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Agriculture and food sector in Finland 2019

Jyrki Niemi and Minna Väre (eds.)

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Natural Resources Institute Finland, Helsinki 2019

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Foreword

The summer of 2018 will be remembered for the extreme weather conditions in Finland. The unusual heat and very small rainfall in North and Central Europe caused the worst drought in two decades. The impacts of drought on the agricultural sector were significant as many farmers lost at least part of their normal yield due to parched fields. The impact was the worst in the Nordic and Baltic countries.

Hence, the summer was difficult for agricultural entrepreneurs, but there were also good news as the EU legislation reducing the occurrence of unfair trading practices (UTPs) in the food supply chain moved forward. The main objective of the Commission's proposal published in April 2018 was "to protect agricultural producers" because they are considered "the weakest link" in the supply chain. Agreeing on the rules related to UTPs in the food supply chain was one of the important targets the current EU administration had set itself before the May 2019 elections.

In 2019–2020, the farm policy agenda in Europe is likely to be dominated by reform proposals which are planned for the next period of the Common Agricultural Policy. On 1 June 2018, the Commission submitted its legislative proposals for the policy reform for 2021–2027. The proposals were created based on extensive stakeholder consultations during the past 18 months.

Also, the withdrawal of the United Kingdom from the EU i.e. Brexit remains a central topic. The terms of future trade relations between the EU and the UK as well as the details of the withdrawal agreement are still open when writing this. The series of very complex negotiations, which lasted all year 2018, culminated in November in the withdrawal agreement between London and Brussels. However, it is still unclear if the deeply divided British Parliament can approve the negotiated agreement.

The world food market was muddled up by the decisions of the US President Donald Trump whose trade war with China led to China placing tariffs for US agricultural products, such as soybeans. That is why the US has been seeking growing markets from Europe for soybean.

The next pages present a short summary on the events of 2018 and a current outlook for what to expect from 2019. The special themes of this review highlight particularly organic production. The thematic articles discuss the development, structure, and environmental impacts of organic production as well as the world market prospects of organic products. Other special topics include the competitiveness of the Finnish meat chain, the investment development of agriculture, the ecosystem services of agriculture and the reform of the EU's Common Agricultural Policy.

We hope that our readers in and outside Finland will find this review useful.

Helsinki, 20 June 2019

Jyrki Niemi and Minna Väre

Keywords: agriculture and food markets, production, consumption, income, profitability, agricultural policy, the environment.

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1. Operating environment of agriculture

1.1. The food sector in the national economy

In Finland, the total annual consumption expenditure on food and beverages is EUR 23.7 billion. Of this, food and non-alcoholic beverages consumed at home account for 56%, or EUR 13.4 billion. Food and non-alcoholic beverages consumed at home comprise 11.6% of the total domestic consumption expenditure. This is the same proportion as the average in the old EU member states, and slightly lower than EU member states average of 12.2%.

When alcoholic beverages (EUR 3.3 billion) and eating out (EUR 7.0 billion) are included, food accounts for 20.6% of total household consumption expenditure. In Finland the share of eating out (6.1%) of the total consumption expenditure is lower than the average level in the EU member states (7.1%), and, in particular, lower than the average level in the old EU states (7.4%).

Food and non-alcoholic beverages, current prices; million euro and %-change (change in volume).

	2016	2017	%-change
Total	23,523	23,729	0.9 (0.8)
Food*	12,257	12,099	-1.3 (0.0)
Non-alcoholic beverages*	1,271	1,304	2.6 (0.7)
Alcoholic beverages*	3,307	3,283	-0.7 (-1.0)
Catering services (eating out)	6,688	7,043	5.3 (3.4)
*Eating at home			

Source: Statistics Finland, National Accounts

In addition to household consumption, the food sector exports products to other countries and uses them as interme-

mediate products in the production of other products. In 2017, the output of the operators in the food sector was around EUR 27 billion at the basic price. When the impact of intermediate products on the output in other sectors is included, the value of the output in the food sector was around EUR 40 billion. This comprises roughly 10% of the output of the national economy at basic prices.

Food and non-alcoholic beverages; percentage of total final consumption expenditure of households.

	2016	2017
EU28	12.2	12.2
EU15	11.6	11.6
Belgium	13.4	13.4
Italy	14.3	14.2
Greece	17.1	16.9
Norway	12.2	11.9
Portugal	17.0	16.7
France	13.4	13.2
Sweden	12.4	12.4
Germany	10.6	10.6
Finland	12.0	11.6
Denmark	11.4	11.4
Estonia	20.3	20.3
United Kingdom	8.1	8.2

Source: Eurostat

Agriculture and horticulture

According to national accounts, the agricultural output at the basic price was EUR 4.4 billion in 2017. The value of the output remained at the previous year's level. In 2012 and 2013, the value of the output was EUR 5.1 billion. The volume of production has decreased in the last six years, except for 2015. The output at the basic price includes sales revenues of production, production for own use and

subsidies on products from agricultural aid (EUR 0.3 billion).

When the other subsidies on production (EUR 1.6 billion) are included, the value of the output was EUR 6.0 billion. The other subsidies on production showed no changes from the previous year.

Intermediate products were used in production to a value of EUR 3.2 billion. The value of intermediate products used increased by roughly 5% from the previous year. As the volume of intermediate product demand increased by 4.6%, more intermediate products were used than in the previous year. In agriculture, feed produced for own use and industrial feed products represent the largest group of intermediate products in terms of value. Major cost items include building maintenance, wholesale in goods supply, fertilisers and crop protection agents, and energy in different forms. Various services including veterinary services that support agricultural production are also significant cost items.

The agricultural value added at the basic price was EUR 1.2 billion in 2017. The value added decreased nominally by EUR 0.1 billion, or 11%, after one significant year of growth (17%). The decrease in the value added resulted from the increase in the value of intermediate products. The sector's share of the national value added at the basic price was 0.6% in 2017.

Agriculture is very capital-intensive because of the machinery, buildings and fields needed in production. In 2017, the value of total investments in agriculture was EUR 1.1 billion, close to the previous year's level. In volume, investments increased by 8% from the previous year. They made up 2.2% of the total investments of the national economy. Agriculture accounts for a much larger proportion of investments than its share of the value added of the national economy.

Food processing

The value of the food industry's output was EUR 11.1 billion in 2017. Nominal growth from the previous year was 2.1%. The value of the output increased for the first time since 2012, even though the volume of output remained at the previous year's level.

The value of intermediate product use (EUR 8.5 billion) also increased for the first time since 2012. Nominal growth was 2.3%. The volume of the intermediate products used increased by 0.4%, having increased by 1.5% the previous year. The value added of the food industry of EUR 2.6 billion increased nominally by 1.8% after three years of decrease. This increase resulted from the higher increase in the value of the output than in the value of intermediate product use.

In 2017, the food industry accounted for 1.4% of the value added of the national economy, remaining at the previous year's level. The food industry made up 7.7% of the value added of manufacturing industry, slightly less than the previous year.

The food industry is the fourth largest industrial sector after the metal, chemical and forest industries, measured by output and value added. Like the forest industry, the food industry is raw material-intensive. Intermediate products make up nearly 80% of the output. Of all intermediate products, agricultural raw materials and semi-finished products of the food industry comprise the largest cost items.

The food industry's domestic investments were EUR 616 million in 2017, increasing nominally by 7.7% from the previous year. Investment volume increased similarly (6.3%). Investments have increased in two successive years, exceeding the previous years' levels in terms of value and quantity. However, their proportion of the total investments of the national economy (1.1%) remained

unchanged. The proportion of the food industry's investments of the total is smaller than the value added of the national economy.

Domestic wholesale and retail trade on foodstuffs

The food retail supply chain, which includes both retailers and wholesale sector, distributes food and drink products to consumers. The wholesale sector acquires food and drink products from domestic and international suppliers for sale in the retail sector. In addition to retail deliveries, the wholesale sector delivers food and drink products to restaurants and institutional kitchens, and is engaged in international food trade. Customer loyalty programmes and advertising are examples of other consumer functions in the trade sector.

Separate statistics for food retail supply chain are not released in the national accounts, as the sector's figures are included in the retail supply chain as a whole. In the national accounts, the output of food retail supply chain is the margin between the prices at which retailers and wholesalers purchase and sell their products. The estimate of the Natural Resources Institute Finland (Luke) for the output of food retail supply chain is EUR 5.6 billion, of which wholesale makes up EUR 1.9 billion and retail EUR 3.8 billion. The value added of food retail supply chain is estimated at EUR 3.0 billion, of which wholesale accounts for EUR 1.0 billion and retail EUR 2.0 billion. Food retail supply chain covers approximately 1.6% of the value added of the national economy.

For distribution, the food retail supply chain acquires products and services from other sectors. The estimate of the value of intermediate products is EUR 2.6 billion. The highest cost items for intermediate products include different support servic-

es for the business sector, as well as transport and storage.

Investments in the food retail supply chain totalled EUR 579 million, comprising 1.4% of the total investments of the national economy.

Food and beverage service activities

Food and beverage service activities include production in restaurants and cafeterias, and public food services. In 2017, the value of the output in the sector was EUR 5.9 billion. The value of the output increased by 4.1%, and the volume by 2.8% from the previous year.

The value of intermediate product use in the food and beverage service activities was EUR 3.4 billion, an increase by 2.9% from the previous year. The volume of the intermediate products used increased by 3%. The value added of the food and beverage service activities was EUR 2.5 billion, showing a nominal increase of EUR 0.1 billion (5.6%) from the previous year. The nominal increase in the value added resulted from the higher increase in the value of the output than in the use of intermediate products. The food and beverage service activities cover approximately 1.4% of the value added of the national economy.

In 2017, investments in the food and beverage service activities amounted to EUR 140 million, decreasing nominally by 8% from the previous year, when they increased nominally by 34%. The volume of the investments decreased by 10% in 2017. Its share of the total investments of the national economy was 0.3%.

Economy-wide effects of the food sector

In addition to agriculture, the food industry, food retail supply chain and the food and beverages service activities, many other sectors in Finland are indirectly involved in food production by producing

goods and services for it. Demand for intermediate products in the food sector generates an output of EUR 14 billion and a value added of EUR 6 billion in other sectors. In practice, the effects of the food sector extend to all other sectors, including the manufacturing industry, transport, trade, energy production, and waste and water management. Some goods and service acquisitions are imported from other countries.

Households use salaries and other income generated in the food sector to buy goods and services. This expands the production effects of the food sector to sectors that produce goods and services for consumption.

Direct investments in the food sector amount to more than EUR 2 billion a year, which in turn expand the effects to sectors producing investment goods. The indirect effects of the investments in the food sector on the national economy have not been studied. Part of the spending on machines and equipment, in particular, focuses on other countries. The effects of construction focus more directly on domestic technological sectors and the production of building materials in Finland.

Foreign trade on foodstuffs

Imports and exports in the food sector consist of agricultural products and processed food products. The value of agri-food exports (CN 1-24) was EUR 1.5 billion in 2017. The value of exports decreased by EUR 65 million (4.1%) from the previous year. The value of agri-food imports was EUR 5.3 billion, close to the previous year's level. Imports increased by 0.2% from the previous year. The value of agri-food imports is EUR 3.7 billion higher than the value of exports.

Agri-food products make up 2.4% of the value of all exported goods and 7.9% of the value of imported goods. The value of all exported goods (CN 1-99) increased

by 7% in 2017, while that of all imported goods increased by 6.5%.

The food sector also imports goods other than food, as its different subsectors use imported products as intermediates in their production. For example, agriculture imports crop protection agents, and all sectors need imported energy. In addition, domestic sectors that manufacture intermediates for the food sector import goods and services for their production. Most heavy-duty machinery, equipment and their parts are imported. Service imports in the areas of business management, design and research, as well as marketing, have increased.

However, domestic content in the food sector continues to be fairly high, nearly 80%, when measured in terms of euros. The proportion of domestic labour, in particular, is high in food production.

Taxes and subsidies in the food sector

The state contributes to the food sector by collecting taxes and allocating financial support to agriculture. In addition to value added tax on consumption, consumers pay excise duties on the food prices. Companies and employees in the food sector pay income tax on their earnings.

The total tax revenue from product taxes in the food sector totals EUR 4.5 billion. Product taxes in the food sector include value added tax and excise duties on certain products. The highest tax revenue comes from alcoholic beverages.

The VAT rate of 14% applied to food and restaurant services is lower than the general VAT rate of 24%. The VAT rate of 14% entered into force at the beginning of 2013. The general VAT rate of 24% is applied to the retail of alcohol.

The VAT revenue from food is just under EUR 1.7 billion, while that from the retail of alcohol is approximately EUR 0.6 billion, calculated from consumption expenditure. The VAT revenue from restau-

rant services is less than EUR 1.0 billion. The total VAT revenue from the food sector is more than EUR 3.0 billion, comprising 15% of the total VAT revenue.

The excise duty on alcoholic beverages is approximately EUR 1.3 billion. The excise duty on alcoholic beverages has been raised many times in recent years. The revenue from excise duties on soft drinks was EUR 151 million in 2017. The duty on confectionery and ice cream entered into force at the beginning of 2011 and was abolished from the beginning of 2017.

The tax revenue from the food sector is higher than production subsidies paid in the sector. In the national accounts, agricultural and horticultural subsidies are divided into subsidies on products and other subsidies on production. In 2017, these totalled EUR 2.0 billion. Some subsidies come from the EU and some from Finland’s state budget. Since Finland’s EU membership fees from the state budget are around EUR 2.0 billion, some

can be considered to return in the form of agricultural subsidies.

The food sector employs approximately 340,000 people.

According to the national accounts, the number of people employed in agriculture was 81,500 in 2017, representing 3.2% of the employed labour force. In the previous year, the corresponding figure was 80,900. This development resulted from the decrease in the number of farms and the replacement of manual labour by machines. Of all people employed in agriculture, 57,300 were entrepreneurs and 24,200 were wage-earners.

The number of employees in agriculture is the highest in Southern Ostrobothnia, Southwest Finland and Northern Ostrobothnia. These three regions accounted for 32% of the total employed labour force in agriculture. Proportionally, the share of agriculture of the employed labour force is the highest in Southern Ostrobothnia

Value-added of agriculture¹, food industry and catering services (current prices, at basic price) and investments.

	Value-added						Share in investments		
	Agriculture	Food industry	Catering services	Agriculture	Food industry	Catering services	Agriculture	Food industry	Catering services
	€ million	€ million	€ million	%	%	%	%	%	%
2017	1,226	2,624	2,719	0.6	1.4	1.4	2.2	1.1	0.3
2016	1,374	2,578	2,543	0.7	1.4	1.4	2.1	1.1	0.3
2015	1,172	2,614	2,409	0.6	1.4	1.3	2.5	1.0	0.3
2014	1,359	2,644	2,281	0.8	1.5	1.3	3.1	1.2	0.3
2013	1,766	2,688	2,246	1.0	1.5	1.3	2.7	0.9	0.2
2012	1,596	2,683	2,331	0.9	1.6	1.4	2.6	0.9	0.3
2011	1,509	2,589	2,214	0.9	1.5	1.3	2.7	0.8	0.3
2010	1,511	2,617	2,092	0.9	1.5	1.2	2.7	0.8	0.3
2009	1,379	2,815	2,003	0.8	1.7	1.2	2.9	0.9	0.3
2008	1,206	2,549	2,023	0.7	1.6	1.2	2.6	0.9	0.2
2007	1,421	2,499	1,957	0.9	1.6	1.2	2.8	0.9	0.3

¹ Agriculture inc. subsidies on products (ca. 300 million €) excl. subsidies on production (ca. 1,600 million €).

Source: National accounts 2007-2017e, Statistics Finland.

(10.5%), Central Ostrobothnia (8.9%) and Ostrobothnia (7.4%).

Through the purchase of intermediate products, agriculture also employs around 15,000 in other sectors. Most of them are employed in the feed industry. In service sectors, agriculture mainly employs people in machine maintenance and repairs, wholesale, transport and veterinary services.

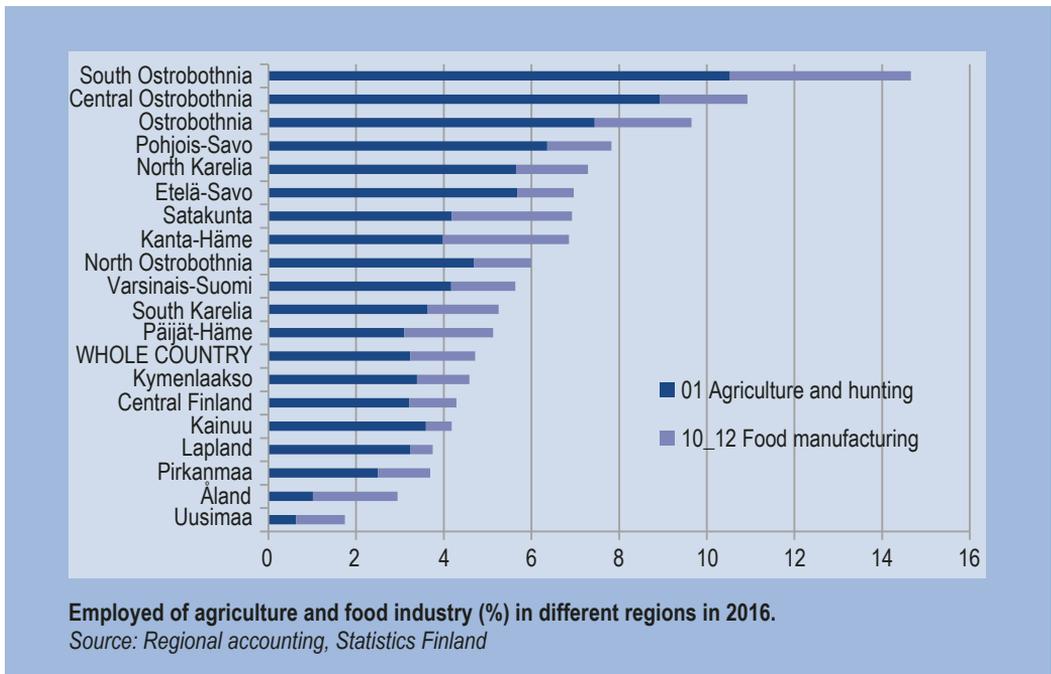
According to the national accounts, the number of people employed in the food sector was 37,800 in 2017, representing 1.5% of the employed labour force. The number of employees increased slightly from the previous year. More than a quarter of all jobs in the sector are in Uusimaa. This is followed by Southern Ostrobothnia (9.5%), Southwest Finland (8.3%) and Satakunta (7.3%). Proportionally, the food sector employs the most people in Southern Ostrobothnia (4.1% of the region's employed labour force), followed by Tavastia Proper (2.9%) and Satakunta (2.7%).

Indirectly, the food sector employs the most people in agriculture through

the purchase of raw materials. In addition to agriculture, the indirect employment effects of the food sector extend to transport and storage, services and industries, for example, in packaging production.

The food and beverage service activities employed 72,200 people in 2017, representing 2.8% of the employed labour force. The number of employees increased by 1,900 from the previous year. The sector mainly produces indirect employment effects in agriculture and the food industry, but also in various services, wholesale and transport.

It is estimated that there are 61,600 employees in the food retail supply chain, of whom 11,300 work in the wholesale sector and 50,300 in the retail sector. In addition, the sector produces indirect employment effects in services, transport and storage. Employees in the food retail supply chain and the food and beverage service sector are mainly located where the population is located.



1.2. Food consumption and consumer prices

Food consumption expenditure

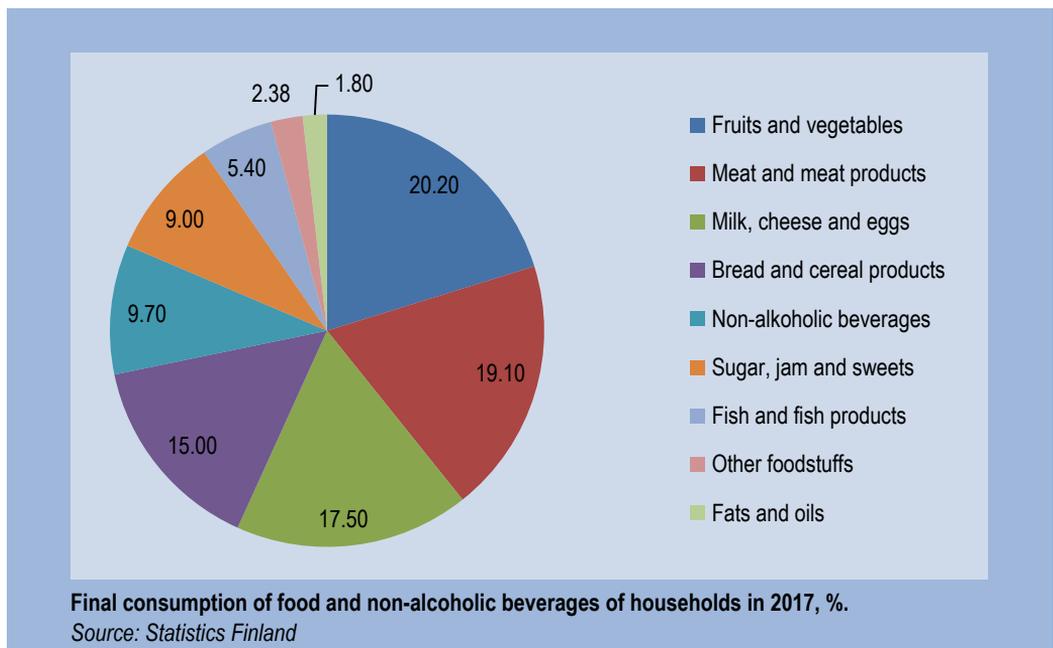
In 2017, the foodstuff and non-alcoholic beverage proportion of private consumption expenditure was the lowest in the 2000s, at 11.6% (EUR 13.5 billion). The three-year increase in the volume of fruit and vegetables turned into a decrease (-1.6%). However, the product group maintained its position as the largest, representing 20.2% of total foodstuff consumption expenditure (EUR 2.7 billion).

The meat and meat products (EUR 2.6 billion) proportion of consumption expenditure is the second highest, and they made up 19.1% of total foodstuff consumption expenditure. The value of meat consumption decreased by 1.6% from the previous year, while the volume only showed a slight decrease (-0.2%). In food expenditure, the third largest product group is milk, cheese and eggs (EUR 2.3 billion and 17.5%). Its volume decreased by 1.7%.

The fish and fish products product group showed the most growth, resulting mainly from an increase in prices. According to the Norwegian Seafood Council, the price of salmon, in particular, was above the previous year's level throughout the year. However, fish and fish products only account for a small proportion of total foodstuff consumption expenditure (5.4%) compared, for example, with meat and meat products.

The volume of the sugar, jam and sweets product group increased notably (+3.8%). One of the reasons for this was the cancellation of the tax on sweets in January 2017. The excise duty on confectionery and ice cream was EUR 0.95 per kg, and its cancellation is seen in a clear drop in prices. The decrease in prices in this product group was EUR 82 million compared with the previous year.

In the non-alcoholic beverages product group, the volume of soft drinks increased by 2%. The volume of mineral waters and juices in this product group also increased by 2%. Interestingly, the



price of coffee went up in this product group. This resulted from a decrease in production volumes of Arabica, the most common coffee type.

Consumption volumes

Most of the nutritional volume consumed consists of cereals, dairy products and meat. In 2017, total cereal consumption increased by just under 1% from the previous year to more than 80 kg per capita. Consumption has been around 79–80 kg for more than 10 years. The consumption of oats increased by 1.0 kg to 7.3 kg and that of rice by 0.2 kg to 6 kg per capita. The consumption of wheat and rye remained almost unchanged from the previous year, at 44.5 and 15.5 kg, respectively. Their consumption has remained relatively stable over the last three years. The consumption of barley was 1.8 kg, i.e. the same amount as in the previous year.

The total consumption of meat remained roughly at the previous year’s level, 81 kg per capita, when game and offal are also taken into account. The con-

sumption of poultry meat increased by 6% from 2016. The consumption has now been increasing for more than ten consecutive years. The consumption of beef also increased – by 1% from the previous year. In contrast, the consumption of pork decreased by almost 4% from the previous year. In 2017, an average of 19.4 kg of beef, 33.4 kg of pork and 24.9 kg of poultry was consumed per capita.

Consumption of certain foodstuffs per capita in 2017, kg.

The consumption of milk decreased by an average of 5% from the previous year. There was a drastic decrease in the consumption of skimmed milk, more than 14%. The consumption of low-fat milk remained almost unchanged from the previous year, while the consumption of whole milk increased by 7.0%, having been on the decline for a couple of years. All in all, approximately 112 litres of milk was consumed per capita, of which one-third was skimmed milk, 56% was low-fat milk and just over 10% was whole milk. The consumption of sour milk

Consumption of selected foodstuffs per capita in 2007–2017, kg.								
	Fresh vegetables ¹	Cereals total	Sugar	Meat total ²	Beef	Pork	Poultry	Eggs
2017*	63.8	80.3	30.6	81.0	19.4	33.4	24.9	11.9
2016	63.7	79.7	29.1	81.0	19.2	34.7	23.5	11.9
2015	62.4	78.8	29.3	79.3	19.2	34.9	21.6	11.5
2014	65.3	80.0	29.5	76.6	18.7	34.6	20.1	10.8
2013	61.2	80.0	28.9	77.1	18.4	35.6	19.5	10.7
2012	57.4	79.2	29.8	77.5	18.9	36.0	18.7	10.6
2011	62.6	78.8	30.1	77.6	18.6	36.4	18.2	10.0
2010	56.1	79.3	31.8	76.4	18.6	34.9	18.2	9.8
2009	59.1	79.5	32.6	74.1	17.8	34.4	17.5	9.5
2008	56.2	80.2	31.8	75.4	18.2	35.3	17.2	9.4
2007	56.4	79.8	30.9	74.9	18.7	34.9	16.4	9.3

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

Consumption of selected milk products per capita in 2007–2017, kg.

	Whole milk	Low-fat milk	Skimmed milk	Sour milk	Yoghurt	Sour cream, crème fraîche, smetana	Puddings, quark with additives	Cheese ¹
2017*	12.4	64.9	37.1	9.1	20.0	1.9	3.1	25.8
2016	11.5	65.4	43.4	9.6	20.1	1.9	3.0	26.4
2015	11.7	66.0	48.0	10.1	21.3	2.4	3.2	26.6
2014	12.5	66.4	50.7	10.9	21.2	2.8	2.8	25.0
2013	12.8	66.6	51.2	11.3	22.6	2.7	2.5	23.2
2012	12.5	68.9	50.8	11.8	23.3	2.5	2.2	21.9
2011	11.4	68.3	52.0	11.9	23.9	2.4	2.0	21.0
2010	10.4	68.6	54.5	12.4	23.4	2.3		19.0
2009	10.0	69.9	54.9	12.5	22.5	2.2		18.7
2008	10.2	72.2	53.8	13.0	22.4	2.1		18.4
2007	10.5	74.8	52.3	13.4	22.2	2.0		17.5

¹ Incl. quark, natural and cottage cheese.

* Preliminary data

Source: Natural Resources Institute Finland (Luke), Balance Sheet for Food Commodities

and curdled milk decreased by approximately 6%. The consumption of yoghurt remained roughly at the previous year's level. Cream consumption increased by approximately 6.0%. In 2017, the total consumption of liquid milk products was 160 kg per capita, approximately 4% less than in the previous year. The consumption of cheese decreased by roughly 2% from the previous year to just under 26 kg.

In 2017, the consumption of butter was close to the previous year's level at 3.5 kg. Almost 12 kg of eggs were consumed per capita, roughly at the level of the previous year.

The consumption of fresh vegetables was approximately 64 kg per capita. However, this figure includes wastage. This was at the same level as in 2016. Of fresh vegetables, tomatoes made up nearly 12 kg, i.e. roughly one-fifth.

The consumption of fresh fruit was 58.8 kg, including wastage. The consumption of citrus fruit decreased by 10% to 13 kg per capita. In addition, the consumption of other species of fresh fruit

remained almost unchanged at 46 kg per capita. Just under 7 kg of fruit preserves and dried fruit were consumed per capita.

In 2017, sugar consumption was just over 30 kg per capita, 5% more than in the previous year, but lower than at the beginning of the decade.

Consumer prices

In 2018, the prices of food products increased. The uninterrupted three-year decrease in prices turned into an increase. The annual increase was 1.9% on average. However, this was a moderate increase compared to 2011 and 2012 when prices went up by more than 5%. A three-year decrease started in 2015: 1.9% during the first year, 1.1% during the second and 0.9% during the third. Consumer prices fell until December 2017. At the beginning of 2018, prices started to increase, and the increase appears to be continuing during the first months of 2019.

When viewed by product group, the most significant increase in prices took place in the vegetables product group

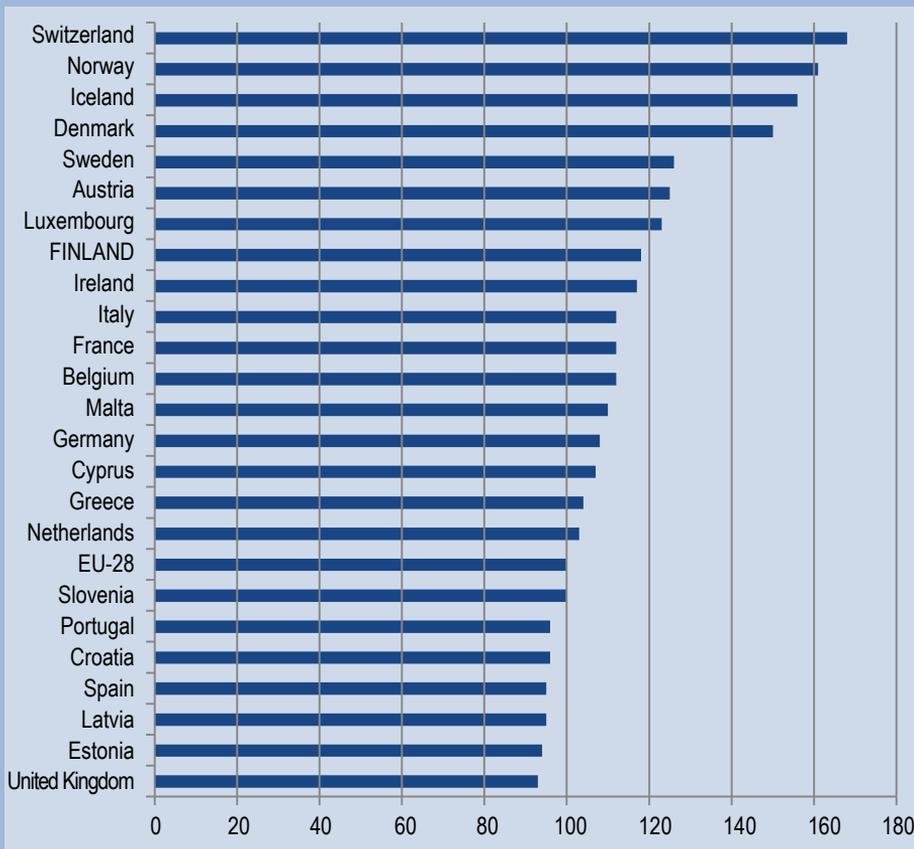
(+5.7%). The rainy summer in 2017 reduced the production of outdoor vegetables in particular. The fats and oils product group showed growth that was nearly as significant (+5.2%). Fruit and berry prices increased markedly (+3.8%). The leaps in fish and shellfish product prices in 2016 (+8.0%) and 2017 (+7.3%) seem to have stopped. In 2018, prices only increased by 0.3%. Only the food products and non-alcoholic beverages product groups showed a slight decrease in prices (both decreased by 0.2%).

Food basket value chain

The price of household food baskets (EUR 13.5 billion) is divided in the production

chain between agriculture, which produces raw materials, the food industry, which processes raw materials and retail, which sells food products. This figure can be divided into product taxes and food product imports, including the food and beverages that are not processed in the Finnish food industry.

Product taxes make up 14% (roughly EUR 1.9 billion) of household food baskets. According to Statistics Finland, food product imports comprise 15.5% (approximately EUR 2.0 billion). Foodstuff trade, including transport, is estimated to account for 33.5% (EUR 4.5 billion). The food industry makes up 33% (EUR 4.5 billion). The role of agri-



Price level index for food and non-alcoholic beverages in some countries in 2016, EU-28=100.

Source: Eurostat

culture consists of unprocessed products in the food basket (EUR 0.4 billion) and raw material fees included in the proportion of the food industry (less than EUR 1.0 billion).

Comparison with other countries

Statistics Finland publishes an international comparison of consumer prices. This data is based on the Eurostat European Comparison Programme (ECP). The purpose of this international comparison is to produce purchasing power parities. The comparison covers 28 EU member states, some candidates and the EFTA member states. Statistics Finland is responsible for compiling the price material in Finland.

