



# **FINNISH** **agriculture** **AND RURAL INDUSTRIES** **2012**



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# **Finnish Agriculture and Rural Industries 2012**

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## Preface

The MTT Economic Research publishes a report on Finnish agriculture and rural industries every year. The report provides an annually updated information package on the state and trends in the agri-food sector and rural areas as well as current topics and challenges, with due account for the most recent research information.

The report again gives a comprehensive account of the profitability development of agriculture and horticulture enterprises, including the preliminary figures for 2011. We can see that there may be considerable differences also between enterprises representing the same production sector and farm size class. The markets are becoming increasingly uncertain, which means that running a farm enterprise requires even more comprehensive expertise, comprising the production, technological and economic aspects of the operations. In the present Government Programme the food sector is recognised as a growth sector of the future, and resources should be allocated to developing its competitiveness and cooperation structures. To ensure the profitability and continuity of Finnish agriculture, development actions should be targeted to the construction and verification of added value all through the food chain and efficient communication on this.

In agricultural policy we are already looking into the next EU programming period starting in 2014. The first reform proposals were published in October 2011. For Finnish agriculture the core issues are the overall level of support, relative weight between the two pillars of the CAP and future of coupled payments. As regards environmental regulation the most important elements are the conditions relating to the greening of the CAP and how well these are suited to our specific conditions. The future of sugar production in Finland depends on the sugar policy and quota system of the EU.

Finnish countryside has changed rapidly, especially over the past fifteen years. Rural areas are an important environment for growth and rural resources an important source of new kinds of business, not only for farming activities. Growing sectors in the countryside include the production of bioenergy and other renewable energy and horse husbandry. The ways of using the rural areas are also changing. The report tells about the current trends in the countryside as well as the national rural policy programmes and their role in Finnish rural policy.

The special themes focus on horticulture and its prospects in Finland. The changing climate – climate warming and longer growing season – promote and diversify our horticultural production and its competitiveness, while new technologies and innovations are developed to improve energy efficiency and increase the yield levels. The growing demand for sustainable domestic green landscaping further increases the commercial opportunities of the sector. The articles written by our experts cover a variety of topics from impacts of climate change to horticulture and use of LED lighting systems in Finnish greenhouse production to possible changes in strawberry production techniques and export potential of wild berries. The article on organic production also draws more attention to the prospects of organic horticulture.

The MTT wishes to thank Professor Jyrki Niemi and Research Secretary Jaana Ahlstedt, who edited the publication, and all the experts involved in the writing process.

Helsinki 16 April 2012

Sari Forsman-Hugg  
Director  
MTT Economic Research

## Contents

1. Operating environment of agriculture.....	5
1.1. Agriculture and the food sector in the national economy .....	5
1.2. Rural enterprises .....	9
1.3. Finnish farm.....	14
2. Agricultural and food market.....	18
2.1. Trends on the world market.....	18
2.2. Arable crops .....	20
2.3. Livestock production.....	28
2.4. Horticultural production .....	35
2.5. Food market.....	42
3. Agricultural policy.....	49
3.1. Common agricultural policy of the EU .....	49
3.2. EU support payments in Finland.....	51
3.3. National aid .....	53
3.4. Structural support for agriculture and farm relief services .....	55
4. Economic situation of agriculture .....	56
4.1. Development of results and profitability of agriculture and horticulture..	56
4.2. Economic development of Finnish agriculture and horticulture .....	62
5. Agriculture and the environment .....	68
5.1. Environmental impacts of agriculture .....	68
5.2. Agri-environment in the Commission's proposals for CAP after 2013....	71
5.3. Agri-environment scheme 2007–2013.....	72
5.4. Water protection objectives in agriculture .....	73
5.5. Main topics and future perspectives.....	74
6. Rural and regional policy.....	78
6.1. Changes in Finnish rural areas .....	78
6.2. Finnish rural policy .....	79
6.3. The role of national rural policy programmes in Finnish rural policy .....	81
6.4. Socioeconomic role of agriculture in rural areas.....	84
6.5. Resources of the countryside: bioeconomy and space .....	85
Appendices.....	90

## Special topics

Climate change, new technologies and horticulture.....	25
LED lighting for Finnish greenhouses .....	33
Will berry exports be a success story for Finland?.....	40
New trends in strawberry production .....	66
Organic farming continues to expand .....	76

# 1. OPERATING ENVIRONMENT OF AGRICULTURE

## 1.1. Agriculture and the food sector in the national economy

In Finland the total annual consumer expenditure on food and beverages is € 20.4 billion. The share of food and non-alcoholic beverages consumed at home is a little over a half of this, € 11.6 billion.

As the standard of living has risen, the share of food consumed at home in the consumer expenditure of Finnish households has decreased to about the same level as in the old EU countries. From 2009 to 2010 this share fell from 12.9% to 12.3%. The temporary rise in the previous year was due to the weaker economic situation of households.

When alcoholic beverages and eating out are included, food represents 21.7% of the consumer expenditure of households. The share of food consumed outside home is 5.8%, which is lower than in the old EU countries (7.2%).

The total value of the annual money flows in the food sector is about € 24 billion, when food exports and agricultural support payments are taken into account, in addition to the total private and public consumer expenditure. This is 13.4% of the Finnish GDP.

Consumer expenditure on foodstuffs and beverages, € million.			
	2009	2010	% change
Total	20,221	20,439	1
Foodstuffs*	10,593	10,569	0
Non-alcoholic beverages*	988	1,020	3
Alcoholic beverages*	3,271	3,343	2
Catering services (eating out)	5,369	5,507	3

\*Food consumed at home  
Source: Statistics Finland, National accounting.

### Share of foodstuffs and non-alcoholic beverages in consumer expenditure of households, %.

	2009	2010
EU 27	13.1	12.9
EU 15	12.5	12.3
France	13.4	13.4
Sweden	12.6	12.3
Germany	11.1	11.0
Finland	12.9	12.3
Denmark	11.4	11.2
Estonia	20.2	19.8
United Kingdom	9.6	9.4

Source: Eurostat National accounts.

## Agriculture and horticulture

According to the national accounting, the gross value of agricultural and horticultural production in 2010 was € 6.1 billion, when production support of 2.1 billion is taken into account. The gross value of the production increased by 2.9% from € 5.9 billion in 2009.

Intermediate products account for a little less than a half of the gross value of agricultural production. In 2010 this share was € 2.7 billion, which is 2.6% larger than the year before. The main intermediate product items are fertilisers, feedingstuffs, electricity and transport fuels and various kinds of services in support of the production activities

The value added produced by agriculture and horticulture to the Finnish GDP was 2.1%, which is the same as in 2009. Fluctuations in the value added of agriculture cannot be explained by the variations in volumes due to the weather conditions alone, but the changes in the product and input prices are also reflected in the economic outturn of these sectors more clearly than before.

Agriculture is very capital intensive because of the various kinds of special machinery and buildings needed in the production. In 2010 the share of agricul-

ture in the total investments of the national economy fell to 3.3% from 3.5% the year before. The share of agriculture in total investments is clearly higher than its share in the GDP.

## Food processing

In 2010 the gross value of the production of food industry was € 10.2 billion, which is about the same as the year before. The use of intermediate products increased slightly from € 7.5 billion in 2009, which is why the value added created in food industry fell by 2.2% to € 2.7 billion in 2010.

After the rise to 1.8% in 2009, the GDP share of the food sector, which produces indispensable goods, fell to 1.7% in 2010. The share of food industry in the value added of the manufacturing industries fell from 10.9% in 2009 to 9.6% as the total value added of the manufacturing industries rose by 11%.

Measured by both the gross value of the production and value added, food industry ranks as the fourth largest manufacturing sector in Finland, after machinery and equipment industry, electronics industry and paper industry.

Food industry is raw material intensive: intermediate products represent more than 70% of the gross value of the production. Food industry purchases most of its raw material from the domestic agriculture and horticulture.

From 2009 to 2010 the tangible domestic investments of food industry fell from € 0.4 billion to about 0.3 billion. The share of investments in food industry of total investments fell from 1.1% to 0.9%. The level of investments is clearly lower than the GDP share of the sector.

## Domestic trade in foodstuffs

The trade sector sees to the final distribution of foodstuffs to the consumers. The value of production in the trade sector is more difficult to estimate than that of pri-

mary production and processing because, in addition to foodstuffs, the trade sector includes other daily consumer goods and durable goods. According to the financial statements on the trade sector of the Statistics Finland, in 2010 the turnover of the trade in daily consumer goods totalled € 15 billion, which was only 0.5% higher than the year before. Foodstuffs account for about 80% of the trade in daily goods.

The value added of the wholesale and retail trade, i.e. their share in the GDP, is estimated at about € 2.7 billion. Foodstuffs require a great deal of handling, which is why wages and salaries constitute a significant item in the value added of the trade sector. Other major cost items are transportation and logistics and various kinds of business and real estate services.

The position of trade at the end of the food chain differs from primary production and processing. The trade sector is not dependent on domestic primary production in the same way as the food industry, and thus it is capable of taking advantage of competition, both within the domestic food industry and between the Finnish and foreign companies.

Food trade is still largely in the hands of domestic operators, founded on chains of wholesalers and retailers, where the buying-in operations both in Finland and abroad are highly centralised. Besides the German discount chain Lidl, which came to Finland in 2002, the small markets and high transportation costs have not attracted any other foreign food chains.

## Foreign trade in foodstuffs

The value of food imports (CN 1–24) grew by € 0.3 billion (8.7%) to € 4.3 billion in 2011. The value of food exports rose by € 0.2 billion (16.6%) to € 1.6 billion in 2011.

The total goods imports (CN 1–99) grew by 16%, which is why the share of food imports decreased from 7.6% to 7.1% in 2011. The share of food exports



in the total value of exports rose from 2.6% to 2.8% as total goods exports grew by 8%.

The most significant imported food products are beverages, including alcohol, and fruits. Some of the imported foods are primary products which cannot be produced in Finland (coffee, cocoa, tea) or the quantities produced are not sufficient (fruit, vegetables). The export and import of products representing the same product categories, such as cheeses, beverages and confectionary, have also increased considerably.

Besides the finished food products, the food sector imports various inputs needed in the production, such as raw materials for processed foods and feedingstuffs, fuels and various kinds of chemicals. Most of the machinery and implements are also imported.

### Taxes and support in the food sector

The State functions in the food chain as it collects taxes and allocates financial support to agriculture. In addition to the value added tax, the consumers pay excise duties in the prices of foodstuffs and beverages, as well as energy taxes included in the production inputs. Income tax is collected in

the food chain on wages and salaries and on capital income.

The tax revenue collected as VAT and excise duties totals about € 4.5 billion. The value added tax revenue from food is about € 1.4 billion. The value added tax revenue from restaurant services is estimated at about € 1 billion and that from retail sale of alcoholic beverages at about € 0.6 billion.

The VAT on food was lowered from 17% to 12% in the autumn of 2009 and raised to 13% in July 2010. The VAT on restaurant services was lowered from 22% to the same 13% in July 2010. The value added tax revenue from food represents about 10% of the total value added tax revenue. When restaurant services and alcohol are included, the share of food commodities in the total value added tax revenue rises to almost 20%.

The excise duty on alcoholic beverages was raised once in 2008 and twice in 2009. The tax revenue from alcoholic beverages totals about € 1.3 billion. Excise duty is also collected on confectionary, ice cream and soft drinks. The duty on confectionary and ice cream became applicable in 2011, and the duty on soft drinks was raised at the same time. After these changes the revenue from the excise duties on confection-

#### GDP share of agriculture<sup>1</sup> and food industry (at basic price) and investments (at current prices).

Year	011, 016	10_12	011, 016	10_12	Share in investments	
	Agriculture	Food industry, etc.	Agriculture	Food industry, etc.	011, 016 Agriculture	10_12 Food industry, etc.
	million €	million €	%	%	%	%
2010	3,336	2,677	2.1	1.7	3.3	0.9
2009	3,234	2,737	2.1	1.8	3.5	1.1
2008	3,012	2,471	1.8	1.5	3.1	1.1
2007	3,204	2,432	2.0	1.5	3.3	1.2
2006	2,857	2,269	2.0	1.6	3.3	1.1
2005	2,880	2,344	2.1	1.7	3.4	1.3
2004	2,804	2,318	2.1	1.7	3.4	1.1
2003	2,836	2,395	2.2	1.9	3.9	1.5
2002	2,907	2,384	2.3	1.9	4.3	1.6
2001	2,885	2,231	2.3	1.8	3.8	1.4

<sup>1</sup>Agriculture including subsidies on production in addition to subsidies on products.

Source: National accounting 2001–2010e, Statistics Finland.

ary, ice cream and soft drinks is expected to rise by € 50 million to a total of about € 180 million a year.

The various types of support to agriculture, a total of about € 2.1, billion, are funded by the EU, co-funded by the EU and from national funds, or paid from the national funds only. The EU contributions to agricultural support total about € 0.8 billion. In 2010 the contributions of Finland to the EU from the State budget totalled about € 1.53 billion.

### Economy-wide effects of the food sector

Besides agriculture, food industry and the trade sector, many other sectors are involved in the food chain and serve food production in various ways. These include, for example, trade in agricultural implements, transport and storage, and various kinds of business and real estate services. In practice the effects of food production extend all through the economy and different industries, also to the energy sector and water and waste management.

