VYR.FI
VILJA-ALAN YHTEISTYÖRYHMÄ

mmm.fi

Production of cereal and oilseed crops in Finland

This brochure describes how cereal and oilseed crops are produced in Finland, and presents some special characteristics of our crop production and cereal chain.

Briefly

The clean soil, air, and water in Finland form the prerequisites for the production of high-quality and safe raw materials for different purposes.

In particular, high technical and hygienic quality numbers among the strengths of Finnish agricultural products.

Finland is located in Northern Europe, mainly between the 60th and 70th latitudes, and is a part of the European Union. Annually, approximately four million metric tons (mton) of cereal and oilseed crops are produced as raw material for feeds, foodstuffs and other purposes. Finland is the world's northernmost grain-producing country. Agricultural production takes place on family-owned farms. Finland is located on the coast of the Baltic Sea, which provides a shipping route to Europe and onwards to other markets. Finland also has easy connections to Russia via road and rail. Annually, approximately 500,000 metric tons of grain are exported from Finland.

The northern location sets some limits, for example with regard to what plants can be cultivated. On the other hand, the cold winter reduces the occurrence of plant diseases and pests. In Finland, the cereal and oilseed crop yield is without exception dried at the farms after harvesting to a moisture content of less than 14 percent. This increases the homogeneity and retains high grain quality. ■

Table of Contents

Agricultural production in northern conditions 3

Production of cereal and oilseed crops 3

- Growing conditions 3
- Barley is the most produced cereal crop 4
- Constant demand for rye and oilseed crops 5

Cereal and oilseed crops are produced on family-owned farms 5

Cultivation-related measures during the growing period 7

- Agricultural plan and production factors 7
- Measures during the growing period 7

Short logistics chain from farms to grain users and ports 9

- Grain trade and export 10

This brochure has been written by the Finnish Cereal Committee in co-operation with operators in the grain chain. It has been funded by the Ministry of Agriculture and Forestry.

In Finland there are several grain dealers and other actors in grain industry.

Further information:

Finnish Cereal Committee: www.vyr.fi
Ministry of Agriculture and Forestry: www.mmm.fi
Finnish Food Safety Authority Evira www.evira.fi

Pictures:

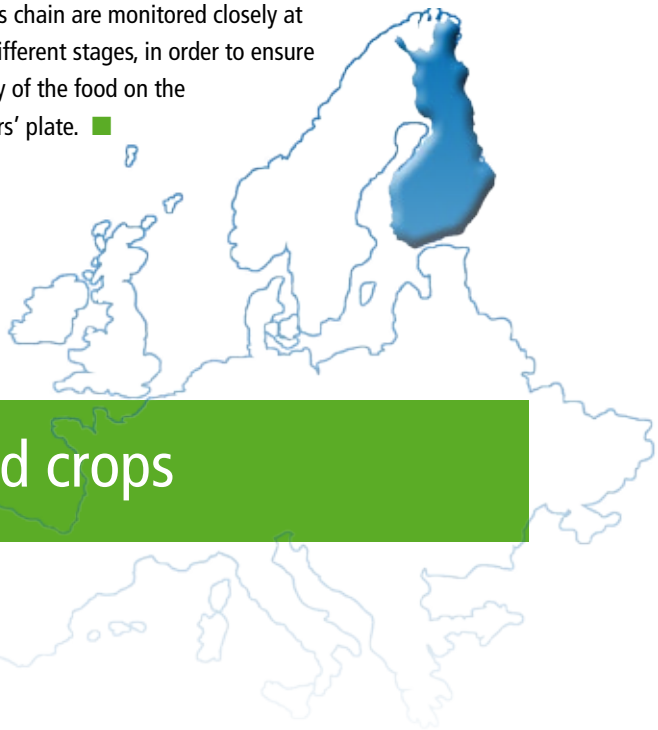
Jukka Virolainen, Kati Lassi, Raisio, Leipätiedotus and Jorma Ruha

VYR.FI VILJA-ALAN YHTEISTYÖRYHMÄ mmm.fi

Agricultural production in northern conditions

Finland is the world's northernmost cereal-producing country, located on the coast of the Baltic Sea. The annual production of cereal and oilseed crops is four million metric tons (mton). Approximately 500,000 metric tons of the yield are exported annually to the global markets. In Finland, four cereal crops are produced on a larger scale: barley, oats, wheat and rye. Although Finland's grain yield is rather small on a global scale, Finland is one of the world's largest producers and exporters of oats. Roughly half of annual grain production is used as feed for livestock, and the rest for foodstuffs and other purposes.