In Finland, the price level of foodstuffs and non-alcoholic beverages is more than 18% above the EU average. In other Nor-

dic countries, price levels are clearly above the average levels in the EU and Finland: Norway 61%; Iceland 56%; Denmark 50%; Sweden 26%. The highest prices are in Switzerland, where foodstuffs and non-alcoholic beverages consumer prices are 68% higher than the EU-28 average. The UK has the lowest price level.

International price comparisons always have their difficulties. Foodstuff consumer prices are affected, for example, by different taxation practices, national characteristics and eating habits, not forgetting labour costs, market structures and production conditions. In Finland, the VAT rate is the second highest among the EU-15 states (14%). The VAT rate is zero in the UK and Ireland, and 25% in Denmark.

Average consumer prices of selected foodstuffs in 2014–2018, €/kg.						
	2014	2015	2016	2017	2018	Change % 2017–2018
Wheat flower	0.68	0.68	0.66	0.65	0.65	0 %
Rye bread, portion size	3.92	3.74	3.59	3.54	3.56	1 %
Beef roast	16.74	16.21	16.07	15.99	16.38	2 %
Pork, strip	9.27	8.99	8.88	8.53	8.57	0 %
Chicken breast fillet	13.47	13.18	13.02	12.84	12.32	-4 %
Rainbow trout, whole	9.56	8.5	9.7	12.22	11.16	-9 %
Light milk, €/litre	1.1	1.03	1.01	0.99	0.99	0 %
Edam cheese	9.8	9.12	8.77	8.8	9.08	3 %
Eggs	3.68	3.6	3.45	3.27	3.42	5 %
Butter	5.74	4.96	4.92	5.16	6.06	17 %
Margarine	3.9	3.6	3.48	3.53	3.53	0 %
Tomatoes	3.25	3.19	3.03	2.92	3.05	4 %
Cucumbers	2.57	2.5	2.47	2.46	2.68	9 %
Potatoes	0.87	0.93	0.97	0.85	0.91	7 %

Source: Statistics Finland, Consumer prices

1.3. Retail trade

The consolidation trend in the Finnish retail sector has continued for a long time, leading to the two largest chains having a market share of roughly 80% in the 2010s. S-Group has expanded particularly strongly since 2005, and its lead over K-Group increased to more than 13 percentage points in 2015. The gap between the two leading chains closed slightly when K-Group acquired Suomen Lähikauppa in April 2016. The acquired units have operated year-round since 2017. This increased K-Group’s market share to 35.8% and narrowed the gap with S-Group to 10 percentage points. This difference remained the same in 2018, as both increased their market shares slightly. Lidl has grown steadily in recent years. In 2018, the German chain opened 11 new shops and reached a market share of 9.6%. The three largest chains strengthened their positions at the expense of smaller local chains and other retailers, whose market share dropped to 7.9% in 2018.

In total, there were 2,804 daily consumer goods outlets in Finland at the

beginning of 2019. The value of daily consumer goods sales totalled EUR 18.2 billion in 2018, more than 3% more than the previous year. This increase indicates that the purchasing power of consumers has improved and the entire economy has turned to moderate growth. In addition, the increase in the value of sales resulted from higher alcohol and tobacco tax rates and the right to sell stronger (at most 5.5% alcohol) alcoholic beverages in daily consumer goods outlets from the beginning of 2018.

The fast progress of the Lidl chain and S-Group’s low-cost campaign prove the significance of prices in steering consumer choices. The recession has made consumers more price-sensitive. Due to this, they are turning to more affordable food products, which has led to a rise in the popularity of discount stores and retail chains’ own brands all over Europe.

Retail chains’ own brands have been given much more shelf space than before. Previously, they played a major role in non-food goods and dry foodstuffs, but in recent years, retail chains have introduced their own brands in an increasing

Market shares of retail companies 2005–2018.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
S-Group	33.9	39.9	41	42.4	43.2	44.1	45.2	45.6	45.7	45.7	45.9	44.6	45.9	46.4
K-Group	35.9	33.4	33.9	33.7	34.2	35	35.3	34.7	34	33.1	32.7	34.8	35.8	36.1
Suomen lähikauppa*	10.8	11.9	11.9	11.3	10.2	9	7.8	7.3	7	6.8	6.4	1.4	-	-
Spar**	6.2	0.5	-	-	-	-	-	-	-	-	-	-	-	-
Lidl***	3.7	4.1	4.7	5	5.1	4.8	4.8	5.5	6.6	7.6	8.3	8.8	9.3	9.6
Other companies	9.5	10.2	8.4	7.6	7.3	7.1	6.9	6.9	6.7	6.8	6.7	10.4	9.0	7.9
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: AC Nielsen. *Earlier Tradeka. **From 2006 M Group; in 2007–2008 included in "Other". ***Nielsen's estimate

Note: In 2016, variety discounters and gas station stores selling a more narrow grocery assortment have retroactively been added to Nielsen’s Sales Directory. Due to the retroactive inclusion of new markets in 2016, the figures presented in the table are not comparable with the previous years.

number of product groups. For example, in dairy products, they have achieved a significant position over the last three to four years in sales of liquid milk, fresh products and cheese.

The increasing number of retail chains' own brands, the threat posed by imported goods, and the price level and limited range of discount stores intensify competition between Finnish suppliers and bring production margins down.

In many countries across Europe, online trade has challenged hypermarket chains in non-food product groups. However, online food sales are still marginal in Europe, and in Finland they made up only 0.3% of total sales in 2017. In 2018, online sales increased significantly. Daily consumer goods were sold online at a value of EUR 70 million, 44.3% more than the previous year. Despite this rapid growth, online sales still account for only 0.4% of total sales.

1.4. Food industry and foreign trade

Development of the food industry

In 2017, the turnover of the food industry was EUR 10.8 billion, up by 3.5% from the previous year. The number of people employed in the food industry remained at the previous year's level. The industry employed 32,682 in 2017.

As a result of the significant increase in turnover in real terms and the nearly unchanged number of people employed, the turnover per person in real terms increased to EUR 329,000 in 2017. This indicator of productivity, which has grown steadily during Finland's EU membership, reached its highest point in 2012 and has been dropping alarmingly ever since. It took a more positive turn in 2016 and continued on this path in 2017.

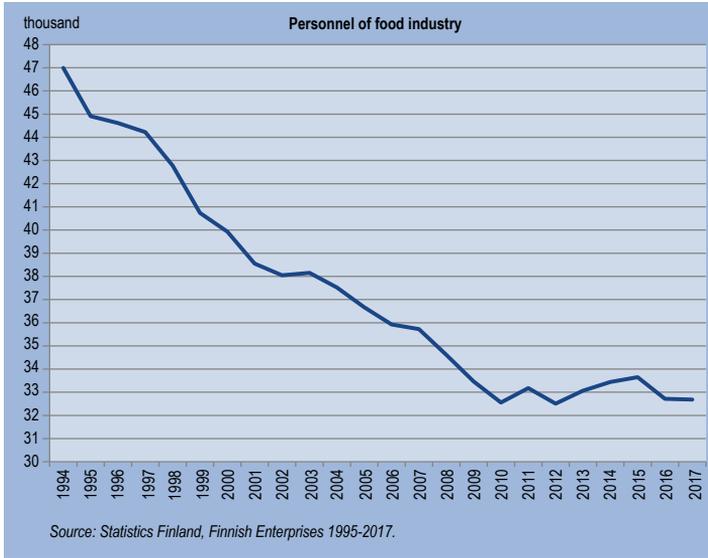
The two main sectors in the Finnish

Turnover of the Finnish food industry at current and fixed prices, 1995–2017.

	Sales revenues (current prices, billion EUR)	Sales revenues (fixed prices of 2017, billion EUR)
1995	7.7	10.7
1996	7.8	10.8
1997	8.0	10.9
1998	7.8	10.5
1999	7.5	10.0
2000	7.9	10.1
2001	8.3	10.3
2002	8.4	10.3
2003	8.5	10.3
2004	8.9	10.8
2005	8.9	10.7
2006	9.2	11.0
2007	9.7	11.2
2008	10.5	11.7
2009	10.3	11.4
2010	10.2	11.2
2011	10.8	11.5
2012	11.2	11.6
2013	11.0	11.3
2014	10.8	10.9
2015	10.4	10.5
2016	10.4	10.5
2017	10.8	10.8

Source: Statistics Finland and own calculations

food industry are the dairy and the meat processing industries. Between them, they contributed 42% of the turnover of the food industry in 2017. The dairy industry peaked in 2013, when prices on the demand-driven world market were high, and a new sales record was achieved in the Russian market. At that time, the turnover of the dairy industry exceeded that of the meat processing industry. Since then, the dairy industry has faced difficulties in the market, resulting in a steep decline, and



the order of the two largest industries has been restored. The turnover of the meat processing industry in real terms has remained stable in recent years, as new market areas and exports to Asia are not yet reflected in the 2017 turnover.

Foreign trade

Finland's food exports fell again in 2018 after a temporary recovery. In 2018, the value of food exports from Finland was

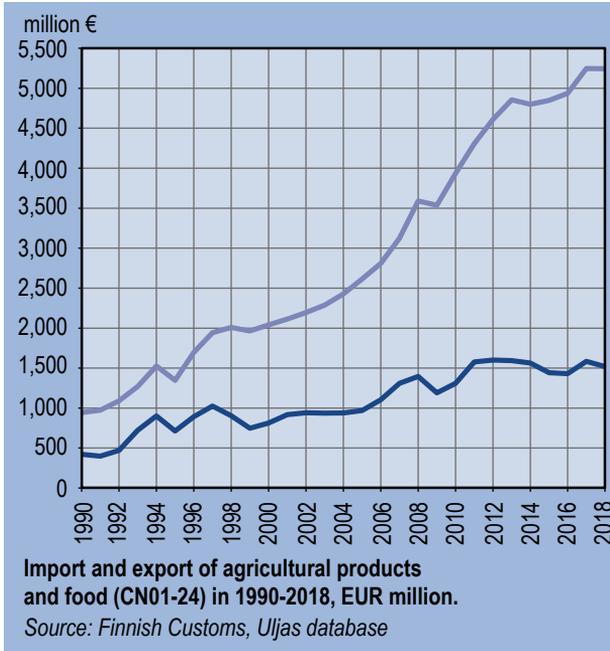
EUR 1,520 million, down nearly 4.0% from the previous year. Exports have still not recovered from the crisis caused by Russia's import ban, as they have not returned to the level preceding the crisis.

In 2018, the value of food imports to Finland was EUR 5,272 million, roughly the previous year's level. Imports even dropped slightly, EUR 3 million, from the previous year.

The combined outcome of the developments in imports and exports is that the deficit in the food trade increased again by approximately EUR 90 million, from EUR 3,662 million to EUR 3,752 million. Traditionally, the balance deficit has largely been due to the large import volumes of fruit, vegetables, raw coffee, alcoholic beverages and tobacco. Other important products imported into Finland include cheeses and cereal products. However, in recent years, Finnish

food production has faced competition in product groups that used to be dominated by domestic production such as meat, dairy and fish.

In recent years, there has been no significant change in the geographical distribution of imported agricultural and food products. In 2018, the majority (65.1%) of Finnish food imports came from the old EU-15 member states. Food imports from countries that joined the EU in 2004



or later decreased for the second year in succession and were 11.2%. Among these states, Poland increased its proportion the most. The proportion of non-EU countries decreased to 23.7%.

As a result of sanctions, exports to Russia have dropped dramatically. In the peak year of 2013, the value of food exports to Russia was EUR 440 million. In 2016, this value had crashed to EUR 126 million. In 2018, food exports to Russia decreased further to EUR 99 million.

Indeed, the proportion of food exports to Russia has fallen from the peak levels of 26–28% to 6.6%. Exports to other EU states have increased. In 2017, exports to Germany, France, the Netherlands and Denmark increased the most rapidly. Exports to these countries increased by 7–15% from the previous year, with the value of exports EUR 70–100 million. In addition, exports to China increased by roughly 15%, and the value of food exports exceeded EUR 50 million in 2018.

More than half of Finnish food exports have traditionally gone to neighbouring

countries, but their total proportion fell dramatically following Russia's import ban. In 2018, Finland's neighbouring countries combined accounted for less than 40% of total food exports (Sweden 20.7%, Estonia 9.1% and Norway 2.9%).

Dairy products continued to form the most significant single product group in food exports. However, exports of dairy products have dropped from EUR 521 million in the peak year of 2013 to EUR 371 million in 2018. In 2017, the sector made up slightly less than a quarter of total food exports, while dairy products accounted for a third of all food exports just a few years ago. In 2018, the value of butter exports

was EUR 138 million, cheese exports only EUR 48 million and whey exports EUR 54 million.

The dairy industry continues to be 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 2017, the foreign trade balance for dairy products increased by EUR 48 million, driven by improved butter exports, only to fall to EUR 27 million in 2018. This resulted from a decrease in powdered milk exports from EUR 90 million to EUR 70 million.

In 2018, the value of cereal exports was EUR 80 million, down by EUR 29 million from the previous year. Oat exports remained at the previous year's level (EUR 59 million), while wheat and barley exports fell steeply. Other key export products include meat, alcoholic beverages and sugar and confectionery products.

Ecosystem services in Finnish agriculture – are farmers interested in producing services citizens want?

Annika Tienhaara¹, Eija Pouta¹, Emmi Haltia² and Kyösti Arovuori²

How important are agricultural ecosystem services from the citizens' viewpoint and how has their production in Finland succeeded? Would citizens be ready to pay for ecosystem services? And do farmers think they can improve the current situation?

Ecosystem services important aspect of agriculture

Ecosystem services are material or immaterial services produced by nature which support human existence and welfare. Ecosystem services can be classified into four categories: provisioning services (e.g. food and fibre), cultural services (e.g. landscape and recreational use), regulating services (e.g. pollination and prevention of erosion) and supporting services (e.g. nutrient circulation).

It has been found worldwide that the supply of ecosystem services has declined in the past 50 years thus also decreasing human welfare. Agricultural ecosystems produce services which are essential for welfare and have significant values. Hence, their consideration is important in agricultural practices and policy guidance.

Ecosystem functions, including biodiversity, create ecosystem services together with production inputs supplied by people. Previous research on the ecosystem services produced by agricultural environments can be found on the Luke website (luke.fi/en/). The provisioning services of agricultural environments and their value are well known. Instead, there is no clear picture of regulating and cultural services and their value.

In 2016–2017, Luke and Pellervo Economic Research PTT implemented a survey on the ecosystem services of agriculture for citizens and farmers. There were 2,066 citizen replies (response rate 25%) and 591 farmer replies (response rate 12%).

Citizens require consideration of agricultural landscape and biodiversity

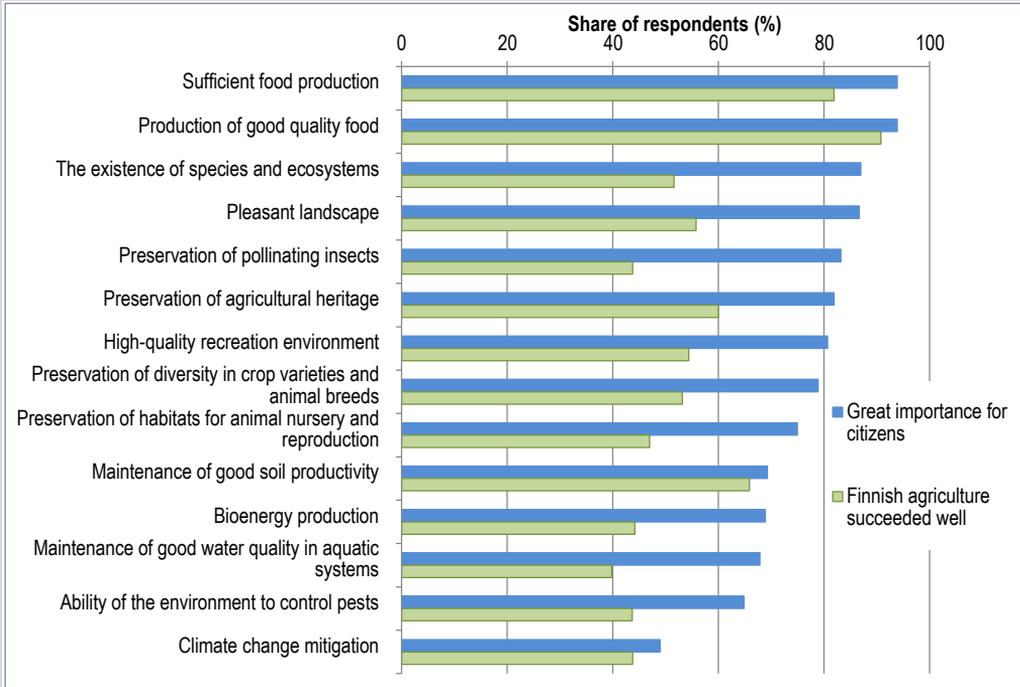
Citizens responding to the survey evaluated the importance of ecosystem services in the agricultural environment and the success of the Finnish agriculture in producing these ecosystem services.

The most important service was sufficient production of high-quality food. It was considered that agriculture succeeded well in the production of this. Important ecosystem services, the production of which the citizens were not satisfied with, were preservation of plant and animal species and ecosystems as well as abundance of plant-pollinating insects. Furthermore, a pleasant agricultural landscape was considered an important ecosystem service, but its current state needs to be improved.

1 Natural Resources Institute Finland (Luke)

2 Pellervo Economic Research PTT

In policy design, it would be a good idea to emphasize those ecosystem services which citizens consider important but where there is room for improvement in their production.



The importance of ecosystem services to citizens and satisfaction in their production

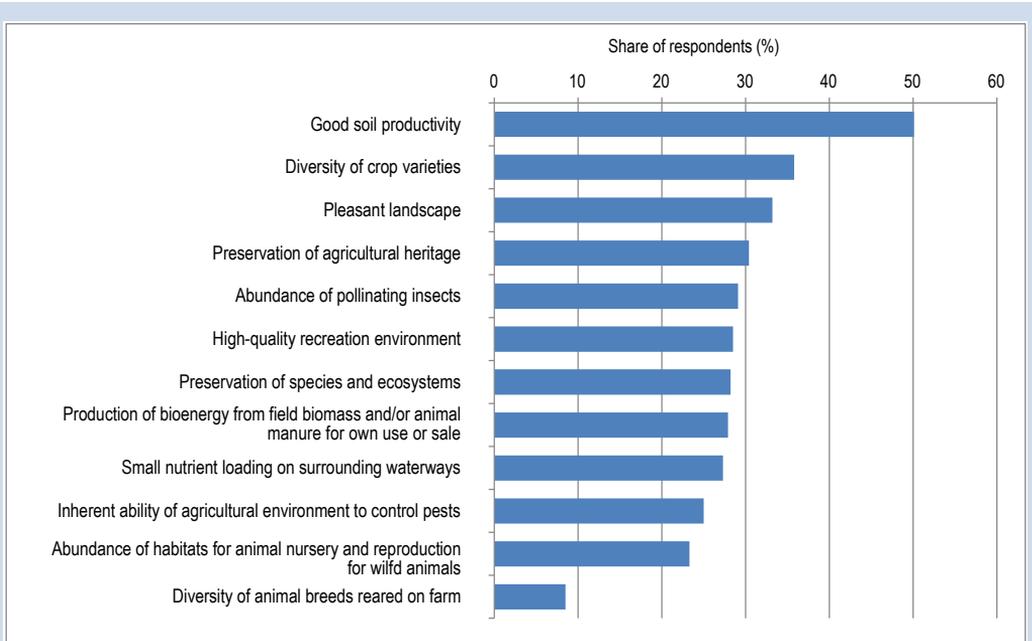
Farmers interested in land productivity

Farmers were inquired on their possibilities to improve the production of ecosystem services on their own farm.

As much as a half of the farmers saw that they had the opportunity to improve the productivity of arable land on their farm. The least opportunities for improvement were seen in increasing habitats for animal nursery and reproduction for wild animals and diversifying animal breeds reared on the farm, on which only less than a third of the farmers would be able to improve.

Considerable share of farmers (82%) were willing to reduce nutrient runoff from their farm for compensation. Also increasing the cultivated area under perennial plants for compensation was popular, as 76% of farmers were willing to do that. The farmers’ willingness to maintain traditional rural biotopes was less popular, but still almost a half of the farmers were also interested in it.

Crop producers and animal husbandry farms did not differ in their willingness to supply landscape-related ecosystem services and traditional rural biotopes. However, the crop producers were more interested in increasing the area under perennial crops and decreasing nutrient runoff to water bodies.



Share of farmers who consider they have opportunity to increase supply of ecosystem services on their farm

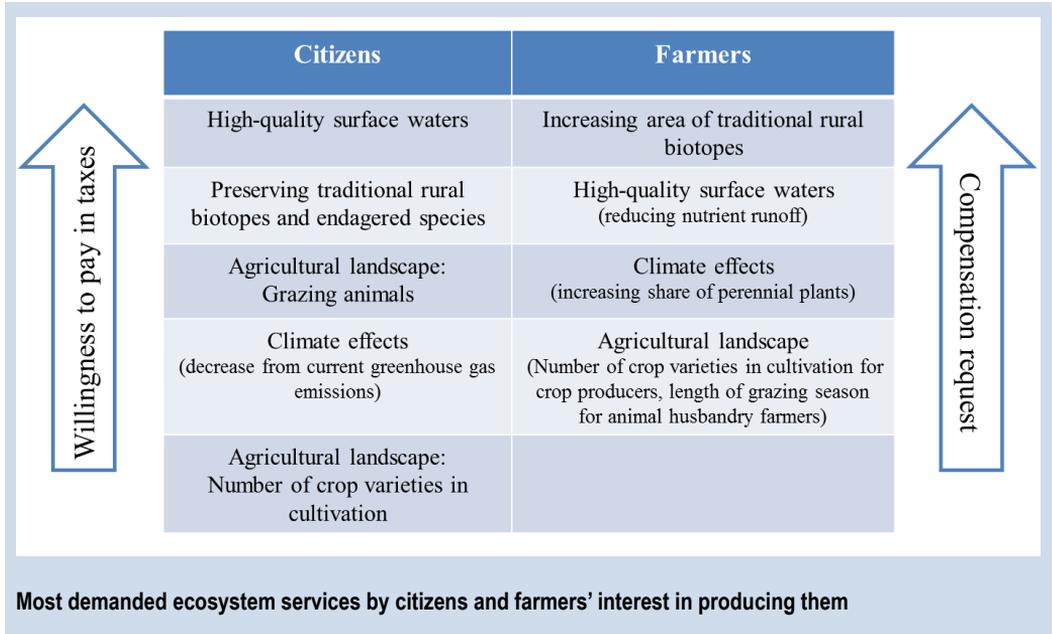
Ecosystem service	Share of farmers
Landscape / Grazing	53 %
Increasing the share of perennial plants from the arable area	76 %
Reducing nutrient runoff	82 %
Increasing area of traditional rural biotopes	46 %

Farmers' willingness to supply ecosystem services for compensation

Do demand for and supply of ecosystem services meet?

Citizens' interest is particularly focused on high water quality and biodiversity, but farmers' compensation request for increasing the production of these ecosystem services was high. Hence, new methods for decreasing the production costs of the above-mentioned ecosystem services should be developed. Citizens' willingness to pay and farmers' compensation request are closest to each other in landscape-related ecosystem services. Based on this, it would be advisable to focus policy measures for example on increasing animal grazing.

Based on the surveys, there exists interest among both farmers and citizens to focus the agri-environmental policy more strongly in producing ecosystem services in agricultural environments. About four out of five citizens are prepared to support environmental programs proven to improve the production of ecosystem services. Thus, it is important that the ecosystem services in all their variety would be considered in decision-making.



2. Agricultural and food markets

2.1. Trends in global markets

The global markets for agricultural products have experienced rapid changes during the last decade. In 2007 and 2008, global market prices increased dramatically, only to drop rapidly after the middle of 2008.

In 2010, the prices of cereals and other agricultural products shot up again in global markets, reaching their peak in early 2012. Following this peak, global cereal prices decreased steadily until 2016.

In 2017 and 2018, the recovered global economy increased demand for cereals and increased their prices. According to the Food Price Index of the Food and Agriculture Organization (FAO), cereal prices increased by 12.5% from the 2016 level in two years. However, prices are still 31% lower than in 2011.

It is estimated that global cereal production will be approximately 2,611 million tonnes during 2018/2019 harvest. This is over 317 million tonnes, or nearly 14%, more than ten years ago.

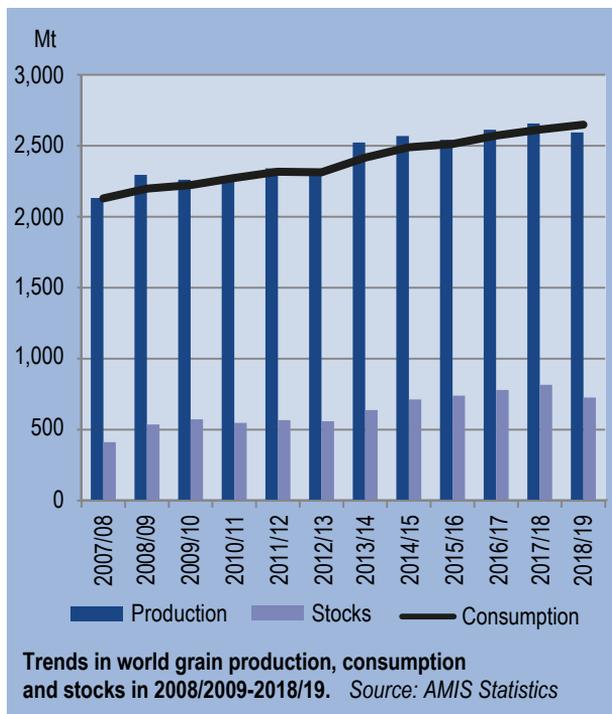
Global cereal trade is estimated to reach 415 million tonnes, comprising more than 15% of global production. Trading volumes have increased by nearly half over the last ten years.

Global wheat production will remain at 728 million tonnes, 4.2% lower than in the previous year, but 8% more than ten years ago. Global feed cereal production will reach 1,383 million tonnes, down by 1.7% from the previous year's record level. In five years, this production has increased by nearly a fifth.

Global wheat trade is expected to decrease by 2.5% to 172 million tonnes, comprising nearly 24% of global wheat production. Instead, feed cereal trade will remain at the previous year's level at approximately 196 million tonnes, accounting for 14% of global production.

Global rice production will reach a new record at 514 million tonnes during the 2018/2019 harvest, 12% higher than ten years ago. Of the total production of rice, some 9%, or 47 million tonnes, enters global trade markets.

Global oil plant production is expected to be 616 million tonnes in the 2018/2019 harvest, up by 4.5% from the previous year. Soy production will increase by 6.7% to 364 million tonnes. Global soy production volumes are 70% higher than ten years ago. Of this production, 42% enter global trade markets.



Global cereal stocks have increased by over 44% in ten years, more than 770 million tonnes during the 2018/2019 harvest. This increase has raised the stocks-to-use ratio to 36% for wheat, over 23% for feed cereals and roughly 15% for soy.

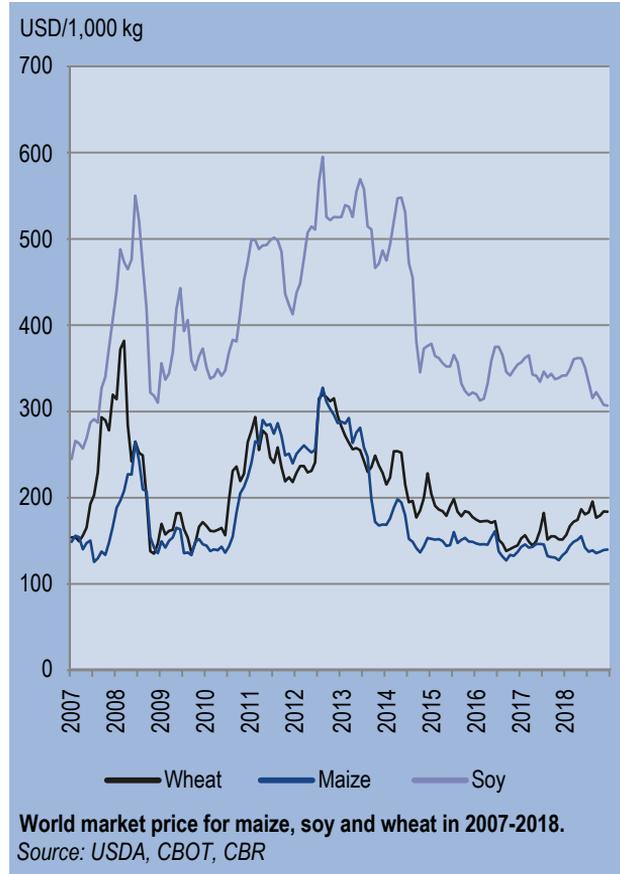
Global sugar production is estimated to increase to more than 185 million tonnes during the 2018/2019 harvest, which is at the previous year's level. Production has increased particularly in Brazil, India and China. Global sugar trade volumes are nearly 58 million tonnes, 31% of global production.

The global market price for sugar started to decrease at the beginning of 2017, following the increase in production. The decrease in the exchange rate of the Brazilian real accelerated this decline. The average price in 2018 was more than 30% lower than in 2016.

Global milk production is estimated to increase to nearly 827 million tonnes in 2018, up by 2% from the previous year. In India, the world's largest milk producer, production increased by more than 4% to nearly 173 million tonnes. The EU countries combined produced 167 million tonnes of milk.

Global milk product trade continues to grow. Population growth and rising income levels are accelerating the consumption of milk products, especially in Asia and Africa. Global trade accounts for some 9% of the global production of milk products.

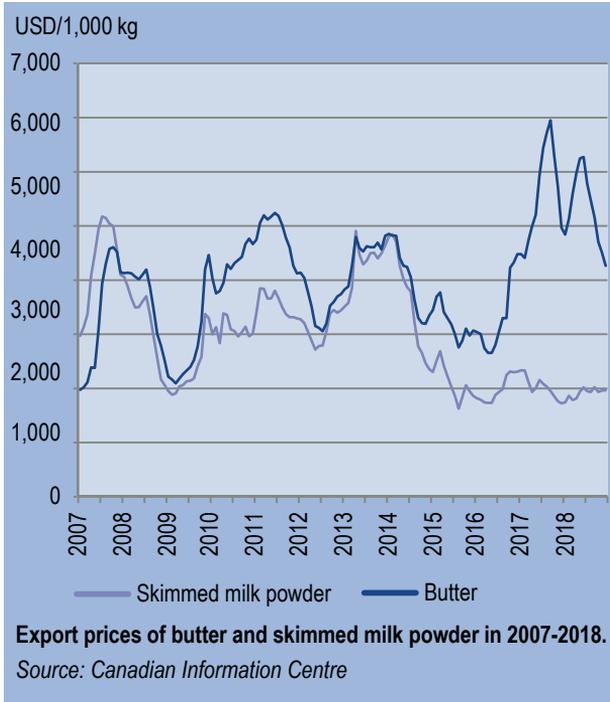
Prices of milk products strengthened at the beginning of 2018 and peaked in May, after which they started to decrease. According to the FAO Food Price Index, the average price in 2018 was 4.5% lower than in the previous year, and over 20%



lower than the record price in 2013. At the end of 2018, global market prices for milk products were decreasing.

The global market price for butter skyrocketed in 2017, and was nearly 70% higher than in 2016. This resulted from the organic boom originating in the USA. Butter replaced margarine in baking and cooking. However, the price for butter decreased in 2018.

Correspondingly, the price for milk powder was historically low in 2015–2018. It seems that global demand is again shifting from protein to fat. However, this is a gradual process, and global demand for milk powder is expected to remain fairly high. Average prices for milk powder were stable, which is a good indication of the generally balanced condition of supply and demand.



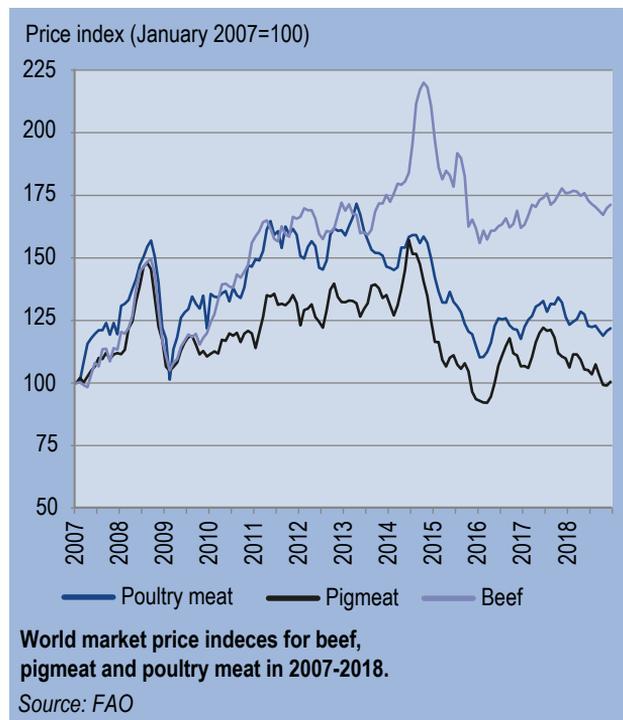
There are significant differences in trading volumes between different types of meat. Global trade accounts for roughly 15% of beef production and less than 11% of poultry meat production. In addition, global trade accounts for 6–7% of pork and lamb production.