Indirect effects of food production are also created in households through the use of income earned in food production for

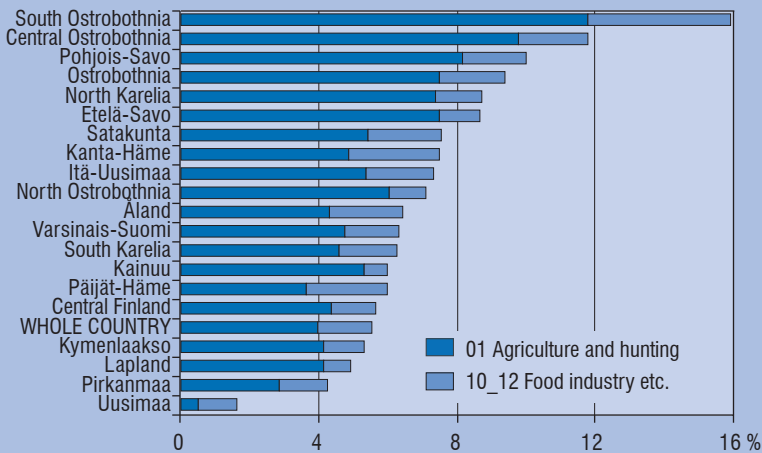
purchasing goods and services. In the rural areas the economic impact of household consumption may be greater than that of input demand in agriculture.

Part of the investment effects flow abroad, especially through the purchase of machinery. The effects of building are more directly targeted to the regions themselves than investments in machinery. Besides agriculture and the processing industry, in recent years building investments have also been made in food trade.

### Employment effects of the food chain

In 2011 the number of people employed in agriculture was about 80,000, which is 3.2% of the employed labour force. This is 4,000 persons less than the year before. The share of agriculture in the employed labour force is greater than its share in the GDP. The number of people employed in agriculture has fallen in all regions along with the number of farms and increased substitution of machines for labour.

In absolute terms the number of people employed in agriculture is the greatest in the regions of South Ostrobothnia, South-west Finland, North Ostrobothnia and

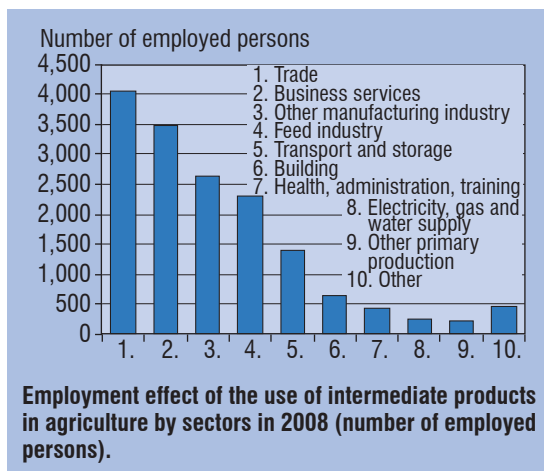


Employed of agriculture and food industry (%) in different regions in 2009. Source: Regional accounting, Statistics Finland.

North Savo, with a 40% share of the total labour force in agriculture. Proportionally the share of agriculture in the employed labour force is the highest in South and Central Ostrobothnia (10%) and North and South Savo, coastal regions of Vaasa and North Karelia (7%). By purchasing production inputs agriculture also employs people in other sectors, such as manufacturing industry, trade, logistics and energy production, about 16,000 persons.

Food industry employs about 38,000 persons. Its share in the total employed labour force is 1.5%, which is about the same as its GDP share. Almost a quarter of the jobs in food industry are in Uusimaa. Southwest Finland, Pirkanmaa and South Ostrobothnia each has about 10% of those employed in food industry. Proportionally food industry is by far the greatest employer in South Ostrobothnia, where it employs 4.1% of the employed labour force. In Häme its share is about 2.5%.

While the number of jobs in primary production and processing are decreasing, more people find employment in restaurants and catering services and in food trade. In 2010 the number of people employed in restaurants and catering services was about 62,900, which was 1,100 less than the year before. The trade in daily consumer goods employed 46,820 persons, which was about the same as in 2009.



## 1.2. Rural enterprises

The Finnish countryside has changed quite dramatically, especially in the past fifteen years, with strong differentiation in the development trends in different types of rural areas. In many sparsely populated areas the population is decreasing and ageing rapidly, while the number of rural residents and enterprises has been growing in urban-adjacent rural areas.

Small rural enterprises can be divided into three groups: farms engaged in basic agricultural production and farm forestry, diversified farms with other business activities besides agriculture and farm forestry, and small rural enterprises with no connection to farms.

In 2010 the total number of enterprises in Finland was about 319,000. The number of small rural enterprises was estimated at about 140,300, of which 32% were engaged in basic agriculture, 14% were diversified farms and 53% were other small enterprises. Diversification of farms is much more common in Finland, the other Nordic countries and West European countries than in the southern and eastern parts of Europe.

Agriculture and farm forestry still constitute the most significant single rural industry. The Finnish farm structure and changes which have taken place in this are presented in more detail in Chapter 1.3.

### Diversified farms in Finland

In 2010 the number of farms practising other gainful activities besides agriculture was 19,500, which means that about 31% of the Finnish farms were diversified. Diversification into other activities besides agriculture has traditionally been quite common among farmers, but in the 1990s and 2000s new operations were launched more than ever before. In 2010, however, there was some decrease in the num-

ber of diversified farms as well.

Starting other gainful activities is often connected to changes in the operating environment of farms, creating new demand for the products and services, while new challenges to agriculture may have encouraged the farm families to seek new sources of livelihood. As regards the types of areas, most of the diversified farms are in urban-adjacent rural areas and remote rural areas.

The other activities on farms are usually strongly linked to farming and its resources, i.e. the farm resources are in joint use for activities in several sectors. In 2010 agricultural or horticultural machinery, buildings, land areas or products and labour force were used for the other gainful activities on 87% of the diversified farms.

Diversified farms operate in various sectors. In 2010 the majority of them (70%) were engaged in services. One out of eight farms was engaged in manufacturing, 5% in primary production other than agriculture and 4% in trade. Many of the diversified farms operate in several sectors, for example, in both contractual work and tourism.

The proportional share of activities practised by diversified farms has changed over the past decade. There has been some increase in the share of enterprises in the service sector, while the share of manufacturing has decreased.

The number of farms in primary pro-

duction has decreased, which also reflects the general trends in these sectors. The numbers of, for example, reindeer herders, fur farmers and fishermen has decreased considerably over the past decade. In this context primary production means fishing, fish or crayfish farming, fur farming and reindeer herding, i.e. primary production other than agriculture, horticulture and forestry.

In 2010 a total of 1,200 farms were engaged in these types of primary production, about a 1,000 of these as their main activity. The number of these farms has decreased slightly. The largest sectors are reindeer herding and fur farming.

About 4,850 farms were engaged in manufacturing industry, and on 2,750 of these it was the main activity. The largest individual sectors were energy production and further processing of foodstuffs or wood. About 700 diversified farms operated in the building sector, which was the main activity on 400 of them. The number of enterprises engaged in the building sectors has decreased quite a bit in the past few years, partly because of the decrease in building activities in general due to the economic recession. The number of diversified farms engaged in trade was about 1,550 and on about 850 farms this was the main activity.

Services were the main sector on about 13,500 diversified farms. The largest individual sector was contractual work (8,900

#### Rural enterprises in Finland in 2000–2010.

Year	2000	2002/2003	2004/2005	2010	Change 2000–2010, %
Total	136,400	130,400	131,500	140,334	3
Basic agriculture farms	58,000	50,150	45,200	44,344	–24
Diversified farms*	21,800	23,550	24,300	19,530	–10
Enterprises with no link	56,600	56,700	62,000	74,450	32

\* incl. horticulture enterprises

Source: Information Centre of the Ministry of Agriculture and Forestry MMM/Tike. Register of small rural enterprises ([www.mtt.fi/pienyrytysrekisteri](http://www.mtt.fi/pienyrytysrekisteri)).

Number of diversified farms in 2000, 2005 and 2010.			
Sector	2000	2005	2010
Diversified farms, total	21,838	24,295	19,530
<i>Primary production other than agriculture and forestry</i>	744	1,815	981
Fur farming	632	510	315
Reindeer husbandry	*	574	365
<i>Industry</i>	4,786	3,53	2,747
Food processing	1,065	684	479
Wood processing	1,349	889	554
Production of renewable energy	648	820	668
Peat production	311	217	239
<i>Construction**</i>	*	881	438
<i>Trade</i>	1,056	1,229	850
<i>Services</i>	15,019	16,547	13,793
Tourism, accommodation, recreation services	2,272	1,865	1,728
Contracting	8,880	10,013	8,896
Horse husbandry services (renting of stables, horse training)	*	734	888
Other	233		721
* Different classification of sectors, this sector not accounted for in the year concerned			
** Clearing, demolition and groundwork building included in machine contracting.			
Source: Information Centre of the Ministry of Agriculture and Forestry.			

farms), which comprises work with agricultural and forestry machinery, bioenergy work, earthworks, snow ploughing and road maintenance.

About 1,400 diversified farms operate in tourism. Other significant service sectors include riding and other services related to horses (a total of almost 1,200 farms), transportation (400 farms) and business services. About 170 diversified farms provide care services and on about 120 of these this is the main activity.

Other gainful activities on farms are usually quite small in scale. In 2010 their turnover was less than € 10,000 on about 40% of the farms. However, on 15% of these farms the turnover of other gainful activities was more than € 100,000. In 2010 employment in these other activities represented about 22,300 AWU. Most of the work is still done by the farm families, but the role of hired labour has been growing. While in 2000 the number of hired labour employed in the other gainful activ-

ities on farms was 11,300, five year later their number had risen to almost 15,000, with a total labour input of 7,600 AWU.

### Other rural enterprises

There are regional differences in the number of small rural enterprises and in their structural development, which usually follow the general trends in the economy. It is estimated that about a third of the Finnish enterprises are located in the rural areas<sup>1</sup>. In 2010 the Register of Enterprises and Establishments included 81,000 rural enterprises<sup>2</sup> other than those engaged in agriculture and farm forestry, with a total labour force corresponding to 135,000 AWU and a total turnover of about € 18

<sup>1</sup> In this context rural area means areas by postal code districts where the population density is less than 50 persons/km<sup>2</sup>.

<sup>2</sup> Small enterprise means an enterprise with a single place of business, turnover of at least € 8,409 and staff of less than 20.

billion. Of the small rural enterprises an estimated 74,500 operate with no connection to farming.

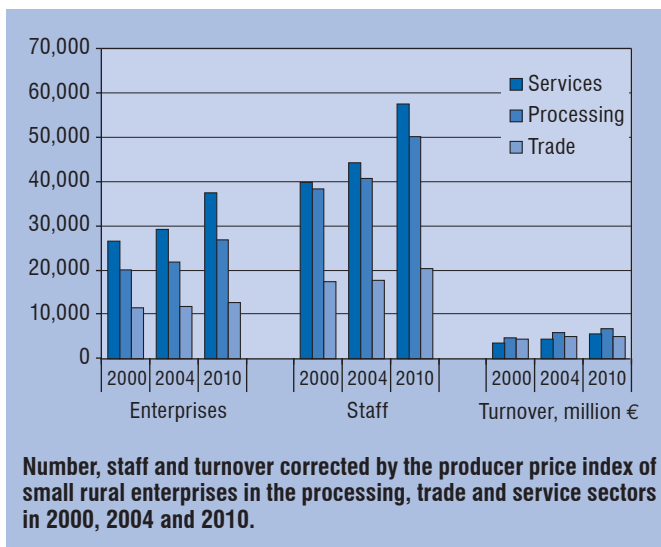
In 2010 about 46% of the small rural enterprises engaged in the services sectors, 16% in trade and about a third in processing. About 5% were engaged in primary production other than agriculture and forestry. Since 2000 the number of enterprises, staff and turnover have increased in both service sectors and processing. In trade there was some decrease in the turnover from 2004 to 2010. In the country as a whole the number of enterprises has grown, but there are considerable regional differences. The number of enterprises has grown the most in urban-adjacent rural areas, but in many peripheral areas the number of enterprises has decreased.

The development of certain important sectors of rural enterprise is described below.

### Energy production and bioenergy

In 2010 energy consumption in Finland totalled about 1,463,846 TJ, which was 1% higher than the year before. The main sources of energy are oil, nuclear power, coal and natural gas, but the role of the resources available in the rural areas for the production of bioenergy and other renewable energy is growing. Bioenergy, i.e. biofuel, is derived from biomass growing in forests, mires and fields as well as from organic, liquid and gaseous biowaste suitable for energy production from communities, agriculture and industry.

The market position of bioenergy has improved considerably in recent years. In Finland bioenergy already accounts for



about a quarter of the energy consumption. According to the long-term Climate and Energy Strategy, the use of bioenergy in Finland should increase by 28 TWh by 2020.

Most of the bioenergy produced and used on farms consists of chips or fuelwood from forests. The most important energy crop in agriculture is reed canary grass, most of this sold to be used as fuel in large power plants. In 2010 about 149 farms were engaged in contractual work relating to bioenergy, which comprises the production of biodiesel, ethanol and biogas, and for 57 farms this was the most important activity in terms of their turnover.

### Food processing

In 2010 there were about 2,900 food companies in Finland. The majority of food processing enterprises are in the rural areas. The field is strongly polarised into few large companies and numerous small enterprises. Most of the enterprises (71%) employed fewer than 5 persons. The most common sectors are the manufacture of bakery products and further processing of meat. In 2010 a total of



1,070 farms engaged in further processing of foodstuffs, and this was the main business activity on about 650 of these. The most common types of food processing on farms are further processing of vegetables and berries, manufacture of bakery products, and slaughtering and further processing the meat.

