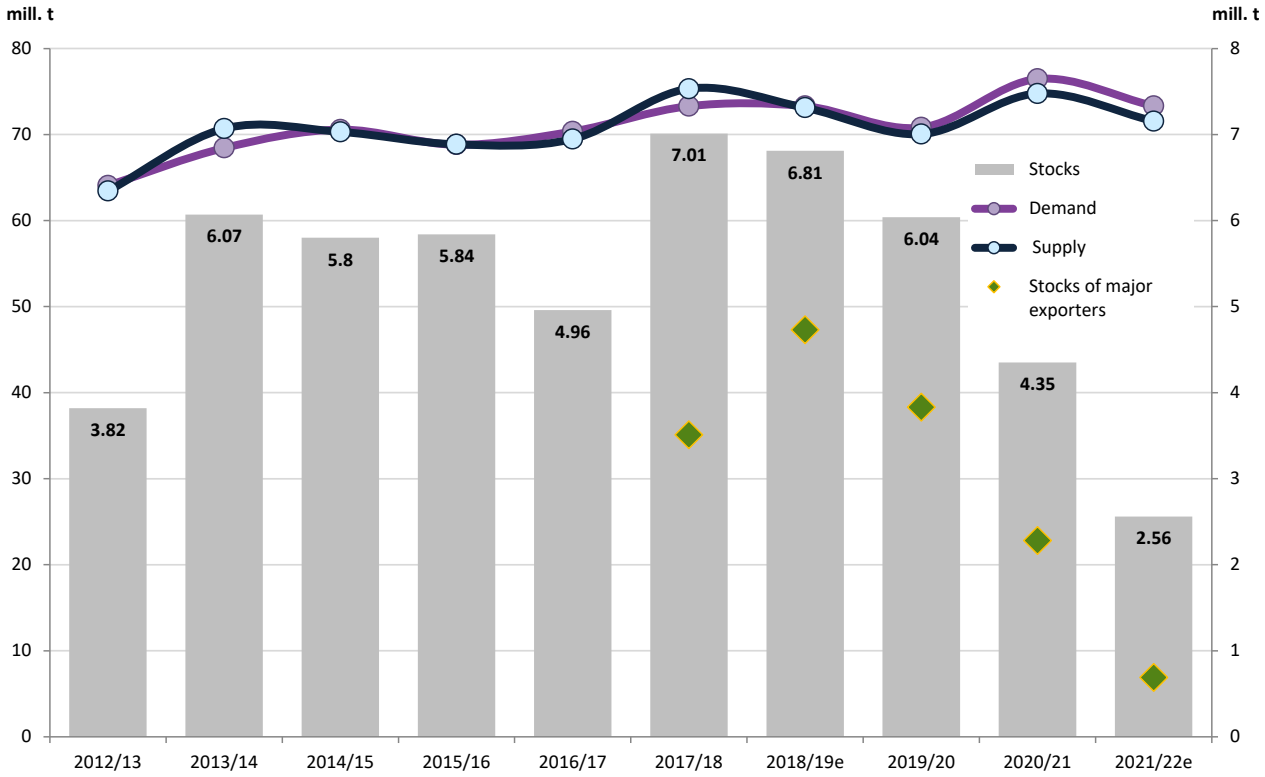
In the future, scarcity becomes a phenomenon extending to several seasons. A part of ports and storage infrastructure in Ukraine has been destroyed, and the soybean or rapeseed producers cannot totally replace the dramatically decreasing global sunflower production. It can be expected that the largest exporters will increase their soybean and rapeseed production starting from the season of 2022/2023. The prices of oil plants compared with the prices of other field crops encourage to cultivate soybean, rapeseed and sunflower all over the world.

EU must be prepared for quick decisions in exceptional circumstances

The consequences of the above-described situation are serious for the EU. It will have to compete on the soybean market with China and on the soybean meal market with several Asian countries, such as Vietnam, Indonesia, the Philippines, and Thailand. The competition will also increase for rapeseed, sunflower and their meals. The most worrying situation is that of the sunflower market because over a half of the total production in the world originated from the Black Sea area.

Due to scarcity on the market, prices will remain record high even until the next harvests. Prices of futures contracts suggest that the price levels will decrease slightly with a normal harvest, but they will remain on a notably higher level than before the crisis.

Global rapeseed supply and demand, total stocks and stocks of major exporters



Source: International Grain Council (IGC) Note: Exporters are Canada, Australia and Ukraine.

A solution for the acute market situation would be an increase in the EU's own production. This should be easiest for rapeseed and sunflower for which the EU already has strong production and there are prerequisites for the production increase. It would have required extremely quick and exceptional changes from the decision-makers.

The war stopped the Ukrainian and Russian trade of the total of over 2 million tonnes of extracted sunflower seed to the EU. Replacing this with the EU's own production would have required at least a million hectares more arable area for sunflower. This area could have been available in regular sunflower producing countries, such as Bulgaria, Romania, Hungary, Spain, and France, if the EU had compromised its three-crop rule of cultivation for one growing season. This did not happen.

EU's sunflower seed and meal supply and demand, 2020/21

Other countries
Other countries
148
267
Russia
Russia
825
239
Ukraine
Ukraine
1,324
199
EU
EU's own production
8,868
Argentine
386
Sunflower meal
Import
EU
6,605
610
Feed
Export
Import
EU
4,527
Sunflower seed
1,454
671
3,032
Other use
Export
Oil

Legend

The map features foreign trade flows of sunflower seed and meal as well as total use of EU. The minimum requirement for depicting a trade flow is 100.000 tonnes.