According to the FAO Food Price Index, prices of meat products were 2% lower in 2018 than in 2017, and more than 16% lower than in 2014. Considering historical levels, meat prices were unusually high in 2011–2014. At the end of 2014, global market prices for meat began to decline steeply. This decline continued until the beginning of 2016, after which prices rose until early 2018, only to drop again later that year.

Global meat production has increased moderately in recent years. In 2018, total production was 335 million tonnes, showing an increase of 1.5% from the previous year. Despite a likely sharp fall in pig meat output, largely as a result of the African Swine Fever (ASF), especially in China, 2019 global meat production is only expected to drop slightly, as current prospects point to a solid worldwide expansion for poultry meat production and a steady progress in bovine meat output.

Global meat trade volumes were nearly 34 million tonnes in 2018, 10% of global production. In 2019 global meat trade is forecast to hover around 35 million tonnes.

Of the total volume of global meat trade, poultry meat makes up nearly 40%, beef less than 32% and pork over 24%.



Global market of organic food products growing strongly

Jyrki Niemi

It has been estimated that the global sales of organic foods and drinks reached about €90 billion in 2017. The annual growth rate has remained around 10% since 2000. Such a fast growth is something the conventional food sector can only dream of – and the growth potential seems still enormous.

The US – world's largest organic market

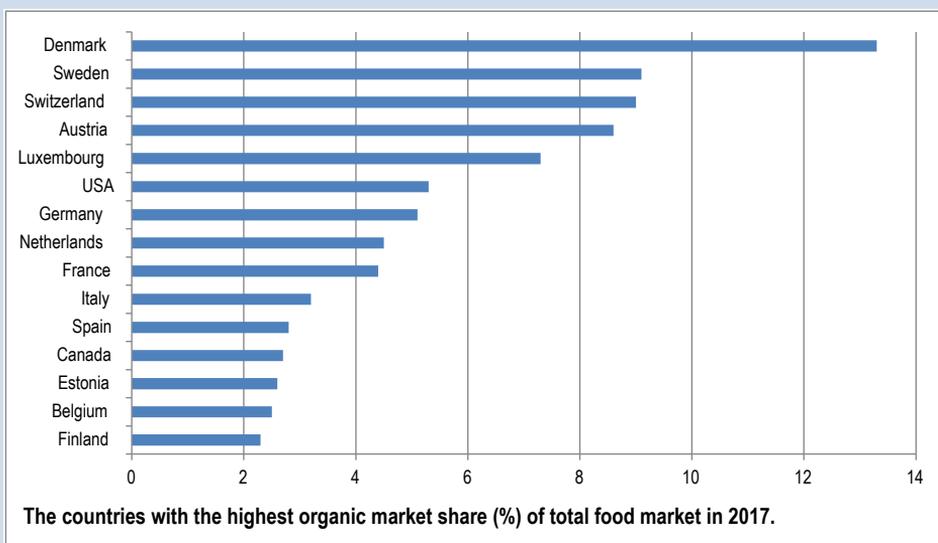
In the USA, organic food products were sold in 2017 for the value of about €42 billion, that is, almost a half (47%) of all global sales of organic foods and drinks. This partly reflects the huge importance of the US on the global food market, but it also reveals that the organic food market has developed and been regulated for a long time.

In the European Union (EU), organic food products were sold for the value of about €34 billion. Six EU member states were among the top 10 largest countries on the organic food market, Germany (€10 billion) and France (€8 billion) being the second and the third, respectively. In Finland sales of organic food products constituted a little over €300 million in 2017.

In Asia, the largest market was China with the sales of €7.6 billion. Along with China, the only remarkably sized Asian organic food markets were Japan (€1 billion) and South Korea (€300 million). It is possible, however, that the official figures may understate the actual size of organic food market in many Asian countries.

Largest market share in Denmark

Measured by organic-product consumption per inhabitant, the largest countries worldwide were Switzerland (€288) and Denmark (€278). Five of the top six countries were Alpine or Scandinavian countries. This is hardly a coincidence, because these



countries are wealthy and their inhabitants' purchasing power is quite high. The organic food consumption of the Finns was only about €50 per capita which is below the average of the EU-28 countries (€60).

The same countries were also high on the list when considering the share of organic foods and drinks of all retail sales of food products. Denmark led with its 13.3% (2017) share of the total sales of foods and drinks. The next were Sweden with the share of 9.1% and Switzerland with the share of 9.0%. Finland was number 15 on the global list with its 2.3% share of sales.

For single products and product groups, the market share of organic food was considerably larger in many countries. For instance in Denmark and France, the market share of organic eggs was about 30% of the total value of egg sales. Organic eggs are, indeed, one of the success stories of organic food sales. Additionally, organic fruit and vegetables are very frequently found in the shopping baskets of European consumers.

Global sales of organic food increasing over 10% annually

The value of organic-product sales has increased in the 2000s considerably faster than the area under organic farming, even though the area has increased very quickly. In 2001, land area registered for organic farming was globally 17 million hectares, and the area increased to almost 70 million hectares in 2017, which constitutes an increase of 312% and on-average annual growth of 8.4%. In the same period, the sales of organic food products have increased even more from €21 billion to €90 billion, meaning a 329-% increase and a 10.2-% annual growth.

In 2017, area under organic farming in the EU countries was the total of 12.1 million hectares which is 7.3% of the cultivated area in the EU and 21% of the area under organic farming in the world. The share of organic production of the arable area in the EU countries was the largest (24%) in Austria. The EU's organic conversion payment and the highly developed organic food and drink industry have sped up the growth in the sector. Furthermore, the Austrian government has actively promoted organic agriculture for many years. In 2017, the area under organic farming in Finland was 260,000 hectares, that is, 11.4% of the Finnish arable area.

Export of organic food products in speedy growth

The international trade of organic products is noteworthy and increasing but still highly specialised compared with conventional products. There are many reasons for this. One of them is that people demand and are ready to pay for freshness of their organic food products. Despite that, it has been estimated that the value of the global export market of organic food is about €14 billion annually. This means that the international trade would cover roughly 15% of the trade of organic food products. Monitoring the international trade is still difficult as there are no globally accepted tariff codes for the organic versions of various products.

The prospects of future growth in the organic food products and agricultural sector seem very promising. If the annual increase rate on the world market will continue to be the current 10%, the total value of the organic market will rise from the present €90 billion to over €200 billion by the year 2025 and to over €300 billion by the year 2030. Considering the increase in the retail sales of organic foods and drinks in the past few years, it is quite possible that these numbers can be reached even earlier.

2.2. Field crop production

The utilised agricultural area in Finland is about 2.3 million hectares, which is 6.8% of the total surface area and 7.5% of the total land area. Compared to the EU average, the share of agricultural area is small in Finland.

In 2018, the cereal area was 0.91 million hectares, producing a yield of 2,732 million kg. This yield was 20% lower than in 2017, although the cereal area was higher. Drought caused the most damage in significant cereal production areas. The average cereal yield in Finland as a whole was only 3,000 kg per hectare, nearly 1,000 kg per hectare lower than in 2017.

In 2018, barley was the most common cereal covering area of 0.41 million hectares. The majority of barley was grown for feed (79%). The barley yield was 1,336 million kg, down by 8% from 2017. Protein content was higher and starch content lower than in previous years.

Demand for Finnish oats is rising. However, the 2018 oat yield was unable to respond to this demand either in quantity or quality. The oat area was 0.29 million hectares, producing a yield of 818 million kg. This volume was 19% lower than in 2017. The average yield in Finland as a whole was only 2,800 kg per hectare, nearly 900 kg per hectare lower than in 2017. Drought also reduced the quality of the oat yield. Of the total oat yield, only 65% exceeded the requirement of 52% used in the quality monitoring programme. This was the lowest figure during the 14-year monitoring period. Oats had high protein content at 13.9%.

Cereals used for making bread were cultivated on 0.19 million hectares in 2018. The area of spring wheat was 167,000 hectares, that of winter wheat 11,000 hectares and that of rye 16,000 hectares. The spring wheat yield was 468 million kg, down by 28% from the previous year. The wet au-

tumn and delayed harvesting period of 2017 significantly reduced the area sown with winter wheat, which in turn reduced harvesting areas in 2018. The winter wheat yield was only 27 million kg, a massive decline of 83% from 2017.

Average wheat yields were very low due to drought. The average winter wheat yield was 2,500 kg per hectare, and the average spring wheat yield was 2,800 kg per hectare. However, the quality of the wheat yield was high. The protein content of spring wheat was very high at 15.5%, whereas that of winter wheat was slightly lower (13.6%). Of the spring wheat yield, 84% fulfilled the quality requirements set for cereals used in breadmaking (hectolitre weight of at least 78 kg, protein content 12.5% and falling number 180). In 2017, only 14% of the wheat yield fulfilled these requirements.

The rye area nearly halved from 2017, and the average rye yield was 2,600 kg per hectare. The total rye yield was 42 million kg, down by 63% from 2017. The quality of rye was good, although the hectolitre weight was lower than in previous years. Of the total yield, 89% exceeded the requirements of the hectolitre weight of at least 71 kg and the falling number of 120. In 2017, the corresponding figure was 42%. The 2018 harvest cannot cover the domestic consumption of rye of approximately 100 million kg.

The total turnip rape and rapeseed area was 53,000 hectares, i.e. slightly lower than in 2017. Winter turnip rape and rapeseed only accounted for 1,500 hectares of this total. In 2018, with a total area of 27,000 hectares, spring rapeseed maintained its position as the most cultivated oil plant, although the area decreased slightly from the previous year. The total turnip rape and rapeseed yield was 71 million kg, 22% lower than in 2017. This was particularly affected by the low average spring rapeseed yield of 1,490 kg

per hectare, which was significantly lower than in 2017. Drought was ruthless in rapeseed cultivation areas in Southern Finland and in coastal regions.

Caraway and pea survived well in the hot and dry conditions in 2018. The total caraway yield was nearly 13 million kg,

up by 7% from the previous year. Average yield was high, at a little over 800 kg per hectare. The total pea yield was 20 million kg, double that of 2017. This mainly resulted from the doubling of the cultivated area. The average pea yield was 2,350 kg per hectare, slightly higher than in 2017.

Areas and yields of the main crops 2017-2018						
Crop	2018			2017		
	Area 1,000 ha	Yield kg/ha	Total million kg	Area 1,000 ha	Yield kg/ha	Total million kg
Wheat	177.8	2,780	494.7	194.3	4,130	802.0
Winter wheat	10.5	2,540	26.8	34.5	4,450	153.3
Spring wheat	167.2	2,800	467.9	159.8	4,060	648.7
Rye	16.4	2,580	42.3	28.9	3,920	113.5
Barley	405.1	3,300	1,336	358.3	4,070	1,460.1
Feed barley	319.2	3,290	1,051.0	284.6	3,990	1,135.3
Malt barley	85.9	3,320	285.0	73.7	4,400	324.8
Oats	288.7	2,830	818.2	269.5	3,760	1,013.9
Mixed crops	15.4	2,520	38.8	10.1	2,850	28.9
Buckwheat	2.1	820	1.7	..	..	..
Grain total	905.5	3,020	2,732	861.2	3,970	3,418.4
Rape and turnip rape	53.3	1,330	70.9	55.2	1,650	91.3
Spring turnip rape	24.5	1,160	28.5	22.5	1,260	28.5
Spring rape	27.3	1,490	40.6	31.1	1,920	59.9
Winter rape and turnip rape	1.5	1,170	1.8	1.6	1,820	2.9
Linseed	0.8	610	0.5	0.4	1,180	0.5
Caraway	15.7	810	12.7	17.8	660	11.8
Potatoes	21.4	28,060	600.3	21.2	28,860	611.9
Sugar beet	9.8	36,270	355.4	11.8	36,550	430.3
Peas	8.6	2,350	20.1	4.2	2,180	9.1
Broad bean	16.1	1,500	24.1	16.1	2,090	33.7
Timothy seed	6.6	310	2.1	5.8	370	2.1
Hay	109.8	2,920	320.1	86.6	3,390	293.3
Silage	570.1	12,730	7,258.9	551.9	12,290	6,783.5
Prewilted	502.9	13,110	6,591.9	478.6	12,620	6,039.5
Fresh	67.2	9,930	667.0	73.3	10,140	744.0
Green fodder	12.2	9,170	111.9	8.9	7,240	64.8
Cereals harvested green	108.2	4,020	435.5	117.1	4,950	579.3

Source: Luke

The broad bean area was 16,000 hectares, the same as in 2017. In 2017, the broad bean yield was 24 million kg, down by 28% from the previous year. The average broad bean yield remained at 1,500 kg per hectare, 600 kg per hectare less than in 2017. The potato area was 21,000 hectares, producing a yield of 600 million kg. This was nearly at the 2017 level.

The sugar beet area was 10,000 hectares, producing a yield of 355 million kg. Buckwheat was a new crop recorded in statistics, and its area was 2,100 hectares.

A significant area of Finnish fields is covered by grass. In 2018, the total cultivation area of silage feed was 0.57 million hectares. The majority of silage feed was harvested pre-dried. The total silage feed yield was 7,260 million kg, up by 7% from 2017. The average yield was 12,700 kg per hectare, slightly higher than in 2017. However, there was high regional variation. Finland’s grasslands regions, which comprised the majority of the total yield, suffered less from drought than southern regions. In addition, the third silage feed harvest improved the situation on some farms.

Market prices for field crops

In 2018, drought reduced yields not only in Finland but in many significant production areas, lowering supply and generating pressure to increase prices. Opening prices in the autumn were higher than in the previous year, and prices were increased many times during the last months of the year. Between August and December, cereal prices increased by EUR 23–55 per tonne – with rye increasing most and oats least. Most of the wheat yield fulfilled the quality requirements set for wheat used in making bread. This narrowed the gap between wheat used in breadmaking and wheat used as feed to approximately EUR 10 per tonne. The price difference between malting barley

and feed barley remained a little higher at roughly EUR 15 per tonne.

In 2018, producer prices for cereals increased significantly from the previous year. The quality-adjusted prices of bread wheat, feed barley and oats were higher in 2018 than in 2017 by some EUR 40 per tonne. The price for rye increased by EUR 15 per tonne, which was significantly less than increases in other cereal prices.

In 2018, the quality-adjusted price for feed barley was EUR 171 per tonne, up by 32% from 2017. The corresponding price for oats was EUR 178 per tonne, 30% higher than in 2017. In addition, the price for bread wheat was EUR 200 per tonne, i.e. 26% more than in 2017. The price for rye increased to EUR 177 per tonne, up by 9% from the previous year.

Cereal market prices in Finland 2009-2018, €/1,000 kg

	Rye	Wheat	Feed barley	Oats
2018	177	200	171	178
2017	162	159	129	137
2016	169	151	124	130
2015	189	169	136	135
2014	196	170	132	125
2013	218	204	174	169
2012	214	203	187	186
2011	187	197	162	166
2010	160	147	113	116
2009	134	132	94	86

Source: Luke

Cereal market prices (2017) in selected EU countries, €/1,000 kg

	Rye	Wheat	Feed barley	Oats
Finland	162	159	129	137
Sweden	128	139	119	108
Estonia	124	155	136	107
Denmark	139	153	148	131

Source: Eurostat

The low turnip rape and rapeseed yields in Finland were not reflected in producer prices, and no price increases as in other cereals were seen in the autumn. The quality-adjusted price remained at EUR 356 per tonne, down by EUR 34 per tonne, or 9%, from 2017. This reduced the relative profitability of oil plants compared with cereals. In 2018, the producer price for potatoes was EUR 186 per tonne, close to the 2017 level (EUR 180 per tonne).

2.3. Horticultural production

In Finland, horticulture is considered to comprise outdoor vegetable production, the production of cultivated apples and berries, nursery production and greenhouses. In some cases, the cultivation of mushrooms and potato production under cover are also included in horticultural production.

Cultivation areas and horticultural enterprises

The total outdoor cultivation area for vegetables, berries and fruit was approximately 19,131 hectares in 2018, showing a slight decrease from the previous year. The production area of outdoor vegetables decreased, while the total area of berries increased by 350 hectares from the previous year. In 2018, the greenhouse production area was nearly 400 hectares, of which vegetables accounted for 48 hectares.

In 2018, there were 3,407 horticultural enterprises in Finland. Of these, 2,708 farms were engaged in outdoor vegetable production, and 999 farms in greenhouse production. Some farms were engaged in both outdoor vegetable and greenhouse production. In 2018, the average outdoor vegetable production area was 7.1 hectares per enterprise, and the average greenhouse area was 3,900 m² per enterprise. The average size of both outdoor

Areas under the most important horticultural products grown in the open and yields in 2018.

	Area ha	Yield kg/ha	Total 1,000 kg
Vegetables grown in the open			
Garden pea	4,717	1,334	6,292
Carrot	1,833	36,347	66,624
Onion	1,254	18,502	23,201
White cabbage	542	35,351	19,160
Cauliflower	317	6,946	2,202
Beetroot	464	25,996	12,062
Swede	359	29,780	10,691
Gherkin	147	62,177	9,140
Chinese cabbage	114	16,070	1,832
Other plants	1,567	7,743	12,133
Total	11,314	14,437	163,337
- share of contract production	2,165	22,357	48,403
Berries and apples ¹⁾			
Strawberry	4,155	3,690	15,333
Black and green currant	1,527	648	990
Raspberries and raspberry-arctic bramble cross bred	296	3,206	949
Other berries	723	959	693
Total	6,701	2,681	17,965
- share of contract production	1,018	1,848	1,881
Apple	673	10,692	7,196
¹⁾ total area			
Source: Luke, Horticultural Statistics.			

vegetable and greenhouse production enterprises has continued to increase.

Satakunta and Southwest Finland are significant regions for outdoor vegetable production, and Northern Savonia is an important berry-producing region. The main regions for apple production are the Åland Islands, Southwest Finland and Western Uusimaa. Vegetable production in greenhouses is concentrated in Ostrobothnia, especially in the Närpes region.

Weather conditions

Weather conditions in the winter of 2017–2018 were favourable to berries, and no winter damage was identified in the spring. Protective snow cover was almost non-existent in Southern Finland. However, there were no extreme cold periods that would have damaged crops. As a result, there was no significant damage during the winter. In northern parts of Finland, berries were protected under snow.

During the 2018 growing season, the weather was mainly hot and dry. Outdoor vegetables, in particular, suffered from the hot and dry weather in many places. Farms using irrigation were able to replace the low precipitation by means of irrigation, and the quality and quantity of their yields were nearly normal. In Finland as a whole, the total yield of outdoor vegetables was lower than in the previous year, although the quality of the yield was high.

For perennial horticultural crops, berries and apples, the hot and dry summer had no adverse impact on yields, and total yields were normal. The quality was also high, as hot and dry weather improves the internal and external quality of berries and apples. Some strawberry and apple farms also use irrigation to reduce the impact of drought.

Outdoor production

In 2018, garden pea was by far the most common outdoor vegetable in terms of area. Garden peas are sold with their pods and as frozen products. The pea area was 3,660 hectares. Measured by yield, carrot was the most important vegetable, with a production volume of nearly 73 million kg. Other significant vegetables were onion (1,120 hectares) and cabbage (540 hectares). Outdoor vegetables were cultivated under production agreements on 2,160 hectares. The main vegetables cultivated for the processing industry were garden pea, carrot and beetroot.

Strawberry was clearly the most important berry, both in terms of area and total yield. In 2018, the strawberry area was 4,160 hectares and its total yield was over 15 million kg. Other important berries were black- and greencurrant (1,530 hectares), as well as raspberry and a hybrid between the raspberry and the Arctic bramble (under 400 hectares).

Berries were cultivated under production agreements on less than 1,020 hectares. Blackcurrant was by far the most significant berry cultivated under production agreements, representing more than 50% of the contractual production area. It was followed by strawberry, which made up 30%. In 2018, the fruit cultivation area was 680 hectares, of which apple accounted for 630 hectares.

Greenhouse production

Greenhouse vegetables were cultivated on 248 hectares, and ornamental plants on 120 hectares in 2018. The total output of greenhouse vegetables was 90 million kg. In weight, cucumber was the most important greenhouse vegetable, with a production volume of 45 million kg. Measured by area, tomato was the most significant greenhouse vegetable, with an area of 101 hectares. The tomato production volume was 39 million kg, of which special tomato varieties made up 5.2 million kg.

In 2018, potted vegetables were cultivated on 36 hectares. Most of the produc-

Areas under greenhouse vegetables (m²) and yield (kg/m²) in 2018

	Area 1,000 m ²	Yield kg/m ²	Total 1,000 kg
Total ¹⁾	2,162	41	89,547
Tomato	967	41	39,315
Cucumber	524	87	45,459
Other vegetables	671	7	4,773

¹⁾ Does not include potted vegetables.
Source: Luke, Horticultural Statistics.

tion area of potted vegetables is cultivated around the year. Lettuce was the most important potted vegetable, with an area of 27 hectares. A total of 116 million potted vegetables were produced.

In 2018, some 8 million flowering potted plants were produced. The most important flowering potted plants were potted daffodil (3.4 million), poinsettia (1.6 million) and winter-flowering begonia (1.3 million). The production of bulbous flowers continued to decrease slightly, with the total volume at 77 million. Tulip was clearly the most important bulbous flower (71 million).

The production of bedding plants amounted to 33 million, with violet the most important in production volume (9 million).

Organic horticultural production

The number of organic outdoor vegetable farms increased slightly from the previous year to 180 farms in 2018. The total organic outdoor vegetable yield was 4.5 million kg. Measured by yield, carrot was the most important organic vegetable (2.9 million kg).

The number of organic greenhouse enterprises decreased slightly, while the production area increased notably. The

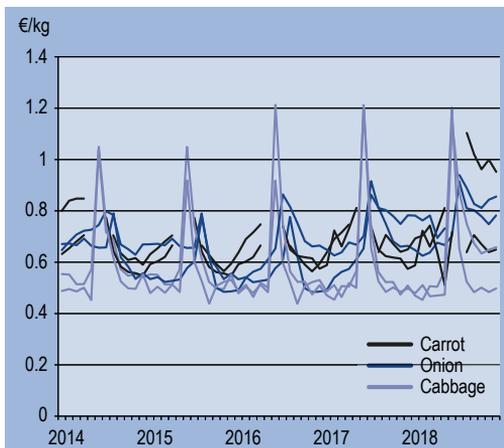
number of organic berry producers increased slightly from the previous year to 265 enterprises. In addition, the production area of organic berries increased to 680 hectares. Strawberry was the most significant organic berry, both in terms of area (195 hectares) and yield (353,000 kg).

Horticultural product markets

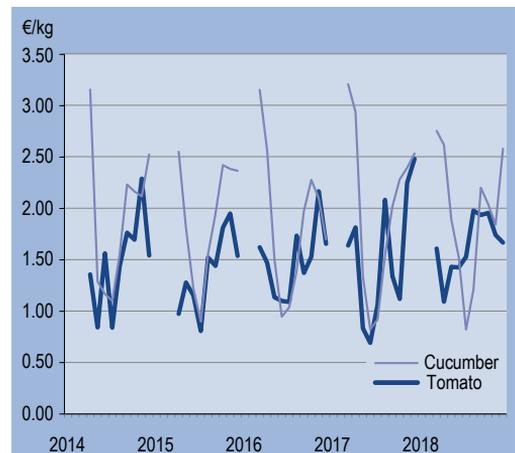
Strong seasonal and annual variation is typical of producer prices and production volumes of outdoor horticultural products. Producer prices are usually low during the main harvest season, when the supply is high. The supply of stored products decreases during the storage period, which is usually reflected in higher prices.

The 2018 growing season was very hot and dry, due to which the supply of outdoor vegetables was very low throughout the season, which in turn kept product prices high. In 2018, the average price for onion, carrot and cabbage, for example was much higher than in the previous year. Stock levels of some vegetables were lower than normal. As a result, prices were unusually high at the beginning of the storage period.

Prices for greenhouse vegetables do not follow weather conditions as closely



Producer prices for certain vegetables grown in the open from 2014 to 2018, €/kg
Source: Kasvistiето Ltd.



Producer prices for greenhouse cucumbers and tomatoes from 2014 to 2018, €/kg.
Source: Kasvistiето Ltd.

as those for outdoor vegetables. Typically, the prices for greenhouse vegetables, cucumber and tomato in particular, drop in June and July, when crops produced using natural light enjoy their main harvest season. During most years, cucumber and tomato markets become congested, resulting in a significant price decrease during the summer.

However, in 2018, the price for cucumber remained higher than in previous years during the summer peak as well, and there were no significant decreases. The average price for cucumber in 2018 was higher than in previous years. The average price for tomato in 2018 also followed this trend, although its price fell to

very low levels in the middle of the summer. The higher average price for tomato is also explained by the increase in special tomato varieties. Their average price was much higher than that for round tomato.

Calculation of returns

The calculation of horticultural returns comprises the value of crops produced at market prices and calculated subsidies paid for the horticultural production area and products in storage.

In 2018, horticultural returns at market prices totalled EUR 648.6 million, a new record. The record returns were based on the good berry harvest, despite the drought, the reasonably high outdoor

Return calculation of horticulture at current prices, € million.										
PRODUCTION IN THE OPEN	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Vegetables	102.2	106.9	130.8	109.9	136.7	148.5	131.4	146.1	141.5	162.7
Berries and fruits	54.2	48.1	66.1	66.9	64.9	74.9	81.9	99.0	105.4	119.9
Nursery production	32.1	34.1	34.1	27.1	28.4	28.4	28.4	20.3	20.1	19.3
Total	188.5	189.1	231.0	203.9	229.9	251.7	241.7	265.4	267.0	302.0
GREENHOUSE PRODUCTION										
Ornamental plants	97.5	88.1	82.8	80.8	79.6	79.7	74.5	77.5	78.1	72.8
Vegetables	150.4	151.9	183.7	160.0	196.2	191.5	180.5	183.8	185.0	226.4
Total	247.8	240.0	266.5	240.8	275.8	271.3	254.9	261.3	263.1	299.2
Return at producer price, total	436.3	429.0	497.4	444.7	505.7	523.0	496.6	526.7	530.1	601.2
SUPPORT PAYMENTS										
Support for greenhouses	36.5	36.5	35.6	32.9	29.9	29.6	28.7	27.6	26.7	25.7
Storage aid for horticulture products	2.1	2.1	2.0	2.1	2.4	2.5	1.6	1.7	1.7	1.9
Agri-environment payment*	9.0	9.1	9.3	8.9	8.8	9.0	8.9	9.7	9.7	11.7
Basic payment**	3.2	3.3	3.4	3.3	3.2	3.3	1.1	1.1	1.1	2.3
LFA support	2.8	2.9	2.9	2.8	2.8	2.8	3.6	3.9	3.9	4.2
Other support***	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.3	1.0	1.6
Total	54.5	54.8	54.1	50.9	48.0	48.1	44.9	45.3	44.1	47.4
RETURN OF HORTICULTURE, TOTAL	490.8	483.8	551.5	495.6	553.7	571.1	541.5	572.0	574.2	648.6
*environmental support until 2014, **single payment until 2014, ***organic production and crop premium Sources: Luke; Finnish Food Authority; Kasvistiето Ltd; Finnish Glasshouse Growers' Association; Finnish Nursery Growers's Association										

Produce prices for the most important horticultural products in 2010-2018, €/kg.									
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Greenhouse production									
Tomato	1.58	1.50	1.74	1.77	1.69	1.68	1.69	1.72	1.85
Cucumber	1.27	1.26	1.40	1.49	1.38	1.33	1.46	1.35	1.65
Production in the open									
White cabbage	0.49	0.48	0.52	0.65	0.62	0.54	0.60	0.57	0.70
Onion	0.56	0.57	0.56	0.69	0.65	0.56	0.63	0.72	0.82
Carrot	0.49	0.56	0.64	0.72	0.62	0.61	0.65	0.69	0.88
Strawberry	3.24	3.58	3.49	3.56	4.43	4.32	4.94	5.72	6.06
Apple	1.48	1.59	1.57	1.66	1.60	1.64	1.47	1.64	1.48

Source: Kasvistieto Ltd.

vegetable yield, the increase in the total production volume of greenhouse vegetables and the prices for horticultural products remaining high throughout the year.

In 2018, more subsidies were paid for horticultural production than in previous years due to the increase in the total outdoor production area eligible for subsidies. Instead, subsidies paid for greenhouse production continued to decrease in line with national support conditions.

2.4. Livestock production

Milk

The amount of milk delivered to dairies in 2018 totalled 2,285 million litres, 12 million litres less than in 2017. Organic milk accounted for approximately 69 million litres of total production, up by 10% from 2017. The production of organic milk has more than doubled during this decade. Kantar TNS Agri has forecast that the milk output will be 2,260 million litres in 2019.

The average milk yield of dairy cows increased by 1.4% to 8,650 litres per cow. The fat content of dairy milk was 4.34%, and its protein content was 3.5%.

The number of milk producers decreased by 8% during 2018. At the end of the year, milk was produced on 6,250

farms, 145 of which were organic. The number of dairy farms has decreased in five years by roughly 29% (2,575 farms), while the amount of milk delivered to dairies has increased by 3%. Farms which exited the dairy farming, were mostly small holdings of fewer than 20 dairy cows.

The average number of dairy cows per farm increased by 2.2 cows from the previous year. Although just under a quarter of all farms had at least 50 cows (1,703 farms), 55% of all cows were on these farms. Altogether 453 farms had more than 100 dairy cows.

In December 2018, the total number of dairy cows was 263,600, up by 7,000 from the previous year. In addition, there were 140,400 heifers (-2.3%) on the farms. The number of calves less than one-year-old was 295,757, down by 1% from 2017.

In 2018, the volume of packed liquid milk was 600 million litres, showing a decrease of 3.6% from the previous year. About 57% of manufactured milk was low-fat milk and 30% was skimmed milk. The production of skimmed milk decreased by 8%. The production volume of sour milk was 46.5 million litres (-4%), that of cream 46.2 million litres (+1%), that of yoghurt 107 million kg (+1%) and of cheese was 87.5 million kg (+1%). Of all

cheese, 72% were ripened. Butter manufacturing decreased by 4% to 50.2 million kg. Pudding was produced four times more than in 2017.

In 2018, total consumption of liquid milk was 584.7 million kg, down by 4.3% from the previous year. The consumption of cheese totalled 142.4 million kg (-0.3%), of which fresh cheese accounted for a third and ripened cheese two-thirds. The growth rate of cheese consumption seems to have slowed down over the last couple of years. The consumption of yoghurt was 111.3 million kg (+0.9%), and that of butter was 19.2 million kg (+3.4%).

A significant part of the fat contained in milk produced in Finland is used to manufacture export products. In 2018, more than 60% of all butter produced was exported. Instead, protein fractions in milk are used in Finland. In certain product groups, such as cheese, a significant part of dairy products is of foreign origin.

Cheese is an important product for the dairy sector. In 2018, roughly 60% of raw milk was used to manufacture cheese.

The consumption of imported cheese increased by an average of 2–3% per annum in the early 2000s. However, since

2013, the share of imported cheese in consumption has been fairly stable, roughly 50% of total cheese consumption. The consumption of fresh cheese has increased at the expense of ripened cheese. In 2018, the volume of imported cheese was 70.4 million kg (+1.1%). At the same time, the volume of exported cheese was 15.3 million kg, 19% more than in the previous year. Imports of yoghurt decreased by 2% to 31.5 million kg, and exports decreased by 3.2% to 27.1 million kg. Exports of butter and butterfat decreased by 11% to 30.6 million kg. In contrast, butter stocks nearly doubled during the year.