### **Rural tourism**

Rural tourism is the part of the tourism industry where the opportunities largely derive from resources characteristic to the countryside. The total number of rural tourism enterprises is estimated at 4,900 and their total turnover is about € 510 million. The potential offered by rural tourism in the development of the rural areas has been understood for a long time, and the long-term development prospects should also be quite favourable. Responsibility is a priority theme in the development of tourism, and in this respect rural tourism has a lot to offer to the whole Finnish tourism industry.

### **Equine industry**

Equine industry is one of the most rapidly growing businesses in the rural areas: about 75% of the business activities in equine industry take place on farms and 17% otherwise in the countryside. In this context equine industry comprises the breeding and rearing of horses and care services for them, training, riding schools and horse-related tourism.

The estimated number of horses in 2009 was about 75,000. The number grows by about 2,000 a year. The total number of stables in Finland is about 15,000, of which about a quarter are companies. The annual money flows in the industry are estimated at more than € 830 million and it is estimated to employ 15,000–16,000 persons. The estimated annual investments

of the sector in the operating environment are about € 23 million.

Trotting is a very popular sport in Finland. Almost 9,000 horses start off each year at trotting races and the annual turnover of betting in horse races is over € 200 million. Each year about 800,000 spectators visit the trotting tracks to see the races, while the number of spectators at the off-track betting points is almost 900,000. The number of riding schools and leisure riding stables approved by the Equestrian Federation of Finland is about 300. There are a total of about one thousand riding stables, of which about a half are enterprises that may be considered riding schools. About 150,000 people enjoy riding as a hobby, the majority of them adults.

### **Reindeer herding**

Reindeer husbandry is a highly significant business in the sparsely populated rural areas in northern Finland. It is a source of livelihood as such, and it is also significant in terms of the image of tourism and the Lappish culture.

The number of reindeer has stayed about the same during the past decade, but in the very recent years there has been some decrease. In 2009/2010 the number of reindeer totalled about 196,500, of which about 100,000 were slaughtered. In recent years the production of reindeer meat has totalled 2.3–2.8 million kg.

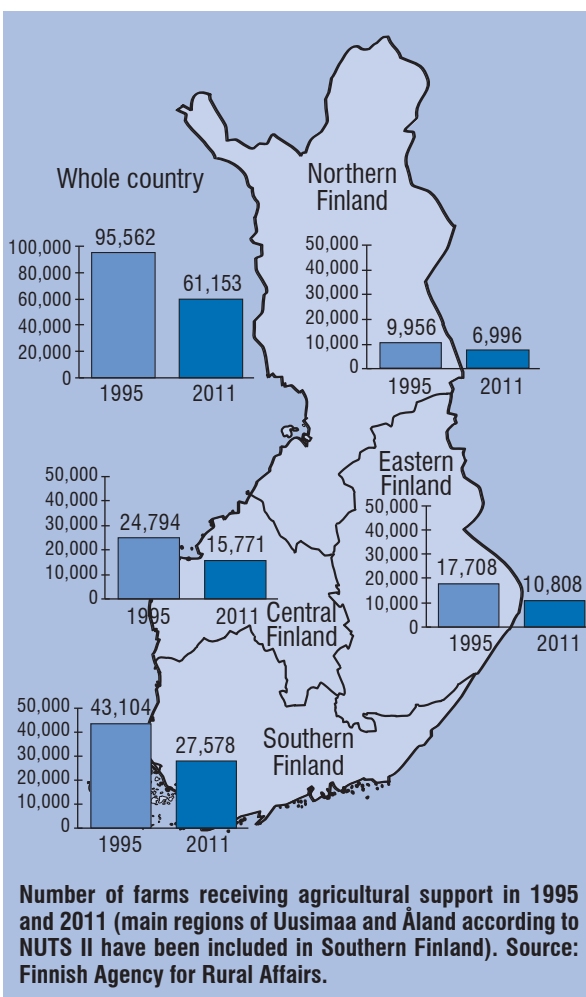
The structure of reindeer husbandry has changed as the number of reindeer owners has decreased and the size of reindeer herds has grown. In the reindeer herding year 1994/1995 there were about 7,200 reindeer owners, while today their number is about 4,650. In the reindeer herding year 2008/2009 61.5% of the reindeer left alive at roundups, 119,000 animals, were owners by herders with over 100 animals. The average turnover of reindeer farms was about € 17,000.

## 1.3. Finnish farm

### Number and size distribution of farms

In 2011 the total number of farms (over 1 ha) which had applied for agricultural support was a little under 61,200. This was about 1,300 farms (2.1%) less than in 2010. In both absolute and relative terms the decrease in the number of farms was close to the long-term average. During the sixteen years in the EU (1995–2011) the number of Finnish farms has fallen by 36% from 95,562 farms in 1995 by a total of about 34,409 farms. On average the number of farms has decreased at a rate of 2.8% a year. Proportionally the decrease has been the greatest in eastern Finland (39%) and the smallest in northern Finland (30%). In both southern and central Finland (36%) the number of farms has fallen less than in eastern Finland.

While the number of farms is decreasing, the average farm size has been growing. The average size of farms receiving agricultural support in 1995–2011 has grown by almost 64% from 22.8 ha of arable land to 37.3 ha. The annual growth in the average size has varied from 0.5 ha to 1.5 ha. The growth is



due to both the decrease in the number of small farms and increase in the number of large farms.

The structural change is reflected in the proportional share of the different size cat-

#### Number of farms receiving agricultural support in 2001–2011.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Whole country	75,384	73,386	72,000	71,100	69,088	68,766	66,821	65,292	63,716	62,450	61,153
Southern Finland <sup>1</sup>	34,192	33,375	32,771	32,245	31,272	30,967	29,945	29,368	28,694	28,098	27,578
Eastern Finland	13,219	12,935	12,630	12,498	12,121	12,173	11,812	11,501	11,218	11,033	10,808
Central Finland	19,443	19,023	18,656	18,458	17,986	17,947	17,574	17,119	16,650	16,177	15,771
Northern Finland	8,530	8,053	7,943	7,899	7,709	7,679	7,490	7,304	7,154	7,142	6,996

<sup>1</sup> Main regions of Uusimaa and Åland according to NUTS II have been included in Southern Finland. Source: Finnish Agency for Rural Affairs.



### Size class distribution and average arable area of farms receiving agricultural support in 2011<sup>1</sup>.

Arable land	Southern Finland <sup>2</sup>		Eastern Finland		Central Finland		Northern Finland		Whole country		2011	
	Number of farms	%	Number of farms	%	Number of farms	%	Number of farms	%	Number of farms	%	Number of farms	%
<10 ha	5,136	19	2,611	24	3,193	20	1,521	22	22,850	24	12,461	21
10–20 ha	5,426	20	2,545	24	3,617	23	1,319	19	30,698	32	12,907	21
20–30 ha	4,073	15	1,714	16	2,540	16	946	14	19,669	21	9,273	15
30–50 ha	5,341	19	1,922	18	2,972	19	1,346	19	15,414	16	11,581	19
50–100 ha	5,273	19	1,546	14	2,611	17	1,350	19	5,706	6	10,780	18
>100 ha	2,234	8	434	4	757	5	488	7	784	1	3,913	6
Number of farms	27,483		10,772		15,690		6,970		95,121		60,915	
Average arable area, ha/farm	40.81		31.34		34.51		38.52		22.77		37.25	

<sup>1</sup> The figures do not include horticultural enterprises if they have no fields under cultivation.

<sup>2</sup> Main regions of Uusimaa and Åland according to NUTS II have been included in Southern Finland.

Source: Finnish Agency for Rural Affairs.

egories: in the past sixteen years the share of farms with less than 20 ha has fallen from 56% to 42% and the share of farms with more than 50 ha has more than tripled from 7% to 24%. Despite the growth in the average size, however, the share of small farms is still high in Finland. Very large farms with more than 100 ha of arable land represent a little more than 6% of the Finnish farms.

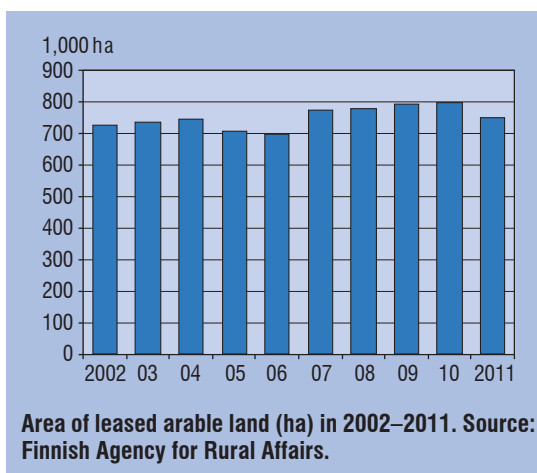
About a half of the growth in the farm size in 1995–2011 has occurred through leasing. In 2011 the total cultivated arable area of farms receiving agricultural support was 2.278 million ha, and about 751,000 ha (33%) of this was leased. In 1995 the share of leased area was 22%. In the 2000s the leased arable area has grown by about 9%, but in 2011 the leased area was almost 6% smaller than the year before. There is considerable regional variation in the leased area: in Central Finland more than 40% of the arable area is leased, while in Southwest Finland and Central Ostrobothnia the share of the leased area is less than 30%.

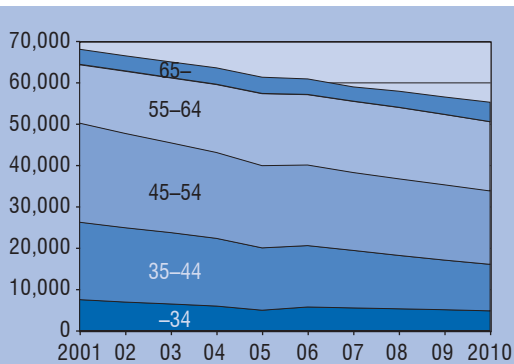
In 2011 the average size of base parcels was 2.43 ha, varying from over 3 ha in southern Finland to less

than 2 ha in eastern and northern Finland. In recent years there has been hardly any change in the average size of parcels, as well as in the total cultivated area.

Finnish agriculture is almost exclusively based on family farms: in 2011 88.3% of farms receiving support were privately owned and 10.4% were owned by heirs and family companies and corporations. Cooperatives and limited companies owned 1.0%, general and limited partnerships 0.2%, and the State, municipalities, schools and parishes 0.03% of the farms.

The average age of farmers on farms





**Number of farmers by age categories in 2001–2010.**  
**Source: Information Centre of the Ministry of Agriculture and Forestry.**

receiving agricultural support is 51.8 years. Since 1995 the average age of farmers has risen by about three years. The age of farmers is the highest, over 53 years, in the Åland Islands and the lowest, 50.4 years, in Central Ostrobothnia. As the farm population is ageing the share of young farmers is falling and the share of the older ones is growing. In 2001 the share of farmers over 55 years of age was 26%, but in 2010 their share was as high as 39%. During the same time the share of the under 44-year-old farmers fell from 38% to 29%.

### Production structure of farms

Measured by the number of farms, the production structure of Finnish agriculture has changed considerably since 1995. The share of livestock farms has fallen while the share of crop farms has increased clearly. In 2011 28% of the farms which applied for support were livestock farms and 67% were crop farms, while in 1995 the share of livestock farms was 52% and that of crop farms was 39%.

In 2011 about 10,500 farms practised dairy husbandry as their main activity. This is 17% of the farms that received agricultural support. In 1995–2011 the number of dairy farms fell by more than 21,500 farms, at a rate of about 6.7% a year. Proportionally the share of dairy farms is the

greatest in eastern and northern Finland, where they represent 29% of all farms. Dairy farms are more evenly distributed to all regions of Finland than the other sectors.

In 2011 about 3,750 farms (6.1% of all farms) specialised in beef production. In 1995–2011 the number of these farms fell by about 5,300, at a rate of about 5.4% per year. The distribution of beef farms across the country is quite similar to the regional distribution of dairy farms.

The number of farms specialising in pig husbandry was about 1,900, which is about 3.1% of the farms that applied for support. Of the pig farms 565 specialised in piglet production, 687 farms specialised in pigmeat and 668 farms practised combined pig production. In 1995–2011 the number of pig farms fell the most, by 69%, at a rate of 7.1% per year. Most of the pigmeat production is located in southern and western Finland.