Trade flows
(1,000 tonnes)

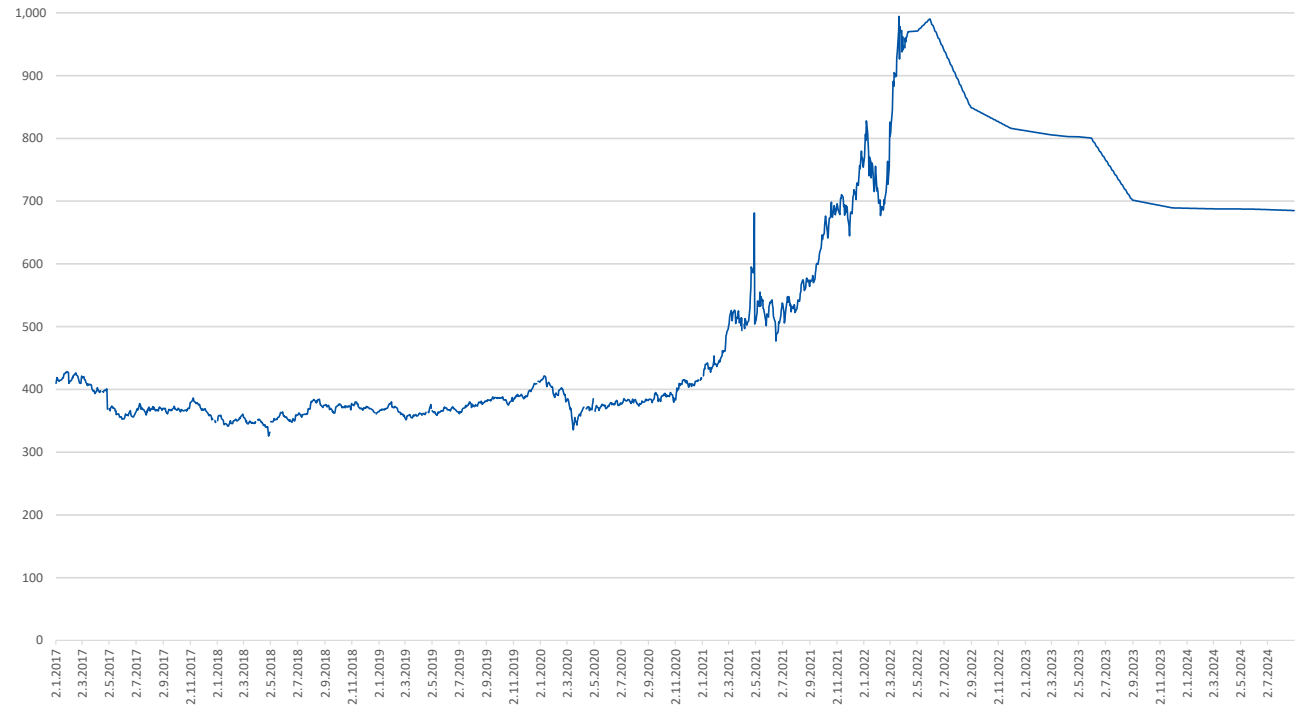
1,300 Sunflower seed

2,600 Sunflower meal

Country — Country of origin

Source: own calculations based on Eurostat, Comext dataset and EU DG-Agri.

Rapeseed price development and futures prices at MATIF futures exchange



Source: International Grain Council (IGC)

Furthermore, sowing seeds became a bottleneck because only 30% of sowing seeds required for the million hectares met the EU's specifications. The remaining 70% had been treated by a non- compliant substance by EU and had been sold to Ukraine but not delivered there. In Ukraine, there is no possibility to use the sowing seeds this spring so it could have provided the required additional volumes on the EU's fields if a one-time special permission were received for the use of this sowing seed batch. No special permission was received. As a result, the EU will probably put a strain on the global extracted oil meal market with its demand for over two million tonnes, that is, the missing batch.

This case highlights the rigidity and inflexibility of the political decision mechanisms in the EU in the occurrence of exceptional crisis situations. The food crisis caused by the war also showed flaws in the EU legislation. For sudden and unforeseen situations that endanger the security of food supply, the EU should have a possibility for immediate response and decision-making. By means of legislation, the EU should ensure, in the occurrence of a crisis endangering the European or the global food supply, that there is a possibility to diverge from the long-term policy for one growing period so much that the food production provided by the moderations would have a real effect on the solution of the crisis.

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Europe's dependence on imported energy increases costs in agriculture

Olli Niskanen, Timo Karhula and Anna-Kaisa Jaakkonen

The Russian invasion of Ukraine causes rearrangement of input markets, and its full impacts are not yet clear. The key impact in the short term is a steep rise in the prices of agricultural inputs as well as problems with the availability of some inputs. The issues on the international input and grain markets are interlinked and this becomes concrete as a clear increase in the prices of arable crops.

The year-on-year change in the purchase prices of means of agricultural production calculated by Statistics Finland was about 22% in January 2022. Agricultural production commodities and services cost as much as about 29% more and investments 8% more than a year ago.

Next, we will look at the market situation in energy-intensive agricultural inputs: fertilizers and, as for energy, fuels and electricity.

Fertilizer price development and outlook

Towards the end of 2021, fertilizer prices started rising. There are many factors causing this rise, such as demand being greater than predicted after the low demand during COVID-19 crisis, China, a major producer of nitrogen and phosphorous fertilizers, restricting its exports, and an energy crisis in Europe. The result was the highest global fertilizer price level of all times in early 2022.

Finnish agriculture uses 138-147 million kilograms of inorganic fertilizer nitrogen, 10-11 million kilograms of phosphorous and 30-35 million kilograms of potassium annually. For crops, the most critically required nutrient in the short term is nitrogen. The most significant fertilizer raw material produced in Finland is phosphorous which is also produced for exports. In addition, a by-product of a phosphorous mine is a little amount of biotite which contains slowly dissolving potassium. The potassium used as raw material by the Finnish fertilizer industry is mainly imported.