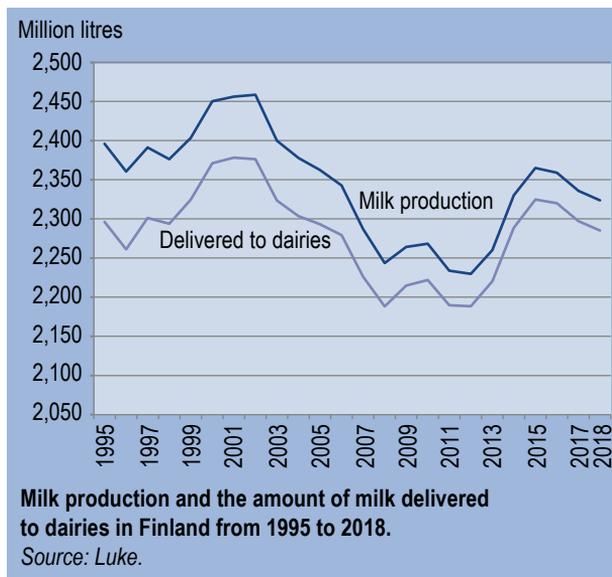
Beef

In 2018, meat production in Finland, including all farm animal species, totalled 393 million kg. Total consumption of meat was 432 million kg. The self-sufficiency ratio was therefore 91%, lower than in the previous year.

In 2018, beef production totalled 86.5 million kg (+1.3%). Kantar TNS Agri has forecast that production will remain at the same level in 2019. The number of cattle slaughtered was 274,700. The average slaughter weight of bulls was 358 kg, that of cows 288 kg and that of heifers 252 kg. Of all slaughtered cattle, 51% were bulls, 29% cows and 19% heifers.

Beef consumption totalled 107 million kg, of which imported beef accounted for a quarter. According to Kantar TNS Agri's forecast, beef consumption will be 104.8 million kg in 2019.

The number of farms specialising in beef production was more than 3,000. In addition, dairy farms also rear cattle for beef production. According to Luke's statistics, suckler cows were kept on 2,160 farms, and bulls of more than two-years-



old on 2,545 farms. Some farms rear both suckler cows and beef cattle. The number of suckler cows has more than doubled during the 2000s. In 2018, there were 60,000 suckler cows and 103,400 bulls.

In 2018, a total of 27 million kg (+5%) of beef was imported to Finland, and 4.5 million kg (+23%) of beef was exported. The main countries of origin for imported beef included Poland, Denmark, Germany, Sweden and the Netherlands. Altogether these account for more than four-fifths of the total import quantity. Beef is exported especially to Sweden, where some Finnish enterprises are operating, and to Denmark and Germany.

Pork

In 2018, around 1.83 million pigs (-8%) were slaughtered in Finland. Pork production totalled 168.9 million kg, roughly 7% less than in 2017. Total pork consumption was 177 million kg (-4%). According to Kantar TNS Agri’s forecast, pork production will decrease to 165 million kg in 2019.

In 2018, pigs were kept on approximately 1,000 farms, while the corresponding figure in 2017 was 1,080 farms. The number of pig farms has decreased by 7–10% per annum in recent years. Only the number of larger farms has increased, and these account for the majority of total production. For example, 54% of pigs were kept on pig farms with more than 1,000 pigs, although these only made up 16% of all farms.

In 2018, the average slaughter weight of pigs was 90.7 kg (+0.8%). Average slaughter weight has increased by nearly 5 kg since 2009.

In 2018, pork exports decreased by roughly a third to 21.9 million kg, while imports in-

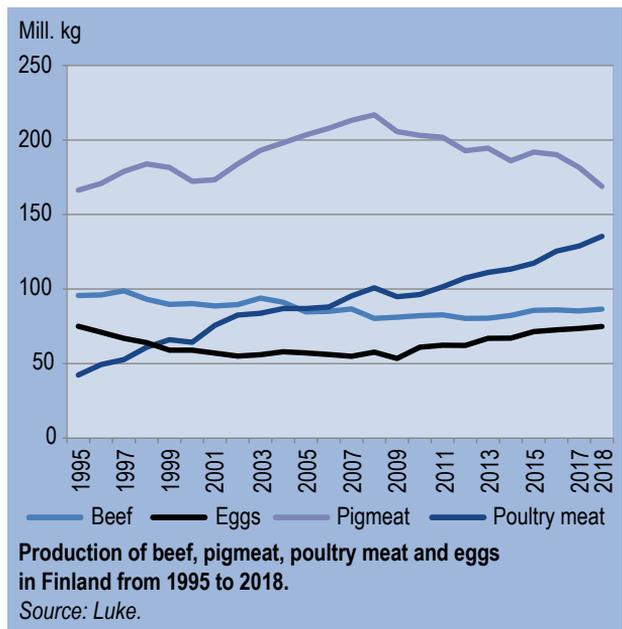
creased by 3% to 33.6 million kg. Imports accounted for 19% of total consumption. Pork imports and production decreased significantly for the second successive year.

Finland has typically exported carcass meat; however, the proportion of meat pieces of total exports has increased in recent years. Pork was mainly exported to Estonia, Sweden, New Zealand, South Korea and Poland. Pork exports from Finland to China continued in 2018. According to Finnish Customs statistics, the value of carcasses exported to China was roughly EUR 7 million.

Pork was mostly imported from Germany, Denmark and Poland, while exports from Spain decreased. Pork products were mainly imported from Germany, Sweden and Estonia. Germany makes up more than half total pork imports.

Poultry meat

In 2018, poultry meat production in Finland totalled 135.3 million kg, the highest quantity ever. Broiler meat accounted



for 93% of all poultry meat production. The production of broiler meat was 126 million kg (+5.3%), and that of turkey meat 8 million kg (+1.5%) in 2018.

The consumption of broiler meat was 130 million kg (+4.4%) and that of turkey meat was 10.7 million kg (+8.3%). Poultry meat consumption has increased substantially, and it is expected to continue its increase. In poultry meat production, the market outlook for broiler meat is more growth-driven than that for other production sectors.

According to Kantar TNS Agri, the production and consumption of broiler meat will increase to 136 million kg in 2019. Correspondingly, the consumption of turkey meat will increase to 11 million kg, and its production to 8.5 million kg.

Broilers were kept on 171 farms and turkeys on 54 farms in 2018. The number of broilers slaughtered was roughly 76 million, and their average slaughter weight was 1.7 kg. A total of 859,000 turkeys was slaughtered, at an average slaughter weight of 9.5 kg.

In 2018, some 22 million kg of poultry meat (-1%) were imported to Finland. Imported meat accounted for nearly 16% of total consumption. Broiler meat was mainly imported as products or boneless pieces. In contrast, turkey meat was imported as boneless pieces meat.

Broiler meat was mostly imported from Thailand, Germany, Sweden and Lithuania. Turkey meat imports focused on Poland and Germany, major producers of turkey meat in Europe, and Estonia. Mainly boneless pieces were imported.

In 2018, 16 million kg of poultry meat (-5%) were exported from Finland. Poultry meat exports mainly consisted of wings and different pieces with or without bones. Poultry meat was mostly exported to Estonia.

Eggs

In 2018, egg production totalled 75 million kg, up by 1.8% from the previous year.

In total, 58% of class A eggs were produced in enriched battery cages, 33% in barn henhouses, 2% in free-range henhouses and 7% at organic henhouses. The number of eggs produced in enriched cages decreased by 0.6%, while egg production in barn and free-range henhouses increased by 3.6%, and in organic henhouses by 20.4%.

In Finland, egg consumption has increased fairly steadily for the last ten years, amounting to 12 kg per person in 2017. In 2018, the consumption of eggs in shells totalled 68 million kg in Finland, up by 2 million kg from the previous year. Egg imports decreased by 5%. Imported eggs comprised a small percentage of total egg consumption.

Egg exports totalled 12 million kg. Eggs were mainly exported in shells. These accounted for 9.7 million kg of total exports. The amount of exported eggs in shells increased by 18%. In 2018, eggs were mainly exported to Germany,

Livestock production in Finland from 2007 to 2018.

	Dairy milk	Beef	Pig meat	Eggs	Poultry meat
	million litres	million kg	million kg	million kg	million kg
2018	2,285	86	169	75	135
2017	2,297	85	182	74	129
2016	2,320	86	190	73	125
2015	2,325	86	192	71	117
2013	2,220	80	194	67	111
2012	2,188	80	193	62	107
2011	2,190	82	202	62	102
2010	2,222	82	203	62	96
2009	2,215	81	206	54	95
2008	2,188	80	217	58	101
2007	2,226	87	213	55	95

Source: Luke.

Denmark and Sweden. Altogether, these made up roughly 80% of total egg exports. Instead, exports of egg products only increased slightly.

In the spring of 2018, the number of egg-laying hens was 3.98 million (+6%). The number of chicks increased by 19% to 607,000 from 2017. In Finland, there is a relatively high number of small-scale laying hen farms. Although some 1,000 farms had egg-laying hens, 86% of all chickens were kept in farms of more than 10,000 laying hens, despite the fact that there were only 133 such farms. Two-thirds of farms had fewer than 50 chickens.

Insects

Consumers and enterprises have shown increasing interest in insect farming and edible insects. Insects offer a new source of protein for use as food and feed. Finland acknowledged insects as food products in the autumn of 2017. There are currently more than 50 insect farmers in Finland.

Producer prices

Market prices for livestock products in the EU influence corresponding prices in Finland. However, Finnish prices have certain special characteristics. For example, market prices show less variation in Finland than in many other EU countries. The producer price for eggs has been low compared with other EU countries. Finnish milk producers have typically received a higher average price than other producers in the EU, and seasonal variation in milk prices is also greater in Finland than in many other countries.

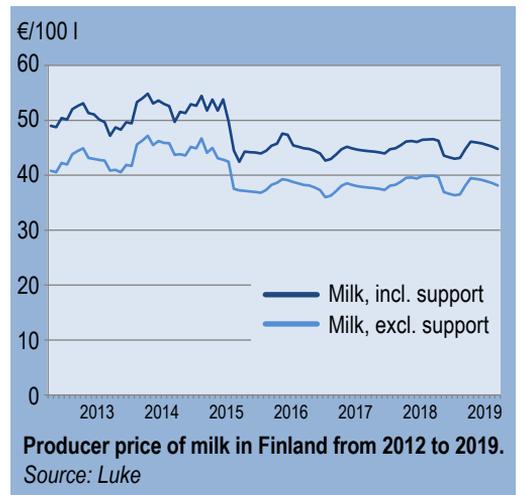
The price for products included in the EU price comparison was higher in Finland than the average price in the EU in 2018. Producer prices for pork and milk decreased slightly from the previous year in the EU, while they increased a little in Finland. The price for chicken meat increased slightly in the EU. In contrast, the

price for beef (R3) decreased by 6% in the EU during the year.

In 2018, the average price paid for milk, taking all price premiums and discounts into account, but excluding retroactive payments and production subsidies, was 38.48 cents per litre (+0.4%). However, the price for regular class E milk was 2% lower than in the previous year. The final price for milk is determined when dairies release their financial statements, and the retroactive payments based on earnings are decided.

In 2018, the price paid for bull meat to producers was EUR 3.50 per kg on average (+3%). The average price for all beef varieties was EUR 3.12 per kg (+5%). The price paid for heifer meat was EUR 3.18 per kg, and that paid for cow meat was EUR 2.22 per kg.

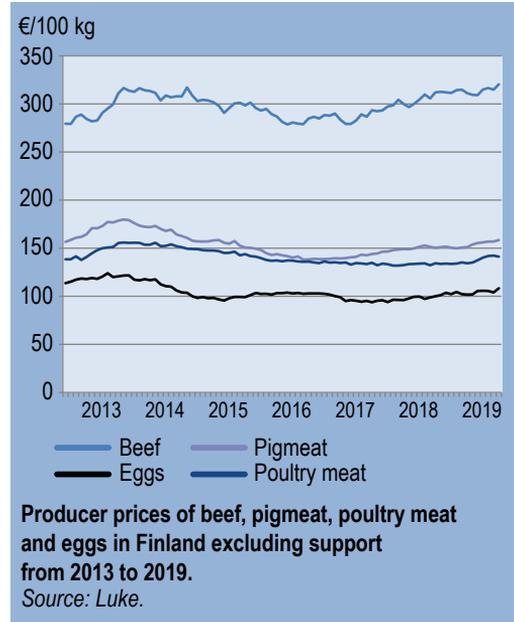
The average price paid for pigmeat was EUR 1.52 per kg (+3%) in 2018. In turn, the average price for fattening pigs was three cents higher than in year 2017. In the EU price monitoring the price for weaner pigs increased by 6% from the previous year. In 2017, the average price paid for weaner pigs (30 kg) was EUR 58.53. The decrease in pork production is expected to slightly increase pork prices in Finland.



The global market situation is influenced by the extensive African swine fever virus epidemic which broke out in Asia in the autumn of 2018. For instance, according to statistics, China is a major producer of pigmeat in the world and the number of pigs decreased by as much as 16% in China in one year.

In 2018, the average price paid for poultry meat was EUR 1.36 per kg (+2%). The average price for chicken meat was EUR 1.32 per kg in 2018. According to the EU price statistics, Finnish producer prices developed more positively in the average price in Europe. However, the monitored product (whole chicken, wholesale price) is not very representative of the Finnish chicken market.

In 2018, the average price paid for eggs was EUR 1.03 per kg, up by 6.6% from the previous year. However, the price for eggs produced in barn henhouses only increased by 1.6%, and that for organic eggs by 1.4%. In 2018, the price paid for eggs produced in cages was 20



cents per kg lower, and that paid for organic eggs was roughly EUR 1.57 per kg higher than the price paid for class A eggs on average.

The producer prices of the most important livestock products in Finland from 2007 to 2018 (€/100 kg, milk €/100 l).

	Milk ¹	Beef	Pigmeat	Poultry meat	Eggs
2018	39.01	312	152	136	103
2017	38.84	298	148	133	96
2016	38.19	284	140	135	100
2015	38.72	290	146	139	102
2014	45.60	303	158	148	100
2013	47.27	310	174	154	117
2012	46.26	281	163	142	116
2011	43.90	253	146	131	96
2010	40.59	240	137	120	88
2009	40.11	247	141	124	87
2008	44.79	241	144	129	92
2007	39.05	221	132	114	77

¹⁾ The milk producer price comprises the average price of milk which includes the quality of portion and other premiums but not production subsidies or quota payments.

Source: Luke

Competitiveness of meat chain in Baltic Sea Region

Csaba Jansik

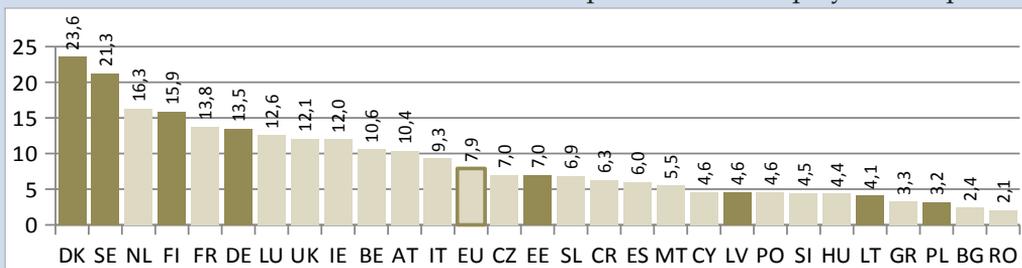
Competitiveness is a complex concept and there is no full consensus on its definition or its assessment methods. In the food chain, it often refers to various indicators of physical productivity. A more productive unit is considered more competitive as it can provide more outputs by the same amount of inputs or the same amount of outputs using less inputs. Economic competitiveness can also be defined by productivity indicators, in this case, the inputs and outputs are measured in monetary terms.

Luke just completed a three-year project which compared the competitiveness of the meat chain of eight EU Member States around the Baltic Sea. The productivity of meat producing farms has a direct link to the costs of the main inputs, such as feed raw materials and labour force, as well as to farm size and applied technology.

Competitiveness of meat producing farms - importance of size and cost management

Farm structure varies by production sector. Farms producing beef are typically small in the Baltic Sea Region, and there are only some big producers. Instead, there are great differences in the structure of pig farms between countries. E.g. in the mid-2010s, more than 98% of Danish sows were on farms of over 200 sows, when the equivalent share in Sweden was 85%, in Finland 62%, in Germany 49%, and in Poland 19%. Similar major differences are found between countries in the structure of farms rearing fattening pigs. Due to economies of scale, it is easier to achieve a lower unit cost level on larger farms. In poultry production, differences in the farm structure are smaller. Especially, the size of broiler houses is quite the same throughout the Baltic Sea Region. There are no major differences between the efficiency rates of one broiler house. The question is mainly about the average number of rearing houses on the broiler farms of different countries as differences in farm size can affect the economic competitiveness and profitability of broiler farms.

The bigger the meat producing farm is, the more likely it has to have external workforce. Labour costs are one of the most important factors affecting competitiveness. In the Baltic countries and Poland, wages are significantly lower than in the west and the north of the Baltic Sea Region. To defeat this cost disadvantage, German and Nordic farms hire labour force from the EU's easternmost Member States or even from the EU's eastern neighbours. The internationality of personnel is very common on large German and Nordic livestock farms where the input of several employees is required.



Hourly salary in EU member states' agriculture in 2017

Source: FADN dataset

In addition to farm structure and labour costs, the competitiveness of farms is also affected by the prices of feeds, energy and other variable items as well as investment costs of buildings and machinery. The latter ones incur extra costs for Finnish farms because of the climate and numerous regulations and strict production standards.

Industrial competitiveness – differences between slaughtering and meat processing

The next segment in the meat chain is slaughtering. Its competitiveness is almost exclusively determined by productivity, while productivity is determined by the size class and cost-effectiveness of the slaughterhouse. Slaughtering is highly-standardised, high-volume and low-margin basic operation in which size and economies of scale have a direct impact on competitiveness. Despite this, the use of labour is still significant, particularly in meat cutting, even in the state-of-the-art units. Thus, wages affect profitability greatly. Poland and the Baltic countries enjoy the benefits of cheap labour in slaughtering, whereas German slaughterhouses use thousands of East-European workers. Even though slaughterhouses in the Nordic countries also employ foreigners, Germany's slacker trade union practices and its closeness to Central and East Europe enable more efficient use of the benefits of cheaper labour.

The competitiveness of slaughterhouses is also affected by the concentration of market structure and utilisation rate of capacity. Where there are more small and medium-sized slaughterhouses or low utilisation rate, it is evident that the unit costs remain high. As a result of strong merger development and shake-out of medium-sized companies, Germany and Denmark have very large and powerful slaughterhouses. Poland still has a lot of small and medium-sized units whereas Finland has too much capacity, both of which pose challenges to the competitiveness of these countries.

The next segment of the chain, meat processing, is usually a more fragmented sector than slaughtering, comprising a lot of small and medium-sized enterprises. The companies aim at separating themselves from the others by their products, production methods or materials and thus achieving larger margins. Marketing and branding play a key role. In the countries of the Baltic Sea Region, there are several dozens, even hundreds or thousands of meat processors, depending on the market size. Even though cost effectiveness is important in meat processing, additional value obtained by good management, differentiation strategy and marketing and branding endures a little higher costs than those of competitors. Despite the fragmentation of the industry, a few enormous conglomerates set the pace in the meat processing in the Baltic Sea Region.

Growth being true indicator of competitiveness

Even though profitability and other economic indicators make it easy to measure competitiveness as technical performance, the actual proven and correct indicator of competitiveness is growth. Growth of an industry or an individual company is a clear indication of their products being in demand and increasing their popularity, i.e. they being competitive.

Growth can be measured at several points in the meat chain. For each country, the competitiveness of the chain is proven by e.g. growth in the volume of meat produced by farms or growth in the market shares of meat industry either on the domestic market or the export markets or the Baltic Sea Region market. The Polish meat chain is the most competitive of the Baltic Sea Region countries by many indicators, such as production volumes of broiler meat, export of poultry meat or growth in the market share of meat industry. During the past eight years, Poland has more than doubled its broiler meat production into 2.6 million tons, which gives it the position of the largest production country by far in the EU. Germany and Denmark have achieved excellent growth rates in the number of pigs, pork production and export.

Production value of the meat industry at current prices and their share of the total for the Baltic Sea region (EU members)

	Sales revenues (billion EUR)		Share in the Baltic Sea region (%)	
	2000	2017	2000	2017
Denmark	4.9	5.7	12.2	7.7
Germany	25.5	44.7	63.4	60.5
Estonia	0.1	0.3	0.2	0.4
Latvia	0.1	0.4	0.4	0.5
Lithuania	0.2	0.6	0.5	0.8
Poland	4.6	16.2	11.5	21.9
Finland	1.8	2.4	4.5	3.3
Sweden	2.9	3.6	7.3	4.9

Source: own calculations based on Eurostat data

Meat consumed more in future

Globally, demand for meat continues its growth in the next ten years (OECD/FAO 2018). Consumption of beef, pork and poultry meat is estimated to increase by the annual rate of 1.3%, 1% and 1.5%, respectively. Growth in demand is significant in developing countries, which is partially due to population growth, partially increasing consumption per capita.

The European debate has questioned the consumption of meat from a nutritional, ethical or environmental viewpoint. Consumers are challenged to decrease their meat consumption in both commercial and social media. This new trend is the strongest in the Nordic countries but, with the exception of Sweden, the actual statistics have so far shown no decrease in meat consumption. Some Nordic meat companies have already responded to possible changes in consumer habits by developing and marketing their own vegetable protein based alternatives.

The growth estimations of meat consumption are not limited to developing countries. Considerable growth is also estimated for North America, and the meat consumption of the EU countries is estimated to grow 0.2% in the next decade. Certainly, the structure of meat consumption in the EU will change because poultry meat will take over a larger share at the expense of pork and beef (OECD/FAO 2018).

Competitive advantage sought by specialisation in Europe

Consumers and decision-makers are also interested in the environmental impacts of meat production. Intensive meat production in densely populated areas, such as Denmark, the Netherlands and North-West Germany, becomes a more and more significant problem due to e.g. manure placement and odour nuisances and might prevent the farms from expanding. The rearing of fattening pigs has transferred from these countries to larger and less densely populated areas, such as East and Central Germany and Poland.

In the course of years, some kind of distribution of work has been made up in pork production between Denmark and the Netherlands on one side and Germany and Poland on the other side. The first have specialised in producing piglets and the latter in rearing fattening pigs. In 2003–2017, the piglet export of Denmark increased from 1.6 million pigs to almost 13 million and that of the Netherlands from 2.8 million to almost 7 million. Close to 90% of export from Denmark and 60% of export from the Netherlands went to Germany and Poland in 2017.

It is usual for the Central European countries to seek competitive advantage by crossing the EU Member State borders. In addition to labour, feeds are also procured from abroad. The same animal can be born and raised in different places far from each other and slaughter and meat processing can occur in different countries. The aim of cost-effectiveness drives this increasing market trade of the meat chain.

Finnish competitiveness in added value

Several value factors are related to meat and meat production particularly in the primary production phase. Animal health and wellbeing, clean production inputs, minor use of antibiotics, controlled antimicrobial resistance situation or minor occurrence of bacteria, such as salmonella, in the whole chain are the main competitive advantages for Finland.

However, competitive advantages related to production methods are being evened out quickly. At the moment, Sweden and Finland are at the forefront in many factors, but the Baltic countries, Germany, Denmark and the Netherlands are gaining the lead. Many rival countries have recently tightened their legislation and established e.g. animal welfare brands. A noticeable example are this year's discussions and ambitious targets of reducing the use of antibiotics in countries practicing intensive livestock production, such as the US, Brazil and Thailand. New commitments are made in order to respond to the consumers' wishes and due to pressures from the burning problem of antimicrobial resistance.

From the viewpoint of productivity or cost-effectiveness, the Finnish meat chain is not the most competitive in the Baltic Sea Region. Nevertheless, Finland has many factors of additional value to be utilised on the export market now, before the rival countries exploiting their extensive and traditional export network can adopt and achieve the same competitive advantages in their own chains. At the same time, all the parts of the meat chain must be made more efficient and the physical productivity rates must be increased to the same level with the rival countries.

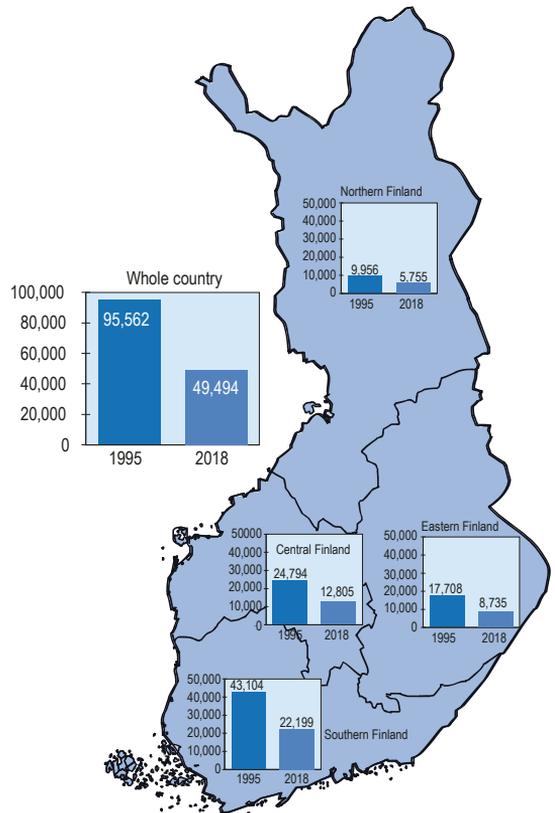
3. Structural development and economic situation of agriculture

3.1. Structural development in agriculture

Number and size of farms

In 2018, the total number of farms of over one hectare applying for agricultural subsidies was a little under 49,500. This figure is more than 990 farms (1.96%) smaller than in 2017. The absolute and proportional decrease in the number of farms was slightly slower than in 2017 and the long-term average. During Finland’s EU membership (1995–2018), the number of farms has decreased by more than 48%. In other words, 46,065 farms have been discontinued during these 23 years. The number of farms has therefore decreased by 2.8% per annum. In proportional terms, the decrease has been highest in Eastern Finland (nearly 51%) and the lowest in Northern Finland (just over 42%). In Southern and Central Finland (over 48%), the situation has corresponded to the national average.

As the number of farms has decreased, the average size of farms has increased. Between 1995 and 2018, the average size of farms applying for agricultural subsidies has more than doubled, from less than 23 hectares of arable land to nearly



Number of farms receiving agricultural support in 1995 and 2018 (main regions of Uusimaa and Åland have been included in Southern Finland).

Source: Finnish Food Authority.

46 hectares. The average size of farms is the smallest in Eastern Finland, where the

Number of farms receiving agricultural support in 2008 - 2018.											
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Whole country	65,292	63,716	62,450	61,153	58,898	57,559	56,016	52,858	51,616	50,474	49,494
Southern Finland ¹⁾	29,368	28,694	28,098	27,578	26,517	25,874	25,119	23,726	23,167	22,655	22,199
Eastern Finland	11,501	11,218	11,033	10,808	10,479	10,281	10,027	9,469	9,141	8,923	8,735
Central Finland	17,119	16,650	16,177	15,771	15,172	14,812	14,410	13,645	13,322	13,045	12,805
Northern Finland	7,304	7,154	7,142	6,996	6,730	6,592	6,460	6,018	5,986	5,851	5,755

¹⁾ Main regions of Uusimaa and Åland according to NUTS II have been included in Southern Finland.
Source: Finnish Food Authority

Size class distribution and average arable area of farms receiving agricultural support in 1995 and 2018 ¹⁾.

	Southern Finland ²⁾		Eastern Finland		Central Finland		Northern Finland		Whole country			
	Number of farms	%	Number of farms	%	Number of farms	%	Number of farms	%	1995		2018	
									Number of farms	%	Number of farms	%
Arable land												
<10 ha	3,709	17	1,990	23	2,285	18	1,025	18	22,850	24	9,009	18
10-20 ha	3,953	18	2,002	23	2,777	22	1,071	19	30,698	32	9,803	20
20-30 ha	2,916	13	1,205	14	1,828	14	726	12	19,669	21	6,675	14
30-50 ha	3,939	18	1,460	17	2,269	18	1,005	18	15,414	16	8,673	18
50-100 ha	4,689	21	1,371	15	2,402	19	1,151	20	5,706	6	9,613	19
>100 ha	2,915	13	684	8	1,183	9	766	13	784	1	5,548	11
Number of farms	22,121		8,712		12,744		5,744		95,121		49,321	
Average arable area, ha/farm	50.34		38.23		42.40		48.88		22.77		45.98	

¹⁾ The figures do not include horticultural enterprises if they have no fields under cultivation.

²⁾ Main regions of Uusimaa and Åland according to NUTS II have been included in Southern Finland.

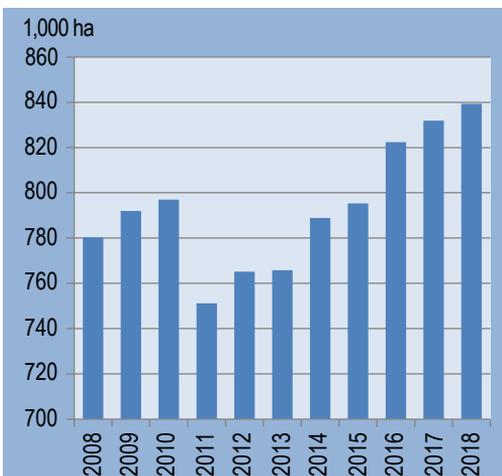
Source: Finnish Food Authority.

proportion of smaller farms of all farms in the region is higher than anywhere else in Finland. The proportion of farms of more than 50 hectares is highest in Southern and Northern Finland, where they account for approximately two-thirds of all farms. During the last 23 years, the proportion of the largest farms of more

than 100 hectares has increased from 1% to 11%. Their proportion is highest in Southern and Northern Finland. However, more than half of all farms of over 100 hectares are in Southern Finland.

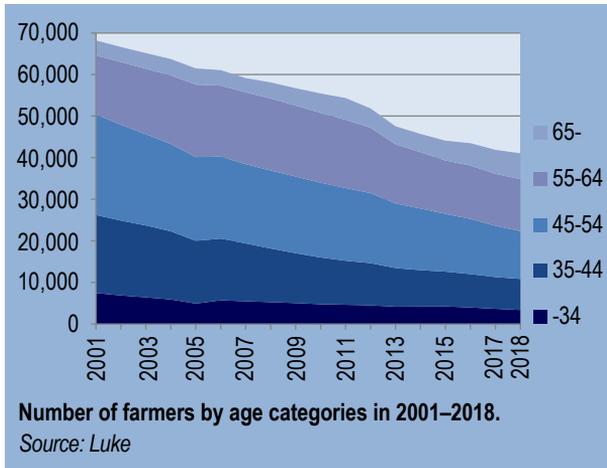
Increased land leasing has significantly accelerated the increase in farm sizes. In 2018, the total cultivated arable area was 2,275 million hectares, of which 839,359 hectares, or nearly 37%, were leased. In 1995, the corresponding figure was only 22%. The area of leased arable land has increased by nearly 18% in the 2000s. The proportion of leased arable land varies by region: it is over 51% in the Åland Islands, nearly 47% in Kainuu and Lapland; it is less than 30% in Central Ostrobothnia. The area of leased arable land per farm is highest in Southwest Finland and Uusimaa, at more than 20 hectares per farm. In these regions, the average farm size is also the highest, more than 56 hectares.

Forests are an integral part of Finnish farms. In 2018, the average forest area on farms was nearly 54 hectares. However, there was high regional variation.



Area of leased arable land (ha) in 2008-2018.

Source: Finnish Agency for Rural Affairs.



In Southwest Finland and the Åland Islands, the average forest area on farms was roughly 34 hectares, while the corresponding figure was 109 hectares in Lapland and 95 hectares in Kainuu.

Ownership of farms and age of farmers

Finnish agriculture is almost exclusively based on family-owned farms. In 2018, nearly 87% of the farms applying for subsidies were privately owned, and 11.3% were owned by heirs and family-run enterprises and corporations. Cooperatives and limited liability companies owned 1.8%, general and limited partnerships 0.2% and sole traders 0.1% of all farms. The state, municipalities, schools and parishes owned 0.08%, and foundations, associations and similar owned 0.05% of all farms.

In 2018, the average age of farmers on farms applying for subsidies was 53.2. The average age was highest, at 54.9, in the Åland Islands and lowest, at 52.4, in Central Ostrobothnia. As the farm population ages, the number and proportion of young farmers have decreased, while those of older farmers have increased. In 2001, 26% of farmers on privately owned farms were over 55 years of age. In 2018, the corresponding figure was nearly 46%. At the same time, the proportion of farmers under 44 has dropped from 38% to roughly 26%.

Production structure in agriculture

The production structure in Finnish agriculture has changed considerably as the number and proportion of livestock farms have decreased, and the proportion of crop production farms has increased. In 2018, some 24% of all farms applying for subsidies were livestock farms, and 71% were crop production farms. In 1995, the corresponding figures were 52% and 39% respectively.