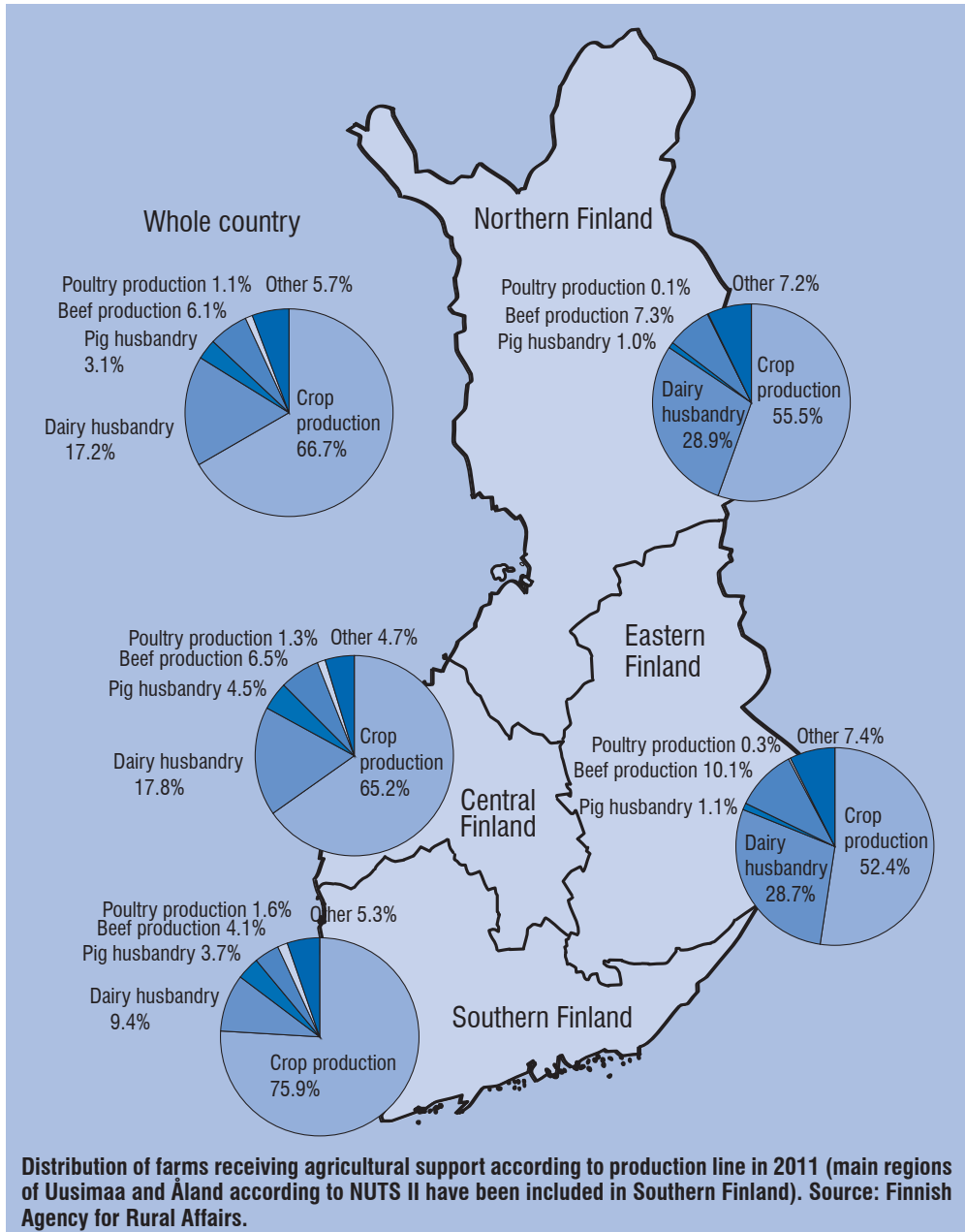
The number of poultry farms was 696, which is about 1.1% of the farms that applied for support. During the EU period the number of poultry farms has decreased by a total of 68%, i.e. about 6.9% per year. The number of farms specialised in egg production has decreased the most, which is why the share of poultry meat farms of all poultry farms has grown. In 2011 about 55% of poultry farms specialised in egg production, 32% in poultry meat production and 13% were breeding units. In 2000 the respective shares were 68%, 21% and 12%. Most of the poultry farms are located in southern and western Finland.

In 2011 there were about 40,700 crop farms, which is almost 3,500 more than in 1995. In recent years, however, the number of crop farms has increased only in eastern and northern Finland, while in southern and central parts of the country the number of crop farms has turned into a fall. More than half of the Finnish crop farms are in southern Finland and a quarter are in central Finland, which means

that the total number of crop farms has also decreased in recent years. In the past couple of years only the number of farms engaged in “other crop production” (e.g. hay) has increased in all regions, while the number of, for example, cereal and horticulture farms has fallen. The distribution of crop farms across the country is simi-

lar to the regional distribution of all farms.

Forest is an integral part of Finnish farms. In 2011 the average forest area of farms that received agricultural support was 50 ha. Regional variation is considerable, however: in Southwest Finland the average forest area of farms is 31 ha, while in Lapland it is 107 ha.



## 2. AGRICULTURAL AND FOOD MARKET

### 2.1. Trends on the world market

In the past few years we have seen quite dramatic and rapid changes on the international agricultural product market. The variations in cereal prices on the world market in 2007–2008 were something we had seen never before. The world cereal prices were almost double the prices in the past few years. The world market prices of dairy products were also much higher than in the previous years.

The dramatic rise in the prices was followed by a rapid fall during the latter part of 2008. In summer 2010 the world prices for cereals started to rise again at a fast rate.

The changes are founded on both random and structural causes. A major share of the sudden and dramatic changes was due to variations in the yields caused by exceptional weather conditions in important agricultural regions and the global economic crisis.

In 2007–2008 the world economy was overheated and the price for crude oil was very high. Besides this, the stocks of both wheat and rice were record low.

The fall in cereal prices in 2008 was much steeper and the prices ended up at a lower level than had been expected. The world cereal crop was very good and the stocks grew. The world economy ran into a recession and the money invested in the agricultural commodity market disappeared just as quickly as it had gone there. Very likely the prices would not have collapsed as drastically had it not been for the recession.

The rapid rise in cereal prices in summer 2010 started from the news about drought in the Black Sea region and the consequent yield losses. In

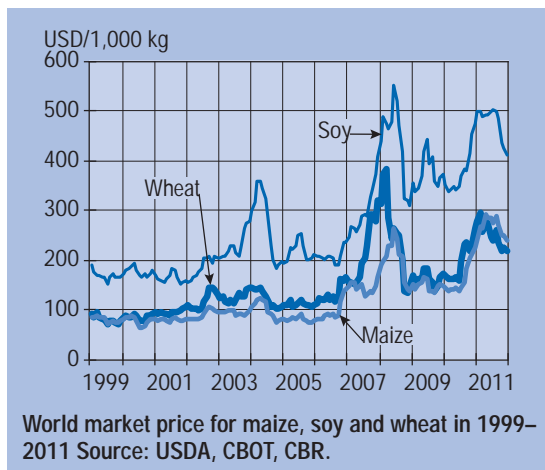
recent years the Black Sea region (Russia, Ukraine and Kazakhstan) has been among the greatest cereal exporters on the world market.

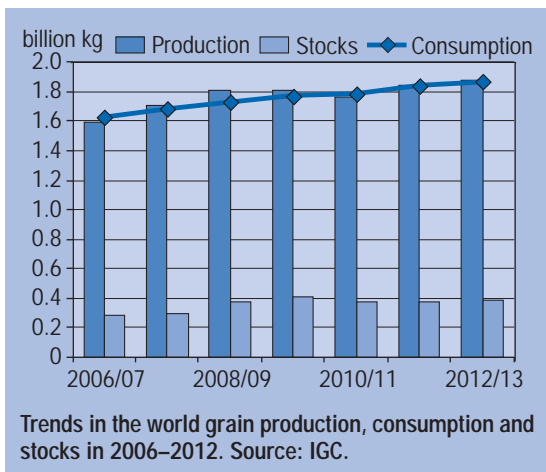
Besides cereal products, the prices for dairy products and oils and fats rose in 2010, the most notably in China, India, Indonesia and Russia.

The food price index of FAO (Food and Agriculture Organization of the United Nations) was at its highest in February 2011. After the middle of the year the demand for raw material slowed down because of the economic crisis at the same time when the stocks were replenished by the crop of 2011. In December 2011 the food prices were 11% lower than in February.

Despite the steady fall in food prices in autumn 2011, the price index for the whole year remained historically high. The average points for the year of 228 were the highest since 1990, when FAO started to calculate food prices. The previous peak of 200 points was reached in 2008.

In January 2012 the food prices again started to rise slightly, but in March 2012 the prices were still almost 10% lower than the year before.





The world market prices for cereals were also at their highest in the early part of 2011. Then the prices started to fall, but this stopped in the beginning of 2012 when the prices of both cereals and oilseed and protein crops began to rise in the world grain exchanges.

The demand for soya was particularly high on the global market. The rise in the standard of living in China and the demand this has created have kept the prices on a high level.

At the moment of world cereals stocks are sufficient to cover the consumption in the short perspective, but the situation is not stable. Even quite small problems in, for example, the weather conditions of the market period 2012/13 may lead to price fluctuations.

In April 2012 the International Grain Council (IGC) estimated that the cereal production of the current as well as the next season should meet the growing consumption, while the stocks should stay at about the present levels.

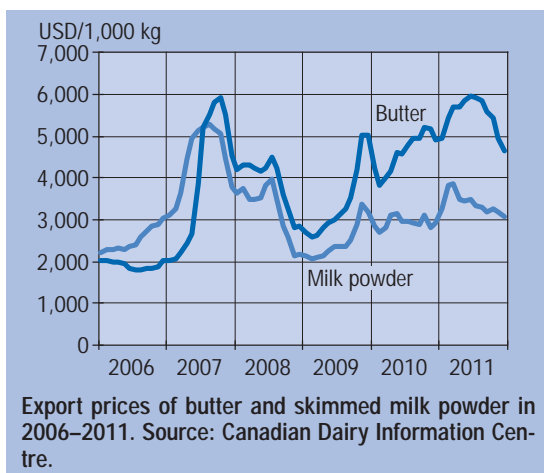
According to the IGC, the production volume of the market period 2011/12 rose to 1,841 million tonnes which is more than 90 million tonnes higher than in the previous period. The consumption is growing as well, and now it is about 1,840 million tonnes. Thus the global demand

is only 1 million tonnes below the production, which means that there is hardly any change in the stock levels. The world wheat production rose to a record high level of 696 million tonnes and consumption to 681 million tonnes.

The IGC estimates the total cereal production volume for the market period 2012/13 at 1,876 million tonnes and consumption at 1,870 million tonnes. The estimates for wheat production and consumption are 681 million tonnes and 683 million tonnes.

In the future growing pressures on world prices will be caused by the population growth and growth in prosperity. The world population increases by about 80 million people a year. The competition for higher standard of living in the population-rich Asian countries means that growing numbers of people are consuming more meat and dairy products.

According to a medium-term forecast published by the Organisation for Economic Cooperation and Development OECD and UN Food and Agriculture Organization FAO in summer 2011, in 2020 the people living in the developing countries will consume almost 20% more beef, 28% more pigmeat and 37% more poultry meat than today. Rearing livestock



consumes large quantities of cereal, which means that larger arable areas now used for food production will be needed for growing animal feed. This leads to higher prices for both cereals and meat.

The prices and price outlook of agricultural products are also influenced by the growing demand for cereal as raw material for biofuels. The increase in biofuel production inevitably takes over part of the arable area which otherwise would be used for food or fodder cereal production.

At present the share of biofuels in the world consumption of transportation fuels is only about 2%. It has been estimated, however, that by 2030 this share could be raised to 5%.

Reducing oil dependency has become an important political objective, especially in the United States. Now as much as a third of the maize used is processed in the United States for fuel ethanol. As a result, the share of ethanol in the consumption of transport biofuels in the country has risen to a little over 10%.

The EU targets for increasing the share of renewable energies, from both forests and arable lands, are highly ambitious as well. The European Commission envisages that by 2020 biomass will be cultivated on about 15% of the total arable area of the EU-27.

Some of the reasons behind the fluctuations in agricultural commodity prices are not directly linked to the balance between the supply of and demand for food. As was the case in connection with the credit crisis, expectations, speculation and suspicion have their role to play in price variations.

## 2.2. Arable crops

The growing season of the year 2011 was exceptionally long, but both the volumes and quality suffered from the hot summer and rains in August. On the cereal market there was no significant increase or decrease. The total cereal crop was 3.7 bil-

lion kg, which is the second lowest in the 2000s. Both the hectareage yields and cultivation areas increased from the year before, when the total crop was as low as 3 billion kg.

### Weather conditions

The year 2011 started with snow in abundance. Especially in the southern and eastern parts of the country the amounts of snow were far above the average and the temperatures were also lower than usual. However, the summer of 2011 was one of the warmest since early 1900s, with the average temperature of June-August two degrees above the long-term average. In Lapland the average temperature of the year was as much as 2–3 degrees above the usual and in the whole country the average temperature was 1.9 degrees above the long-term average. The average annual temperature varied from 6 degrees on the southern and south-western coast to a little under one degree in northern Lapland.

The lowest temperature of the year,  $-41.8\text{ }^{\circ}\text{C}$ , was measured on 18 February in Salla in eastern Lapland. The highest temperature,  $+32.8\text{ }^{\circ}\text{C}$ , was measured in Ylitornio in north-western Finland.

In some places the thermal growing period was the longest in the history of measurements. The growing period started one to two weeks ahead of the normal. In the south it started on 15–16 April and ended as late as 8 November. In southern Finland the growing period was more than 200 days long, in central and western Finland it was about 170 days and in the north it was 140 days, which all are longer than usual.

The effective temperature sum was also higher than the average in the whole country. In Jokioinen in south-central Finland the temperature sum accumulated was  $1,615\text{ }^{\circ}\text{C}$  (long-term average  $1,245\text{ }^{\circ}\text{C}$ ), in Jyväskylä in central Finland it was  $1,448\text{ }^{\circ}\text{C}$  ( $1,134\text{ }^{\circ}\text{C}$ ) and in Rovaniemi in the north it was  $1,146\text{ }^{\circ}\text{C}$  ( $879\text{ }^{\circ}\text{C}$ ).

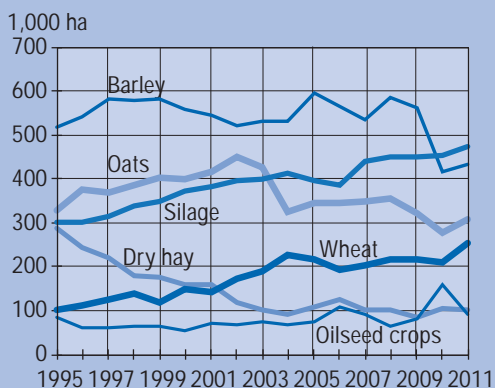


## Areas and yields

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

In 2011 cereals were cultivated on about 1,042,300 ha in Finland. The cereal area was 10% larger than the year before. The total cereal crop grew by almost a quarter from the previous year to 3,668 million kg.