The first stage in producing fertilizer nitrogen is ammonia which is prepared of hydrogen obtained from natural gas and atmospheric nitrogen. There is no production of ammonia in Finland. Ammonia is produced at dozens of plants in Europe but natural gas largely comes from outside the EU. Due to price pressures on natural gas, the European ammonia plants have been operating with more or less low capacity as early as from autumn 2021.

Globally, ammonia is most produced where fossil energy sources are readily available. Most part of ammonia is processed at the same plant into a fertilizer product (urea or some further processed fertilizer product), only less than a fifth ends up on the global market as ammonia. The EU's production capacity of ammonia is about 22 million tonnes a year. In addition, 2-3 million tonnes of prepared ammonia were imported to the EU annually.

The short-term situation of the European ammonia industry depends on the price level at which the new equilibrium on the natural gas market will be normalised. Natural gas is imported to the EU area both as gas and as liquid (LNG). The share of gas in the imports was two thirds, more than half of which came from Russia. Of the reminder, the shares of both Algeria and Norway were 18%. Of LNG imports, Russia's share was 18%, the USA's 26%, Qatar's 23%, and Nigeria's 14%. Other importing countries were Algeria and Trinidad.

Only a small fraction of natural gas entering Europe is used for the preparation of fertilizers. Many other EU industries, such as transport, heating and energy production, are dependent on natural gas. Replacing the Russian imports by imports from the global LNG market is still challenging and will increase prices if e.g. the manufacturing industry cannot reduce its consumption of gas. Over 80% of ammonia prepared in the EU is used for fertilizer production.

Indeed, the European fertilizer supply was primarily based on its own industry but on imported raw materials. When the European ammonia industry runs with reduced capacity, the production must be replaced by imports from the Middle Eastern, Northern African, Northern American or Caribbean markets where the price of energy (natural gas) remains reasonable. About 8 million tonnes of prepared nitrogen fertilizers, a little less than 1 million tonnes of prepared phosphorous fertilizers and over 3 million tonnes of prepared potassium fertilizers were imported to the EU annually. International trade will now grow and, as the demand increases, prices will also rise in the other continents.

Most of the potassium needed in the European fertilizer industry were supplied by Russia and Belarus which together form the most important production area in the world. Canada is the largest single producer of potassium chloride. As the prices of potassium chloride rise, the Canadian mining companies try to meet the increased demand by expanding their production.

Imports of raw materials to the Finnish fertilizer industry and of competitive prepared fertilizers from Russia by rail were cost-effective due to benefits in logistics and prices at the normal time. As for raw materials, this led to a large share, about 80%, of Russian imports of ammonia and potassium salt. However, the situation on the fertilizer market changed rapidly. In accordance with the situation in April 2022, the EU banned the purchases of raw materials and fertilizer products from the central Russian fertilizer companies due to their sanctions.

Before long, the high prices will increase the production of ammonia in areas where gas prices offer possibilities to produce ammonia profitably and to increase its production. China is also predicted to normalise its fertilizer imports at least partially towards the latter half of 2022, which can mitigate the market situation of nitrogen and phosphorous. The decrease in world market prices will before long come across in the prices of fertilizers sold in Finland, but the level will most probably remain considerably higher than in the previous years.

As for the security of supply in Finland, the issues are particularly related to ammonia and potassium, and their import must be rearranged. Ammonia can be imported by ships. Potassium must also be procured from new markets in a situation where imports from Russia are not possible. Alternative fertilizer products, such as recycled nutrients, and fertilizer-preserving farming methods will have now and in the near future an exceptionally high demand.

Energy price significant for agriculture and horticulture

Agriculture and horticulture use 10.7 terawatt-hours of energy, of which, motor fuel oil (3.2 TWh), forest chips (3.1 TWh) and electricity (1.9 TWh) are the most used in terms of energy quantity. The amount of motor fuel oil used increased significantly, even 28% from 2016 (2.5 TWh).

Agriculture and horticulture are particularly dependent on light fuel oil and a significant part of it (80%) was imported from Russia. It is possible to replace Russian oil with oil from other producer countries, but the demand pressure for alternative Brent-quality crude oil already rose the prices of end-products.

The world market price of crude oil increased to a high level already in the final quarter of 2021. This was also reflected in the consumer prices of liquid fuels. According to Statistics Finland, the price of motor petrol was 27% and that of diesel 28% higher than one year earlier. Furthermore, the tax on light fuel oil used for heating and machines was raised at the beginning of 2022, so its price increase was as much as 44% in the corresponding period. The prices of liquid fuels are still significantly on the rise during 2022.

The second largest form of energy, forest chips, is the most important fuel used for heating in agriculture and horticulture. The number of plants using solid fuels based on wood, field or peat increased and, especially in large companies, the consumption of heavy fuel oil decreased clearly. The prices of energy wood will most probably rise because the share of wood imported from Russia was significant.

Agricultural and horticultural farms that require a lot of heat energy, such as greenhouse companies, largely transferred to using solid fuels instead of fuel oils. There are some companies still using light fuel oil because they are concerned about the investment costs of the shift or their use volumes are small. Light fuel oil is also used in agricultural and horticultural machines equipped with combustion engines and additionally in crop drying where the volume and moisture content of the crop harvest directly affect the volume of oil used.

Farms are also very dependent on electricity which was also increasingly used in the past few years. Currently, domestic electricity covers more than 80% of the total of electricity consumed. Less than a fifth is net import, of which, Russia accounted for about 10%.

According to Statistics Finland, the price of electricity was record high already in the final quarter of 2021. The system price of electricity in the Nordic power exchange and the area price for Finland broke all previous records. Never before had the monthly average of the system price or Finland's area price risen to over €100 per megawatt-hour, but in December the system price was at its highest €147 per MWh and the area price for Finland €193 per MWh. This change is steep compared with the exceptionally low prices of 2020 when the system price was at its lowest €2 per MWh and the area price for Finland €20 per MWh.