The strengths of the Finnish grain chain lie in primary production and the clean soil and air. The logistics chain from the farms to the grain traders, industry, and the ports is short and efficient. In Finland, primary production and the entire foodstuffs chain are monitored closely at several different stages, in order to ensure the safety of the food on the consumers' plate. ■



Production of cereal and oilseed crops

Growing conditions

The utilised agricultural area in Finland totals 2.3 million hectares. Agricultural land accounts for around eight percent of the country's surface area. Cereal crops are cultivated annually, in an area of approximately one million hectares.

The growing conditions differ somewhat from, say, European growing conditions due to Finland's northerly location. For one thing, the growing season is clearly shorter. Only spring-sown varieties that have been bred or tested to suit our growing conditions are cultivated on a larger scale. Due to the growing conditions, the yield level (tn/ha) is lower than in the rest of Europe.

Spring field work and sowings in Finland generally begin in May, which is a couple of months later than spring sowings in Central Europe. Harvesting generally begins at the start of August and continues until September. A significant part of cereal production is concentrated in Southern and Western Finland. In Southern Finland, the thermal growing season generally lasts for 175 to 185 days, while it is only around 105 days in the northernmost parts of Finland.

On the other hand, growing conditions are also beneficial to the production, because cold winter reduces the number of plant diseases and pests. Consequently, less plant protectants are used, and the risk of their residues in the yield is therefore reduced. Due to the climatic conditions, the cereal and oilseed crops need to be dried after harvest, practically without exception. This increases costs but improves the homogeneity and retains high grain quality. ■

Growing season intensive and short

- *The spring and early summer have relatively low rainfall, while the autumn sees heavier rain*
- *Days are long and light during the growing season*
- *In the major cereal crop production areas in the south-western part of the country, the effective heat summation during the growing season is around 1,300°C, and precipitation is around 340 mm.*

Barley is the most produced cereal crop

Cereal crops are cultivated on roughly half of Finland's field area (see Table). Four different cereal crops are in wide-scale production in Finland: wheat, barley, oats, and rye. Organic cereal crops are cultivated on approximately four percent of the cereal crop cultivation area, and organic turnip rape on approximately three percent of the oilseed crop cultivation area.

With regard to wheat, barley, and oats, the production in Finland is sufficient to cover domestic consumption, and grains are also exported. Rye and oilseed crops are also imported. The total cereal harvest has averaged four million metric tons over the last few years. Turnip and oilseed rape are the main oilseed crops produced in Finland.

Utilization of agricultural area and total yields of main crops in 2013

	Area 1000 ha	Yield (1000 mton)	Average yield (mton/ha)
Spring barley	494	1904	3,9
Spring oat	344	1197	3,5
Wheat	227	869	3,8
Rye	12	26	2,1
Grain total	1100	4044	3,7
Turnip and oilseed rape	53	81	1,5
Grasslands	650		
Other crops	141		
Fallow area	254		
Utilized agricultural area	2259		
Source: Tike			

In addition to the primary cultivated crops potatoes, sugar beet, peas, fava beans, oil and fiber flax, and caraway are also produced.

Unlike in other EU countries, spring barley is the most cultivated cereal crop in Finland.

A majority of the barley is used as livestock feed directly at the farms. Barley is also used in the malting, starch, and alcohol industry and in the production of enzymes. Feed and malting barley are also exported to the global markets.

In the marketing season of 2012/13, Finland was the world's fourth largest and Europe's second largest producer of oats.