The area under fodder cereals was about 759,500 ha in 2011 and the yield totalled 2,615 million kg. About 1,195 million kg of this was barley. The cultivation area of fodder cereals grew by 6% and the total output by as much as 19% from the year before. Like in the previous year,



Harvested areas in 1995–2011, 1,000 ha.

the quality was quite weak. The hectolitre weight of fodder barley was the lowest in seven years.

Only 38% of the fodder barley crop reached a hectolitre weight of more than 64 kg. There was some regional variation in the quality, but less than the year before.

### Harvested areas and yields of main crops in 2010 and 2011.

	2010			2011		
	Area 1,000 ha	Yield kg/ha	Total million kg	Area 1,000 ha	Yield kg/ha	Total million kg
Winter wheat	22.3	3,970	88.5	39.4	4,400	173.4
Spring wheat	188.9	3,370	635.9	214.0	3,740	801.4
Rye	25.2	2,720	68.5	26.9	2,910	78.4
Barley	417.4	3,210	1,340.2	432.0	3,510	1,514.3
Oats	278.3	2,910	809.7	308.2	3,390	1,043.1
Mixed cereals	19.4	2,380	46.5	19.4	2,950	57.2
Peas	6.1	2,190	13.4	4.8	2,500	12.0
Potatoes	25.2	26,210	659.1	24.4	27,580	673.3
Sugar beets	14.6	37,120	542.1	14.1	48,010	675.7
Dry hay	106.1	3,600	382.4	102.7	3,670	376.7
Silage	451.6	17,890	8,081.3	471.6	15,590	7,351.3
Green fodder	13.6	8,820	120.3	6.7	11,480	77.4
Cereals harvested green	57.5	4,180	245.0	57.2	4,190	239.9
Turnip rape	141.5	1,120	158.6	76.5	1,180	90.4
Rape	16.2	1,230	19.9	14.5	1,700	24.7
Pasture	77.3			75.0		
Other crops	55.1			51.8		
<b>Total</b>	<b>1,916.3</b>			<b>1,939.2</b>		
Set aside and managed uncultivated arable land	307.0			275.7		

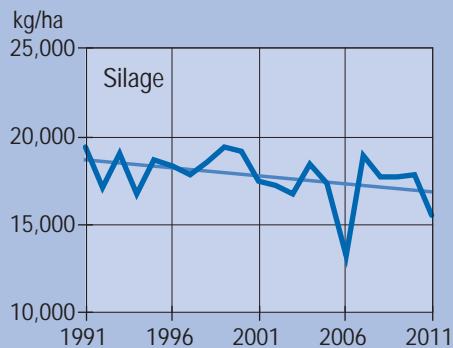
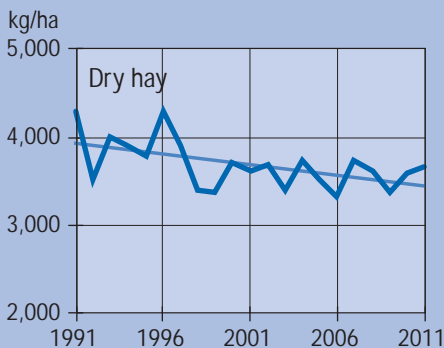
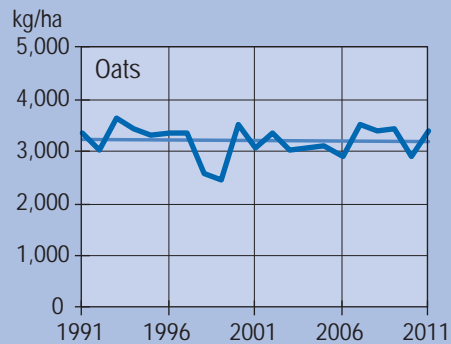
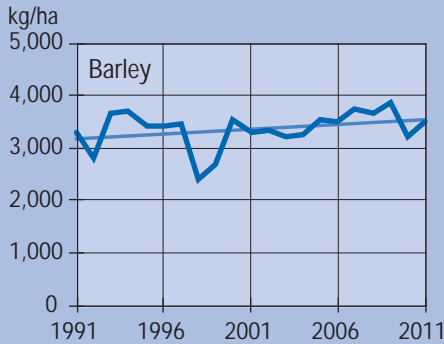
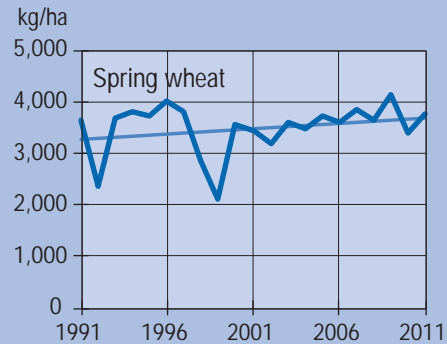
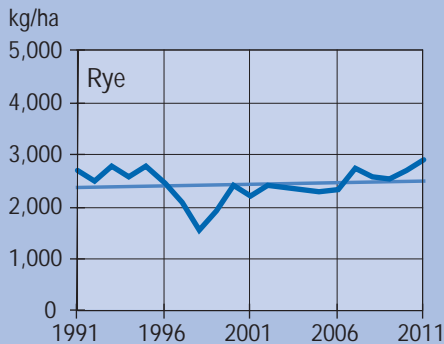
Source: Information Centre of the Ministry of Agriculture and Forestry.

In Uusimaa in southern Finland 78% of the crop was above the hectolitre weight of 64 kg, but in North Savo in central Finland only 20% of the crop reached this hectolitre weight. The hectolitre weight of oats was also low, but it was still better than the year before: 90% of the crop was above the hectolitre weight of 52 kg, which is the minimum requirement commonly used by the feedingstuffs industry. 22% of the oats crop was above the hectolitre weight of 58

kg usually required for grits, while in 2010 this figure was as low as 3%.

The yield of malting barley in 2011 was about 319 million kg, which was 31% higher than the year before. About 74 million kg, 23% of the crop, was fit for malting. The main reason why part of the crop was not suitable for malting was the too small grain size.

The total area under bread cereals in 2011 was 280,300 ha and the total yield



Yields of main crops in Finland from 1991 to 2011. Source: Information Centre of the Ministry of Agriculture and Forestry.



harvested was about 1,053 million kg. This was as much as 33% higher than the year before, due to both the higher total output because of the larger cultivation area and higher average yields.

The total yield of winter and spring wheat was 975 million kg, of which 77% fulfilled the quality criteria for bread wheat. The yield of spring wheat was about 801 million kg and that of winter wheat about 173 million kg. The total amount of wheat harvested was higher than ever before, and the quality was also better than in the past few years. The hectare yield of winter wheat, 4,400 kg/ha, was much higher than in 2010 as well as above the long-term average. 79% of the spring wheat and 71% of the winter wheat was fit to be used as bread cereal. In 2011 the protein content and falling numbers of both spring and winter wheat were high and the hectolitre weights were good.

The total yield of rye, about 78 million kg, was 14% higher than in 2010. 83% of the crop was fit to be used as bread cereal. The area sown with rye in autumn 2011 was about 23,000 ha, which was 6,000 ha less than the year before.

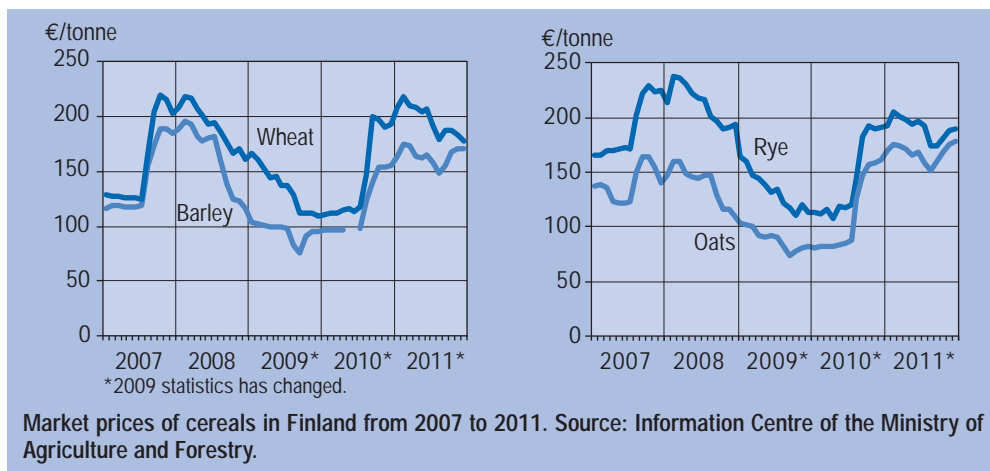
The silage area was about 471,600 ha, which is about 4% more than in 2010. The total yield was 9% higher, about 7,351 million kg. The average silage yield was only 15,590 kg/ha, which is below the av-

erage. The dry hay area fell from the previous year to 102,700 ha and the total yield of 377 million kg was 1% lower than the year before. The average yield of dry hay was 3,670 kg/ha, which is above the ten-year average. The pasture area decreased from the year before to 75,000 ha

The potato yield of 2011 totalled about 673 million kg, which is 2% higher than the year before. The cultivation area of potatoes fell by about 3% to 24,400 ha. The average potato yield of 2011 was clearly above the long-term average. Of the total yield about 300 million kg were ware potatoes.

The yield of sugar beets was also clearly above the average. The total yield of 2011 was 676 million kg, which is a quarter higher than in 2010. The average yield per hectare was as high as 48,010 kg, while the long-term average in Finland is 36,590 kg/ha. The cultivation area was 14,100 ha, which is almost the same as in the previous year.

The cultivation area of oilseed crops totalled 109,500 ha in 2011, which is as much as 37% smaller than the year before. The total yield of 127 million kg was only about a third smaller than in 2010. Turnip rape was cultivated on only 76,500 ha, which is a little over a half of the turnip rape area in 2010. The total yield of turnip rape was 90 million kg. The hectare yield



yield of turnip rape was a little higher than in 2010 but smaller than the long term average. The hectare yield of oilseed rape, 1,700 kg/ha, was close to the long-term average and higher than in 2010.

### Market prices for arable crops

In 2011 the trends on the Finnish cereal market were quite moderate, with no similar great fluctuations in the prices as in the previous years. The prices for malting and fodder barley rose during the year, while the prices for wheat and rye fell.

The price of fodder barley was about 165 €/tonne in the early part of 2011. The price continued to rise during the first months of the year, but in the summer the prices turned into a slight decrease. In December 2011 the average price of fodder barley was 174 €/tonne, which was about 5% higher than in January. The price of malting barley rose by about 20% in 2011. By December 2011 the price had risen to more than 214 €/tonne, from 178 €/tonne in January. The average price of the year for malting barley was 197 €/tonne.

The average price of oats in 2011 was about 171 €/tonne. Despite the slight fall in August-September the price level remained quite stable all through the year. In December the average price of oats was 176 €/tonne.

The average price of wheat fell in 2011. In the beginning of the year the average price for wheat was about 200 €/tonne, but by December it had fallen to 171 €/tonne. The average price of wheat for the whole year was 189 €/tonne. The price of rye also fell during 2011 from 205 €/tonne in February to about 189 €/tonne in December. The average price of rye for the whole year was 191 €/tonne.

The prices for oilseed crops stayed at a high level all through the year. In June 2011 the price of turnip rape and oilseed rape was 458 €/tonne, while the average price in 2010 was 325 €/tonne. At its lowest in March 2011 the price was 444 €/

Market prices of cereals in Finland from 2001 to 2011, €/1,000 kg.

	Rye	Wheat	Barley	Oats
2011	186.89	196.91	162.40	166.14
2010	159.71	147.39	112.58	115.71
2009 <sup>1</sup>	134.15	131.95	93.93	86.41
2008	207.02	189.14	160.71	137.80
2007	192.19	159.90	145.80	149.73
2006	139.81	110.50	102.00	107.26
2005	118.41	106.20	99.51	87.13
2004	120.90	119.80	106.51	87.32
2003	124.88	126.66	105.57	92.21
2002	126.57	131.79	106.00	104.38
2001	131.31	132.36	109.66	111.37

<sup>1</sup> Statistics has changed. Quality-adjusted price paid to farmers on delivery to first customer  
Source: Information Centre of the Ministry of Agriculture and Forestry.

tonne.

The average price of ware potato varied quite strongly in 2011, with 190 €/tonne as the average for the year. In the middle of the year the price was still as high as 240 €/tonne, but in July it started to fall so that during the autumn the prices were halved and by December the price was as low as 110 €/tonne.

The cereal prices in Finland were below the prices paid in Central Europe all through the year. On the domestic market the prices are slow to react to a rise in the price level, while fall in the EU prices is quite rapidly reflected on the Finnish market.

Market prices of cereals in 2010 €/1,000 kg.

	Rye	Wheat	Barley	Oats
Finland	159.7	147.4	-	115.7
Sweden	129.0	168.8	142.6	113.2
Denmark	120.8	131.6	131.6	124.9
Germany	128.7	149.5	-	129.8
Austria	139.1	131.2	-	111.4
England	-	152.8	123.9	117.5
Spain	146.5	173.4	150.3	139.7

Source: Eurostat.