There were several reasons for the dramatic rise in the exchange price for electricity. In addition to the prices for fuels and emission rights being high, the Nordic water reserves were simultaneously low and there was less wind power available than usually. Electricity consumption also increased due to the very cold weather in December and due to a rise in economic activity after the worst shock caused by COVID-19. For electricity users, changes in the wholesale prices are visible with a delay. The consumer prices for the final quarter of 2021 were 11-15% higher than 12 months earlier.

Electricity prices for enterprise and corporate customers are typically closer to ones in power-exchange agreements and their prices reacted faster to market changes. In December 2021, the prices for users of smaller volumes were 22% and for users of larger volumes 125% higher than in December 2020.

At the beginning of 2022, the price of electricity remained high, on the level of over €100 per MWh. However, the prices are predicted to cheapen towards the summer because the new Olkiluoto nuclear power plant will start its production and the consumption will stabilise, but the situation can change if electricity imports to Europe from Russia stop.

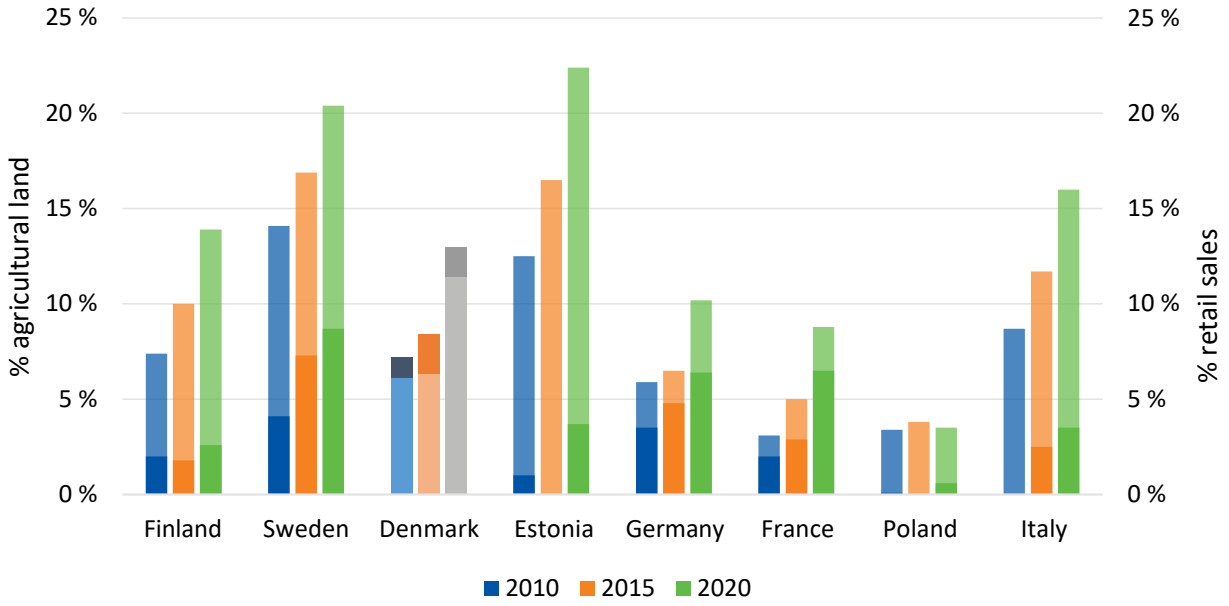
Increase in organic product consumption product-specific

Jarkko Niemi and Minna Väre

The objectives in Finland's National Programme for Organic Production are to increase the market share of organic food products to 5%, use of organic products in professional kitchens to 25% and organic arable land area to 25% by the year 2030. Despite policy measures that promote organic production, the volume of the organic livestock production, especially pork and poultry production, is still quite quite small when compared to conventional production.

According to the Finnish Organic Food Association Pro Luomu, organic sales were €409 million in Finnish retail stores in 2020. The market share of organic products in the grocery trade was 2.6%, which is clearly less than in the other Nordic countries. However, the share of organically-farmed land of the total agricultural land in Finland is about 14%, which is quite a high number in a European comparison (Figure 1).

Organic share of arable land (lighter bars) and food retail sales (darker bars) in 2010, 2015 and 2020 in eight EU countries. Data on Estonia in 2010 and Italy and Poland in 2015 are missing from retail sales.



Source: Willer et al. 2017; 2022; Willer & Kilcher, 2012.

Scarcity of organic pork and chicken

Apart from mutton, the share of organics in the production volumes of livestock products is less than 10%. The most popular organic livestock products are eggs, milk and beef. The production of especially organic milk and eggs has increased in the past few years (Figure 2). However, only 0.4% of Finnish pork is organic. The share in chicken is even smaller because the production volume of organic chicken was about one per mill of poultry production in the past few years. In terms of weight, three quarters of organic meat is beef.

As much as 6.9% of eggs produced in Finland are organic. According to Pro Luomu, the share of organic in the value of egg retail sales is as much as 21%, and eggs are the second most sold organic product group after baby foods. The difference between the percentage shares of the production volume and the sales of organic eggs is, on one hand, because organic eggs are rather sold than used for manufacturing and, on the other hand, due to the higher price of organic eggs compared with conventional eggs. Four and half percent of retail sales of milk is organic.

The share of organic meat in the value of retail sales of meat is 1-2%. The share is low particularly for pork and poultry sales. The small share of organic livestock products in sales is visible in the value of total sales of organic products because meat and other livestock products are valuable products. An increase in their sales would create a rapid increase in the value of total sales of organic food.