In Finland, a majority of the oats are used as animal feed. Roughly a third of Finland's oat harvest is exported, for example as raw material for the mill industry in Central Europe. Finland's oat yield accounts for around 13 percent of EU production. On the global oat markets, after Canada Finland is the second largest exporter of oats.

The use of oats in foodstuffs has increased, which has also increased demand for oats globally. One of the reasons for this is the good health properties of oats. Oats promote, for example, the maintenance of normal blood glucose and cholesterol levels, and its fibers support the digestion process.

Almost half of the wheat produced in Finland is used as livestock feed, the rest by the foodstuff industry.

Feed use has increased, for example due to the increase of poultry production. Unlike in the rest of Europe, the growing conditions stipulate that spring wheat is cultivated on roughly 90 percent of the area. The benefit of spring wheat is that it often has better baking properties than winter wheat. ■

The quality factors of Finnish oats

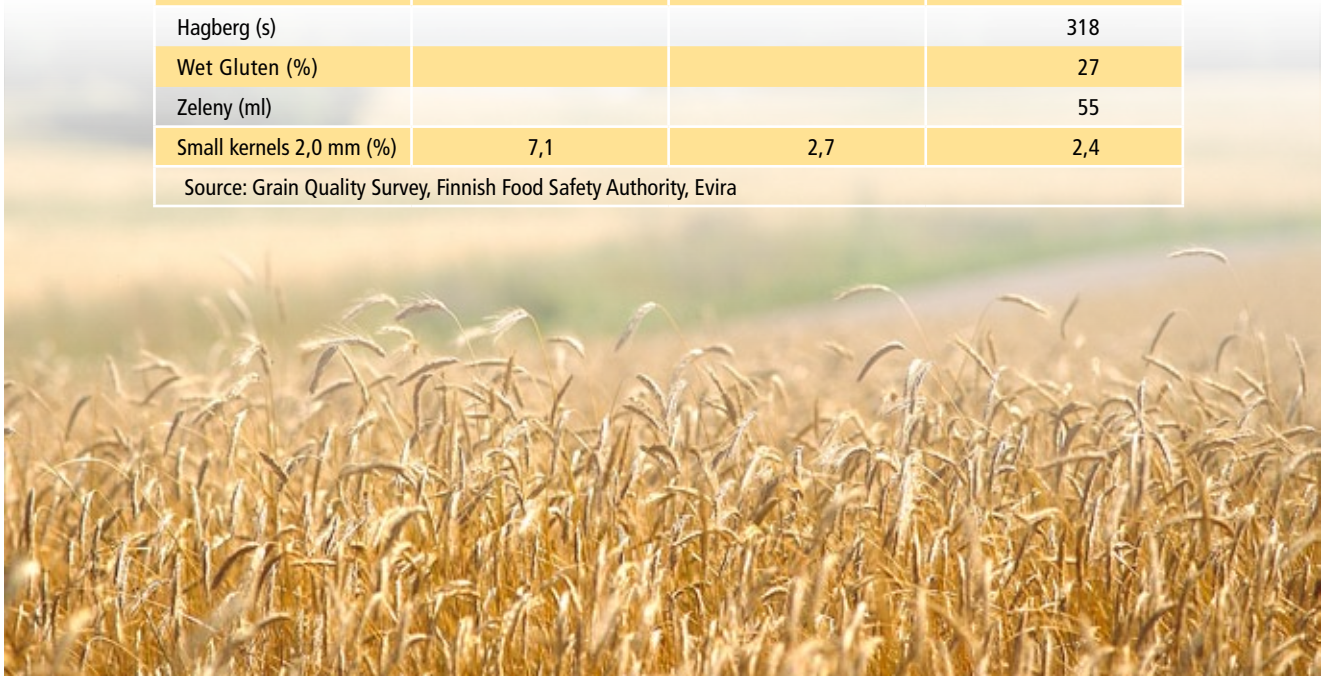
- *oats are well suited to the Finnish climate and soil*
- *a long tradition of cultivation, a high level of cultivation know-how, and a good selection of varieties*
- *oat kernels are large due to the long days*
- *oats have light-coloured hulls*
- *low hull content*
- *high hectolitre weight*
- *low moisture content*

Constant demand for rye and oilseed crops

Rye production is concentrated in Southern Finland, and unlike the other cereal crops, a majority of the varieties are autumn-sown varieties. In Finland, rye is almost entirely used as human food, although globally, it is classified as a feed grain. The rye is used to bake sour rye bread, which is a staple of the Finnish food tradition and diet. The popularity of rye is particularly based on the taste characteristics of the sour rye bread and its numerous health properties. Rye production does not meet domestic demand.