# Climate change, new technologies and horticulture

*Risto Tahvonen*

In recent decades the efficiency of horticultural production in Finland has improved both in the open and in greenhouses. In the next couple of decades the conditions for horticulture will be further improved as the climate change proceeds, the winters get milder and the cultivation conditions in the summer become more favourable. There will be less winter damage especially in fruits, the need for energy in greenhouse production decreases and the demand for horticultural products will be growing.

The key factors in the cultivation of horticultural products in Finland, both now and in the future, include advanced techniques, dark winter, daylight in abundance in summer and benefits to be derived from climate change. At the turn of the millennium significant progress was made in the cultivation techniques so that the yields of vegetables grown in the open, berries as well as greenhouse crops came close to those in the best regions of Europe, or even exceeded these.

## Horticulture changes along with the climate

Longer growing season and especially warmer winters improve the competitiveness of horticultural crops. Finnish climate has changed considerably from the 1960s to the present day. The growing season is usually indicated by the efficient temperature sum, i.e. sum of temperatures exceeding +5°C. In the 1960s the effective temperature sum was a little under 1,300°C, while in the past decades it has been 1,400–1,500°C, which means a 2 to 4 weeks longer growing season.

According to the present forecasts, the lengthening of the growing season will continue and winters will get warmer so that in the 2040s the climate in southern Finland should be close to that prevailing in northern Germany in the middle of the past century. Increased winter precipitation ensures that we have clean water in abundance, which is a major advantage compared to the farming regions in southern and even central Europe, which suffer from drought. Another significant benefit for Finland is the low incidence of pests.

## The most efficient greenhouse vegetable cultivation in Europe

In the global perspective, Finnish greenhouse production takes place in highly exceptional conditions. From November till February there is not enough sunlight, which is why artificial lighting is now being used in the production. During the whole growing season, however, the amount of sunlight energy is a little higher in Finland than in the Netherlands.

Artificial lighting is an efficient substitute for heating in greenhouses when artificial light is applied in quantities required for good growth. In the cultivation of cucumber, for example, 95% of the energy needed for heating the greenhouses comes from lamps and energy created in the production of carbon dioxide, which means that the energy efficiency per kilo of crop has improved considerably compared to traditional production based on natural light. At present the annual yield of the most efficient cucumber producers may be more than 200 kg/m<sup>2</sup>, i.e. 2 mill. kg per hectare, while in the 1980s it was 40–50 kg/m<sup>2</sup>/year. It is interesting to note that in Spain, for example, 20 kg/m<sup>2</sup> would be considered a good annual yield, because the summer is too hot for reaching high production efficiency.

Greenhouse production continues to develop in the future when the most recent growth medium and irrigation methods, which are now being studied, LED lighting techniques and solutions for the cooling of greenhouses are ready for use in the production. The energy efficiency and yields could rise by 20–40% from the level today, which is already quite good.

**Development of horticultural production with cucumber as an example in 1970–2010 and forecast for the 2030s.**

Year	Yield	Relative advancement of production techniques				
		Artificial light	Technique	Irrigation	Growth medium	Plant protection
1970	25	0	1	1	2	1
1980	40	0	3	3	3	2
1990	50	0	3	3	3	3
2000	100	2	3	3	3	3
2010	200	3	3	3	3	3
2030	250	4	4	4	4	4

*Yield=kg/m<sup>2</sup>/year, advancement in production techniques: 0=not used, 1=traditional 2=in transition, 3=modern, 4=now being studied, in use within the next few years*

### Changing climate promotes and diversifies horticulture in the open

In the present and future climate all commercial horticulture is based on efficient irrigation. There will be no shortage of water in Finland for this because of the increase in the total annual precipitation. This is a significant advantage compared to central and southern Europe. Modern irrigation and related fertilisation techniques specifically developed for the Finnish conditions have led to a considerable increase in the yields in the 2000s. In the 1980s the yield level of, for example, strawberry varied between 2,000 and 5,000 kg/ha, but the usual level today is 15,000–20,000 kg/ha. In vegetable production in the open the yields of cabbage, carrot and gherkin have doubled. Precision irrigation and related fertilisation based on the growth of the plants have improved the utilisation of nutrients by the plants and the nutrient discharges from arable lands have decreased because of the more accurate targeting of cultivation measures.

### Changing climate expands the opportunities for fruit production

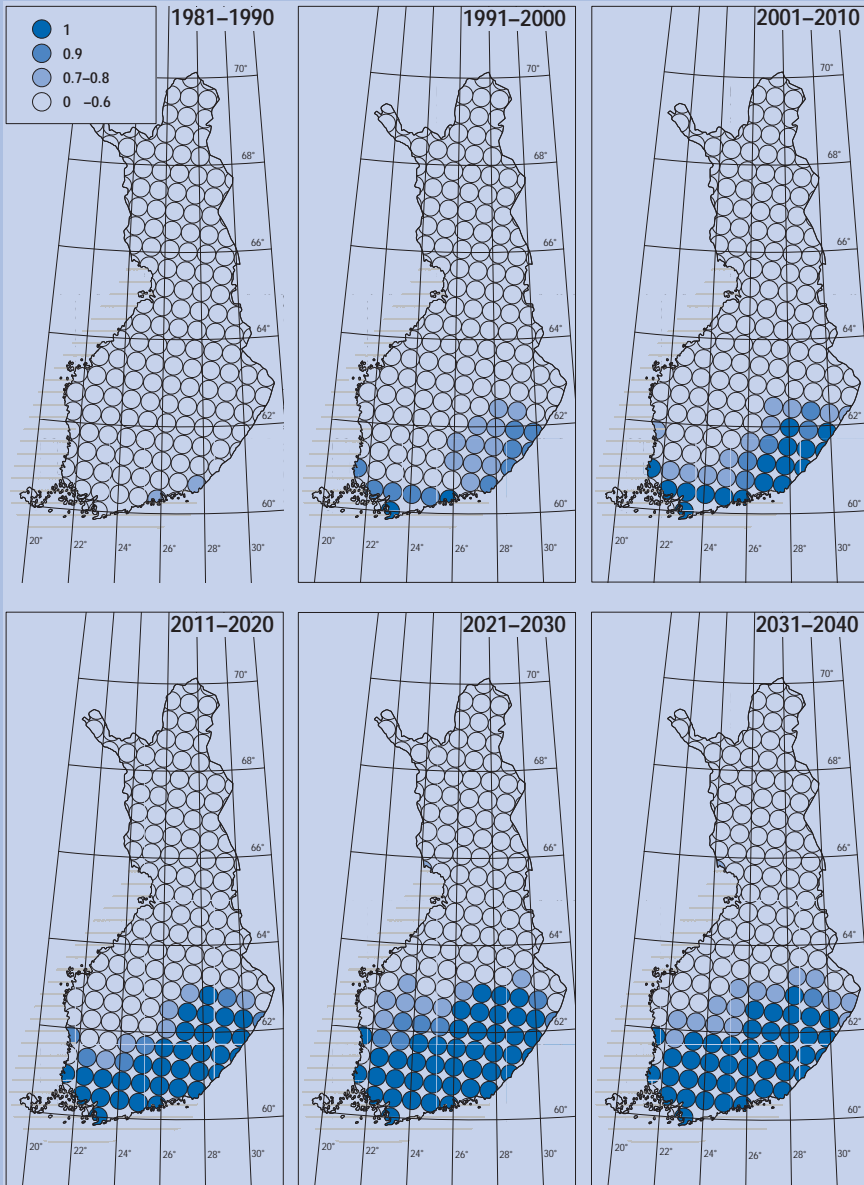
In the future climate the growing season will be longer and winters milder. This means that the area where apples, including winter varieties, can be produced will expand to the whole of southern Finland up to the Salpausselkä ridge. Summer and autumn varieties can be cultivated in central parts of the country as well, while the hardier summer varieties grown in private gardens succeed all the way to southern Lapland. Pear and plum will quite soon be introduced for commercial cultivation in the most favourable regions in southern Finland. Even certain varieties of sweet cherry will succeed in the Finnish conditions.

Because of the natural conditions prevailing in Finland the berries produced here have a very high nutritional value. Even at present the new varieties of strawberries and currants and advanced cultivation techniques produce very good yields up to the Oulu and Kajaani regions quite far in the north. In these areas the crop ripens 1–3 weeks later than in southern and central Finland, which is a significant advantage as regards the marketing of the products.

### Pleasant surroundings through green landscaping

Urban living is spreading fast in Finland, but we still demand and need beautiful and successful plants for green landscaping, or greenscaping, to ensure our well-being. Finn-

ish climate is changing, but the hours of daylight will stay the same. This must be taken into account in green landscaping: about 50% of the varieties are of domestic origin. We need to secure efficient and functioning production and supply of domestic seedling material as well as research focused on this – otherwise green landscaping plantations will turn into foreign and disposable ones. The total annual value of green landscaping is almost € 1 billion a year, of which the share of plants is about 10%, which is about the same as the total commercial value of all other horticultural plants.



Success of the cultivation of apples and climate change with the autumn variety Melba as an example. Dark blue circle = crop ripens and the trees overwinter every year, Light blue circle = crop ripens and trees overwinter in 0-6 years out of ten.



## 2.3. Livestock production

### Milk

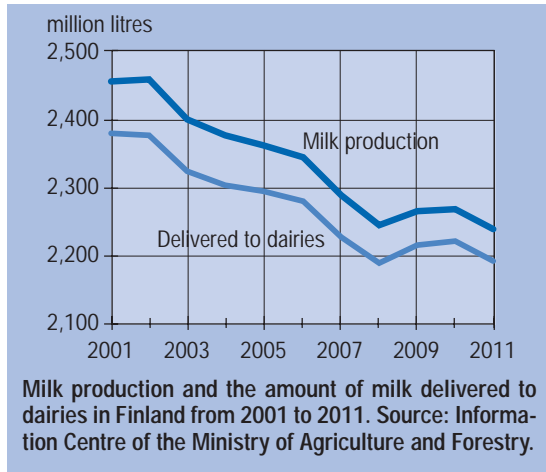
The amount of milk delivered to dairies in 2011 totalled 2,190 million litres, which was 32 million litres (-1.5%) less than in 2010. The production of organic milk totalled 31 million litres (+4.4%).

In the quota period 2010/2011 milk production in Finland totalled about 2,222 million litres, which was 242 million litres (9.8%) short of the national quota. The Gallup Food and Farm Facts has forecast the milk output of 2012 to total 2,215 million litres (+1.2%).

Milk was produced on 9,938 farms (-6.5%), of which 126 (i.e. 10.5%) were organic farms. During the 2000s the number of dairy farms has decreased by 53%, but milk production has fallen by only 8%. The average dairy herd size grew by 1.4 cows to 27.7 cows. The number of dairy cows decreased. The average milk yield per dairy cow fell by 0.4%.

In 2011 the production of butter totalled 41.7 million kg (-10%) and a total of 22 million kg (+20%) was consumed. Butter was in high demand during the year and at times there was shortage of butter at supermarkets, even if the exports were reduced to 24.7 million kg (-20%) and the stocks fell to 0.7 million kg at the end of the year. The production and consumption of fat blends was about 16.5 million kg (-7). The production of liquid milk products totalled 704 million litres (-0.6%) and the consumption was 687 million litres (-1%). The production of buttermilk totalled 62 million litres (-3.5%).

In 2011 a total of 123 million kg of yoghurt was produced (+5%) and the consumption was about 128 million kg (+2%). Cheese production totalled 100.5 million kg (-0.4%) and consumption 121 million kg (+5%). The production of open-texture cheeses and Finnish squeaky cheese "leipäjuusto" increased the



most. The production of cream increased by 9% and that of soured milk products by 11%. The production of milk powder fell by 10% and consumption by 13%.

Even if the domestic consumption exceeds the production, considerable amounts of certain individual products need to be exported. A major share of fat contained by the milk produced is still used to export products. Instead, the protein fractions in milk find use in Finland.

Yoghurt exports totalled 31 million kg (+10%) and imports 37 million kg (+2%). The import of liquid milk totalled 52 million kg, which is about 20% of the consumption. Cheese exports totalled 50.2 million kg (-1.4%) and imports 52.5 million kg (+17%). Of the cheeses produced in Finland almost a half are exported, while imports represent as much as 43% of the cheese consumption. Butter exports fell to 24.7 million kg (-20%). Milk powder exports fell by 10% and imports by 37%.

### Beef and sheepmeat

In 2011 meat production in Finland, including all farm animal species, totalled 387 million kg. Meat consumption totalled 400 million kg. Finland was a net importer.

In 2011 a total of 82 million kg of beef was produced in Finland (+0.5%). Beef consumption increased by 1% to a little over 99 million kg, of which 18% was im-

ported meat. The Gallup Food and Farm Facts has forecast that in 2012 beef consumption rises to 99.7 million kg and domestic production to 83 million kg.

The number of bovines slaughtered was almost 268,000 (+0.5% from 2010), of which 53% were bulls, 32% cows and 14% heifers. The number of bulls slaughtered was about the same as the year before, but the number of slaughtered cows increased by 2% and that of heifers by 1%.

The increase in average slaughter weights has slowed down the fall in beef production volumes. Since 1996 the average slaughter weight of bulls has increased by 70 kg. In 2011 the average slaughter weight of bulls was 343 kg, (-3 kg) and that of heifers was 248 kg (-2 kg). The average slaughter weight of cows rose by 2 kg to 282 kg.

The number of suckler cows has almost doubled during the 2000s. In May 2011 there were 57,300 suckler cows in Finland, which is 3% more than in 2010. The number of farms specialised in beef production was about 3,700, of which 2,200 had suckler cow production.

The average weight and number of calves sold for rearing (117,000 in 2011) increased by about 1% from the year before.