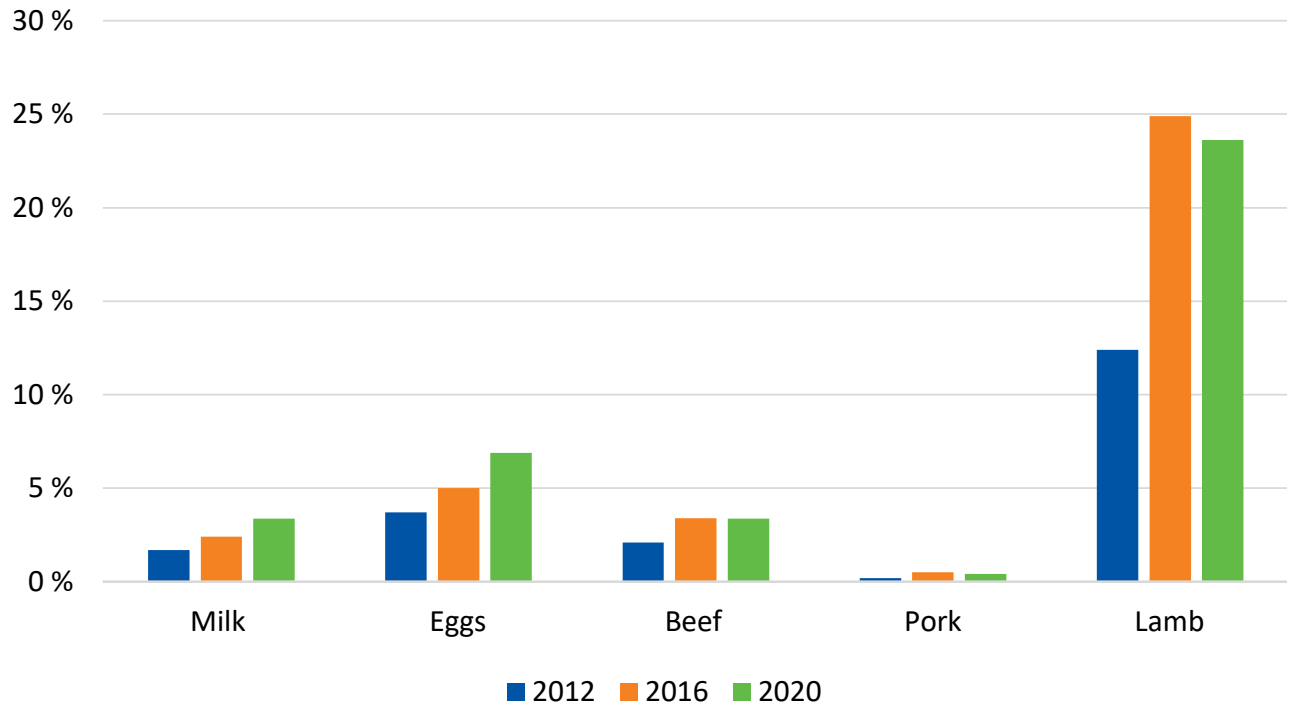
The small volume causes challenges in different stages of the value chain. For example, the keeping of small production batches separate in production processes results in additional costs.

Organic methods still to be improved

The most typical reasons for purchasing organic foods are their cleanness, taste, quality, and friendliness to the environment as well as desire to support small farmers and producers. Even though almost a fifth of consumers choose an organic product without considering its price, the price is still the greatest obstacle to buying organic products. However, consumers should be prepared to pay more for organic products than for traditional ones. Roughly calculated, the production costs of organic meat and eggs are at least 2-3 times those of traditional production.

Even though organic livestock production provides several benefits related to e.g. animal welfare and product quality, there is still room for improvement. The Poultry and Pig Low-input and Organic production systems' Welfare (PPILOW) project delved into the challenges and possibilities of organic pig and poultry production. Based on interest group discussions, organic livestock production was observed to have many bottlenecks and practical issues which can prevent the development of production.

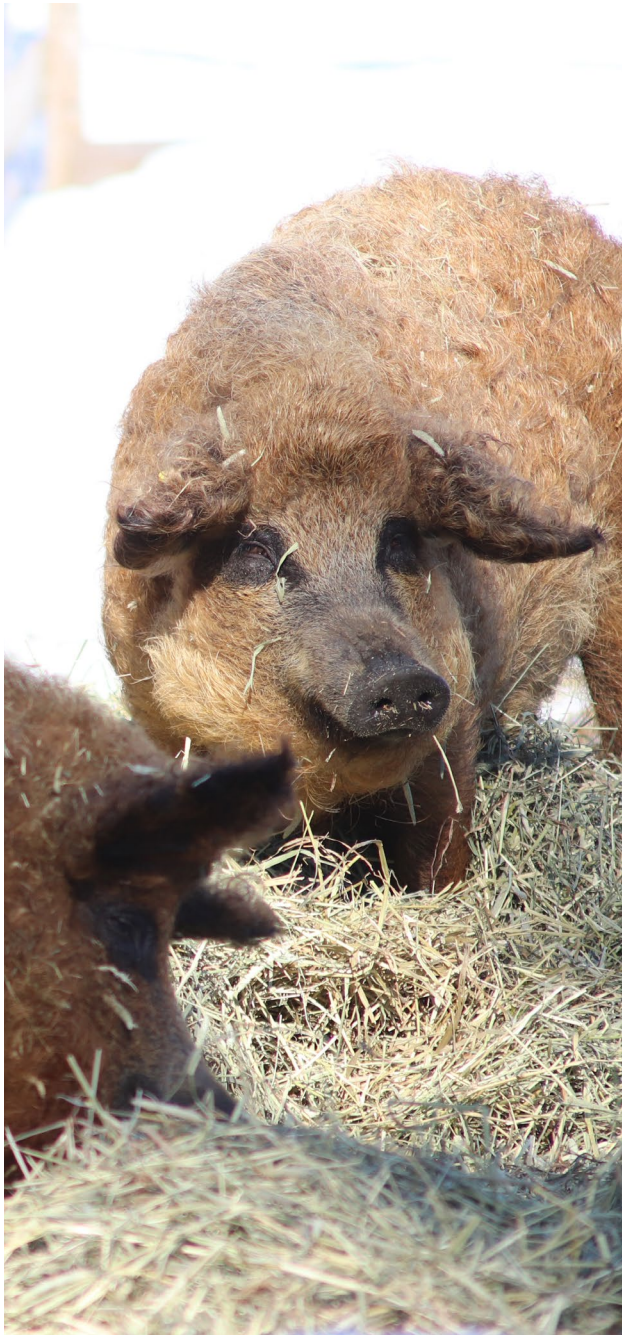
Organic share of production volumes of livestock products in Finland in 2012, 2016 and 2020.