Nearly 6,900 farms were engaged in dairy husbandry as their primary production line in 2018. Between 1995 and 2018, the number of dairy farms decreased by nearly 25,200 farms, i.e. 6.5% per annum. Furthermore, the proportion of dairy farms of all farms has decreased. While nearly 34% of all farms receiving subsidies specialised in dairy husbandry in 1995, the corresponding figure had fallen to under 14% in 2018. Proportionally, the number of dairy farms is highest in Eastern and Northern Finland, where they account for nearly a quarter of all farms in the respective regions. Dairy farms are more evenly distributed across all regions than farms specialising in other lines of production.

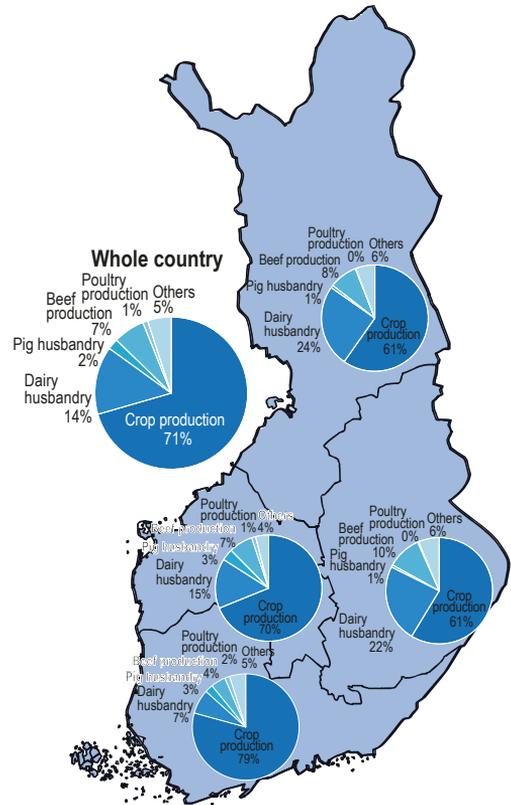
In 2018, fewer than 3,300 farms specialised in beef production. This was nearly 7% of all farms applying for subsidies. Between 1995 and 2018, the total number decreased by nearly 5,800 farms, i.e. 4.3% per annum. In 1995, beef production farms represented 9.5% of all farms. The regional distribution of beef production farms across the country is fairly similar to that of dairy farms.

In 2018, fewer than 1,080 farms specialised in pork production. This was nearly 2.2% of all farms applying for subsidies. Of these, 248 farms specialised in piglet production, 472 in pork produc-

tion and 360 in combined pig and pork production. Between 1995 and 2018, the number of pig farms decreased most compared to other production lines: by more than 83%, or 7.3% per annum. The number of pig farms decreased by 6.7% from 2017. Pork production is concentrated in Southern and Western Finland. Nearly a quarter of all farms are in Southwest Finland, one-fifth in Southern Ostrobothnia and one-sixth in Ostrobothnia.

In 2018, a total of 514 farms specialised in poultry production. This was roughly 1% of all farms applying for subsidies. During Finland’s EU membership, the number of poultry farms has decreased by nearly 77%, or 6.1% per annum. In 2018, a total of 236 farms specialised in egg production, 217 in poultry meat production, and 61 farms were breeding units or similar. Poultry production is also concentrated in Southern and Western Finland. Nearly half of all egg production farms are in Southwest Finland. Farms specialising in poultry meat and other poultry production, e.g. breeding units, are also concentrated in Southern Ostrobothnia and Satakunta.

In 2018, just over 35,200 farms specialised in crop production, only 2,009 farms, or 5.4%, fewer than in 1995. Two-thirds of all crop production farms specialise in cereal cultivation, and approximately a quarter specialise in other crop production such as hay production. In 2000, the corresponding figures were nearly three-quarters and approximately one-tenth respectively. Between 2000 and 2018, only the number of farms specialising in other crop production has increased, and it has more than doubled. In Eastern and Northern Finland, these farms already account for more than half of all crop production farms and roughly one third of all farms in the regions. Unlike in other regions, the number of farms



Distribution of farms receiving agricultural support according to production line in 2018

Source: Finnish Food Authority.

specialising in cereal cultivation also increased in Northern Finland by nearly 5% between 2000 and 2018. Currently, cereal farms account for more than a quarter of all farms in the region.

In 2018, the total number of other farms was a little over 2,400, accounting for 5% of all farms. The number of these farms has decreased by more than 72%, or 5.4% per annum, over the last 23 years. Other farms include farms engaged in horse, sheep or goat husbandry, and those engaged in other types of production or activity (e.g. farm tourism). After a period of growth, the number of farms engaged in horse husbandry has also decreased in recent years.

3.2. Development of results and profitability in agriculture and horticulture

The profitability in Finnish agriculture and horticulture is examined using the results of Luke's bookkeeping farms. The data from around 800 bookkeeping farms are weighted so that they indicate the average results of the 35,000 largest agricultural and horticultural enterprises. These account for more than 90% of the output of Finnish agriculture. In calculating the results, individual revenue and expense items are allocated to the year of production, in accordance with the accrual principle. Thus, yields, production volumes and returns, and changes in prices and support payments are directly reflected in annual profitability figures.

Farm size increases, while total return decreases

A farm's total return includes the value of the products sold and the subsidies received during the year, as well as the change in the products and supplies in stock, and the value of feed produced and used at the farm, i.e. the value of farm use. In 2017, the total revenue per farm averaged €155,300, with an increase of around 3% from the previous year. According to a forecast, the total revenue in 2018 decreased by 1% from the previous year, to €153,700 per farm.

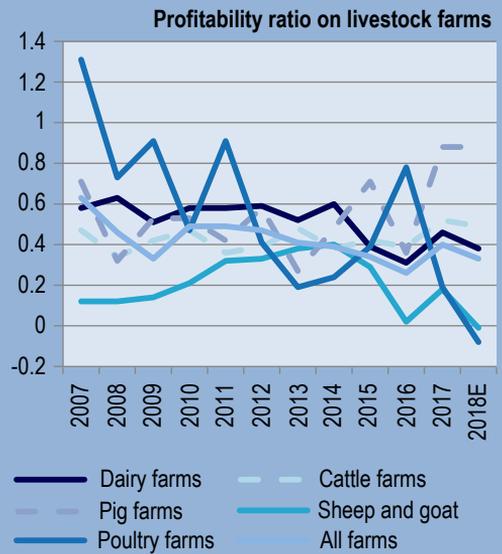
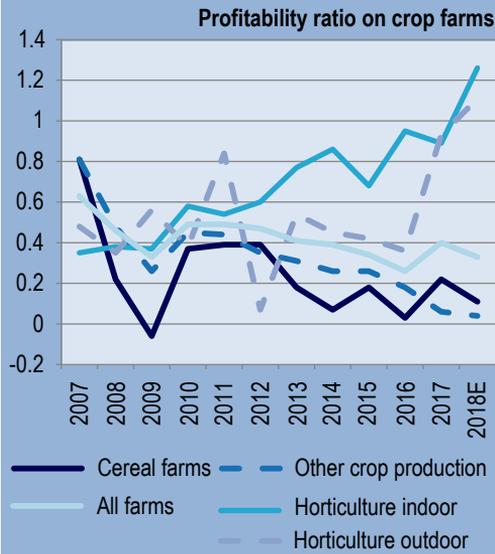
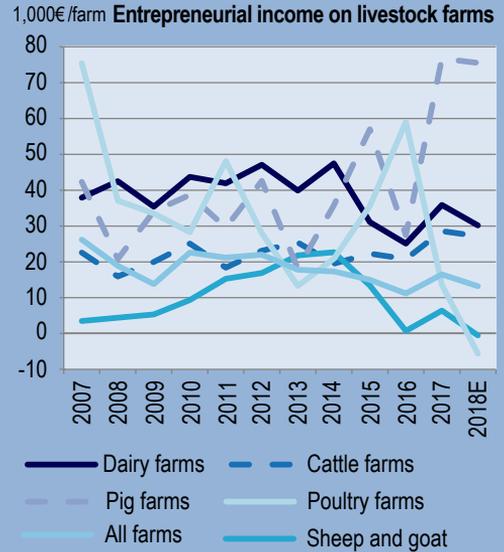
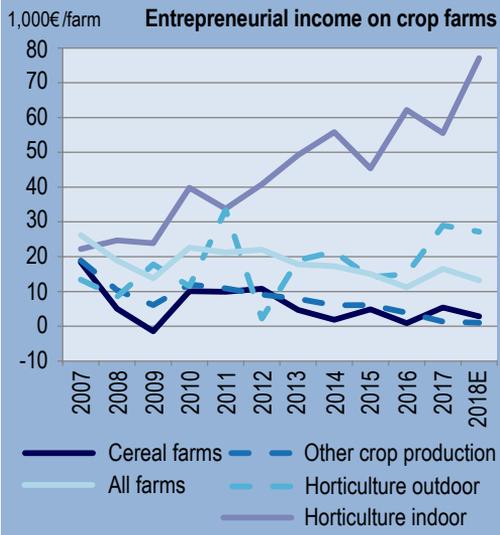
Total revenue has continued to grow slowly throughout the decade from 2007 to 2017, but the growth stalled or took a downward turn in all production lines at the end of the decade. The effect of the increasing farm size and the structural development on total revenue has been hidden by the falling producer prices, as producer prices took a downward turn from 2012–2016, following a period of increasing prices.

In terms of the share of direct support of total revenue, there is great variation between farms representing different production lines. In recent years, the average share of support has been around one third of total revenue, which is slightly down (2–3%), compared to the beginning of the ten-year period. In 2017, the share of support was the largest in sheep and goat farms (61%) and cereal farms as well as other crop production farms (50%). The share has varied by a few percentage units from one year to the next due to changes in support systems, but also because of variation in yields and prices. In 2017, the share of support of total revenue was the smallest in greenhouse enterprises (7%) and poultry farms (10%). Here, the share of support has more than halved, compared to the situation ten years ago.

Entrepreneurial income almost halved in a decade

Entrepreneurial income is the part of a farm's total revenue that is left for farmers (entrepreneur) for their work and own capital invested in their business activities. Thus, all costs excluding the wage claim on own labour and the interest claim on own capital are deducted from total revenue. Entrepreneurial income can be used to cover the needs of the farmer's private household. If the objective is to continue farming, and the depreciation of assets is used to finance replacement investments, the entrepreneur will not, in the long term, be able to withdraw for own use more than the entrepreneurial income from the farm profits.

Entrepreneurial income per farm was €16,500 in 2017. Despite increasing farm sizes, entrepreneurial income has almost halved during the last ten years. In the long term, the increase in input prices has been greater than the increase in producer prices. This has eaten away a substantial portion of the potential increase in entre-



Entrepreneurial income and profitability ratio of agriculture and horticulture by production line from 2007 to 2018.

preneurial income generated by structural development and improved production efficiency. Variation in yields also cause annual changes in entrepreneurial income. The lowest entrepreneurial income, from €1,000 to 6,000, was earned in cereal farms and other crop production farms. Variation among farms is great. The most successful cereal farmers make an entrepreneurial income of €21,700. In terms of total revenue, greenhouse enterprises and pig farms are the largest ones, with an entrepreneurial income of €55,500 and €76,700 respectively in 2017, which are considerably higher than in other production lines. Greenhouse farming and pig farms are the only production lines with a clearly higher entrepreneurial income (60% and 45%), when compared to the levels ten years ago.

Work has been replaced by capital

In the point of view of entrepreneurs, entrepreneurial income is a key indicator but, alone, it does not indicate the profitability of operations. Other factors, such as the farming family's capital tied up in the business operations, and the value of their labour contribution must also be accounted. In 2017, the farming family's average labour contribution per farm was 1,830 hours. The trend has been decreasing in the past ten years (-22%). The biggest labour contributions were made on milk farms (4,040 hours) and in pig farms (3,760 hours).

The amount of own capital invested in business operations by farming families has been on the increase throughout the 2000s. It has increased by 39% from 2007 to €349,000 per farm in 2017. The strongest growth has been seen on livestock farms. In the past few years, however, the growth of own capital has been slow. The largest amount of own capital is tied up in pig farms (€1,054,000) and in poultry farms (€564,000). Increase in lia-

bilities has been only slightly slower than in own capital and, throughout the ten-year period, the equity ratio has remained at around 72–75%.

Profitability at a poor level

Profitability ratio is considered the best single key indicator of profitability. It is calculated by dividing entrepreneurial income by the sum of the wage claim of the farming family's own labour and the interest claim on own capital invested in farming. The higher the ratio, the better the compensation achieved for the labour and capital. In 2017, the average profitability ratio was 0.40 and a slightly lower level is forecast for 2018. Greenhouse enterprises, pig farms and farms engaged in outdoor horticulture production were the most profitable, but still, the average profitability ratio of all of them remained below 1. In other crop production farms the ratio is close to zero, on cereal farms 0.22, on milk farms 0.46 and on other cattle husbandry farms the ratio was 0.52. In the past decade, the profitability trend has been on the decrease, following the decrease in entrepreneurial income. In the short term, it is impossible for farmers to adjust their use of labour and capital to match the poorer expected returns.

The return on total assets is obtained by deducting all expenses from total revenue, excluding the interest on liabilities (including the wage claim for own labour), and showing the difference in proportion to the entire capital of the farm. It tells the same sad story of poor profitability as the profitability ratio: the return on assets was negative in 2017 (-1.9%), and has not been positive at any time in the past decade. A negative return on assets means that the value of farmers' own capital has decreased in the long term; they have been forced to "eat" their capital.

The picture painted of the development and level of profitability of farms is

desolate, as is the forecast for the results for 2018. We should remember, however, that there is also great variation behind the average figures within production lines. For example, the average profitability ratio among the most successful quantile of the dairy farms, beef farms and outdoor horticulture farms was at a good level of 0.9 - 1.2 in 2017. On the most successful cereal farms, it was 0.95. These figures clearly indicate that it can be possible to achieve at least satisfying profitability levels. Success requires efficient and professional farm management, as well as favourable conditions. It also requires that the development of product and input prices and changes in support systems do not cancel out the efforts made by farmers in order to improve their results.

Results available in EconomyDoctor

The results of agriculture, horticulture and reindeer husbandry can be found online in EconomyDoctor (<https://luke.fi/economydoctor>). Users can, for example, view the average results of enterprises representing various production types and economic size classes since 2000, using the chosen area classifications. EconomyDoctor also provides the profitability figures for agriculture in other EU member states.

3.3. Overall level of agricultural income

Luke follows trends in the return and cost items, as well as assets, of Finnish agriculture and horticulture in general using the total calculation system for agriculture. Total results are calculated from enterprise-specific profitability accounting data by means of weighing and adding up. The most recent results are available in the Total Calculation online service of Luke's EconomyDoctor (www.luke.fi/economydoctor/total_calculation).

Development of results

Gross returns on agriculture and horticulture were EUR 5.62 billion in 2017, while production costs totalled EUR 6.59 billion. Entrepreneurial profit, obtained as the difference between gross returns and production costs, was negative at EUR -0.97 billion. Entrepreneurial profit has been negative every year. This means that income from sales and subsidies has not been sufficient to cover production costs. When costs arising from the farming family's own work input and own capital are excluded from the total costs, the result is the entrepreneurial income remaining for these inputs. In 2017, entrepreneurial income totalled EUR 520 million. In the early 2000s, it was more than EUR 1 billion.

Breakdown of returns

In the 2000s, the number of farms has decreased from 78,000 to 48,900. However, as a result of growing farm sizes, returns on agriculture and horticulture have remained at EUR 5–6 billion throughout this period. In recent years, returns have decreased due to a negative input and output price development and, most recently, due to unfavourable weather conditions.

Revenues and expense items are allocated as returns and costs in the year of production in accordance with the accrual principle. The postponement of sales or subsidies to the following financial year has no impact on results.

Subsidies also include investment payments from previous years that are allocated as annual returns using items, the amount of which equals the annual depreciation on assets funded by investment payments.

Returns include not only sales revenue, but also the value of products transferred to other production sectors and the private sector, and the value of products produced on farms or used as feed, which was about EUR 500 million.

The proportion of crop production returns from gross returns has been less than 20%, of horticultural returns more than 10%, of livestock returns 33% and of subsidies roughly 33%. These proportions have remained fairly stable throughout the 2000s.

Breakdown of costs

Production costs of agriculture and horticulture were EUR 6.59 billion in 2017. Production costs also include the use of intermediate products, recognised as returns above. As a result, the use of intermediate products does not increase entrepreneurial income. In the 2000s, wage claim costs due to a farming family's own work input has decreased by EUR 600 million to roughly EUR 1.08 billion. This has mainly resulted from the transfer from livestock production to less labour-intensive crop production and from technical developments in production, meaning work input has been replaced by capital.

In the 2000s, the total amount of equity invested in agriculture by farming families has increased from EUR 9.5 bil-

lion to EUR 12.5 billion. The amount of equity per farm has nearly doubled, while low interest rates have decelerated the increase in interest expenses.

Development of profitability

The entrepreneurial income of approximately EUR 520 million in 2017 covers around 35% of the costs arising from farming families' own work input and equity (EUR 1.5 billion). The profitability ratio is thus 0.35. In the early 2000s, the ratio was nearly 0.5.

If the hourly wage claim of EUR 1.08 billion is deducted in full from the entrepreneurial income of EUR 520 million, the return on equity is negative, at -6.6%. It has remained negative, meaning that if the current level of production volumes is to be maintained, external funding is constantly required.

Development of solvency

At the end of the 2017 financial year, capital invested in agriculture and horticulture was more than EUR 17 billion. Asset items have been measured at current val-

Economic development of agriculture and horticulture (€ million) and profitability ratio as well as return on total asset, %

	Farms represented	Total return	Production cost	Entrepreneurial profit	Farm net income	Profitability ratio	Return on total assets, %
2017	48,875	5,624	6,587	-973	520	0.35	-2.6
2016	49,866	5,653	6,980	-1,335	324	0.2	-4.3
2015	50,919	5,716	6,991	-1,281	465	0.27	-3.6
2014	53,025	6,060	7,245	-1,188	597	0.33	-2.6
2013	54,437	6,070	7,285	-1,218	614	0.34	-3
2012	55,291	6,208	7,430	-1,225	765	0.38	-2.3
2011	57,888	5,838	6,906	-1,054	858	0.45	-1.8
2010	59,304	5,676	6,880	-1,199	932	0.44	-2.2
2009	61,017	5,290	6,728	-1,437	521	0.27	-4.5
2008	62,539	5,782	7,097	-1,313	663	0.34	-3.4
2007	63,868	5,671	6,635	-1,010	1,034	0.52	-1.6

Source: www.luke.fi/economydoctor/total_calculation

ues, and they include investment payments not yet allocated as income. Fixed assets acquired using investment payments are taken into account in calculation of depreciation costs. However, these payments are recognised as income in the income statement following depreciation periods.

Of the total assets, EUR 12.5 billion constituted farmers' equity, bringing the relative proportion of equity from total assets, i.e. the equity ratio, to 72%. The equity ratio has always been very high. However, agriculture is a highly capital-intensive sector, and turning capital into income is slow in relation to the cost of interest and repayments arising from liabilities. International FADN results show that a high equity ratio is required to maintain agricultural activities.

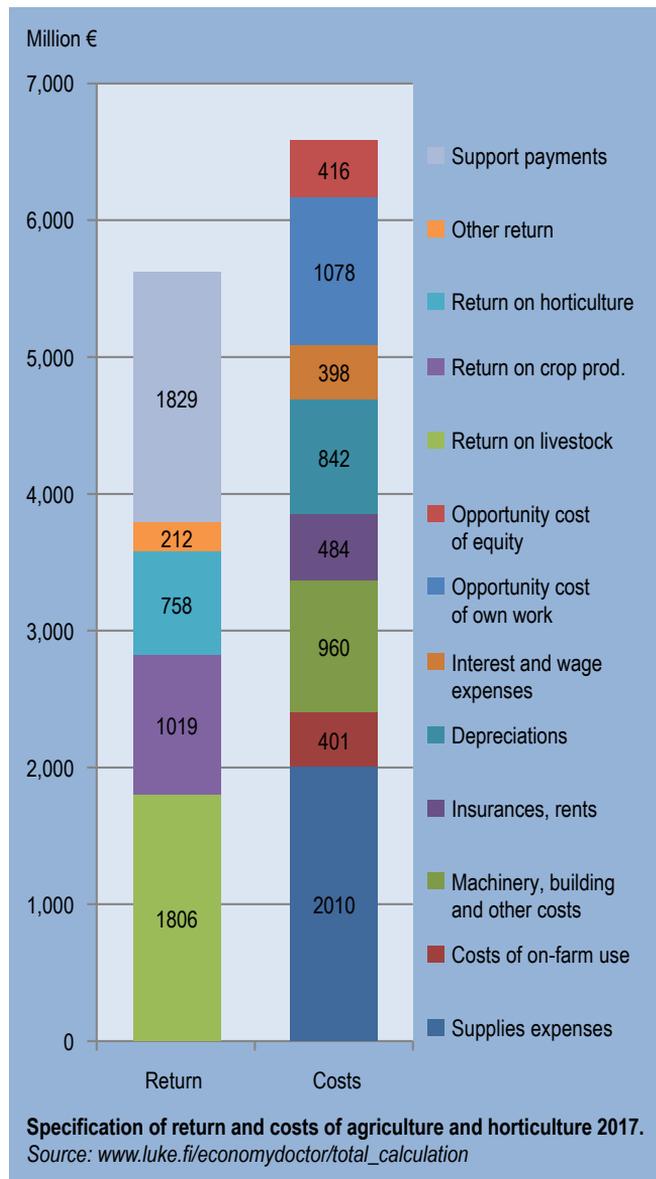
At the end of 2017, liabilities totalled EUR 4.8 billion. Any debts of farming families related to forestry, other entrepreneurial activities and private household activities are not included in agricultural debts. The debt-to-turnover ratio, i.e. relative indebtedness, was 85%. The turnover includes subsidies and sales revenues.

Changes in the calculation of weighting coefficients

In the total calculation, results for the whole country are obtained by adding up the results of profitability accounting farms. Because the number of these farms is under 800 in 2017, each accounting farm represents 60 farms. The total results therefore cover all the

48,000 farms in Finland. This number of represented farms, i.e. the weighting coefficient, is calculated for each farm according to how many similar farms in terms of production line and farm size are located in the same region.

The calculation of weighting coefficients consists of two stages. In the first stage, preliminary weighting coefficients are calculated for each farm as described

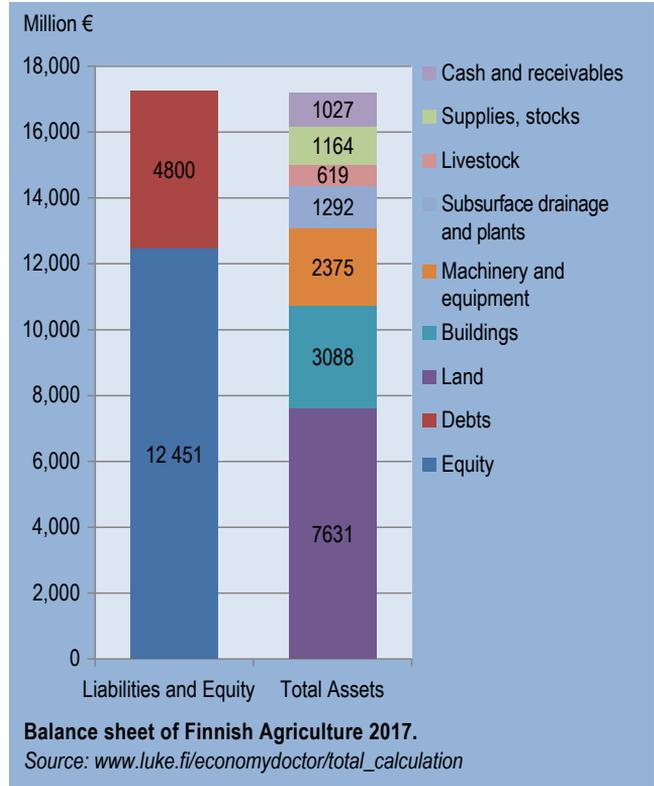


above. The calculation of the weighting coefficients was specified retroactively from 2002, meaning the classification of production lines is now based on the 24-category production line classification instead of the previous 10-category classification.

In the second stage, the preliminary weighting coefficients are calibrated by means of unconstrained non-linear optimisation so that the number of farms and arable land areas multiplied by the weighting factors and added up corresponds with the actual number of farms and arable land areas in five regions. The regions used are subsidy regions A, B, C1 and C2, and the northernmost subsidy regions C2P, C3 and C4 combined, as these regions have fairly few farms.

The weighting coefficients are also limited so that the calculated total number of farms in Finland corresponds with the actual number of farms per production line and farm size. Although the EU farm size classification consists of 14 size categories, only seven categories are used to calibrate the weighting coefficients. The largest and smallest size categories have been merged, as only a small number of farms belong to these.

The classification of farm types in the second stage is based on the 10-category production type classification, although the first stage is based on the more detailed 24-category production line classification.



In the second stage, the aim is to minimise any changes in weighting coefficients in proportion to preliminary coefficients of the first stage. In nonlinear optimisation, the minimised function is the sum of the squares of the difference between the final and preliminary weighting coefficients. Repeated quadratic optimisation is used as the optimisation method.

The results calculated using the weighting coefficients involve some inaccuracies, as the weighted group of accounting farms is not fully representative of the diverse group of agricultural enterprises in Finland. However, the calculation based on the new weighting system produces a representative overview of the entire sector.

Development of Finnish organic production and farm structure

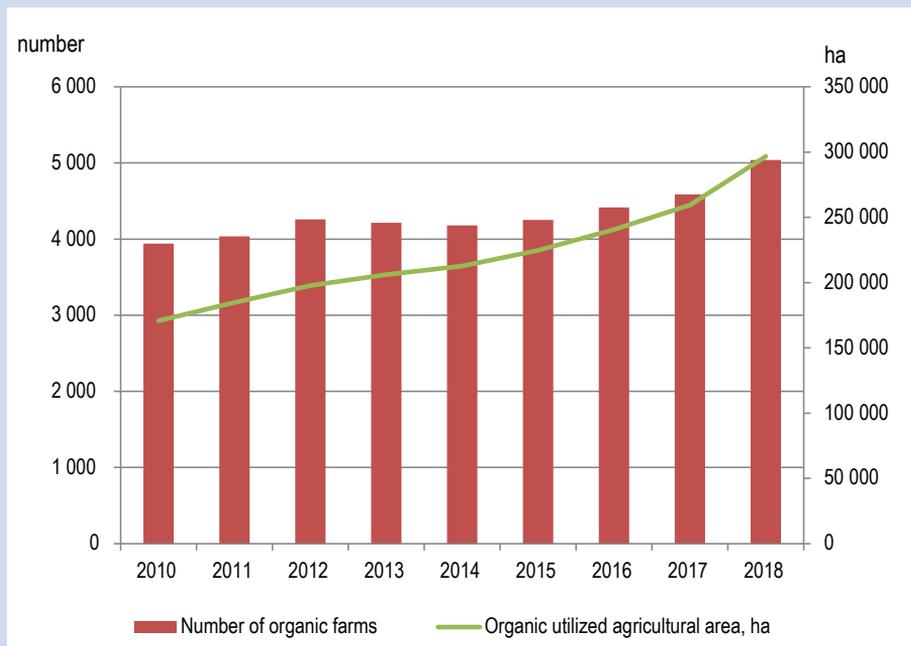
Jaana Kyyrä and Minna Väre

According to the Finnish Food Authority, about 5,000 farms i.e. 11% of all Finnish farms practised organic farming in 2018. The number of organic farms increased from the previous year by almost 500 farms. From 2010, this number has increased by over 1,000 farms.

13% of arable area organically farmed

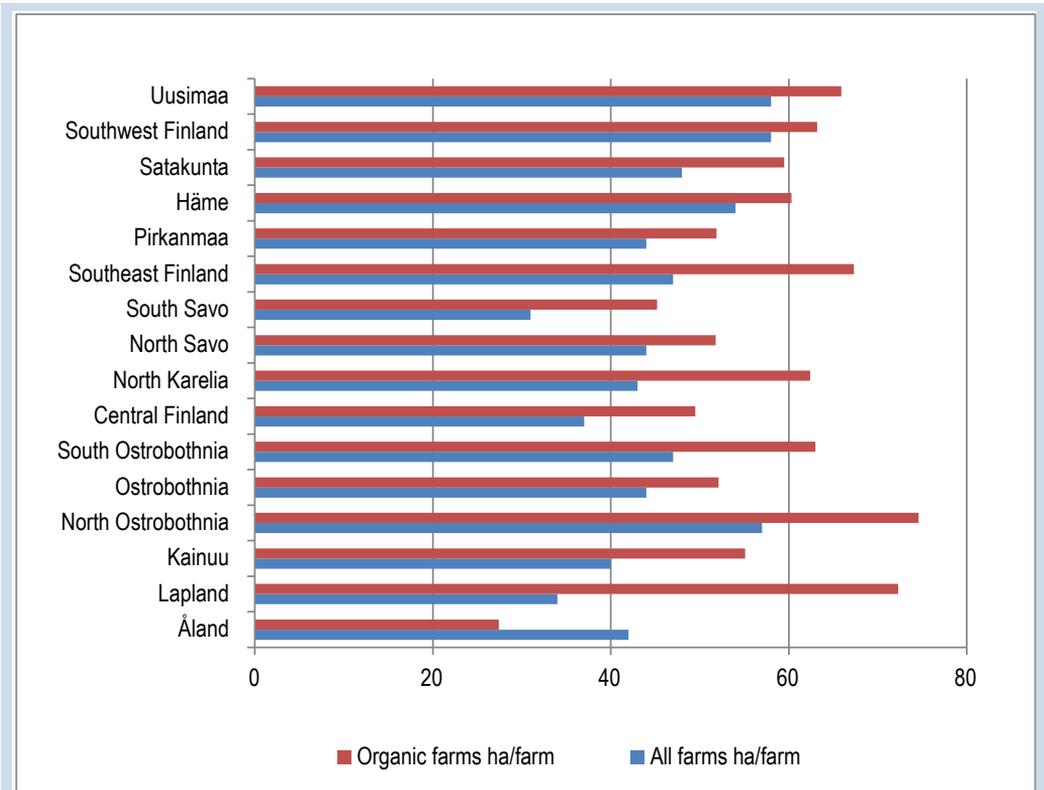
In 2018, the total organically farmed area was 296,645 hectares, of which 235,000 hectares was certified organic and almost 62,000 hectares in conversion. Organically farmed area increased by more than 37,000 hectares from the previous year. Organically farmed area thus accounted for about 13% of Finland's total arable area. The largest proportion of organically farmed arable land was in the region of the North Karelia ELY Centre where more than a quarter of the fields were organically farmed.

The average arable area of organic farms increased to 59 hectares in 2018 when the corresponding figure across all farms was 48 hectares. The average arable area of organic farms was larger than that of conventional farms in all ELY Centre regions. The average size of organic farms has also increased significantly faster than that of all farms.



Development in number of organic farms and in organically farmed area in 2010–2018.

Source: Luke, Finnish Food Authority.



Average size of all farms and organic farms in 2018, ha/farm.

Source: Luke, Finnish Food Authority.

Three per cent of cereal harvest organically produced

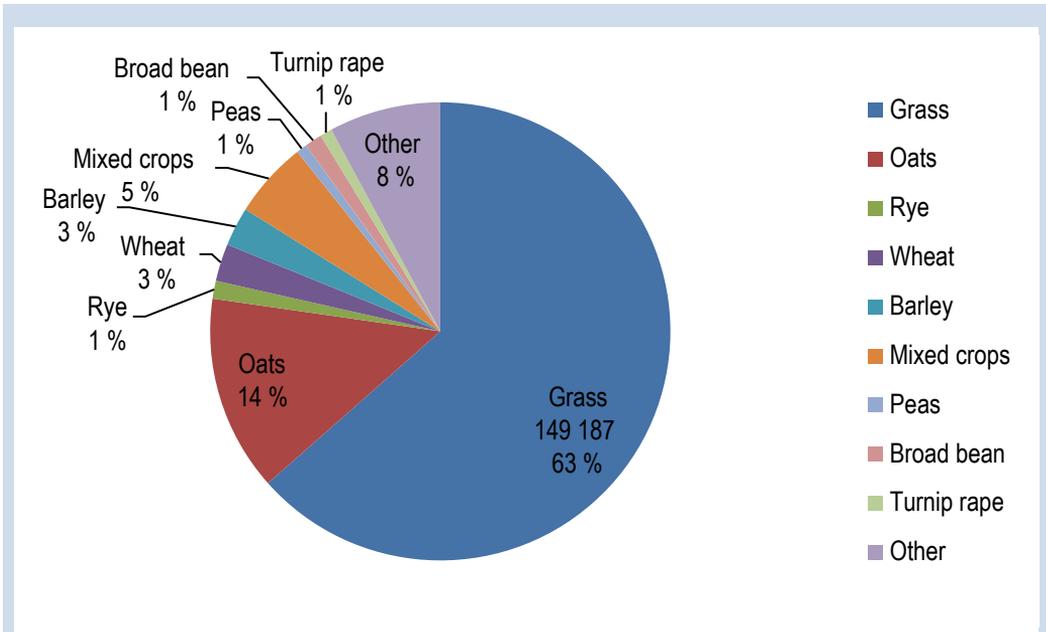
Livestock husbandry is a more common main production line on organic farms than on conventional farms. According to Luke’s Agricultural and Horticultural Enterprise Register, livestock husbandry was the main production line on 40% and cereal production on 55% of organic farms in 2018. The rest of the farms had no main production line.