In 2011 a total of 17.9 million kg of beef was imported to Finland and 1.6 million kg (2% of the production) was exported. Imports grew by 3% and exports

decreased slightly. The amount of beef in the stocks decreased by almost 19% during 2011. The total amount of beef imported from Poland, Denmark and Germany accounts for 57% of the imports. More than half of the processed beef product imports were from Sweden, where Finnish meat companies are also operate. In recent years beef has been exported from Finland almost exclusively to Sweden and Norway.

Of the other ruminants the production of sheepmeat has grown by 30% in the past years, and the consumption has also increased rapidly. However, the total sheepmeat production was only 0.9 million kg and the consumption was 3.5 million kg.

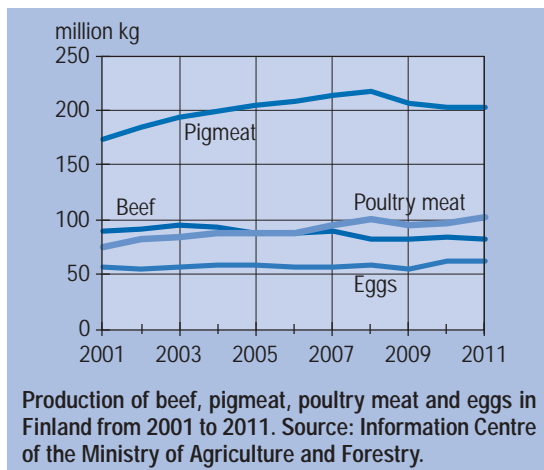
## Pigmeat

Pigmeat production totalled 202 million kg (-1% from 2010). The production has fallen for three years in a row. Pigmeat consumption grew by 5% to 196 million kg. The Gallup Food and Farm Facts has forecast that pigmeat production falls to 193 million kg in 2012 and consumption rises to 197 million kg, Finland becomes a net importer of pigmeat.

The number of pigs slaughtered in Finland was almost 2.3 million (+1%). One reason for the decrease in the total production was the fall in the average slaughter weight of fattening pigs to 87 kg (-1.4%). In the previous year the slaughter weights

were exceptionally high because of the strike at the Finnish slaughterhouses, which delayed the slaughtering of animals. The number of sows slaughtered increased by 4%. The average weight of piglets sold rose to 32 kg.

In April 2011 there were almost 143,000 sows in Finland (-5%) and 470,500 fattening pigs ( $\geq 50$  kg, -4%). The number of pig farms was about 1,900 (-8%). During the 2000s the number of sows has decreased by 22% and that of boars by 45%, while the number of fattening pigs has increased by 16%. Most of



the production is located in south-western Finland and Ostrobothnia, with 76% of the pigs and 70% of pig farms.

In 2011 a total of 41.2 million kg of pigmeat was exported (+13%). Imports totalled 27.9 million kg (-2%). A fifth of the production was exported. The frozen pigmeat stocks decreased by 6.6 million kg (46%). Most of the exports go Russia, Estonia, Sweden, New Zealand and South Korea. An agreement signed at the end of 2011 improves the opportunities to export pigmeat to China.

Of the pigmeat consumption 14% is covered by imports, mainly from Germany, Denmark and Poland. Processed meats come from Germany and Sweden.

### Poultry meat

In 2011 poultry meat production in Finland totalled 101.5 million kg and consumption 98.5 million kg. The production grew by 5% and consumption by a little under 1% from the year before. About 91% of the poultry meat produced in Finland is broiler.

Broiler meat production totalled a little under 92.5 million kg (+7% from 2010) and that of turkey meat 7.9 million kg (-9%). At total of 93.4 million kg of

broiler meat (+7%) and 9.7 million kg of turkey meat (+3%) was consumed. Besides these, small amounts of other poultry meats were produced and consumed. The production of broiler meat has been around 85 to 90 million kg in the past few years. The production of turkey meat has decreased by 43% from 2005.

According to the Gallup Food and Farm Facts, in 2012 the consumption of poultry meat rises to 102 million kg, of which 91 million kg is broiler meat and less than 10 million kg is turkey meat. The production is forecast at 107 million kg, of which 99 million kg is broiler meat and less than 9 million kg is turkey meat. The market outlook for broiler seems more favourable than that for other meats.

The number of broilers slaughtered increased by 5% from the year before, but the average slaughter weight fell by about 30 g to 1.65 kg. The number of turkeys slaughtered decreased by 7% and the average slaughter weight of 9.25 kg was about 160 g lower than the year before.

In 2011 a total of 11.5 million kg broiler meat (about the same as the year before) and 3.0 million kg turkey meat (+21%) was imported to Finland. Most of the broiler meat imports were from Brazil and Denmark. About 13% of the

Livestock production in Finland from 2001 to 2011.

	Dairy milk million litres	Beef million kg	Pigmeat million kg	Eggs million kg	Poultry meat million kg
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	57	95
2006	2,279	85	208	57	88
2005	2,293	84	203	58	87
2004	2,304	91	198	58	87
2003	2,323	94	193	56	84
2002	2,376	91	184	55	83
2001	2,378	90	174	57	76

Source: Information Centre of the Ministry of Agriculture and Forestry.



broiler meat and as much as 31% of the turkey meat consumption was covered by imports. Processed meats were imported from Thailand, Germany, Denmark and Brazil. Turkey meat was imported mainly from the Netherlands, Poland and Germany. The share of higher value-added meat products has grown: today poultry meat preparations represent well over half of the imports. A major share of the carcass meat imports is boneless meat.

Broiler meat exports from Finland were 17 million kg (+17% from 2010) and turkey meat exports 2 million kg (+11%). The exports went mainly to Estonia, Russia, Hong Kong, Lithuania and Latvia. Exports consisted mainly of pieces with bones.

## Eggs

The amount of eggs delivered to packaging in 2011 totalled 62 million kg. Besides this, about 1% of the production has gone to direct sale or farm household use. Egg production was 2% higher than the year before. This was the first time since the end of the 1990s that egg production was this high. The production of organic eggs decreased by 20% and that of eggs produced in battery cages by 3%. Egg production in barn systems grew by 18 %.

Of the eggs produced 3% came from organic production, 28% from barn systems and 69% from battery cage systems. The share of battery cages has decreased, because in 2012 eggs can no longer be produced in unenriched cage systems. The number of farms which have not converted their system and thus have decided not to continue egg production should be reflected in the volumes at the turn of the year.

Egg consumption totalled about 55 million kg, which is 6% more than in 2010. The consumption of shell eggs increased by 3.7%. The exports of shell eggs decreased slightly while there was some growth in the exports of other egg products, so that the total exports stayed at a

**The producer prices of the most important livestock products in Finland from 2001 to 2011 including production support (€/100 kg, milk €/100 l)<sup>1</sup>.**

	Milk	Beef	Pig-meat	Poultry meat	Eggs
2011	44.24	253	146	131	96
2010	40.59	240	137	120	88
2009	40.11	247	141	124	87
2008	44.79	241	144	130	92
2007	39.05	221	132	114	77
2006	36.90	212	126	109	62
2005	35.55	205	128	114	60
2004	36.37	190	120	117	74
2003	37.31	186	115	117	80
2002	37.29	190	137	120	79
2001	36.48	208	150	117	69

<sup>1</sup>Statistics of milk price has changed. Producer price is the average price paid to producers. Source: Information Centre of the Ministry of Agriculture and Forestry.

little over 10 million kg. There are 3.3 million laying hens in Finland (+3%).

The Gallup Food and Farm Facts forecasts egg production to decrease in 2012 by 5% to less than 60 million kg. The growth in the consumption is expected to continue.

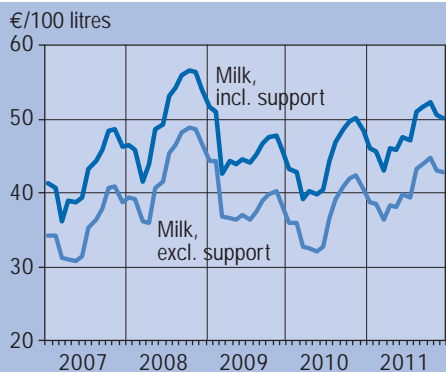
## Producer prices

The market prices of livestock products in the EU influence their prices in Finland,

**Market prices for livestock products in selected EU countries in 2010, €/100 kg<sup>1</sup>.**

	Milk	Pigmeat	Beef (bull)	Poultry meat <sup>2</sup>	Eggs <sup>3</sup>
Finland	42.84	149.9	300.8	249.0	118.4
Sweden	37.90	148.4	329.8	220.3	208.9
Denmark	35.55	138.9	338.3	235.4	178.3
Estonia	32.29	156.3	241.0	-	103.6
Germany	34.68	155.7	348.7	254.3	107.7
France	33.47	146.6	343.7	223.6	107.9

<sup>1</sup>Milk the average price of January–November, other January–December, - information not available. <sup>2</sup>Sale price at slaughterhouse, <sup>3</sup>Sale price at packaging plant. Source: European Commission.



Producer price of milk in Finland from 2007 to 2011. Source: Information Centre of the Ministry of Agriculture and Forestry.

but the Finnish prices have certain special characteristics. The market prices for pigmeat and milk, for example, usually vary less in Finland than in many other EU countries. In Finland there is oversupply in eggs, and their producer price has been low compared to the other parts of the EU. Instead, the prices paid to the Finnish milk producers are slightly higher than in the EU on average, and in Finland the seasonal variation in prices is also greater. Studies show that the price changes observed on the European meat market are transmitted to the Finnish prices slowly.

In 2011 the average producer price for standard milk with quality premiums was 40.50 €/100 l (+10% from 2010). In addition, the average of 7.44 €/100 l was paid as production aid. The average price for grade I standard milk was 37.02 €/100 l, which means that the share of quality premiums in the price was 3.48 €/100 l. The final price for milk is determined when the dairies complete their financial statements and the retroactive payments based on the result are decided. In 2010 the average retroactive payment was 3.74 €/100 l.

The average price paid to the producers for bull meat was 2.95 €/kg, which was 6% higher than the year before. The average price for all types of beef was 2.53 €/kg (-5%).

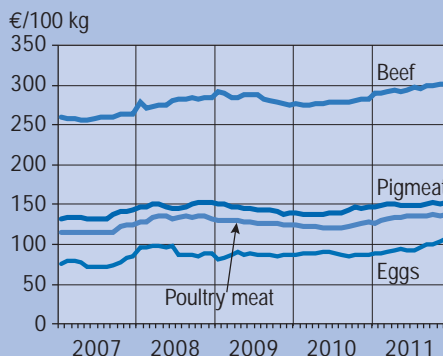
The price of bull meat increased less than that of heifer meat (2.39 €/kg, +7%), but a little more than the price for cow meat (1.68 €/kg, +4%). In Finland the beef prices increased less than the EU average. In the long term the Finnish prices have been close to the EU average.

The prices paid for calves sold for rearing were about the same as the year before or up to 2% higher. The average price paid for a male colostrum calf was € 154 and that paid for a female calf was € 82.

In 2011 the average price paid for pigmeat was 1.46 €/kg (+7%). The average price paid for fattening pigs was 1.50 €/kg (+7%). The average price paid for piglets (30 kg) was € 58 (-3%). In June-July the price paid for piglets fell below € 50. Except for the first quarter, the average price of pigmeat in the EU was higher than the price in Finland. Instead, the prices paid for piglets in Finland were higher than the EU prices.

The average producer price for poultry meat was 1.34 €/kg (+9%). The price for broiler meat was 1.31 €/kg (+10%).

The average producer price for eggs was 0.96 €/kg (+9%). The prices paid for eggs produced in barns systems were 0.09 €/kg and the price for organic eggs almost 1.7 €/kg higher than that of eggs produced in battery cages.



Producer prices of beef, pigmeat, poultry meat and eggs in Finland from 2007 to 2011. Source: Information Centre of the Ministry of Agriculture and Forestry.

## LED lighting for Finnish greenhouses

*Kari Jokinen*

The daily solar radiation alone does not allow efficient greenhouse production in Finland, especially in winter. In Finland artificial lighting is applied 12–20 hours a day, depending on the time of the year and type of plants. For example, the installed lighting capacity for tomato and cucumber is about 250 W/m<sup>2</sup>. The efficiency of greenhouse vegetable production has improved considerably since the year-round production started in the 1990s. Without artificial lighting the annual production period of greenhouses would be only eight months, which would mean much lower profitability. Year-round greenhouse production using artificial lighting as much as triples the yield of cucumbers per square metre, but it also increases the amount of energy used per unit of production.

In our cold climate efforts are made to improve the technological competitiveness and profitability of greenhouse production through new technical solutions. One important objective for both greenhouse production and society as a whole is to reduce greenhouse gas emissions. According to calculations made at the MTT Agri-food Research Finland, in latitudes of southern Finland the incoming energy flow into a technically well equipped greenhouse that is appropriate for year-round production is about 2,000–2,500 kWh/m<sup>2</sup>/year. Most of the energy comes from artificial lighting (52%), second-most from solar radiation (40%) and the least from heating (8%).

In Finland almost solely high pressure sodium (HPS) lamps are used for artificial lighting of plants cultivated in the greenhouse. Lamps based on the LED (light emitting diode) technology have been introduced as a new alternative. The functioning of LED is based on electroluminescence, where an electric current conducted to solid matter causes it to emit visible light.

Thus the LED technology is completely different from that in, for example, a traditional light bulb, where the heat in the filament, i.e. thermoluminescence, creates the light. The functioning of HPS lamps is based on sodium steam which emits visible light.