Finland is the only country in the world where turnip rape is the most important cultivated oilseed crop. The longer growing period of oilseed rape limits its cultivation primarily to Southern and Western Finland, although interest in its cultivation is growing. Most turnip and oilseed rape varieties are spring-sown. Domestic demand for oilseed crops outweighs production. In addition to oil, valuable protein feed for livestock is produced. ■

Average quality of oats, spring wheat and feed barley in years 2009-2013			
	Oats	Feed barley	Spring wheat
TW (kg/hl)	56	64	81
Protein (%) d.m.	12,7	11,7	13,3
Starch (%) d.m.		61	68
Hagberg (s)			318
Wet Gluten (%)			27
Zeleny (ml)			55
Small kernels 2,0 mm (%)	7,1	2,7	2,4
Source: Grain Quality Survey, Finnish Food Safety Authority, Evira			



Cereal and oilseed crops are produced on family-owned farms

The prerequisites for clean and high-quality foodstuffs are created during primary production on farms. Throughout the cereal production process, special attention is paid to the purity of the products, high technical and hygienic quality, and traceability. EU and national legislation create the frameworks and obligations for agricultural production and its monitoring. In Finland, primary production and the entire foodstuffs chain are closely monitored at several stages, in order to ensure the safety of the food on the consumers' plate. ■

Finland is part of the European Union

Finland has been a member state of the European Union (since 1995) and is covered by its common agricultural policy. Finland's policies for supporting agriculture and horticulture are based on the forms of support set out in the EU's Common Agricultural Policy (CAP), supplemented by certain national agricultural support schemes. In Finland the preconditions for farming are quite difficult in many respects, especially due to the short growing season and cold winter temperatures. In the context of the CAP the whole country is currently classified as less-favoured area. This means that, in addition to the support available under the first pillar of the CAP, Finnish farmers are eligible for LFA-support. Almost all farms receive agricultural support and subsidies have a major effect on agricultural income also in Finland.

Finnish producers are interested in, aware of, and ready to invest in sustainable agriculture. The commitment of Finnish farms to the EU's agri-environmental aid program has been widespread – during the program period of 2007 to 2013, 90 percent of farmers and 95 percent of the field area were covered by agri-environmental aid. With the reform of the EU's common agricultural policy, it is increasingly targeted at promoting the state of the environment and the quality of the products.

A Finnish farm is family-owned

A typical Finnish farm is owned by the farmer and their family; a family farm. Very little external workforce is used on Finnish farms. The share of farms that are limited-liability companies is around one percent.

In Finland, the structural change of agriculture has been rapid, as it has been in the rest of Europe. In 2000, there were 80,000 farms in Finland, while in 2012 the number had fallen to less than 60,000. In the same time period, the average field area of the farms had increased from 28 hectares to 39 hectares. In 2012, 45 percent of farms were crop farms, while 31 percent were livestock farms. The share of crop farms has been constantly growing, while the share of livestock farms has been falling.

Size distribution and number of farms in 2012	
Arable land (hectares)	Number of farms
0-25	29117
25-50	15016
50-75	7048
75-100	3613
100-200	3662
200-	586
Number of farms	59042

Source: Tike

Cultivation-related measures during the growing period

Finnish farms are required to keep parcel-based-records e.g. of the crops cultivated and the cultivation-related measures taken during the growing period. The following chapters describe cultivation measures typically applied in Finland, and the special characteristics of Finnish production. ■

Agricultural plan and production factors

The prerequisites for the successful crop production are functional water economy and good soil structure in the field. Functional drainage also reduces surface run-off and the run-off of nutrients along with the soil.