There were almost 150,000 hectares of cultivated grassland, equivalent to over 60% of certified organic area. Most of the organic area was used for fodder production. The share of mixed crops produced for cattle feed was almost 40% of the total Finnish organic production and the share of organic whole crop cereal silage was about a quarter of the total Finnish production.

Cereal production was the main production line on about 7% of organic farms. Cereals were cultivated on around 60,000 hectares which was more than one quarter of the organic area. The most common grain crop on organic fields was oats. Other plants, such as broad bean, pea and turnip rape, were cultivated on about one tenth of the organic area.

The organic crop yield in 2018 was a little less than 87 million kg which is about 3% of Finland’s total cereal harvest. Of this, the harvest of oats was 46 million kg, barley almost 12 million kg, wheat 10 million kg and rye 4 million kg.

Of rye, the share of organic production from the total production was 10%. Of other cereals, the share of organic production was smaller than this.



Distribution of organically farmed area into different crops in 2018.

Source: Finnish Food Authority.

Organic milk production quadrupled in 2000s

According to the Finnish Food Authority, there were organically reared animals on the total of 1,037 farms in 2018. Most of these farms reared cattle. The number of dairy cows was a little fewer than 10,000 which corresponds to 4% of all Finnish dairy cows. About a quarter of the Finnish organic cows were located in the region of the South Ostrobothnia ELY Centre.

145 milk producers sent organic milk to the dairy. The share of organic milk producers was 2% of all milk producers.

In 2018, nearly 69 million litres of organic milk were delivered to the dairies, which is 3% of all milk delivered. In 2000, the production amount of organic milk was only around 16 million litres, whereby the production of organic milk has quadrupled since the beginning of the millennium.

There were less than 22,000 suckler cows on about 600 organic farms. This number is around 40% of all Finnish suckler cows. The largest number of suckler cows was located in the region of the North Ostrobothnia ELY Centre.

Small organic share in pig and poultry production

In 2018, 2.6 million kg of organic beef and 0.7 million kg of organic pork were produced. The share of organic production in beef was about 3% and in pork less than 0.5%.

On 15 farms, there were around 700 organic sows. Their share of all sows was less than 1%. On only 11 farms, there were a total of about 4,000 organically reared fattening pigs. Their share of all fattening pigs was less than 1%. In 2018, about 30,000 chickens were reared organically on just three farms. Their share of all chickens was only around 0.2%.

Relatively considered, the largest organic share is in the production of mutton. In 2018, it was one quarter, which in 2018 was 0.36 million kilos of mutton were produced organically.

Seven per cent of eggs organically produced

In 2018, there were organic laying hens on 52 farms. The total number was a bit less than 300,000 hens. About half of organically reared laying hens were located in the region of the Southwest Finland ELY Centre.

4.7 million kg of organic eggs were produced, which is about 7% of Finnish egg production. Since the year 2010, the production of organic eggs has tripled.

Statistics on organic farms and production in Finland

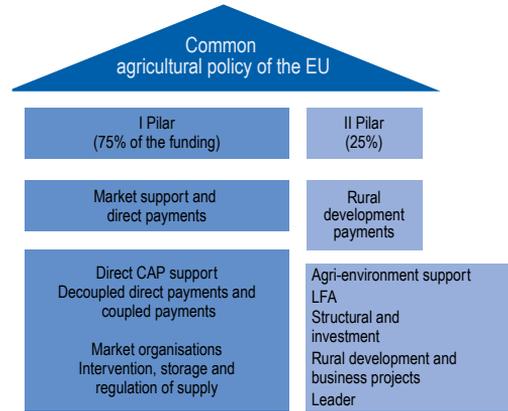
Organic farms can be studied by means of statistics provided by the Finnish Food Authority¹, which began its operations at the beginning of 2019, and Luke. The Finnish Food Authority monitors the organic actors in primary production and publishes statistics on organic farms, production lines and animals. At the moment, Luke compiles statistics on the production of organic milk, meat and eggs and this compilation is about to be widened. Even though Luke's Agricultural and Horticultural Enterprise Register does not contain data on organic production, it is possible to collect information on organic farms from the register data. These data are not fully consistent with the data published by the Finnish Food Authority.

1 The Finnish Food Authority began its operations on 1 January 2019 when the Finnish Food Safety Authority, the Agency for Rural Affairs and part of the IT services of the National Land Survey of Finland were merged into one single Authority.

4. Agricultural policy

Finnish agricultural policy is founded on the support schemes set down in the common agricultural policy of the EU, i.e. direct payments funded by the EU and the co-funded less-favoured area (LFA) and agri-environment payments.

In Finland, these payments are complemented by national aid that comprises northern aid, national aid for Southern Finland and certain other payments.



The structure of the common agricultural policy (CAP).

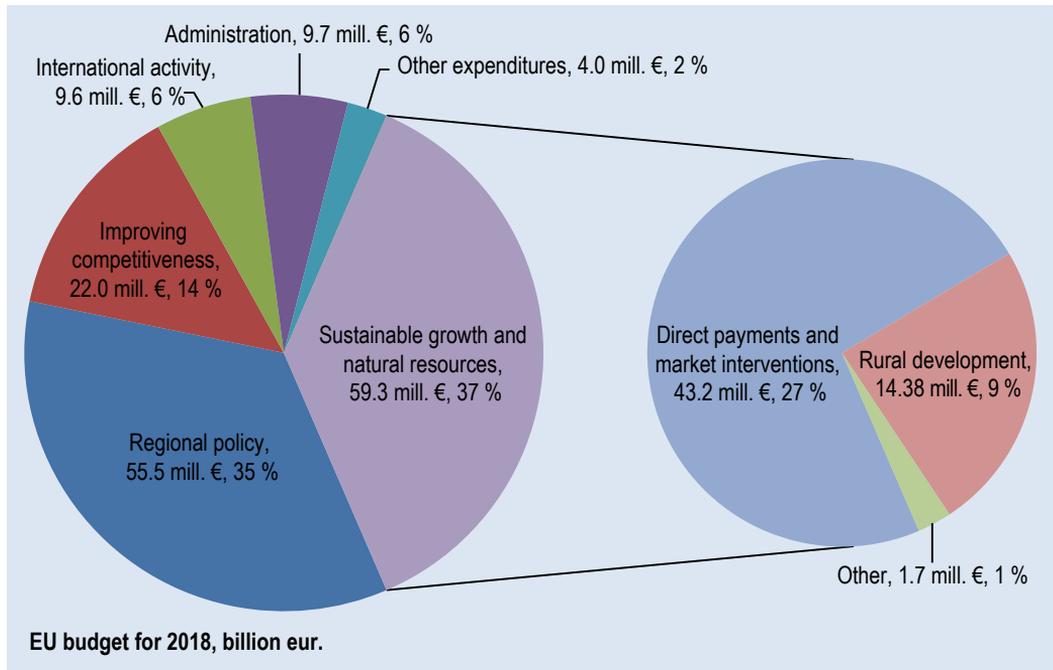
4.1. Common agricultural policy of the EU

The common agricultural policy (CAP) of the EU has been implemented for more than 50 years. From the very beginning, the main objectives were to improve the productivity of agriculture and balance the food markets, as well to secure the supply of food, a reasonable standard of

living for farmers, and reasonable prices for consumers.

In time, these objectives have been supplemented by other aims, in particular, those relating to environmental issues, which reflect the societal demands that have arisen over recent decades.

The share of expenditure that arises from the CAP in the EU budget is considerably high, about 37% of the total budget



in 2018. It should be born in mind, however, that in the other sectors of the EU the integration does not go as wide and deep, and there is no common policy in the same way as is implemented in the agriculture sector through the CAP.

The CAP is comprised of the so-called first and second pillar. Most of the funding (75%) is allocated to the first pillar, mainly direct and market support. The smaller share of the funding (25%) is used for rural development measures under the second pillar (Rural Development Programmes, RDP).

As an outcome of the policy reforms during the past two decades, direct payments to farmers now constitute the lion's share of EU agricultural expenditure. In the early 1990s, most of the CAP funds were still used for export refunds for agricultural products and other market interventions.

CAP reforms since 1992

As a result of the policy reforms of 1992 and 1999, the intervention prices of agricultural products in the EU were lowered to be closer to the world market prices. The price reductions were compensated for by means of direct payments, which is why support payments based on arable area and livestock numbers gained a central position in the CAP.

In the policy reform of 2003, most of the EU payments for arable crops and livestock were transferred to the decoupled single payment scheme (SPS). At the same time, new conditions relating to the environment, maintaining the condition and productivity of the land, food safety, animal welfare, and occupational safety were incorporated into the scheme.

The reform of the EU's agricultural policies, dated November 2008, also known as the "Health Checks", continued the earlier reforms and strategic outlines, aiming to increase the market orientation of EU agriculture. Decoupled payments

are now applied even more widely, and some of the remaining production restrictions have been abolished, to allow farmers to better respond to market demand.

In June 2013 political understanding on the outlines and content of the CAP until 2020 was reached. The CAP for the 2014-20 introduced the so-called greening of direct payments, and it aimed for a more even distribution of payments among the Member States. However, most of the traditional main elements of the common policy were retained, even reinforced.

Distribution of EU support for agriculture 2014–2020

The average annual budget for the EU agriculture policy for the programme period 2014–2020 is €55,7 billion.

The largest recipient of EU support for agriculture during the current funding period is France, whose share of all EU support for agriculture amounts to 16% (€8.9 billion). The second largest recipient is Germany (€6.2 billion) and the third largest is Spain (€6.1 billion). Finland's share of all subsidy payments for agriculture is some 1.5% (€864 million).

On average, about €13.6 billion is distributed annually in the EU as rural development payments, which amounts to 24% of all EU support for agriculture. The largest recipient of rural development funds was Poland (€1.6 billion) and the second largest was Italy (€1.5 billion). In relation to its size, Finland has traditionally received a significant amount of rural development payments. During 2014–2020, Finland will receive an annual average of €340 million of second-pillar support.

Support for agriculture has a significant impact on the total income of farms in the EU. The relative importance of EU support for income formation can be examined through the ratio between the subsidy payments and the farm gross return and net value added. In 2015, the

share of agricultural subsidies of the farm gross return in the EU was 13.4% on average. In the EU, the percentage was the lowest in the Netherlands, where the share of agricultural subsidies was only

3.4% of the farm gross return. In Finland, the share was the highest in the entire EU. In 2015, agricultural subsidies accounted for almost a third (32.3%) of the farm gross return in Finland.

Agricultural support per year in EU-28 by Member State on average in the programming period 2014–2020.					
	Agricultural support. € million per year on average	Rural development payments under Pillar II. € million per year on average	Share of MS of EU agricultural support %	Share of subsidies in farm total output %*	Share of subsidies in farm net value added %*
France	8,899	1,416	16.0	12.7	42.9
Germany	6,243	1,174	11.2	12.9	43.8
Spain	6,056	1,184	10.9	13.6	27.7
Italy	5,275	1,490	9.5	11.1	21.5
Poland	4,593	1,563	8.2	15.5	52.4
Great Britain	3,944	369	7.1	12.4	51.6
Romania	2,973	1,145	5.3	10.1	24.8
Greek	2,584	599	4.6	21.1	47.2
Hungary	1,763	494	3.2	17.5	53.4
Ireland	1,525	313	2.7	20.6	58.2
Austria	1,255	563	2.3	17.6	56.8
Czech	1,183	310	2.1	21.7	74.9
Portugal	1,165	580	2.1	22.7	47.0
Bulgaria	1,116	334	2.0	21.2	50.1
Denmark	985	90	1.8	8.1	32.5
Sweden	948	249	1.7	15.9	65.9
Finland	864	340	1.5	32.3	157.9
Netherlands	839	87	1.5	3.6	12.9
Lithuania	706	230	1.3	21.0	65.1
Slovakia	659	270	1.2	20.4	79.4
Belgium	597	79	1.1	8.3	27.9
Croatia	534	332	1.0	18.8	57.9
Latvia	396	138	0.7	20.3	74.7
Slovenia	255	120	0.5	19.8	136.4
Estonia	253	104	0.5	17.5	85.1
Cyprus	68	19	0.1	12.4	38.1
Luxemburg	48	14	0.1	23.4	83.1
Malta	19	14	0.0	5.7	20.0
EU-28	55,747	13,620		13.4	39.3

Source: Official Journal of the European Union L 347/655; Official Journal of the European Union L 347/487 *Percentages are based on the Farm Accountancy Data Network preliminary results from the year 2015 (http://ec.europa.eu/agriculture/rica/database/database_en.cfm).

EU's common agricultural policy will be renewed after 2020

Jyrki Niemi

The EU's common agricultural policy (CAP) has a significant impact on the operating conditions of Finnish agriculture. The direction and content of the CAP have been agreed until the year 2020. During 2018, the European Commission introduced the key elements of agricultural policy for the programming period 2021–2027: the EU budget proposal was published on May and the legislative proposal for the CAP reform on early June.

The new delivery model

The most important innovation of the new CAP is the proposal for a new delivery model which takes better account of the subsidiarity principle and gives a larger role for the EU Member States. At the same time, the Member States will be required to draw up a national strategic plan for their agricultural policy. This means that the entire CAP budget would be administered in the future in the same way as the rural development programmes are at the moment – that is, nationally within 27 different strategies.

The CAP strategic plan of each Member State must be in line with the EU's nine key policy objectives. These objectives are divided into the following economic, environmental and social ones:

- ensuring a fair income for farmers, increasing the competitiveness of EU agriculture and rebalancing the power in the food chain;
- tackling climate change, environmental care and preserving landscapes and biodiversity; and
- supporting generational renewal, maintaining the vitality of rural areas and protecting food quality and safety.

EU's common agricultural policy not simplified

In order to ensure equal and fair competition, the Commission prerequisites prior approval for the national strategic plans and also intends to annually monitor the actions of each member state and their progress towards agreed objectives. Without such accountability, there would naturally be a risk that the strengthening of the Member States' decision-making powers would lead to a race to the bottom in which some states would try to defeat others e.g. by means of subsidies.

The Member States must also report to the Commission annually on their progress towards the set objectives. From the EU budget, there will be performance bonus at the end of the period for states which have succeeded well in their targets. There can also be penalties for not achieving the objectives of the national strategic plans.

Thus, the new suggested CAP seems more coherent than before and clearer of its inner logic. However, one long-awaited target, i.e. policy simplification, appears still to be missing. The policy system based on three regulations, nine specific objectives, 27 national strategic plans and 26 conditions for support payments can hardly be described as 'simple'.

Smaller agricultural budget

The fact that agricultural funding still continues to be divided into two pillars will not do any good for simplifying the CAP, even though the national strategic plans are made, according to the reform plans, by combining the objectives of Pillar I and Pillar II. On the total level, the CAP funding will decrease by about 16% in 2018 prices from the current period when comparing the EU-27 countries. The funding of direct payments under Pillar I will decline by around 11% and the funding of rural development aids under Pillar II by around 28%.

The most drastic cuts will thus be done in the rural development aids under Pillar II, and the hectare-based income support under Pillar I will be cut relatively less. This does not quite correspond to the Commission's rhetorics, according to which, the common agricultural policy should be more focused and ambitious in its environmental and climate targets. Admittedly, the Commission gives the Member States some latitude for compensating the cuts in the EU funding by national allowances. Furthermore, 40% of the total CAP budget is expected to promote climate measures.

Environmental and climate measures are also promoted by making the first-pillar direct payments conditional on stricter environmental requirements. Furthermore, each Member State must introduce the so-called eco-schemes which support farmers who want to apply environmental practices that go beyond the mandatory requirements. The eco-schemes are funded from the national direct payment budget.

Aid Capping

One key element of the new CAP proposal is the plan to cap direct payments at €100,000 per holding, and this limit could be reduced to €60,000 at a Member State's discretion. Direct payments will be reduced as follows:

- (a) by at least 25% for the tranche between €60,000 and €75,000;
- (b) by at least 50% for the tranche between €75,000 and €90,000;
- (c) by at least 75% for the tranche between €90,000 and €100,000.

The impact of this measure is however moderated substantially by the provision that an implicit charge for family labour as well as salaries can be deducted from the payment before the capping is applied. The proposal may still be weakened in the course of the subsequent discussions in the Council and European Parliament.

Reform schedule probably delayed

Considering the schedule of the ambitious legislation process implemented by the Commission, it is unlikely that the EU bodies will reach an agreement on all the details of the CAP in 2019. Legislative work will be ineffective for most part of this year because the terms of both the European Parliament and the Commission will end in 2019. The actual negotiations on the details of the future CAP will not start until the new Parliament and the new Commission start their terms in June and in November, respectively. Bearing in mind the mutual dependencies of the CAP and the funding framework for 2021–2027, the probability for the CAP passing before the year 2020 is very small.

It is thus very likely that the situation in 2021 will be a repetition of the one in 2014. That is, the current agricultural policy will still continue at least for the year 2021, and the new policy will be implemented in 2022, the earliest.

4.2. Payments of EU agricultural support in Finland

In 2019, the support for Finnish agriculture under the CAP will total €1,404 million. This consists of the CAP payments for arable crops and livestock (€525 million), less-favoured area (LFA) payments (€521 million) and environmental payments (€241 million). Additional support dedicated to organic production and animal welfare is also paid (€117 million). This is funded either by the EU alone or co-financed by the EU and Finland.

CAP payments are an integral element of the common market organisations and are funded in full from the EU budget. The EU contributes less than 20% of the LFA and more than 40% of the en-

vironmental payments. The rest is paid from national funds.

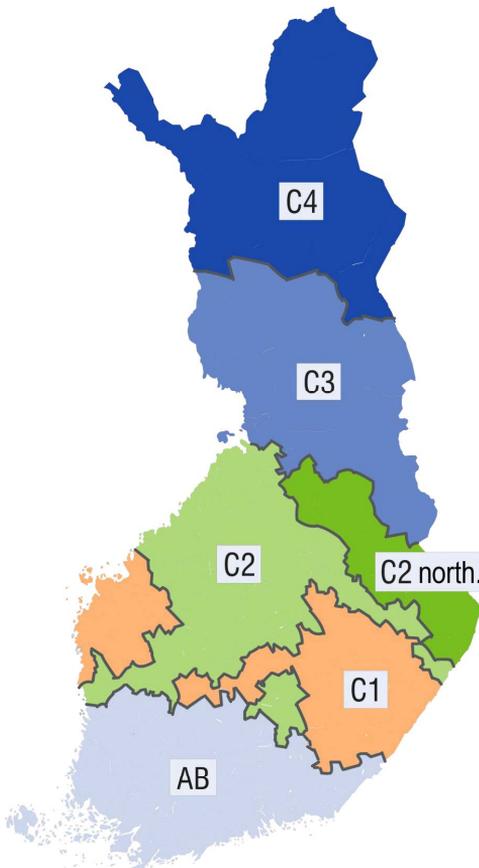
Besides the EU support, in 2019, about €319 million will be paid to Finnish farms as national aid. The national aid scheme comprises northern aid (€293 million), national aid for southern Finland (€20 million) and certain other national aid programmes (€5.5 million). As of 2015, national top-ups to LFA payments are paid as part of the EU LFA payments.

Before 2015, Finland was divided into three main support areas (A, B and C) for the allocation of payments. In 2015, the support areas were reduced to two (AB and C). CAP support, environmental support and LFA payments are paid throughout the country.

Northern aid is only paid in support area C. This has been divided into five regions for the differentiation of the aid. Support areas C3 and C4 are also divided into sub-regions. National aid for Southern Finland is paid in support area AB.

Because the agricultural policy of the EU was not designed for farming in northern conditions and mainly by small farms, Finland has to pay for 56% of the necessary support for agriculture from national funds, while just under 44% comes from the EU agriculture budget. Still, Finland can be considered to have succeeded relatively well in obtaining EU funding for agriculture. In the period 2014–2020, the average annual EU payments to Finnish agriculture are around €864 million, of which around 39% are rural development payments.

In order to be eligible for most types of support, cross compliance is expected, meaning that farmers must comply with the basic standards. Cross compliance comprises standards for good agricultural and environmental conditions and statutory management requirements. The statutory management requirements refer to the environment, public, animal and plant health and animal welfare.



Support areas in Finland.

Structure of CAP support from 2015.		
Type of support	Status	Amount
Basic payment	Mandatory	Remaining share
Greening	Mandatory	Fixed 30% share
Natural constraint payment	Optional	Max 5%
Aid for young farmers	Mandatory	Up to 2%
Coupled support	Optional	Max 8% or 13%, optional 2% to protein crop top-up
Small farmers' payment	Optional	Max 10%

CAP support

Most of the so-called CAP support, financed in full by the EU, is paid in Finland through the single payment scheme adopted in 2013 (as of 2015, basic payment). In Finland, the payment scheme is implemented as the so-called hybrid model. Former CAP payments have been converted into payment entitlements, which consist of a regional flat-rate payment and farm-specific top-ups. In 2018, the value of the flat-rate payment entitlements in support area AB is around €122, and in support area C around €108 per hectare. Most of the farm-specific top-ups have already expired.

Along with the reform agreed upon in 2013, so-called greening measures, i.e. environmental measures that go beyond the base level, are included in the conditions for direct CAP payments as of 2015. 30% of the national maximum amount of direct payments of each country is reserved for greening. In 2018, the amount of support in support area AB is around €75 and in support area C around €65 per hectare. To be eligible for the payment, a farm must have at least two/three crops in cultivation, permanent pastures must be maintained, and at least 5% of the cultivation area must be left as an ecological

focus area (EFA) in the regions of Uusimaa and Varsinais-Suomi.

The objective of support for young farmers, financed fully by the EU, is to make it easier to start a farming business and to ease structural development in agriculture. The support is paid for the first five years after setting up an agricultural holding, if the applicant has set up such a holding for the first time as head of the holding under the age of 40. In 2018, the amount of support paid for young farmers is around €53 per hectare.

Part of the CAP support may be paid as coupled payments. The reform of 2013 allowed payments to be re-coupled to the production of certain commodities in the coming years. In Finland, the share of coupled payments of the total amount of CAP support rose to 20% in 2015. Coupled support is paid for suckler cows, bulls and ewes.

Less-favoured area payments (LFA)

Certain rural regions in the EU have been defined as less favoured areas (LFA). The purpose of LFA payments is to ensure the continuation of farming in these regions and to keep rural areas populated. In Finland, LFA support is paid for practically the entire cultivated area (2.16 million hectares).

The objective of the LFA payment is for agricultural production to continue in spite of the adverse climate conditions due to the northern location, the number of farms to develop in a controlled manner, and economically viable farming units to continue to exist, thus contributing to rural employment and promoting economic development in rural areas.

The whole of Finland is entitled to LFA payments. The maximum amount of the payment in the so-called mountain area, i.e. in Finland support area C in the north, is €450 per hectare, while in the rest of the country it is €250 per hectare.

In 2018, the payment for plant production farms is €217 per hectare in area AB, and €272 per hectare in area C, and for livestock farms €237 per hectare and €297 per hectare, respectively.

In 2007–2013, the average annual LFA payments in Finland totalled €421 million. The amount budgeted for 2019 is €521 million. The payment sum has increased because the national LFA payment (ca €120 million) has been paid as part of the EU LFA payment as of 2015. The EU contribution to the LFA payment in Finland is less than 20%.

Agri-environment payment

Agri-environmental support compensates for income losses resulting from reduction in production and increased costs to farmers who commit to undertake measures aimed at reducing environmental loading caused by agriculture.

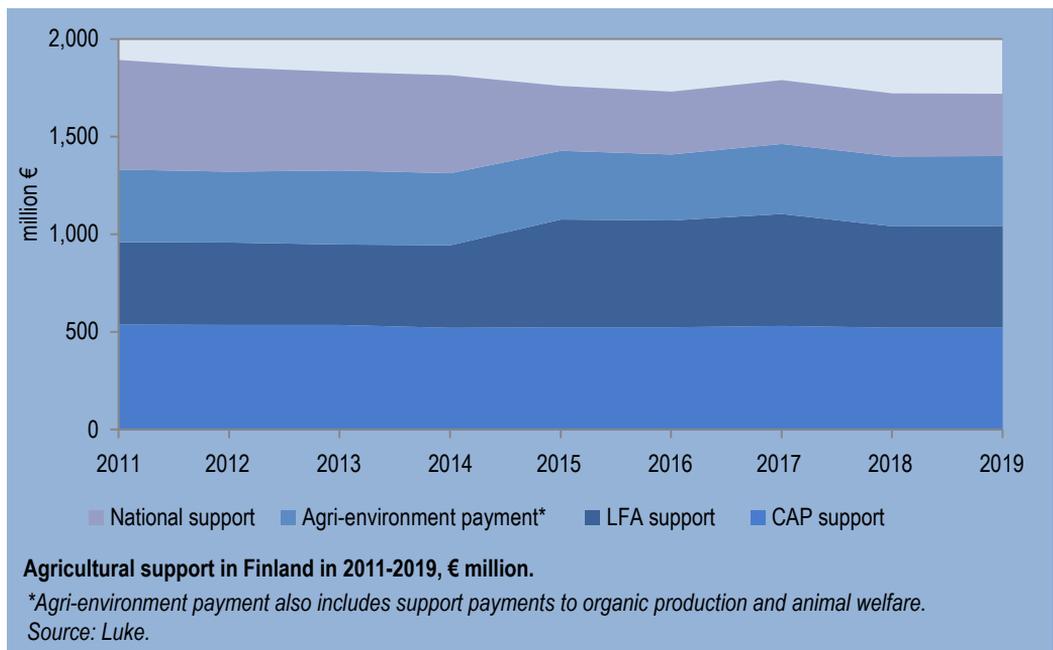
As of 2015, agri-environmental support has been called agri-environment payment. At the same time, the scheme

that comprised three types of measures (basic, additional and special measures) was replaced by measures targeted to specific parcels.

The agri-environment climate scheme strives to further the biological diversity of nature and to reduce emissions from agriculture into the air and waterways. The agri-environment commitment is divided into the farm-level measure concerning balanced use of nutrients, which is mandatory to all those committed to the scheme, and optional parcel-specific measures.

All farmers who are committed to the scheme must adhere to certain limits for the use of nitrogen and phosphorus in arable farming. Parcel-specific measures deal with the use of manure and the promotion of biodiversity, among other things.

In the programming period 2007–2013, an annual average of €320 million was paid in agri-environment support. The average share of the EU contribution to



the agri-environment payment has been 28%. The agri-environment payments budgeted for 2019 total €241 million, of which €140 million comes from national funds. In addition to agri-environment payment, a total of €117 million is paid as support for organic farming and animal welfare. Measures that support organic production and animal welfare are aimed at steering agricultural production toward more ethical and ecological practices.

The agri-environment scheme is presented in more detail in Chapter 5.

4.3. National aid

The national aid paid in Finland comprises northern aid, national aid for southern Finland and certain other payments. The aim is to secure the preconditions for Finnish agriculture in different production sectors and parts of the country. The principles to

be applied in determining the level and regional distribution of national aid were agreed in the EU membership negotiations. The aid may not increase production, nor may the amount of aid exceed the total payments before the accession.

Northern aid

The Accession Treaty of Finland (Article 142) allows for the payment of national northern aid in areas north of the 62nd parallel and adjacent areas, i.e., support area C. A little over 1.4 million hectares, i.e. 55.5% of the cultivable arable area in Finland, is eligible for this aid.

Northern aid consists of milk production aid and aid programmes based on the number of animals and cultivated area. The scheme also includes aid for greenhouse production, storage aid for horticultural products, wild berries and mushrooms and headage-related payments for reindeer.

Agricultural support in Finland 2012-2019 (fully or partly financed by EU), million €								
	2012	2013	2014	2015	2016	2017	2018*	2019*
CAP	539	539	524	527	527	534	525	525
LFA	422	412	423	552	547	573	519	521
EU share paid	118	115	118	97	97	103	97	97
National share paid	304	297	305	455	450	470	422	424
Agri-environment payment	363	379	369	255	236	241	241	241
EU share paid	107	112	107	107	99	101	101	101
National share paid	265	267	262	148	137	140	140	140
Organic production				45	50	50	49	49
EU share paid				19	21	21	21	21
National share paid				26	29	29	28	28
Animal welfare				52	52	68	68	68
EU share paid				22	22	29	29	29
National share paid				30	30	39	39	39
Total	1,324	1,330	1,316	1,431	1,412	1,466	1,402	1,404
EU share, mill. €, total	764	766	749	772	766	788	773	773
National share, mill. €, total	560	564	567	659	646	678	629	631
<i>*Estimate</i>								

Northern aid paid in 2019 will total around €293 million. The most significant types of aid are northern aid for milk production (€160 million) and northern aid based on livestock units (€78 million).

The effectiveness of the northern aid is evaluated every five years. The latest evaluation report was completed in 2016. It assessed to what level the objectives set for northern aid were achieved, and the feasibility and justification of the measures applied in the scheme. Based on the results, in 2016, the European Commission and Finland discussed the future development needs of northern aid.

The EU Commission’s new decision on Finland’s northern aid scheme came into force on 1 January 2017. The decision provides Finland with more flexibility in the implementation and monitoring of the aid. The recipients and types of northern aid remained the same.

National aid for southern Finland

In 2015, Finland transferred a significant share of the coupled aid in Southern Finland to EU-funded direct payments. This means that milk and beef production, sheep and goat husbandry and cultivation of starch potato and vegetables in the open, in Southern Finland, is now mainly supported by a scheme based on EU support.

National income aid is still paid to pig and poultry husbandry and horticultural

production in Southern Finland by virtue of Article 214a of the Single CMO Regulation and the Commission Decision C(2014)510 for the years 2014–2020. This legal basis under Community law to continue the payment of national aid for agriculture in Southern Finland was approved by the EU institutions in autumn 2013. This national aid paid in 2019 will total around €20 million.

4.4. Structural support for agriculture and farm relief services

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. In practice, forms of structural support include subsidies, interest subsidies and state guarantees. In 2018, some 2,700 subsidy decisions were made for farms within the scope of structural support, and the funding granted totalled EUR 134 million.

Agricultural investment payments aim to promote growing farm sizes and thus to reduce production costs. In 2018, investment payments were granted for 2,057 farms, totalling EUR 117 million. The start-up subsidy paid to young farmers supports the passing on of business

Nationally paid subsidies in Finland, million € (per production year)								
	2012	2013	2014	2015	2016	2017	2018**	2019**
Total	534.3	504.9	502.1	332.1	322.3	326.8	323.2	318.7
Subsidies for northern areas	328.2	317.4	314.7	296.5	285.7	296.3	294.5	292.8
Subsidies for southern Finland	74.9	62.5	62.5	28.9	27.0	25.1	23.2	20.4
Nationally paid LFA top-up*	119.4	119.3	118.6	-	-	-	-	-
Other national aid	11.8	5.7	6.3	6.7	9.6	5.4	5.5	5.5

*Since 2015, nationally paid LFA top-up has been paid as a part of the EU LFA payment scheme
 **Estimate

activities from one generation to the next. In 2019, the start-up subsidy was granted to 474 farms, totalling EUR 14 million. Interest subsidy loans, which are mainly granted to finance production buildings on farms and the acquisition of real estate and movable property related to the start-up subsidy for young farmers, totalled EUR 135.7 million for investments and EUR 67.4 million for new farmers. Interest subsidy costs from subsidised loans totalled EUR 11 million. In 2019, new loans can be granted up to a total of EUR 250 million. At most, EUR 80 million in state guarantees in accordance with the structural support legislation can remain unpaid at any one time. In 2018, a total of 51 state guarantees were granted for a loan capital of EUR 13.2 million. The average cost of the guaranteed investments eligible for subsidies was EUR 1,150,000.

Guarantees were granted for an average loan capital of EUR 259,000.

Farm relief services

Farmers practising livestock production on a full-time basis are entitled to 26 days of holiday per year. The Ministry of Social Affairs and Health is responsible for the management, control and coordination of farm relief services. Their purpose is to ensure that farming activities continue uninterrupted during holidays, and that substitute help is available in the event of illness or accidents. The number of farmers entitled to an annual holiday has decreased annually as the number of livestock farms has decreased. It is estimated that there are 15,011 livestock farmers in 2019; the corresponding figure in 2009 was 27,780. In 2019, a total of EUR 134.7 million will be allocated to farm relief services.