Source: Luke, Pro Luomu.

An important factor in organic pig and poultry production is the price and availability of organic protein feed. Supplementary organic protein feed has limited availability. With a special permit granted by the Finnish Food Authority, a farm is able to use up to 5% of conventionally produced protein feeds in the feeding of young poultry and pigs weighing no more than 35 kg. This exception is valid for a transition period expiring at the end of the year 2026.

Another practical matter causing uncertainty in organic pig and poultry production is the use of pasture and outdoor areas. Rainy weather, for instance, weakens the condition of outdoor areas and can cause problems with hygiene. As for hot weather,



it exposes animals to heat stress and sunburns. Furthermore, the use of the whole pasture area involves there being sufficient sheltering areas, such as bushes and open shelters, on the pasture.

The risks of salmonella and animal diseases must also be considered. Due to the risk of African swine fever, pigs that spend time outdoors must have double fences and the construction of them is expensive. With poultry, the risk of avian influenza must be considered and contacts between wild and production birds must be prevented.

More uniform interpretation of regulations on organic production

Even though organic production is regulated uniformly on the EU level, there are country-specific differences in applying the regulations. It was highlighted in expert workshops in the PPILOW project that regulations related to organic production should be interpreted in the same way in the whole EU in order for companies to be able to compete equally on the EU market. The experts also wished that the monitoring of organic production would better consider those animal-rearing solutions that farmers have noticed to work well.

Organic livestock production demands versatile knowhow from the producer. For example, the welfare of organic livestock can be improved by developing production methods.

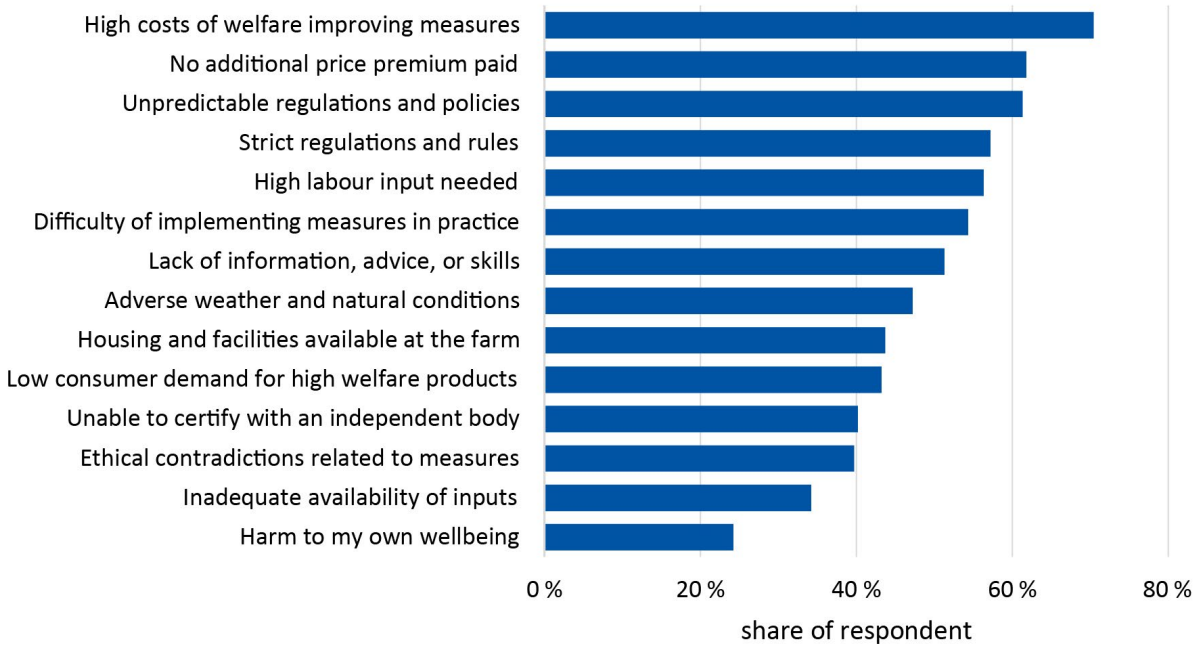
In Finland, the production of organic pigs and poultry is quite a small industry which is also seen in the availability of advisory services and some other inputs. There are only limited expert advisory and veterinary services available for organic poultry farms, for instance, because the number of farms is small. There is, indeed, room for strengthening the availability of support services.

Economic factors and regulations as barriers for adoption

The PPILOW project studied in nine countries what are the producers' and other experts' viewpoints on fac-tors preventing or enabling the improvement of pig and poultry welfare in organic and low-input outdoor rearing.

The majority of survey respondents thought that economic and regulatory factors were barriers for adopting measures that improve animal welfare. These factors included the high costs and labour input of welfare improvements, expected low price premium received from products that take welfare into account, the foreseeability of legislation and policy, and the strictness of regulations. In addition to these, practical problems and factors related to weather or climate were important according to every other respondent. Instead, less than 40% of respondents saw that the farm conditions or the availability of inputs prevent the improvement of animal welfare (Figure 3).

Share of livestock producers and livestock production experts who thought that factors shown in the figure are barriers to improving animal welfare in the organic and low-input outdoor production of pigs and poultry.