Sowed crops and varieties are recorded in the cultivation plan based on parcel accounting. Special characteristics of the plant, the conditions in the area, and the crop rotation are taken into account. Furthermore, a liming and fertilization plan is prepared, taking into consideration the results of the soil fertility analysis. The plan helps to optimize the fertilization and reduce the nutrient load on water bodies.

Seed material that is healthy, viable and has a good germination performance forms a key production input factor.

In Finland, the Seed Trade Act stipulates that seed purchased from outside the farm must be certified. When seed produced on the farm is used, it is conditioned before sowing and the weight and germination performance of one thousand seeds is determined. Furthermore, seed treatment is recommended, as this reduces seed-borne plant diseases. ■

Examples of taking the environment into consideration in production:

Measures required by the agri-environmental subsidy and the Nitrates Directive:

- *Spreading manure late in the autumn and during the winter is prohibited*
- *Some of the farm's fields must have plant cover throughout the winter*
- *Tilling of fields must be reduced*
- *An agricultural plan and a soil fertility analysis by agricultural parcel must be made on the farms*
- *Protective zones must be left along waterways and ditches.*

The complementary conditions of the environmental subsidy also include:

- *Taking the axle weight of machines into consideration and avoiding driving on wet fields.*

Measures during the growing period

Planting and fertilization

A majority of the crop varieties cultivated in Finland are spring varieties and sowed in May. Winter varieties are sowed in August-September. Fertilizer placement during sowing can be considered to be a special characteristic of Finnish crop production. The fertilizers are placed in the immediate vicinity of the seed during sowing, which increases the plant's use of nutrients. The amount of fertilizer is determined according to the needs of the plant and the crop`s yield potential, taking into consideration the parcel and the conditions of agri-

environmental aid and the EU's Nitrates Directive. Livestock manure can also be used as a fertilizer. Additional fertilization for winter varieties is applied during the spring as a surface application.

The cadmium content of apatite, a phosphorus raw material for fertilizer excavated in Finland, is low, due to which the cadmium content of Finnish fertilizers is significantly lower than that of fertilizers used elsewhere in the EU. In Finland, the cadmium limits set for fertilizer products are lower than in the rest of Europe. Cadmium might transfer to cultivated crops from our naturally acidic soil more easily than from soil with high lime content.

The amount of soluble selenium is low in Finnish soil. Selenium has been added to Finnish artificial fertilizers, as it promotes the health of people and livestock. Thanks to the selenium added, the selenium intake of Finns is at the recommended level, as it is obtained from food, including milk, meat, and grain products.

In Finland, only products for which the composition has been analyzed may be used as fertilizers and soil conditioners. In this way, heavy metals can be prevented from ending up in the soil and the products.

Plant protection

Fewer plant protectants are used in the prevention of plant diseases, pests, and weeds in Finland than in the EU on average. In 2012, an average of 0.67 kg of active plant protectant ingredients per field hectare was used. The pre-harvest treatment of cereals intended for food purposes with glyphosate is prohibited in Finland. In practice, this also applies to feed grain, as it is one of the quality criteria for the majority of grain buyers. Post-harvest treatments are not performed in Finland during storage to combat pests or diseases, as they are usually non-existent due to the cold winters.

EU legislation requires that plant protectants are used in a balanced and preventive manner only when required. Agri-environmental aid also requires that farmers make plans on how plant protection will be performed. In the use of the products, things to take into consideration include the limitations set by waterways, and avoiding building a resistance to pesticides and herbicides. A farmer using plant protectants must complete training every five years. The equipment used must also be tested.

Farmers must apply the general principles of Integrated Pest Management (IPM) beginning on 1 January 2014. This requirement applies to farmers both in Finland and within the whole EU. The measures used in Finland to reduce the environmental and health risks from the use of plant protectants are recorded in the National Action Plan (NAP).

In Finland, special attention is paid to preventing common wild oats (Avena fatua).