Structural support; number of objects and funds committed to these 2012–2018.

	2012	2013	2014	2015	2016	2017	2018
Number of support decisions	2,205	2,461	2,694	1,317	2,133	2,726	2,720
Funds committed, mill. €,	73.1	92.2	92.3	52.8	96.9	119.2	133.7
Dairy and beef cattle buildings	363	376	319	116	255	311	305
Buildings in pig production	38	29	27	17	29	37	33
Investments in horticulture	55	51	41	51	59	72	54
Sub-surface drainage	368	324	428	336	590	618	554
Subsidized loans to investments, mill. €	129.9	140.3	105	60.1	103.9	128.9	135.7
Subsidy for young farmer starting to farm	544	597	1108	127	300	312	474
Subsidized loans for starting farm, mill. €	60.9	68.9	134.9	19.4	45.1	46.3	67.4
Total interest subsidy expenses, mill. €	18.6	11.3	12.5	12.7	11.0	10.6	11.0

Source: Ministry of agriculture, Finnish food authority

Agriculture requires continuous investments

Olli Niskanen and Anna-Maija Heikkilä

Agricultural production requires large capital in relation to its turnover. According to Luke's profitability bookkeeping, the balance sheet total of Finnish farms was on average €484,000 in 2017. 75% of it consisted of three large property items: land 43%, buildings 18%, and machinery and equipment 14%. In 2016, the purchase costs of these property items in the whole agricultural sector were the total of about €650 million.

Investments prerequisite for maintaining production

Investment requirements in agriculture are largely maintained by the structural development of agriculture, because investments have to replace the production capacity of farms exiting production or changing production line.

The newest estimate on the structural development and investment requirement of farms extends to the year 2030. The annual investment requirement was estimated as €222–295 million depending on the development of the demand for agricultural products. The estimation focused on investments within the range of supported agricultural construction in the financing period 2014–2020; these include, inter alia, production buildings of animal husbandry, drying-houses and greenhouses as well as underdrainage. Investments in milk production constitute the largest portion by far, almost 40%, of the estimated total of investment requirements.

After 2014, the approved cost estimates of supported construction have been on average €250 million per year. In 2018, investing within supported construction had a record rate, about €330 million. The actual sum is even larger because the statistical costs are based on approved unit costs and there are no statistics on the amount in excess. This large investment sum was partially due to the slow investment years of 2014 and 2015.

Investments aiming at growth in productivity

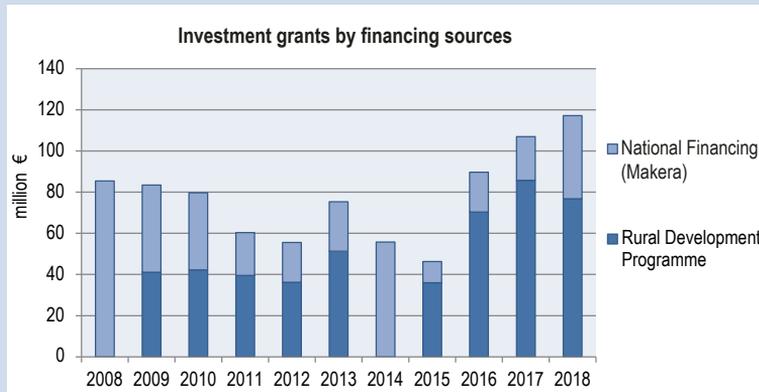
When Finland joined the common EU market in 1995, the Finnish agricultural structure was dominated by smallholdings due to the historical background and practiced agricultural policy. Because of that and northern location, the productivity of agriculture was lagging behind the productivity of competing countries. Later on, improving the structure of agriculture and, through that, accomplishing productivity growth has been one essential object in agricultural policy – even though the means of policy practiced have partially been in conflict with this object.

Today's producers must be able to meet the challenges of decreasing producer prices and increasing price variation in order to remain competitive in the common EU and even global market. As a way to achieve this, many farms aim to decrease unit prices by expanding production. Even though farms have made considerable investments and obtained growth in productivity, the development of their productivity is limited due to the northern conditions. In the long run, climate change can improve the situation in northern areas in relation to areas having a longer growing season but, due to increasing unforeseeable weather conditions, this is not a certainty.

Investment support in central role

Over the years, investments have been supported by the EU's joint financing via

rural development programmes and by national financing through the Development Fund for Agriculture and Forestry (Makera). Most important structural payments have been investment grants and measures related to the transfer of farm holding to young farmers. The record investments in 2018 were supported by investment grants of €117 million. Particularly in large production building investments, the investment aid has in practice been the prerequisite for implementing the investment. With the help of Makera financing, the continuity of investment aids was ensured also during the stoppages of financing when rural development programmes changed.



Investment grants (million €) by financing sources in 2008–2018

About 12% of farms active in 2017 developed their operations in the previous 10 years by means of investment support. Investing was relatively the most active on farms continuing animal husbandry. Over 90% of continuing pig farms and almost 75% of poultry farms implemented a supported project, most commonly a drying-house or underdrainage investment. A little less than third of the farms producing milk in 2017 made supported investments in the previous 10 years. Of the sum of payments granted in the ten-year period, 41% was focused on dairy cattle farming, 12% on beef cattle production, 10% on horticulture, 5% on pig farming, and 4% on poultry farming. The remaining share was divided into a large group of smaller projects, such as drying-house, drainage and storage investments.

Investments promoting safety and wellbeing

In addition to growth in productivity, agricultural investment aids have improved animal wellbeing and the work conditions and work safety of farmer families and agricultural workers. Currently, there is also investment grant available specifically for investments promoting the work environment, production hygiene and animal wellbeing or state of the environment.

Investment supports are a means for controlling construction to correspond to the future requirements as well as possible. Hence, the conditions of supported construction are partially stricter than the requirements of legislation. For instance, aid for the new construction of stall cowsheds was removed in 2018, even though the legislature still allows stall cowsheds. Increasing demands for technical solutions required by animal wellbeing also require changes for current production solutions on many farms. As long as the costs of the measures cannot be transferred into product prices, government support in financing the development is crucial.

5. Agriculture and the environment

5.1. Environmental impacts of agriculture

Besides food production, agriculture has an important role in maintaining biodiversity and rural landscapes, and in providing recreational services. In addition to its positive effects, agriculture also has adverse environmental impacts on soil, water systems and the atmosphere.

Soil

The quality and cultivability of the soil, together with crop rotation, significantly impacts total yields and environmental loading from arable land. Finnish agricultural soil contains no heavy metals, and its average phosphorus content is satisfactory. However, soils acidity is increasing, while the organic matter content is decreasing.

The soil phosphorus content is an indicator of both productive capacity of fields and phosphorus load on water bodies. The soil test phosphorus concentrations (mg/l soil) of Finnish agricultural soils have been rising until the present day, even though phosphorus fertilization has been significantly reduced since the 1990s through, for example, fertilization restrictions under the agri-environment scheme. Currently, the annual increase in phosphorus through purchased fertilizers is approximately 6 kg per hectare, which is less than one-third of the 1995 level. The amount of phosphorus entering the land through animal manure (roughly 9 kg per hectare) is higher than the amount of phosphorus contained in purchased fertilizers, and no significant reduction has occurred since Finland joined the EU in 1995.

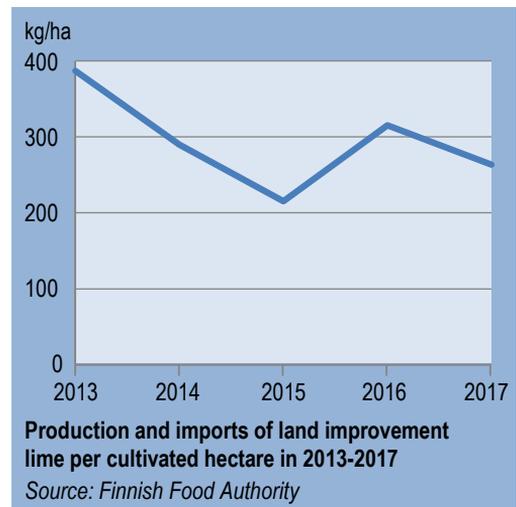
Studies have shown that a further reduction in total phosphorus fertilization (purchased fertilizers and manure)

would be possible without any decreases in yields, except in parcels where the phosphorus content is particularly low. In the light of current knowledge, achieving a negative phosphorus balance in arable lands is the most efficient way to permanently reduce the phosphorus loading. When the phosphorus balance is negative, the amount of phosphorus leaving arable land through harvested crops is higher than the increase in phosphorus through purchased fertilizers and manure.

The load on watercourses from arable farming is also influenced by the soil structure. Soil compaction reduces the permeability of the soil and increases the risk of nutrient surface runoff and erosion. It also weakens the nutrient intake of plants, which lowers the nutrient utilisation rate. Poor permeability may also increase the release of greenhouse gases.

Less than 10% of Finland's land area is agricultural land. The proportion of agricultural land is highest in Southwest Finland and Uusimaa and lowest in Northern and Eastern Finland.

The ownership of arable land is decisive for the long-term productivity of



land. Studies have shown that less land improvements are carried out on rented fields than on owned fields. For example, due to the increased proportion of land cultivated under a lease contract, the amount of lime used for soil improvement has halved from the level it was before Finland joined the EU. In recent years, the annual amount of agricultural lime has been on average less than 300 kg per cultivated hectare.

Loading to watercourses

Nutrients leach into ditches, rivers, lakes and the Baltic Sea from arable land, causing eutrophication in water bodies. This can be seen in the turbidity of water, in increased growth of cyanobacteria, which are harmful to health, and in the vegetal invasion of coastal areas. Although the volumes of nutrients used per hectare have been significantly reduced, eutrophication continues, and measurements have shown no improvements in the state of water bodies since the early 2000s.

The Finnish Environment Institute estimates that around 60% of phosphorus loading and slightly less than 50% of nitrogen loading comes from agricultural sources in Finland. Agriculture plays a much greater role with regard to loads in

the Archipelago Sea and Finland's coastal waters. The loading is caused by both arable farming and livestock production. It is estimated that 90% of the loading to watercourses caused by agriculture occurs outside the growing season. Phosphorus and nitrogen also leach into watercourses from forestry, sparsely populated areas and point-like sources, such as municipal wastewater treatment plants, industrial plants and fish farms.

Because of the regional concentration of livestock production, the amount of manure is excessive in many places relative to the agricultural area utilised and the needs of the crops cultivated. The phosphorus contained in manure, in particular, has become a problem. In total, Finnish agriculture produces 15.5 million tonnes of manure per year.

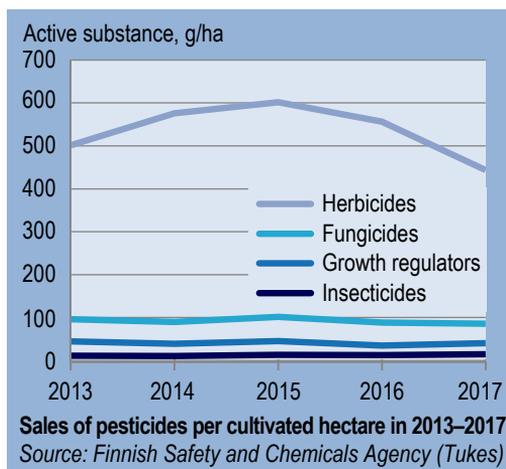
Use of pesticides

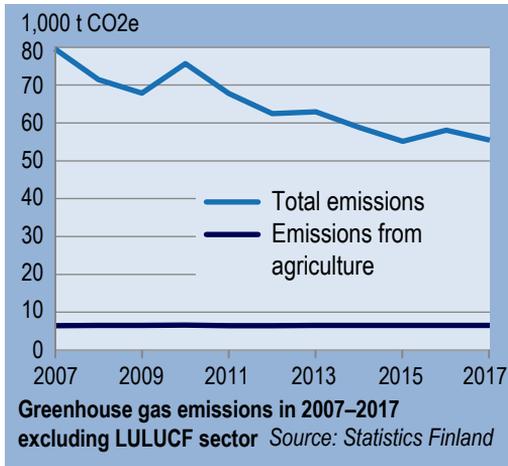
Four-fifths of the pesticides used in agriculture and horticulture are herbicides intended for weed control. Two-thirds of these are glyphosate products. The main reasons for the increased use of herbicides have been the increased cereal monoculture and the wider use of no-till cultivation. However, the application of pesticides in Finland is still quite moderate compared with many other European countries.

Emissions to the air

Climate change poses challenges to Finnish agriculture. Adaptation measures change the relative strength of species and varieties as well as the profitability of different crops and production methods. In addition to the impacts of climate change on agriculture, agriculture also affects climate change because agricultural production generates greenhouse gas emissions.

In 2017, greenhouse gas emissions from the agriculture sector accounted





for 12% of Finland's total emissions. The highest volumes of greenhouse gases are released from the soil (nitrous oxide emissions) and the digestive system of ruminant livestock (methane emissions). In addition, manure management and liming also cause greenhouse gas emissions.

According to the United Nations Framework Convention on Climate Change (UNFCCC), carbon dioxide emissions from soil and the energy consumption of farms are not calculated for the agriculture sector. Carbon dioxide emissions from arable land are reported under the Land Use, Land Use Change and Forestry (LULUCF) sector, apart from emissions from liming. Emissions from the energy consumption of farm buildings, grain drying and agricultural machinery are reported under the energy sector.

Greenhouse gas emissions from the agriculture sector have decreased by 13% since 1990, mainly due to reduced use of mineral fertilizers. The most significant decrease in agricultural greenhouse gas emissions took place during the early 1990s, and there have been no significant changes in these emissions in the 2000s.

According to the 2014 report of the Finnish Climate Change Panel, the most cost-efficient measures for reducing agricultural greenhouse gas emissions in-

clude: diminishing the need to clear organic soil for cultivation, for example, by promoting the solid-liquid separation of manure; long-term fallowing or grass cultivation of organic soil; and reforesting arable lands that have become redundant for production and food security.

In sectors not covered by the EU Emissions Trading System (transport, agriculture, heating, and waste management), obligations to reduce greenhouse gas emissions in the EU are allocated to the Member States using the Effort Sharing Regulation. During the first period, the collective target of the EU Member States is to reduce greenhouse gas emissions in sectors excluded from emissions trading by 10% from the 2005 level by 2020. Finland's target is 16%. For the second period (2021–2030), the collective target is to reduce greenhouse gas emissions by 30% from the 2005 level by 2030. According to the Effort Sharing Regulation, Finland needs to reduce its emissions by 39% from the 2005 level by 2030.

Biodiversity in farming environments

Biological diversity means the abundance of species, diversity of habitats and intra-species genetic diversity. Loss of biodiversity is considered a serious environmental problem, as biological diversity is the basis of functioning ecosystems. Biodiversity is also a prerequisite for the ability of ecosystems to adapt to environmental changes, such as climate change.

Agricultural production is based on the utilisation of biological diversity. Similarly, many wild plant and animal species have, over the centuries, adapted to man-made agricultural environments.

In Finland, the positive impact of agriculture on biodiversity peaked when animal feed was produced on meadows and natural pastures. The increase in farm size since the 1950s, coupled with the increased input intensity and farm-specific

and regional specialisation, has led to a decline in the biodiversity in farming environments and to an increase in the number of threatened species and habitats.

For some wild species, changes in habitats due to new and more efficient agricultural production methods have been too extensive and rapid, and they have been unable to adapt to the new conditions. In particular, biota in traditional rural biotopes (i.e. semi-natural grasslands and grazed woodlands) has declined and become endangered due to the decrease in grazing and cattle husbandry. Nearly one third of the plant species growing in traditional rural biotopes are on the Red List of Finnish Species. In Finland and in the Nordic countries, red-listed are those species which are classified as regionally extinct, endangered, near threatened or data deficient. According to an assessment of threatened habitat types in Finland published in 2018, 40 of 42 habitats in semi-natural grasslands and grazed woodlands were considered critically endangered. Their preservation requires constant care.

Of bird species using arable land as their prime nesting environment, 40% are endangered and 60% are on the Red List. The decline in grazing has caused scrub invasion in coastal meadows, which is particularly harmful for waders, and a decrease in diversity in agricultural environments and in insect feed.

Nonetheless, habitats maintained by agriculture still include numerous species of wild flora and fauna that benefit from farming, the openness of fields and cattle grazing as well as policy measures, such as the agri-environment scheme and non-productive investments.

Ecosystem services in agriculture

In addition to biodiversity, the protection of ecosystems and the ecosystem services they produce are considered vital. Ecosystem services are the benefits people

obtain from nature. These can be material, such as nutrition and raw material, or non-material, such as recreational use. Farmers play a key role in the production of ecosystem services in the agricultural environment. Demand for agricultural ecosystem services and interest in producing them are discussed in a special topic in this review.

Ecosystem services are often reviewed in accordance with the Common International Classification of Ecosystem Services (CICES). This classification divides ecosystem services into three main categories: provisioning services; regulating and maintenance services; and cultural services.

In agricultural environments, provisioning services, i.e. food and fibre, and their value are well known. Instead, the picture of other ecosystem services is only emerging. Regulating, maintenance and cultural services are often non-material benefits, and many of them are freely usable. Examples of regulating and maintenance services include nitrogen fixation and insect pollination. Cultural services include the recreational use of nature and the cultural heritage associated with nature.

Landscape and recreational values of the arable environment

The countryside and rural margin areas around cities and towns with arable lands offer important recreational environments for people. Farming environments are important for outdoor recreation, particularly in areas with a high proportion of agricultural land. Farming environments are commonly used for local recreation, especially in Southern Finland.

On average, Finnish adults engage in outdoor activities close to their home 170 times per year; 35% of this occurs in farming environments. This means a total of 230 million instances of outdoor

recreation per year. Besides local outdoor activities, agricultural areas are also used for recreation involving overnight stays. The average number of nature trips per year is 8, and the average total number of days spent on such trips is 25. Summer cottages and holiday homes are the most popular destinations. About a quarter of nature trips are made to areas with both agricultural and forestry activities. Altogether, this means 10 million days a year are spent on nature trips in farming environments.

As the aim is to make rural tourism a significant source of livelihood in the countryside, it is important to consider how to develop farming environments into a real attraction in rural tourism destinations. One way to promote landscape values and access to farming environments for outdoor recreation is through the agri-environment scheme. Studies have shown that the value of the agricultural landscape is improved, in particular, by the presence of grazing animals in the landscape and the renovation of farm buildings located on open fields. Both these landscape features are becoming less common because of the aim of higher efficiency in agriculture and the regional differentiation of production sectors.

5.2. Agri-environmental regulation

In the EU programming period 2014–2020, the baseline for environmental protection and agri-environment measures is set by compulsory cross-compliance. Cross-compliance requirements, i.e. rules that farmers are expected to comply with, include statutory management requirements (SMRs) and good agricultural and environmental conditions (GAECs). Compliance with the cross-compliance requirements is a precondition for farmers to receive direct payments and some

other forms of support.

In total, 30% of direct payments paid by the EU during the programming period 2014–2020 have been targeted at greening measures, covering all hectares of arable land and including conditions regarding ecological focus areas, crop diversification and the maintenance of permanent grasslands. As a concrete measure, farmers in Uusimaa and Southwest Finland and on the Åland Islands must designate 5% of their agricultural area as an ecological focus area. Arable farming must be diversified to include two to three crops, depending on farm size. In addition, permanent grasslands must be maintained. Organic production is considered to meet the greening conditions, which means being entitled to the greening payment without the measures listed above.

Agri-environment climate scheme

The first new agri-environment-climate commitments under the 2014–2020 programming period were made in the spring of 2015. The former scheme, composed of basic, additional and special measures, was replaced by a parcel-specific system. In addition, during the programming period 2014–2020, organic farming is a specific measure and it is no longer included in the agri-environment climate scheme.

In the current scheme, farmers commit to monitoring soil fertility as a farm-specific measure and complying with more stringent use of fertilizers than the baseline requirements. Plant-specific nitrogen fertilization limits are based on the organic matter content, whereas, under the previous scheme, they depended on the geographical location and soil type of the parcel. The plant-specific maximum amount of phosphorus fertilization is affected by the soil fertility class, which is determined on the basis of the soil type, and organic matter and phosphorus content.

In addition to the balanced use of nutrients in all parcels of farms, there are parcel-specific measures concerning the plant cover on arable land in winter, promoting biodiversity in arable environments and recycling nutrients and organic matter. During the programming period 2014–2020, the measure concerning plant cover on arable land in winter as well as the measures concerning buffer zones and nature management field grasslands have been targeted on the grounds of water protection. This means that in catchment areas of rivers discharging into the Baltic Sea, these measures are more demanding, and the payments to farmers are higher. Environment contracts are signed on more detailed and site-specific environmental measures. During the programming period 2014–2020, environment contracts include the management of wetlands, the management of biodiversity and landscape in agricultural environments, reducing crop damages caused by cranes, geese and swans and securing suitable vegetation for the birds, rearing of Finnish local breeds and the maintenance of local crop varieties.

In 2015, some 86% of active farmers who applied for the basic payment under direct payments committed themselves to the agri-environment climate scheme for five years. In 2017, there were 43,400 commitments. The commitment area was 2.07 million hectares – more than 90% of the agricultural land area of the farmers who applied for the basic payment. The target area of the commitments was met during 2015, the first commitment year, and no new agri-environment-climate commitments have been made since.

The funding of the Rural Development Programme for Mainland Finland 2014–2020 totals EUR 8.3 billion. Of this, the proportion of agri-environment-climate measures is EUR 1.6 billion. Approximately EUR 225 million is to be used

for the agri-environment climate scheme every year, which is a little less than during the programming period 2007–2013. A total of 42% of the scheme is funded by the EU.

During the first commitment year, some of the parcel-specific measures in the agri-environment commitment considerably exceeded the target areas set for the programming period 2014–2020. For example, more than twice as many buffer zones were established compared with the requirements estimated in water management plans.

To ensure adequate funding, restrictions were issued in a Government decree regarding certain parcel-specific measures and the right to switch measures. The decree entered into force in 2016. Compensation for measures concerning the incorporation of slurry into the soil and the recycling of nutrients and organic matter is paid for no more than 60% of a farm's eligible arable land area. For measures concerning catch crops and renovation plants, the restriction is 25%. Previously, it was possible to receive payments for all arable land eligible for agri-environment payments. As of 2016, farmers have no longer been able to register new buffer zones. After the end of the 2016 payment application period, it has not been possible to register new zones concerning perennial environment grasslands and the control of runoff waters.

Changes were also made to the calculation of plant cover on arable land in winter. For example, calculations of the plant cover percentage no longer include buffer zones, perennial environment grasslands or nature management field grasslands. At the same time, the new decree allows farmers to give up measures concerning plant cover if their farm already has the maximum plant cover area in winter, and to switch measures.

A change in the measure concerning

renovation plants was approved in 2018. Accordingly, compensation can be paid to farmers whose crop rotation includes potatoes, sugar beet or outdoor horticultural crops regarding such basic parcel areas for which any of these crops were registered for cultivation in the application in 2015, 2016 or 2017.

Biodiversity fields can cover at most 15% of the eligible arable land area subject to the agri-environment commitment. Biodiversity fields and nature management field grasslands can cover a maximum of 20% of the eligible arable land area subject to the agri-environment commitment in targeted areas, and at most 15% in other areas.

Payments may no longer be applied for to implement new non-productive investments to build wetlands or clear and fence traditional rural biotopes or natural pastures, as the appropriations allocated to these are already assigned to ongoing projects. Instead, active farmers and registered associations may apply for environment contracts for the management of wetlands and environment contracts on the management of biodiversity and landscape in agricultural environments. Corporations under water law in accordance with the Water Act may apply for wetland management contracts.

No new commitments or contracts regarding environmental compensation will be made in 2020. Instead, contracts started in 2015 will be extended by one year. Contracts started after 2015 will continue until the end of their five-year period or end no later than at the beginning of the new measures in the next funding period.

The following restrictions and cuts have been planned for the agri-environment scheme to be implemented in 2020. The annual payment for the balanced use of nutrients will be EUR 17 per hectare for cultivated crops and EUR 80 per hectare for horticultural crops. No compensation will be paid for buffer zones next to main

ditches, and the payment for buffer zones will decrease to EUR 400 per hectare in targeted areas and to EUR 350 per hectare in other areas. The payment for agricultural parcels under grass for green manure will be EUR 17 per hectare in 2020. Compensation will only be paid for nature management field grasslands in targeted areas, and they may cover a maximum of 15% of the eligible arable land area. The maximum amount of farm-specific biodiversity fields will be 10% of the eligible arable land area. The total amount of nature management field grasslands and biodiversity fields will be at most 15% of the eligible arable land in targeted areas. The restrictions have sought to preserve the effectiveness of agri-environment measures and to take into account national strategies and policies.

New programming period planned to start in 2021 from an environmental perspective

The main points of the European Commission's common agricultural policy (CAP) renewal proposal from the point of view of environmental and climate objectives are: 1) the enhanced conditionality; 2) the first pillar's eco-scheme; 3) the second pillar's agri-environment climate scheme; and 4) the second pillar's other measures.

The enhanced conditionality will replace the current scheme's cross-compliance arrangement and greening measures. The enhanced conditionality will become a requirement for obtaining the full amount of direct payments funded in full by the EU and the payments paid to farmers for rural development funded in part by the EU. In addition, the enhanced conditionality includes definitions of requirements for good agricultural and environmental condition of the land and statutory management requirements in accordance with EU law. Most of the requirements included in the enhanced

conditionality are already listed in the cross-compliance and greening requirements of the current scheme. However, not all current requirements are included in the enhanced conditionality. For example, the requirement for three crops under the greening payment would be replaced by crop rotation. Some requirements will change towards a more environmentally effective direction. Ecological focus areas will be replaced by a minimum proportion of non-productive areas. New requirements include the appropriate protection of peatlands and wetlands, the prevention of bare ground during sensitive seasons, a tool for the sustainable use of nutrients, and parts of the Water Framework Directive and the Directive on the Sustainable Use of Pesticides.

The first pillar's climate and environmental scheme for direct payments, i.e. the eco-scheme, is a new element which will be obligatory for the Member States and voluntary for farmers. The Member States will prepare a list of positive agricultural practices considering the climate and the environment and included in the eco-scheme from which farmers can then select the best practices. The eco-scheme's measures need to be more demanding than the enhanced conditionality requirements, and they must also go beyond the minimum requirements set for the use of fertilizers and pesticides. In addition, the eco-scheme's measures must differ from the second pillar's climate and agri-environment commitments and be more demanding than climate and environmental legislation. Payments will be granted from the eco-scheme in the form of annual payments for eligible land, either as an additional hectare-specific top-up payment of basic support or it will compensate for the recipient's additional costs incurred and/or income foregone in full or in part, as in the current agri-environment climate scheme.

The inclusion of the second pillar's agri-environment measures in the CAP plan must be based on recognised needs. In addition, annually monitored goals must be set for the measures. The second pillar's agri-environment measures may be carried out as area-based management commitments, investments, different projects or advisory services. The Member States will have to offer agri-environment-climate commitments and advisory services, but the uptake will be voluntary for recipients of payments. The commitments must be more demanding than the enhanced conditionality requirements and the minimum requirements set for the use of fertilizers and pesticides, and they must be stricter than the requirements set for keeping land in good agricultural and environmental condition. In addition, the conditions of the commitments must differ from the requirements set for the eco-scheme. The Member States must compensate for costs arising from agri-environment commitments and any loss of income and, if required, any transaction costs also for results- or performance-based measures. In principle, the scheme will be similar to the current agri-environment climate scheme. Payments will be defined on the basis of hectares with regard to climate and agri-environment measures as well as organic production.

The second pillar's other measures require the Member States to provide environmental advisory services. Payments may also be granted to alleviate any adverse impact resulting from statutory requirements (the EU Water Framework Directive or the Habitats Directive). Other measures may include different projects with a positive impact on the climate and the environment (e.g. LEADER projects). With regard to investments, payments may be higher than 75% for forestation related to the climate or the environment or for non-productive investments.

During the new programming period, the Member States will have more decision-making powers regarding the content, supervision and monitoring of their payments. Every EU Member State will prepare a CAP plan, including both CAP pillars. The plan must describe the goals and results of the programming period and the measures required to reach them. The Commission will approve the Member State specific plans and monitor the fulfilment of their goals.

A national strategy group and three stakeholder groups (the agricultural group, the rural area group and the market group) have been set up for the preparation of the CAP period. Environmental issues will be discussed in all groups, particularly in the agricultural group. Finland's CAP plan, which includes the Åland Islands, will be prepared by the Ministry of Agriculture and Forestry during 2019 on the basis of feedback received from workshops and hearing and discussion events.

No decisions have yet been made on funding or country-specific budgets. According to the Commission's preliminary plans, however, 40% of EU funding for CAP measures should be allocated to climate measures and 30% of each Member State's rural development fund assets

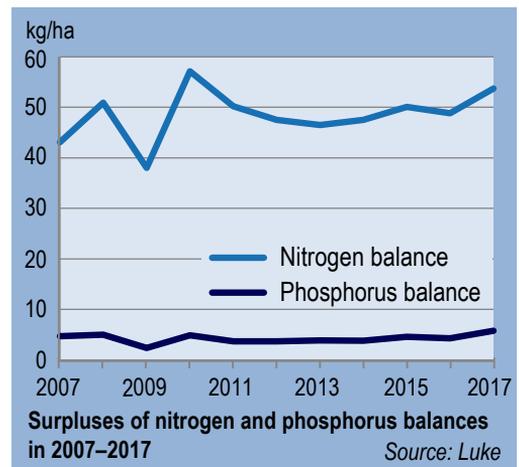
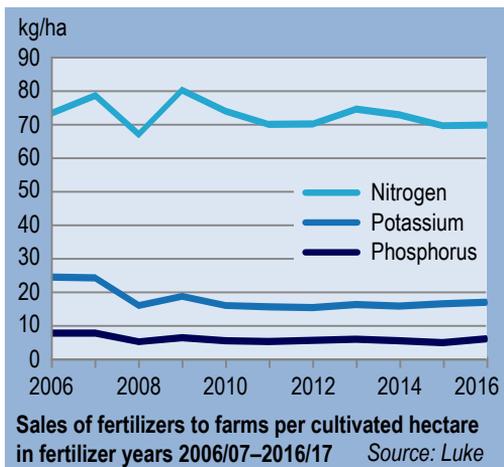
must be allocated to the fulfilment of climate and environmental goals. Environmental goals should not be lower than previously, although total funding will be lower in both pillars of the CAP.

5.3. Guidelines for water protection

Nutrient loading from agriculture involves non-point source pollution from over a million agricultural parcels with highly varied characteristics. Besides physical characteristics, such as slope and soil type, loading from a specific parcel depends on weather conditions and cultivation and tillage practices.

Nitrogenous fertilizer use is regulated by the Government Decree on Limiting Certain Emissions from Agriculture and Horticulture. The decree implements the Nitrates Directive and applies to all farmers throughout Finland. The decree aims to reduce the level of nitrates from agriculture and horticulture leaching into watercourses and ammonia emissions into the air. The use of phosphorus fertilizers by all farmers is regulated by the decree of the Ministry of Agriculture and Forestry on fertilizers.

Some 230,000 tonnes of nitrogen fer-



tilizers are used annually in agriculture and horticulture. Of this, 40% come from manure and sewage sludge. Some 33,000 tonnes of phosphorus fertilizers are used per year, with 60% of the phosphorus used coming from manure and sewage sludge.

In recent years, sales of nitrogen fertilizers have been 70 kg per hectare of cultivated land. Sales of phosphorus have dropped to some 6 kg per hectare of cultivated land. The trend is going in the right direction considering both the efforts to reduce nutrient loading and the profitability of agriculture. However, we should remember that the average per hectare is composed of very varying fertilization volumes, which may have much greater loading potential in areas susceptible to erosion. Certain risk areas load watercourses much more than on average.

The nitrogen and phosphorus balances (kg per hectare) indicate the difference between the volume of nitrogen and phosphorus fed through fertilizers and the volume removed from the soil. The nitrogen balance indicates the nitrogen loading potential of arable farming in surface water and groundwater. The phosphorus balance has an impact on the loading potential by slowly altering the content of highly soluble phosphorus in the soil, which in turn has an impact on soluble phosphorus loads. The phosphorus content in arable land also has an impact on the transfer of phosphorus tied to the soil, even though the prevention of erosion is the fastest way to reduce the leaching of phosphorus into watercourses. Nitrogen and phosphorus balances measure the risk of nutrient leaching. They have remained fairly stable in recent years throughout Finland. However, there are significant regional differences, in particular due to the concentration of livestock production.