Farm conditions, easy-to-use measures, ethical benefits, and consumer demand were still seen to enable improvements in welfare. According to many respondents, the operation of the market has a key role in the implementation of animal welfare improvements in organic and low-input outdoor production..

The volume of organic meat production is small and there is limited availability of organic meat in retail shops even though a retail shop is the most popular place for purchasing organic products. Organic products are also sold as direct sales and in online shops. This can offer new sales opportunities for organic producers, because only 4% of Finns now purchase organic food from online shops. With the current distribution chains and by enhancing marketing, online sales and home delivery of products requiring cold storage could offer a possibility for increasing the sales of organic livestock products.

Consumer awareness of production to be increased

According to surveys, the majority of consumers have poor understanding of the methods of domestic animal production. Consumers still value organic production and prefer it compared with non-organic production. The organic production method has been defined quite well, and the cleanness and verifiability of organic products are perceived better than those of e.g. free-range products. Communication to consumers should be increased in order for the consumers to get to know organic production and its practices better.

According to studies, the Finns have reasonable trust on authorities, veterinarians and scientists as a source of information on animal welfare. In Finland, this trust on experts is quite high when compared with other European countrie. The communication should rely on fact.

Because the consumers have varied levels of knowledge, it should also be considered how much power consumers are given on controlling the production methods. Even though consumers' views must be understood, their wishes considered and their wishes responded to, perhaps the development of production should consider more on improvements based on expert and research data and present the data to the public in clear language. The development of production methods based on expertise also builds the consumers' trust on the organic production method.

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Cellular agriculture challenges conventional livestock production

Henrik Wejberg and Jyrki Aakkula

What is cellular agriculture?

Cellular agriculture supplies products similar to agricultural products by means of cell culture technologies. This is about utilising applications of biotechnology and molecular and synthetic biology in the production of various food substances (e.g. proteins and fats) and tissues. In principle, the textures, nutritional values and tastes of cellular agricultural products can be similar to those of conventional agricultural products. A difference is that their production takes place on cell culture substrates in bioreactors, that is, in a closed industrial production environment, and no fields, crops or farmed animals are actually required.

Thus, the applications of cellular agriculture strive for products which can replace traditional animal products, like meat, fish, dairy or eggs, such that the nutrients in the new product are equivalent to those in the animal products. As such, it is also possible to produce vegetable nutrients by means of cellular agriculture, but there is less demand for them compared with animal nutrients.

Cellular agriculture became a general topic of conversation less than a decade ago. A milestone in media publicity was perhaps the news coverage in 2013 on the first beef steak grown by means of cellular agriculture. Its price was then evaluated to be about €220,000. The steak was cultured by Professor Marcus Johannes Post's group of scientists at the Eindhoven University of Technology in the Netherlands, and the steak was eaten by Austrian food trends researcher Hanni Rützler who said that it tasted almost like a conventional beef steak.

Why interest in cellular agriculture?

The interest in cellular agriculture arises from ethical, environmental and economic reasons which reflect the viewpoints of actors in the food system on the approvability of production methods, the global sufficiency of food, the nutritional value of food, and the profitability of food production.

A possible driver of cellular agriculture is the ethical objective of developing animal protein production into such a direction which would ensure the rights of farmed animals as well as possible. Meat cultured in bioreactors would eliminate the need for slaughtering animals or for limiting species-specific behaviour, which is a key reason especially for animal rights activists to be in support of cellular agriculture.

Decreasing the detrimental impacts of food production on the environment and climate has been an objective in agricultural and environmental policy for a long time. Cellular agricultural production is controlled and takes place in a closed system, whereby it is possible to monitor the impacts of production on the environment and climate more closely and also easier to reduce them when the total emissions of the process can be determined and the loading factor can be identified. In terms of preventing nature loss, it can be beneficial that, as cellular agriculture becomes more common, the total requirement of arable area decreases significantly. Then, there are more alternatives for promoting biodiversity by means of local and regional land-use.

Even though food is for the time being produced sufficiently for everyone in the world, market disturbances created by various conflicts can quite suddenly diminish the availability of food particularly for the poorest of people. Moreover, the world population is still growing and the climate change threatens to weaken the possibilities of food production in many now important food production areas. Therefore, there is interest in food production methods of cellular agriculture, because it helps the continuation of food production even in those regions where natural conditions are developing into an unfavourable direction. In other words, cellular agriculture is a way to increase the global security of food supply.

Because production processes in cellular agriculture are closely controlled and there are easier and more versatile ways to affect the consistency of the end-product than in conventional food production, cellular agriculture offers better possibilities than earlier to customise the nutritional content of food in terms of its health benefits. This has significance from the viewpoint of Finnish public health, because proper nutrition has a key role in the prevention of many diseases which are widespread in Finland.

At the moment, cellular agriculture is in such a stage in its development that there are no actual cellular agricultural products on the consumer market. It is still obvious that, if it offers a way to produce food

or food ingredients more profitably than conventional agriculture, the market opportunities are immense. Therefore, investments in cellular agriculture and its research increased significantly in the past few years. There is a possibility that the first ingredients produced by means of cellular agriculture can find their way onto the tables of European consumers as early as in 2023.

Production costs in cellular agriculture

There are three factors which define the competitive strength of cellular agriculture compared with current production: the structural complexity of the cultivated product, the quantity of effective material and the difficulty of collecting the material. A steak is an example of a product which has a complex structure and is entirely of effective material. Hence, producing beef by means of cellular agriculture is significantly harder than producing e.g. dairy protein. The first products replaced by cellular agricultural ones were insulin and rennet; they were earlier collected from animals until their production was substituted by synthetic alternatives produced by cellular agriculture. The quantity of effective material was small and difficult to collect, whereby alternatives produced by cellular agriculture rapidly grew to become the market leaders in both product groups.