Farms and parcels where wild oats have been found are listed in a special register. If an inspector finds a parcel to be free of wild oats during two consecutive growing seasons, it can be removed from the register. Failure to combat wild oats leads to a reduction in agricultural subsidies. ■

Management of weeds, plant diseases, and pests

Different broad-leaved/grass and annual/perennial types of weed species exist in the fields during the growing season. In addition to herbicides, weeds in are managed through tillage, crop rotation, and other options related to the cultivation technique. Good soil structure and water economy also help to manage weeds, as then the crop can effectively compete with the weeds. In general, often the most problematic weeds to control are perennial weeds that spread from their roots.

In addition to fungicides, plant diseases are managed by means including crop rotation, the use of healthy and treated seeds, tillage, and the use of growth regulators. In Finland, plant diseases typical for barley and wheat are spot diseases, powdery mildews, and various fungal diseases. The most harmful plant disease affecting oats is oat leaf spot. Plant diseases affecting turnip and oilseed rape include clubroot, white mould, and, in some years, damping-off.

Cereal crop pests usually cause relatively few problems, and pesticide applications are seldom done. Oilseed crops have two main pests during the growing season: flea beetles at the beginning of the growing season, and the pollen beetle, before flowering. Pesticide application is performed when the pest control threshold is exceeded.

The occurrence of various mycotoxins in the national cereal yield is monitored annually, for example through monitoring executed by the Finnish Cereal Committee. The grain trade and industry operators perform analyses systematically in their self-monitoring schemes. Mycotoxins are toxic metabolites produced by Fusarium species (a genus of fungi). EU legislation has set limit values for the Fusarium toxin deoxynivalenol (DON). Immediate drying of the crops after harvesting, to a moisture content of less than 14 percent, reduces mycotoxin occurrence. Dry weather during early summer and moist weather during late summer favour the development of Fusariums. Infection takes place during bloom or later. Fusariums are managed using high-quality, treated seeds and early-growing varieties. The risk can also be reduced by crop rotation, fungicides, and generally by investing in healthy crop vegetation. Methods for the prevention of Fusariums are continuously being developed. Ochratoxin does not appear in Finland.

Harvest

In Finland, cereal and oilseed crops are harvested in August-September, once the crops have fully matured. The crops are harvested with a combine harvester. A majority of the farms have their own machinery, or use common machines with their neighboring farms.

Due to the rather wet and cool autumn, cereal and oilseed crop yields must be dried. Almost every farm has its own hot air dryer. In most cases, cereals must be dried to a moisture level of less than 14 percent, and oilseed crops to a moisture level of less than 9.5 percent. Drying must be carried out as quickly as possible after harvesting, in order to retain high grain quality.

When the crops rotate in the dryer, weed seeds, pieces of straw, and other possible impurities are also often eliminated. Additionally, the grains are honed during drying, increasing the hectoliter weight and making the grains easier to handle. The crop harvest also becomes mixed during drying, which increases the homogeneity of the batch. The cereal and oilseed crops are cooled down to storage temperature prior to storage and immediately after drying. Storage primarily takes place on the farms. ■

Short logistics chain from farms to grain users and ports

In Finland, grain is increasingly commonly stored on the farms instead of in the warehouses of grain companies, and is delivered from the farms directly to the industry or ports. Farmers are required to keep silo-specific records and carry out self-monitoring of storage conditions.

In Finland, grain is not subjected to chemical post-harvest treatments. The access of rodents, birds, and other such pests to storage spaces has been prevented, and the conditions are monitored throughout the year.

It is a common practice in Finland that, before selling the harvest, the farmer takes a preliminary sample of the grain batch and sends it to the buyer. Based on the results of an analysis of the preliminary sample, the grain is then directed to the appropriate use based on its quality.

During intake, the recipient of the load performs quality analyses before accepting the product and mixing it with other batches. The analyses are performed separately for each arriving vehicle and batch.

In Finland, grain is primarily transported from the farms to the silos belonging to the industry or grain merchants by professional haulers. The size of a typical load is around 44 metric tons of grain.