To enhance water protection and

achieve a good water status, a number of national and regional programmes and strategies have been launched. The Government Resolution on Water Protection Policy Outlines was passed in 2006. It determined the national objectives for water protection and the measures for achieving a good status of rivers, lakes, coastal waters and groundwater by 2015. Reducing the nutrient loading that causes eutrophication was set as the key objective. According to the resolution, nutrient loading from agriculture was to be reduced by at least a third from the average in 2001–2005 by 2015. The goal was to reduce phosphorus loading by roughly 3,000 tonnes per year and nitrogen loading by approximately 30,000 tonnes per year.

Finland was divided into eight water management areas, each with a specific water management plan designed in 2009 for 2010–2015. In 2015, the Government approved new water management plans for 2016–2021 for the seven water management areas in Mainland Finland.

In 2018–2020, Finland will chair the Baltic Marine Environment Protection Commission (HELCOM). During Finland's term, the Baltic Sea Action Plan will be revised. HELCOM's previous action plan dates back to 2007.

Some water protection objectives still unfulfilled

According to the 2015 ecological assessment of surface waters, 85% of Finland's lake area and 65% of rivers are in good or excellent condition. Only 25% of coastal waters achieved the same status.

The objectives set in the first water management plans for reductions in loading were not met. In agriculture, the positive news is that the nutrient surplus of cropland has nearly halved from the surpluses in the 1990s. Despite this, the soil reacts very slowly to changes in fertilization, particularly where phosphorus is

concerned. Even significant reductions in phosphorus fertilization are therefore not immediately reflected in the loads.

The concentration of livestock production and growing farm sizes also present a problem in meeting the objectives. Transporting manure is costly. Three quarters of manure is processed in the form of slurry or liquid manure. More than 40% of slurry is spread through injection spreading. Some 30% is spread by means of band and knife spreading or by using other mechanical means. Broadcast spreading only accounts for less than 30%. Manure is often spread based on the nitrogen need of the crop. This means that the phosphorus levels become too high for the crops' needs, and the loading potential increases. A new threat to water quality is climate change, which is expected to increase precipitation, especially outside the growing season.

5.4. Discussion topics and future perspectives

Greening

Greening measures, included in payments funded in full by the EU, go beyond the cross-compliance but are more limited than agri-environment measures. In total, 30% of direct payments have been tied to greening. Farms engaged in organic farming or primarily grassland cultivation have been granted a full or partial exemption from greening measures. To avoid double funding, the coordination of greening measures and the agri-environment climate scheme required clear distinctions in definitions.

Farmers must comply with three greening measures in their eligible arable land:

1. Crop diversification: On farms of 10–30 hectares, farmers must cultivate at least two crops, and three crops on farms larger than 30 hectares. Farms north of the 62nd

parallel and in adjacent areas constitute an exception: they are only required to produce two crops on farms larger than 10 hectares. The diversification requirement does not apply to farms cultivating more than 75% grasslands if their remaining cultivation area is less than 30 hectares.

2. Maintaining permanent grasslands: Monitored at member-state or regional level.
3. At least 5% of the arable area of a farm must be an ecological focus area: In Finland, fallow land, nitrogen-fixing plants, short rotation coppices and landscape features in accordance with the cross-compliance conditions are accepted as ecological focus areas. Exceptions with regard to ecological focus areas have been provided for areas and farms that meet certain requirements (e.g. predominantly forested areas and farms focused on grasslands). In Finland, farms in the regions of Southwest Finland and Uusimaa, or on the Åland Islands are required to have ecological focus areas. The ecological focus area requirement does not apply to farms in other regions, as they are exempt due to the area being predominantly forested.

The severity of the consequences of failing to comply with the greening measures increases gradually: after a two-year transition period, in addition to losing the greening payment, farmers may also lose a part of their basic payment. Based on experiences and analyses, the implementation of the greening measures is not considered to be a highly successful environmental policy.

Permanent grasslands

Maintaining permanent grasslands is an objective throughout the EU. Since 2015, the requirement to maintain permanent grasslands has applied to permanent grasslands in accordance with the new definition. According to the Direct Payments Regulation, permanent grasslands are agricultural lands that are used for cultivating grasses and other herbaceous forage and that have not been included in the crop rotation of a farm in at least five years. A land parcel is classified as permanent grassland if it has been grassland continuously for the previous five years, and it is also reported as grassland in the sixth cultivation year.

The status of permanent grasslands does not impose actual restrictions on use if grass cultivation does not decrease throughout Finland. The status of permanent grasslands is annual, depending on the crop cultivated in the parcel each year. The status does not mean that grass should also be cultivated in the parcel in question in the future. If crops other than grass are cultivated in a parcel assigned the status of permanent grassland, the status is removed.

Parcel-specific grassland measures in accordance with the agri-environment scheme, such as buffer zones, grasslands for green manure, nature management field grasslands or perennial environment grasslands, stop the accumulation of permanent grasslands. The situation of permanent grasslands is monitored nationally in accordance with the requirements of the greening payment. Only if the area of permanent grassland decreases by 5% in the whole of Finland from the guideline value confirmed in 2015, farmers may be required to return grassland parcels used for other purposes to grass cultivation.

Bioeconomy

There is no single definition of the bioeconomy, and different parties underline dif-

ferent aspects. For some, the bioeconomy is about biotechnology, while others emphasise biofuels. Many perceive the bioeconomy as the utilisation and processing of biomass, in which case, it covers all production that produces, utilises, processes and markets renewable resources as well as the consumption of products made from renewable resources. This includes the forest industry, the chemical industry, the fishing industry, agriculture, forestry, the food industry and the pharmaceutical industry. Nature tourism can also be seen as part of the bioeconomy.

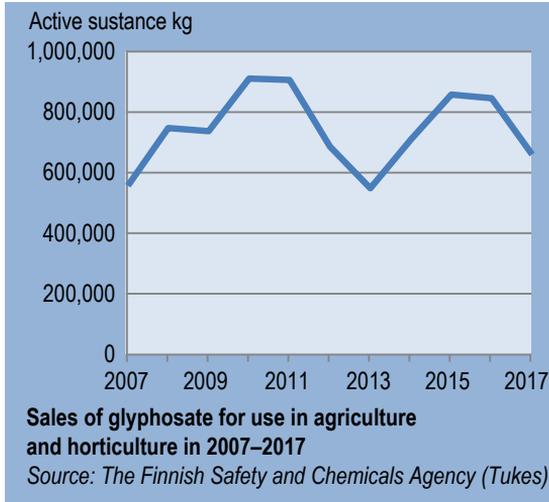
The bioeconomy strives to reduce dependency on non-renewable natural resources and to maintain the diversity of ecosystems. In the context of green growth, it seeks to promote economic development and the creation of new jobs, following the principles of sustainable development. Particularly at the initial stage, the bioeconomy requires significant public investments in research, education and the construction of the infrastructure.

Glyphosate discussion

Glyphosate-containing herbicides are used for the chemical control of common couch and perennial weeds. Glyphosate has provoked heated discussion because of its suspected carcinogenic effects.

In 2015, an independent group of experts from the International Agency for Research on Cancer (IARC), who identified adverse effects of glyphosate, proposed that glyphosate should be classified as a probable human carcinogen. However, the European Chemicals Agency (ECHA) does not classify glyphosate as a carcinogenic substance. The European Food Safety Authority (EFSA) has reached the same conclusion and has also stated that glyphosate does not disturb hormonal activities.

The EU approval of glyphosate remains valid until the latter half of 2022.



Glyphosate products available for sale cannot contain any polyethoxylated tallow amine (POEA). In addition, the EU Commission has issued a recommendation according to which the Member States must pay attention to the use of glyphosate products in sensitive areas, especially in uncultivated areas, public areas and playgrounds.

Glyphosate is the most widely used herbicide in the world, and banning its use would lead to extensive changes in conventional agricultural production. In Finland, some 700 tonnes of glyphosate are sold annually as an active substance for use in agriculture and horticulture. In no-till farming, glyphosate products are usually applied before sowing. In tilled land, glyphosate is mainly used after threshing. Desiccating cereal crops with glyphosate (i.e. dry down before harvest) is not permitted in Finland. Instead, the use of glyphosate products to remove common couch on feed barley, feed oats, turnip rape and rape farms before threshing is permitted.

Gypsum treatment of fields

Gypsum treatment of agricultural fields is a large-scale water protection method

which can be carried out alongside with other farming tasks. Gypsum can be spread using a manure spreader or a wet lime spreader. The effect of gypsum in binding phosphorus and limiting its leaching into watercourses has been studied in Finland for the past ten years. The impact of gypsum is based on increasing the ionic strength of the soil. Less phosphorus leaches into soil water, while phosphorus remains available for crops. In Finland, the method is suitable for more than 500,000 hectares of arable land in the catchment areas of watercourses discharging into the Bothnian Sea, the Archipelago Sea and the Gulf of Finland.

Applying gypsum to agricultural fields significantly reduces erosion and the leaching of dissolved and particulate phosphorus tied to the soil particles through runoff water. The increase in the ionic strength as a result of gypsum also reduces the leaching of dissolved organic carbon. Gypsum has a direct impact on leaching, which rapidly improves the state of coastal waters. According to current knowledge, gypsum treatment reduces phosphorus leaching for some five years.

Sulphate contained by gypsum has not been found to have any adverse impact on rivers. Only a small amount of gypsum (4 tonnes per field hectare) is needed to produce the desired impact on water bodies. In Finland, gypsum is available, for example, as a by-product of the phosphoric acid industry in Siilinjärvi.

The costs of gypsum treatment were identified in the Savijoki river pilot project and in previous projects in which gypsum acquired from the YARA factory in Siilinjärvi has been used. The total costs of gypsum amendment have been roughly EUR 220 per hectare. Transportation from Siilinjärvi to the farms accounts for 60% of the total costs. The remaining

costs comprise the material and spreading costs. Gypsum amendment does not reduce crop yields or the cultivated area. Therefore, it causes no loss of income for farmers. The cost of gypsum amendment in proportion to its ability to reduce the phosphorus load from agriculture is roughly EUR 60–70 per each kg of phosphorus reduced. Reducing the phosphorus load entering the Baltic Sea by means of gypsum treatment of fields is therefore less expensive than by increasing the number of buffer zones or wetlands.

Alien species

Alien species are species that have spread from their natural area of distribution as a result of human activities, either intentionally or unintentionally. Alien species that cause serious damage or harm to indigenous species, ecosystems, cultivated crops, forestry or other business activities are controlled throughout the EU, and they are called invasive alien species. Of the invasive alien species listed by the EU, Himalayan balsam, three giant hogweed species, American skunk cabbage, muskrat, raccoon dog, signal crayfish, and Chinese mitten crab can be found in Finnish nature.

According to the EU Regulation on Invasive Alien Species, all Member States

must apply effective management measures to eradicate or contain invasive alien species. In Finland, the Act on Managing the Risks Caused by Alien Species and Government Decree on Invasive Alien Species of National Concern entered into force at the beginning of 2016 in Finland. The act stipulates the responsibilities of landowners and professional parties for preventing invasive alien species that may cause significant damage, particularly in the Finnish conditions. The EU has prepared a list of invasive alien species considered to be of Union concern. In addition, the Government decree defines other nationally significant invasive alien species, which are not included on the list of species of Union concern, but can be considered harmful in the Finnish environment.

The first Finnish management plan for invasive alien species was approved in March 2018. The plan guides the control of 37 alien species and presents available management measures and necessary co-operation bodies. In the spring of 2019, the Ministry of Agriculture and Forestry proposed additions to the management plan. The proposal includes measures to prevent 12 new species added to the Union list.

Environmental impacts of organic production

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There is an extensive consensus on that the sustainability of the Finnish food system should be developed, but there are various views on the tools of change. The Finnish organic farming is based on the EU's regulation on organic production and its supervised compliance makes it possible to market products as certified organic products. The object is to produce healthy food in a way which takes into consideration the wellbeing of the environment, people and animals. In Finland, consumption of organic products continues its increase. About 13% of our field area and about 10% of our farms are certified organic. This article considers the impacts of organic production on the climate, waterbodies and biodiversity and evaluates the possibilities of organic farming to promote the sustainability of the food system.

Organic farming supporting climate change mitigation

Alongside with methane, nitrous oxides are noteworthy greenhouse gases created in primary production. Nitrous oxides are released from the soil due to the use of chemical fertilizers and manure and the decomposition of plant remnants. In organic production, nitrous oxide emissions are mainly explained by soil properties, such as the amount of nitrogen in the soil. In a long-term Central European field experiment, nitrous oxide emissions per area were 40% lower on organic fields than on conventional ones. In Finland, there have been no corresponding long-term field experiments. In a short-term Finnish study, nitrous oxide emissions of organic grass production were considerably lower than those of conventional cereal cultivation but not lower than those of conventional grass.

In the agricultural production chain, the industrial manufacture of chemical nitrogen fertilizers based on fossil energy is a significant source of loading for the atmosphere. In organic production, biological nitrogen fixation of leguminous plants and cattle manure produce nitrogen in the field, whereby energy consumption is lower. Smaller dependency on the use of fossil energy and better energy efficiency are the means of organic production for containing the release of greenhouse gases into the atmosphere.

Organic farming methods, such as the use of perennial grasses in crop rotation, versatile crop rotation including leguminous plants and the use of manure, promote the accumulation of organic matter and carbon into the soil. The climate impacts of organic production, calculated as greenhouse-gas emissions and considering various emission sources, are smaller per area than those of conventional production. However, the yields and outputs in organic farming are about 20–25% lower, even though there is variation between plants and depending on production conditions. Still, many studies have shown that the climate impact calculated per produced unit is on the same level both in organic and conventional production. Most of the comparative studies were performed in the temperate climate zone. Very little research has been done in conditions corresponding the Finnish ones. It is also important to notice that the current methods of life cycle analysis (LCA) utilized in evaluating sustainable food production to estimate the carbon footprint of products are still defective, because they only rarely consider changes in soil carbon resources, special characteristics of the organic production method and the impacts of the production

methods on the soil health in the long-run. The development of methods would increase our understanding on the climate impacts of organic production.

Adaptation to the climate change is important for farmers' livelihood and food security. Organic production improves soil health and structure which enhance the soil's resistance for extreme weather conditions, such as torrential rains and drought. In the future, yield may become more important than crop yields and actions targeting it must be developed also for organic farming.

Low chemical loading being environmental benefit of organic farming

In organic farming, crop fertilization is based on green manuring crops fixing atmospheric nitrogen and cattle manure rather than mineral fertilizers. The challenges are releasing nutrients timely available for the needs of crops and preventing their leaching into waters. In short field tests, differences in nitrogen leachings between organic and conventional farming are often very small. However, long-term tests have shown that about 20–30% less nitrogen per area has leached from organic fields. In phosphorous loading, differences between organic and conventional production are very small. When calculated per produced yield kg, the differences between organic and conventional farming are evened out. In LCA modelings, the variation in nutrient leaching estimations is usually very large and it is difficult to show differences between production lines. Thus, field-experiment measurements in our northern conditions are needed to be able to improve the defining power of models.

Chemical loading of organic farming is lesser than that of conventional farming. The use of chemical pesticides is forbidden and the use of animal drugs is limited, whereby the release of these substances from organic fields or pastures into waters or groundwater is negligible. When monitoring hazardous substances in Finnish waters, several dozens of pesticides or their degradation products were observed in the 2000s. Even though their concentrations were usually low, some exceeded environmental quality standards (EQS).

Due to global warming, rains and runoffs in the winter will increase, which adds to the leaching of nutrients and agricultural chemicals into waters. Permanent vegetation cover on the fields decreases erosion and leaching. More research is required on how to prevent leaching particularly in our northern conditions.

Organic farming maintaining biodiversity

We are experiencing the sixth extinction wave. The disappearance of insects is particularly fast and it has been observed to be related to the use of agricultural chemicals. Accumulating research data shows that organic production is more beneficial than conventional production in relation to biodiversity. In a global research survey, 95% of studies showed that the average numbers of different organisms were higher in organic farming than in conventional farming. Furthermore, decreasing crop diversity endangers food security as the climate changes. Two thirds of plant production in the world is dependent on only nine crops which are susceptible to climate change. More attention to the diversity and local adaptation of crops should be paid in the climate change debate. Organic production emphasizes the use of varieties adapted to local conditions.

Organic production giving means for sustainability change

Based on current research data, environmental benefits of organic production include smaller local nutrient emissions, lower chemical loading, carbon sequestration potential

on organic fields, maintenance of soil health and biodiversity, smaller energy use and, thus, smaller dependency on fossil energy. These benefits can be obtained even though the climate impacts per yield kg were on the same level as those of conventional production. The most criticism the organic production faces is related to lower crop yields. In organic farming, it is possible to increase yields by optimizing nutrient supply and by strengthening plant protection. Developing new recycled nutrients for the requirements of organic production is indeed important. Sustainable increasing of yields must still be done with care in order not to increase environmental loading. Here, farmers' skills are crucial.

Alongside with considering efficiency focusing on maximizing yields, we should also consider total sustainability, particularly ecosystem services provided by organic farming and their long-term benefits. The discussion should also involve the sufficiency of food and non-renewable natural resources: controlling production and consumption such that the environmental impacts of food production would be as small as possible, food would provide health benefits and there would be enough nourishment for the people of the world.

In Finland, the environmental impacts of the conventional agriculture are not yet as clearly visible as they are in many places in Europe but we have become conscious of the necessity of improving the sustainability of agriculture. The Finnish farmers' increasing interest in organic farming methods is the proof of that. The purpose of Finnish organic research is to produce information on the environmental impacts of organic production in the Finnish conditions and to develop its environmental sustainability. Organic research will develop means for farmers to recognize the environmental impacts of their own farm production and to test and adopt practical farming methods to reduce farm-level environmental loading. The extensive implementation of these measures depends on society-level decisions, i.e. will we support ecologically, economically and socially sustainable or non-sustainable food production by means of the European Common Agricultural Policy.



Grass cultivation has an important role in the Finnish organic farming where cattle feeding is mainly based on grass utilization. Cultivation of perennial grasses improves soil health and decreases the risk of load on waters. Photo: The archive of the Finnish Organic Research Institute

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Attachments

Number of farms receiving agricultural support according to production line in 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Crop farms	40,578	40,891	41,136	41,263	40,736	41,688	41,488	41,496	41,195
Dairy Husbandry	21,026	19,839	18,561	17,427	16,399	15,002	13,732	12,635	11,807
Pig husbandry	3,979	3,807	3,646	3,385	3,149	2,959	2,722	2,477	2,239
Beef production	5,137	4,955	4,818	4,640	4,425	4,244	4,122	4,035	3,932
Poultry production	1,135	1,077	908	1,015	972	928	879	817	769
Other	3,510	3,380	3,450	3,355	3,396	3,927	3,878	3,773	3,717
Number of farms	75,365	73,949	72,519	71,085	69,077	68,748	66,821	65,233	63,659

Source: Finnish Food Authority

Number of farms receiving agricultural support according to production line in 2010-2018.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Crop farms	41,114	40,730	39,609	39,717	38,693	36,607	35,987	35,544	35,241
Dairy Husbandry	11,136	10,501	9,827	9,008	8,708	8,223	7,792	7,298	6,854
Pig husbandry	2,036	1,920	1,771	1,539	1,477	1,348	1,250	1,157	1,080
Beef production	3,789	3,745	3,633	3,490	3,469	3,403	3,385	3,355	3,271
Poultry production	724	696	589	568	563	551	546	531	514
Other	3,589	3,504	3,417	3,195	3,073	2,727	2,597	2,521	2,446
Number of farms	62,388	61,096	58,846	57,517	55,983	52,859	51,557	50,406	49,406

Source: Finnish Food Authority

Number of farms receiving agricultural support according to production line in 2018

	Southern Finland		Eastern Finland		Middle Finland		Northern Finland	
	Number of farms	%	Number of farms	%	Number of farms	%	Number of farms	%
Crop farms	17,564	79.3	5,279	60.6	8,913	69.7	3,485	60.6
Dairy Husbandry	1,638	7.4	1,949	22.4	1,871	14.6	1,396	24.3
Pig husbandry	552	2.5	59	0.7	424	3.3	45	0.8
Beef production	986	4.5	868	10.0	933	7.3	484	8.4
Poultry production	334	1.5	19	0.2	154	1.2	7	0.1
Other	1,080	4.9	538	6.2	495	3.9	333	5.8

Main regions of Uusimaa and Åland according to NUTS II have been included in Southern Finland.

Source: Finnish Food Authority

Producer price index and index of purchase prices of means of agricultural production (2015=100)

	Producer price index of agriculture ¹	The index of purchase prices of means of agricultural production			
	Total index	Total index	Goods and services	Investment	Buildings
2018	100.3 *	102.6	102.3	103.5	102.2
2017	98.3	98.9	98	101.3	100.4
2016	95.9	97.4	96.2	100.4	100.2
2015	100	100	100	100	100
2014	106.7	101.6	102.6	99.3	99.9
2013	125.3	103.3	105.4	97.9	99.1
2012	117.1	101.3	103.1	97	98.8
2011	109.8	97.7	98.8	95.1	96.4
2010	93.6	87.6	86.2	91	91.7
2009	87.3	85.4	83.6	89.8	89.6
2008	98.9	93	93.9	88.4	93.2
2007	89.1	80.4	78.8	84.2	89.6
2006	84.8	76.9	75.2	80.9	82.2
2005	81.4	74.2	72.5	78.1	77.7
2004	82.8	72.2	71.2	74.8	74.7
2003	81.1	70.2	69.4	72.3	72.5
2002	86.9	69.2	68.8	70.6	71.4
2001	88.7	68.9	69	68.9	69.9
2000	83.9	67.4	67.7	66.9	68.3

¹ Incl. Fur production.

* Preliminary information

Source: Statistics Finland.

Structural change in agriculture					
	Number ¹ of farms 1,000	Average ¹ size of farms, hectares	Number of milk suppliers 1,000 suppliers	Employed in agriculture 1,000 persons	% of employed
2018	48	48	6	72	2.8
2017	49	47	7	68	2.7
2016	50	46	8	65	2.7
2015	51	45	8	70	2.9
2014	53	43	9	76	3.1
2013	54	42	9	76	3.1
2012	56	39	10	78	3.1
2011	62	37	10	80	3.2
2010	63	37	11	84	3.4
2009	64	36	11	88	3.6
2008	66	35	12	88	3.5
2007	67	34	13	87	3.5
2006	69	33	15	90	3.7
2005	70	33	16	91	3.8
2004	72	32	17	93	3.9
2003	74	31	18	99	4.2
2002	75	30	19	106	4.5
2001	77	29	21	112	4.7
2000	80	28	22	118	5.1
1999	..	..	24	121	5.3
1998	88	25	26	120	5.4
1997	90	24	28	130	6.0
1996	94	23	30	133	6.3
1995	100	22	32	141	6.7

¹ The compilation of farm statistics was renewed in 2010. According to the new Agricultural and Horticultural Enterprise register, the economic output threshold for a farm enterprise is € 2000. Approximately 4000 farms earlier included in the register now remain below the threshold.

² From 2005 based on new industrial classification TOL 2008.

Sources: Luke, Statistical services, Statistics Finland.

Number of animals in May and the average yield per cow.				
	Dairy cows	Yield per cow	Pigs	Hens
	1,000 pcs	litres	1,000 pcs	1,000 pcs
2018	271	8,650	1,087	3,663
2017	275	8,534	1,129	3,650
2016	282	8,406	1,235	3,599
2015	285	8,323	1,243	3,595
2014	285	8,201	1,245	3,645
2013	283	7,977	1,300	3,432
2012	284	7,876	1,290	3,172
2011	286	7,859	1,335	3,304
2010	289	7,896	1,367	3,394
2009	290	7,850	1,381	2,926
2008	289	7,767	1,483	3,190
2007	296	7,796	1,448	3,134
2006	309	7,646	1,436	3,103
2005	319	7,505	1,401	3,128
2004	324	7,404	1,365	3,069
2003	334	7,251	1,375	3,016
2002	348	7,117	1,315	3,212
2001	355	6,932	1,261	3,202
2000	364	6,786	1,296	3,110
1999	372	6,443	1,351	3,361
1998	383	6,225	1,401	3,802
1997	391	6,183	1,467	4,152
1996	392	5,993	1,395	4,184
1995	399	5,982	1,400	4,179

Source: Luke.

Structural change and milk production in organic production.

	Number of organic farms	Average size of organic farms, hectares	Organically cultivated area 1,000 ha ¹⁾	Number of organic milk producers	Received organic milk Mill. l
2018	5,039	58.9	297	145	69
2017	4,587	56.5	259	144	63
2016	4,415	54.5	241	139	55
2015	4,251	52.8	225	143	54
2014	4,180	50.9	213	135	47
2013	4,215	48.9	206	132	41
2012	4,260	46.4	198	131	38
2011	4,036	45.8	185	118	31
2010	3,939	43.4	171	117	30

¹⁾ Area approved and in transition.

Sources: Finnish Food Authority, Luke.

Number of animals in organic production.

	Dairy cows 1,000 pcs	Suckler cows 1,000 pcs	Hens 1,000 pcs	Ewes with lambkins 1,000 pcs
2018	10	22	284	25
2017	9	20	231	22
2016	8	18	204	23
2015	8	18	198	23
2014	7	15	166	19
2013	6	15	163	18
2012	7	14	136	14
2011	6	12	113	12
2010	5	10	98	10

Source: Finnish Food Authority.

		2013	2014	2015	2016	2017	2018	2019
	Unit	€/unit	€/unit	€/unit	€/unit	€/unit	€/unit	€/unit
NATIONAL SUBSIDIES FOR AGRICULTURE AND HORTICULTURE								
NATIONAL SUBSIDIES FOR SOUTHERN FINLAND, NORTHERN SUBSIDIES AND SUBSIDIES FOR CROP PRODUCTION								
SUBSIDIES PER LIVESTOCK UNIT								
Suckler cows								
AB	€/lu	93	93					
C1	€/lu	300	300	300	300	315	315	322
C2	€/lu	300	300	300	300	315	315	322
C2north and archipelago	€/lu	376	376	376	376	391	391	398
C3	€/lu	451	451	451	451	466	466	473
C4	€/lu	636	636	636	636	651	651	658
Male bovines >6 months								
AB	€/lu	187	187					
C1	€/lu	422	422	422	520	560	560	567
C2	€/lu	430	430	430	520	560	560	567
C2north and archipelago	€/lu	506	506	506	620	660	660	667
C3	€/lu	582	582	582	700	735	735	742
C4	€/lu	767	767	767	1050	1080	1080	1087
Ewes								
AB	€/lu	184	184					
C1	€/lu	390	390	363	363	363	363	370
C2	€/lu	398	398	369	369	369	369	376
C2north and archipelago	€/lu	474	474	426	426	426	426	433
C3P1–P2	€/lu	664	664	568	568	568	568	575
C3P3–P4	€/lu	745	745	629	629	629	629	636
C4P4	€/lu	956	956	787	787	787	787	794
C4P5	€/lu	956	956	787	787	787	787	794
Decoupled subsidies for pigs and poultry								
AB	€/lu	74	76	78	75	68	62	50
Farms below the farm specific limit¹								
C1	€/lu	208	208	191	186	181	177	173
C2	€/lu	182	182	167	163	158	154	150
C2north and archipelago	€/lu	242	242	223	215	211	208	205
C3 ja C4	€/lu	251	251	230	222	218	215	212
Farms over the farm specific limit¹								
C1	€/lu	105	108	111	107	97	88	71
C2	€/lu	91	93	96	92	83	76	61
C2north and archipelago	€/lu	77	79	81	78	71	65	52
C3 ja C4	€/lu	77	79	81	78	71	65	52

¹ The farm-specific differentiation of decoupled support is applied in northern aid. The farm specific limit for small farms is 146 LU in area C1, 170 LU in area C2, 200 LU in area C2 north and in areas C3 and C4.

		2013	2014	2015	2016	2017	2018	2019
	Unit	€/unit	€/unit	€/unit	€/unit	€/unit	€/unit	€/unit
Northern subsidies for slaughtered animals								
Male bovines, C3–C4								
P1–P2	€/slaught. animal	131	131	131	131	131	131	131
P3–P4	€/slaught. animal	182	182	182	182	182	182	182
P5	€/slaught. animal	333	333	333	333	333	333	333
Heifers								
AB	€/lu	240	240					
C1	€/lu	498	498	498	473	500	500	507
C2	€/lu	498	498	498	473	500	500	507
C2north and archipelago	€/lu	580	580	580	555	580	605	612
C3	€/lu	650	650	650	625	650	675	682
C4	€/lu	793	793	793	768	800	800	807
Production subsidies for milk								
AB	cents/l	2.8	2.8					
C1	cents/l	7.7	7.7	7.7	7.9	7.1-7.6	7.3	7.3-7.8
C2	cents/l	8.4	8.4	8.4	8.7	7.8-8.3	8.0	8.0-8.5
C2north	cents/l	9.4	9.4	9.4	9.8	8.8-9.3	9.0	9.0-9.5
C3P1	cents/l	12.4	12.4	12.4	13.1	11.8-12.3	12.0	12.0-12.5
C3P2	cents/l	14.1	14.1	14.1	15.0	13.5-14.0	13.7	13.7-14.2
C3P3-P4	cents/l	16.7	16.7	16.7	17.9	16.1-16.6	16.3	16.3-16.8
C4P4	cents/l	21.4	21.4	21.4	23.1	20.8-21.3	21.0	21.0-21.5
C4P5	cents/l	30.6	30.6	30.6	33.4	30.0-30.5	30.2	30.2-30.7
SUBSIDIES FOR CROP PRODUCTION								
Subsidies per hectare in northern Finland								
C1-area								
Wheat	€/ha	58	58	31				
Rye	€/ha	230	230	154	65	75	75	75
Starch potatoes	€/ha	204	204	154	100	100	100	150
Vegetables grown in the open	€/ha	535	535	535	325	350	350	400
Arable crops, excl. cereals	€/ha	184	184	123	65	75	75	75
Protein crops	€/ha			69	39	45	45	45
Sugar beet	€/ha	154	154	154	100	100	100	150
C2- and C2P-areas, archipelago								
Wheat	€/ha	58	58	31				
Rye	€/ha	230	230	154	65	75	75	75
Starch potatoes	€/ha	204	204	154	100	100	100	150
Vegetables grown in the open	€/ha	535	535	535	325	350	350	400
Arable crops excl. cereals (excl. C2P)	€/ha	73	73	69	65	75	75	75
Protein crops (excl. C2P)	€/ha			69	39	45	45	45
Sugar beet	€/ha	154	154	154	100	100	100	150
C3- and C4-areas								
Vegetables grown in the open	€/ha	535	535	535	325	350	350	400

		2013	2014	2015	2016	2017	2018	2019
	Unit	€/unit	€/unit	€/unit	€/unit	€/unit	€/unit	€/unit
Subsidies for special crops in southern Finland								
AB -area								
Starch potatoes	€/ha	100	100					
Vegetables grown in the open	€/ha	100	100					
Aid per hectare of livestock farms								
AB-areas	€/ha	39	41					
General areal subsidies for arable crops								
C2	€/ha	33	28	14		10	10	10
C2north and archipelago	€/ha	33	28	14	10	20	20	20
C3	€/ha	49	44	30	20	30	30	30
C4	€/ha	100	95	70	50	55	55	55
Areal subsidies for young farmers, C1–C4	€/ha	36	36	36	36	40	40	50
National subsidy for sugar beet, whole Finland	€/ha	350	350	350	350	350	350	350
Subsidies for greenhouse products, AB								
over 7 months	€/m2	10.3	10.5	9.7	9.6	9.4	8.9	8.6
2–7 months	€/m2	3.8	4.0	3.7	3.6	3.4	3.0	2.8
Subsidies for greenhouse products, C1 –C4								
over 7 month	€/m2	10.6	10.6	10.0	9.7	9.5	9.1	8.8
2–7 months	€/m2	4.1	4.1	4.0	3.7	3.5	3.1	2.9
Storage subsidies for horticulture products,								
AB-area								
Storages with thermo-control system	€/m3	14,2	14,2	14,2	14,2	10,0	10,0	10,0
Other storages	€/m3	8.8	8.8	8.8	8.8	6.2	6.2	6.2
C-areas								
Storages with thermo-control system	€/m3	14.2	14.2	14.2	14.2	14.2	14.2	14.2
Other storages	€/m3	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Converting number of animals into livestock units (lu) in national subsidies								
Animal	lu							
Suckler cows	1							
Suckler cow heifers, over 2 years	1							
Suckler cow heifers, 8 months–2 years	0.6							
Bulls and steers, over 2 years	1							
Bulls and steers, 6 months–2 years	0.6							
Ewes	0.15							
Goats, female	0.48							
Horses								
- breeding mares (horses and ponies)	1							
- Finnhorses, 1 year or older	0.85							
- other horses 1–3 years	0.6							



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