Cell meat has received considerably more publicity than dairy products or other simpler protein goods, even though the evaluated production costs of cell meat are clearly higher. Researchers estimated that the production costs of cell meat are about €16 per kg but the calculations were done with favourable presumptions especially about nutrient costs. Current costs are indeed significantly higher. At the same time, it is essential to consider that the prices of nutrients required in the production process can decrease when the production volume increases. The production costs of dairy goods and other simpler protein goods were evaluated to be €9 per kg. The most probable way of cellular agriculture becoming more common is that proteins of simpler structure become cost-effective on the market before cell meat.

Strategy in product choices

The expected production costs of a cellular agricultural product and the sales price of a current replaceable product are essential when evaluating what the companies should develop first. At the moment, there are dozens of start-ups in cellular agriculture which are developing various products. Finnish Solar Foods anticipated in 2021 that the production of Solein protein would start in the first half of the year 2023. Onego Bio and Perfect Day are focused on albumen and dairy proteins because their production using the technologies of cellular agriculture will most probably become cost-effective most rapidly. Perfect Day already has almost ten partners manufacturing and selling various dairy-based products. Onego Bio is in the seed funding stage and still developing their product.

With modern technologies, cell meat production should aim at producing either especially inexpensive single-celled meat or structurally more complex products with high additional value. A start-up called Future Meat Technologies is implementing the former strategy because its product is in practice single-celled chicken meat. The company says that their production costs decreased in six months from $34 (about €32) to about $16 (about €15) per kilo. Another start-up, Wildtype, aims at producing a structurally

Examples of cellular agricultural start-ups.

Company	Product	Country	Funding	Funding round
Solar Foods	Solein protein	Finland	39 million €	Round A
Onego Bio	Albumen	Finland	9 million €	Seed
Wildtype	Salmon for sushi	USA	107 million €	Round B
Future Meat Technologies	Chicken	Israel	359 million €	Round B
Perfect Day	Dairy products	USA	660 million €	Round D

more complex product i.e. salmon suitable for making sushi. Even though the production cost of cell salmon would be clearly higher, the price of the end-product is also much higher than that of cell chicken, whereby profitable operations are possible.

On competitive markets, sales prices are determined based on supply and demand, but it is possible that other than price factors affect the demand. There exist questionnaire surveys on the subject but their reliability on measuring demand is not necessarily good because there are no products available to speak of, that is, the market is hypothetical. Based on previous studies, it was observed that the acceptability of cell meat is the greater the more the survey acknowledges public benefits and similarity with traditional meat, and technological innovativeness is not emphasised. Two factors that affect the acceptance of cell meat are previous knowledge about technologies and fear of novelties generally related to food. In the studies, acceptability was usually higher with men, young people and persons eating both animal and plant food. In Europe, the acceptance of cell meat was lower than in Asia and the USA.

The meaning of acceptability also varies depending on the product being sold directly to consumers or from business to business. In the latter case, cellular agriculture enables replacing previous animal ingredients or enhancing nutrient values of the end-product. For example, Solar Foods's Solein protein is used for this purpose. If the ingredient is more a part of the end-product than an independently used end-product, acceptability does not have such an important role.

Future prospects of cellular agriculture and its effects on conventional agriculture

The potential of cellular agriculture as a supplementary or even replacing production method is large but the speed of change is dependent on many factors. Even in such a situation where cellular agricultural products are competitive of their taste and price compared with conventional products, consumers' willingness to buy is somewhat questionable. Although the definition of cellular agriculture does not include the use of genetic modification, it is evident that, especially in the future, cellular agriculture will utilise genetically-modified organisms. This can have an impact on consumers' attitude towards cellular agriculture.

In addition, the authorities' approval processes for products cultured by means of cellular agriculture take their time and incur costs. In the EU, cellular agricultural products are required a novel food authorisation which costs €1-2 million and takes 3-4 years. It is evident that the novel food authorisation process being so expensive and slow decreases companies' interest in food innovations like cellular agricultural products or at least directs companies interested in the field to other markets, such as Northern America or Asia, where authorisation processes are smoother.

Ultimately, the market share of cellular agriculture is dependent on if cellular agriculture is able to supply quality products that are more inexpensive than those supplied by conventional agriculture. It is probable that, already in the next few years, cellular agriculture will prove competitive in some specific, well-defined product groups. The most interesting are such product groups where an ingredient produced by means of cellular agriculture improves the nutritional or textural quality but the ingredient has such a consumer image that it does not become a decisive factor in the purchase decision. Such ingredients can be, for example, ingredients which improve the nutritional quality of snack products or the texture of bakery products.

Most of the capability of cellular agriculture to produce food 'better' than conventional agriculture is dependent on there being available a sufficient amount of inexpensive renewable (electric) energy because cellular agriculture in most cases uses more energy than conventional agriculture per nutritional unit produced. Therefore, the enhancement of cellular agriculture is also dependent on energy policy. The general public aim at the green transition supports cellular agriculture even though food production does not play a significant role in the big picture of energy policy.

If the most extreme predictions were realised, the changes in conventional agriculture would be substantial even in quite a short term. According to a US think tank RethinkX, the number of dairy cows in the USA could decrease by 50% from the current number by 2030 if dairy protein produced by cellular agricultural methods increasingly started to replace the protein of cow milk. This would naturally have a declining impact on conventional dairy production and dairy industry.

Changes on the way in the operational environment of food production strongly indicate that cellular agriculture will in the long term start to take the market share of livestock products produced by the

conventional methods but, in the first stage, plant-based products will compete over the market shares of conventionally produced meat, dairy and eggs. It is still extremely important to prepare in time for the structural change which the conventional livestock production will encounter as cellular agriculture starts to become more common and mainstream.

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Agri-food sector outlook analyses the current situation and the near-term prospects of Finnish agri-food sector.

Description of development in the agri-food sector:

- food production
- food consumption and prices
- foreign trade in foodstuffs
- agricultural policy
- agricultural structures
- development of economic situation in agriculture

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