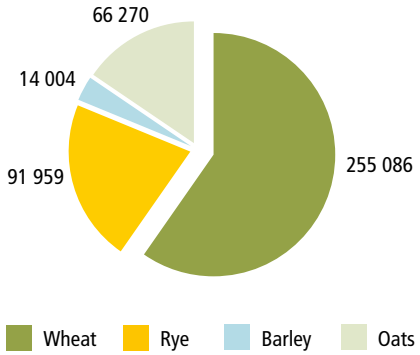
Grain information travels on the Grain Passport

- *In co-operation with the grain trade, industry, and other operators in the grain sector, the Finnish Cereal Committee prepared a common grain dispatch in the spring of 2013, the Grain Passport*
- *A majority of the operators in the grain chain have replaced the company-specific grain dispatches with it.*
- *The Grain Passport is used in the transfer of information when a batch of grain is sold and delivered from the farm to the recipient's warehouse*
- *In addition to information on the grain batch, information on the production, the three previous transport loads, and the cleaning of the cargo space is required on the Grain Passport*
- *The Grain Passport improves the traceability of the Finnish grain chain and brings added value to its operators*

Livestock sector is the largest user of grain in Finland

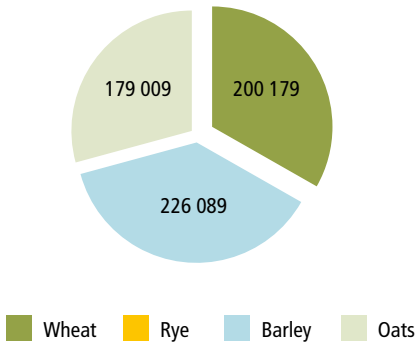
In Finland, the livestock sector is the largest user of grain. In the marketing year 2012/13, 67 percent of the crop yield was used as livestock feed and 15 percent for foodstuffs. Approximately 60 percent of the feed grain was barley, 23 percent was oats, and the rest was wheat. Feed use of wheat has increased with the growth in poultry production. The use of oats as feed is also increasing.

Grain use in foodstuffs industry in year 2013 (metric tonnes)



Source: Tike

Grain use in feed industry in year 2013 (metric tonnes)



Source: Tike

In the Finnish foodstuffs industry, the use of rye and oats has increased, while the use of wheat has slightly decreased. Finnish consumers eat roughly 70 to 80 kg of grain products per person annually. The industry uses more rye and turnip and oilseed rape than is produced in Finland.

Grain trade and export

Finland's agricultural sector is a part of a more extensive global operating environment. Events on the global cereal and oilseed markets are reflected in the internal markets and, on the other hand, in the export operations.

During the marketing season, roughly half of the grain from each year's crop production (2 million mtons) is sold by farmers to grain traders/merchants, other farms, or directly to industry. The share of feed trade between farms forms around 20 percent of all grain trade. Grain is traded throughout the year, and the peaks in demand have been alleviated to a certain degree by the increased storage capacity of the producers and the increased competition between the buyers.

The grain trade/merchants and industry make agreements with the farmers before the growing season. These agreements aim to even out grain deliveries; on the other hand, the agreements also reduce the market risks for all operators. The agreements usually specify the amount of grain to be bought, its purpose of use and quality requirements, the variety, and the delivery and payment schedule. The sale price of the harvest can remain open, or can be agreed upon when the agreement is concluded. In the agreements, the price is in majority cases remained open, when contracts are drafted. After harvest, the merchants and industry find a suitable use for the grain based on its quality information, preferably without intermediate storage.

During the marketing season, Finland exports 500,000 metric tons of grain, depending on the market situation and the domestic crop yield. The primary export product is oats. In addition to oats, feed and bread wheat, and feed and malting barley are exported. There are several grain export companies, and grain is exported to, for example, Europe, North Africa, and the United States. The interest of the agricultural producers in grain exports, for example in the form of export groups, has increased over the last couple of years, but the volumes of producer-driven exports have thus far remained small. Grain is primarily exported from Finland by sea. The primary export ports are located in Naantali, Rauma, Vaasa, Loviisa, and Kotka. ■