A single LED chip is a source of light which emits only one wavelength, but the colour of the light can be adjusted by combining LEDs of different colours or by adding luminescent substances to the LED. Nowadays LED lights manufactured from different materials cover all wavelengths of visible light as well as ultraviolet and infrared light.

### Higher efficiency through tailored greenhouse lighting

LED is considered as a very energy-efficient solution. Depending on the colour, up to 50% of the electricity fed into the LED is converted into light. With HPS this efficiency ratio is about 35%. Another significant advantage of LED compared to other light sources is its long operating life. The operating life of a LED chip may be as long as 100,000 hours, and the illumination efficiency is also high compared to other light sources. The illumination efficiency of, for example, filament lamps is about 10 lm/W. The efficiency of white LEDs used for general lighting varies between 70 and 130 lm/W, but in laboratories efficiency as high as 230 lm/W has been reached.

In greenhouse cultivation the response efficiency of the light “perceived” by the plants cannot however be determined simply by using the units for power (watt) or illumination (lumen), because the light sensitivity curve of a plant is very different from that of, for example, a human eye. The amount of radiation received by the plant can best be measured as the amounts of light quanta, i.e. photons, emitted by natural and

artificial lighting, with micromoles per square metre per second as the unit ( $\mu\text{mol}/\text{m}^2/\text{s}$ ). As a rule an increase in radiation by one per cent in a greenhouse increases the crop by one per cent until the saturation point for light has been reached.

Because the light spectrum of the LED can be adjusted almost steplessly, greenhouse lighting can be tailored to the most efficient wavelength range in terms of the growth and development of the plant. This special characteristic is lacking in the traditional greenhouse lighting systems. The most sensitive light absorbing ranges of the receptors that participate in photosynthesis (chlorophylls and carotenoids) are in the ranges of the blue and red light. This means that the artificial lights used for cultivation should contain these particular wavelengths as much as possible.

Besides the efficiency of photosynthesis, the adjustment of the light spectrum also influences the morphological development of the plants, which is regulated, among other things, by the amount of far red light. For example, the marketable quality of poinsettia is strongly dependent on the light composition of the LEDs used in its cultivation. This means that adjusting the LED lighting to meet the needs of each plant allows to reduce the energy consumption of greenhouses as the wavelengths that are less significant or even harmful for the plants can be removed.

### **Energy costs reduced by up to a third**

When producing light by the LED system, its calculated lighting efficiency may in fact be smaller but the growth response higher than when using HPS lamps. This apparent conflict is due to the fact that a LED lamp can be placed very close to the plants because the LED light is characteristically cold. Accordingly, there is less risk of harmful impacts on plants caused by heat radiation as is the case with HPS lamps installed too close to the plant tissue.

The lighting efficiency of LEDs applicable for practical cultivation decreases however considerably as its distance from the leaf surface grows. This means that using the LED lights available at present above high-wire plants such as tomato and cucumber is not a realistic solution yet. However, the lighting efficiency of LEDs is expected to increase by 35% a year, while the price should fall by about 20%. If this scenario will occur, LED technology is going to be soon a feasible alternative for the cultivation of tomato and cucumber as well.

An increase in the efficiency of LED lighting in converting electricity into light which promotes photosynthesis in plants to a level that is, for example, a third higher than in HPS lighting would reduce electricity consumption by a third. This means that the direct energy costs per kilo of fruit yield would also be a third lower than in the present year-round production by means of artificial lighting. The LED system would also reduce the need for ventilation in the greenhouses during the warm season particularly, which means that a greater benefit to growth will be gained from carbon dioxide fertilisation. The need for other heating energy during the cold season increases, but there are renewable energy sources available for this additional heating.

The light efficiency of some of the LED lights is already technically sufficient for the cultivation of, for example, leaf vegetables, spice plants and ornamental plants. The main question in their use for artificial lighting is however whether the LED lights and what kinds of them are suitable for producing high-quality plants at a lower cost than applying HPS lighting. Besides the price of electricity, the costs of lighting include the value of investments and the maintenance costs of the lighting system. A comprehensive study of all these factors is the main future challenge in the research on LED lighting.

## 2.4. Horticultural production

In Finland horticulture is considered to comprise vegetable production in the open, production of cultivated berries and apples, 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 horticulture enterprises

In 2011 the area of horticultural production in the open was about 16,200 ha. There has been some growth in the area over the past five years, especially in the area under outdoor vegetables and fruits. Instead, the berry production area has decreased slightly. The total greenhouse production area was 360 ha, of which 226 ha was used for vegetable production and 134 ha for ornamental plants. The greenhouse area used for both types of production decreased from the year.

In 2010 there were a total of 4,500 horticulture enterprises of Finland, of which 3,500 were engaged in production in the open and a little more than 1,600 were greenhouse enterprises. Some of the enterprises practice both outdoor and greenhouse production. From 2009 the number of horticulture farms fell by 170 enterprises. The total horticultural production area increased by more than 300 ha,

which means that the remaining enterprises grew in size.

The most significant horticultural production area in Finland is Southwest Finland, with 19% of the enterprises practising production in the open and 21% of greenhouses. North Savo is an important berry production region, while most of the apple production takes place in the Åland Islands and south-western Finland. More than half of the greenhouse production is located in support area C.

### Weather conditions

In the winter 2010–2011 there was a lot of snow in all parts of Finland. Berry plants benefitted from the abundant snow cover, overwintering succeeded very well and hardly any frost damages could be observed in the spring

The spring was favourable for horticultural plants. There was very little spring frost and the damages to the blooming berry plants and fruit trees remained small. Early vegetables did not suffer from night frosts and early crop was harvested quite at the usual time, in mid-May from greenhouses and a little later in the open.

Both summer temperatures and precipitation were above the average. Especially in the south the rains during the growing season came as showers, which means that there was great regional variation. Some regions had a suitable amount of rainfall

Areas under horticultural production in 2005–2011, ha.

	2005	2006	2007	2008	2009	2010	2011
Production in the open, total	15,417	15,468	15,357	15,533	15,734	16,032	16,213
Vegetables grown in the open	8,254	8,327	8,405	8,146	8,378	8,731	9,034
Berries	6,495	6,470	6,283	6,300	6,278	6,206	6,094
Fruits	667	671	669	690	685	696	702
Greenhouse production, total	405	404	399	392	375	369	360
Vegetable production	245	243	242	240	231	231	226
Ornamental plants	160	161	157	152	143	138	134

Source: Ministry of Agriculture and Forestry, Support Register.



during the growing season while others suffered from drought. The hot summer conditions caused very little damage to horticultural plants, except for iceberg lettuce and cauliflower, which suffered from occasional quality problems caused by the excessive heat. In the warm conditions the strawberries ripened quickly and the season remained short. Apples were harvested about a week ahead of the usual.

### Production in the open

In terms of the area garden pea is the most common vegetable, with a cultivation area of about 2,800 ha in 2010. This was almost 300 ha larger than in 2009. The second most common is carrot, which was cultivated on 1,600 ha. The two main crops represent almost half of the vegetable production area in the open. Other important outdoor vegetables are onion (980 ha) and head cabbage (590 ha). The main crops cultivated under production contracts with the processing industry are garden pea, carrot, beetroot and gherkin. A little under 2% of the vegetable production area in the open was under organic production. In terms of the areas the most significant organic vegetables were carrot (47 ha), garden pea (25 ha) and onion (33 ha). From the year before the organic vegetable production area decreased by a little over 10%.

Strawberry is by far the most significant berry plant in terms of both the area and yield. In 2010 the cultivation area was almost 2,900 ha and the total yield was 10 million kg. The strawberry area grew for the first time after a steady decrease over the past ten years, but the number of strawberry farms continued to fall. The strawberry yield has

stayed about the same, with some annual variations due to the weather conditions.

The second most important berries are black and green currants, which in 2010 were cultivated on about 1,500 ha. The cultivation area of raspberry and arctic bramble hybrid was about 400 ha. Black and green currants are also by far the most significant berries cultivated under production contracts with the processing industry as they represent 77% of the contract production area. About 9% (540 ha) of the berry production area was under organic production, most of this under currants (303 ha) strawberry (122 ha) and raspberry (19 ha). The organic berry production area decreased by 13% from the

Areas under the most important horticultural products grown in the open and yields in 2010.

	Area ha	Yield kg/ha	Total 1,000 kg
<i>Vegetables grown in the open</i>			
Garden pea	2,827	1,631	4,610
Carrot	1,607	41,877	67,276
Onion	979	20,263	19,829
White cabbage	591	37,481	22,159
Cauliflower	279	8,085	2,258
Beetroot	421	29,346	12,340
Swede	379	28,935	10,964
Gherkin	217	46,506	10,069
Chinese cabbage	186	15,225	2,829
Other plants	1,170	9,448	11,056
<b>Total</b>	<b>8,654</b>	<b>18,879</b>	<b>163,389</b>
– share of contract production	1,667	27,620	46,042
<i>Berries and apples<sup>1</sup></i>			
Strawberry	2,917	3,526	10,286
Black and green currant	1,472	676	996
Raspberries and raspberry- arctic bramble cross bred	394	1,345	529
Other berries	548	1,193	654
<b>Total</b>	<b>5,331</b>	<b>2,338</b>	<b>12,465</b>
– share of contract production	793	1,356	1,075
Apple	588	7,251	4,262

<sup>1</sup> Crop yielding area

Source: Information Centre of the Ministry of Agriculture and Forestry, Register of Horticulture Enterprises 2010.

previous year.

The cultivation area of apples has been growing for the past ten years. In 2010 the crop-yielding area was 588 ha. The total yield has also been growing but not as steadily as the area due to the annual variations in the crop. In 2010 apple production totalled 4.3 million kg.

### Greenhouse production

In 2010 the total greenhouse area in Finland was 440 ha. Of this 60% was used for vegetable production and 35% for the production of ornamental plants. The other greenhouse plants include seedlings, cuttings and berries. Measured by both the cultivation area (114 ha in 2010) and total yield (39 million kg), tomato is by far the most important greenhouse vegetable. Cucumber was produced on about 67 ha with a total yield of 31 million kg. Artificial lighting is used on about 25% of the cucumber area and 20% of the tomato area. Potted vegetables, most of these lettuces, were cultivated on 25 ha. The production area of potted vegetables has grown steadily over the past 20 years.

The area under ornamental plants was 150 ha in 2010. In most cases various ornamental plants are cultivated in the same greenhouse. Measured by the number of enterprises the production of bedding plants is the most common type of

### Areas under greenhouse vegetables (m<sup>2</sup>) and yields (kg/m<sup>2</sup>) in 2010.

	Area 1,000 m <sup>2</sup>	Yield kg/m <sup>2</sup>	Total 1,000 kg
Total <sup>1</sup>	2,442	31	74,749
Tomato	1,143	34	39,198
Cucumber	670	47	31,793
Other vegetables	628	6	3,758

<sup>1</sup> Does not include potted vegetables.

Source: Information Centre of the Ministry of Agriculture and Forestry, Register of Horticulture Enterprises 2010.

production, with 650 enterprises. Potted plants were grown in 380 enterprises, bulbous flowers in 190 and cut flowers in 110. The number of ornamental plant producers has decreased steadily in the past few years. The number of producers of cut flowers has fallen the most, to only a fifth of their number 20 years ago

Violet was the most common bedding plant in 2010, with a total production of 13 million, which is about two violets for each Finn. Violet accounted for 29% of the production of bedding plants. The second most common is petunia. Of the potted plants the most common was daffodil (3 million) followed by the Christmas flower poinsettia (2.3 million).

The cultivation area of roses, 100 ha, represents 62% of the total area of cut flowers. The production of bulbous flow-

### Producer prices for the most important horticultural products in 2005–2011, €/kg.

	2005	2006	2007	2008	2009	2010	2011
<i>Greenhouse production</i>							
Rose (€/unit)	0.41	0.41	0.45	0.47	0.46	0.47	0.45
Tomato	1.15	1.17	1.32	1.40	1.32	1.58	1.50
Cucumber	0.99	1.04	1.34	1.21	1.21	1.27	1.26
<i>Production in the open</i>							
White cabbage	0.27	0.37	0.58	0.56	0.42	0.49	0.48
Onion	0.33	0.44	0.60	0.48	0.43	0.56	0.57
Carrot	0.37	0.40	0.47	0.48	0.47	0.49	0.56
Strawberry	2.68	2.25	3.58	3.90	3.52	3.24	3.58
Apple	0.87	1.18	1.53	1.28	1.20	1.48	1.59

Sources: Kasvistieto Ltd., Glasshouse Growers Association.

ers continues to grow. In 2010 a total of 67 million bulbs were forced, of which 89% were tulips.

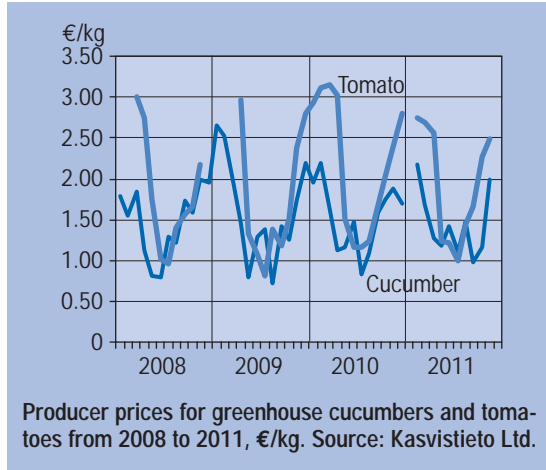
### Horticultural product market

Strong seasonal and annual variations are characteristic to the producer prices and volumes of horticultural products grown in the open. Usually the producer price is low during the main crop season, when the domestic supply is high. The supply decreases during the storage period, which usually raises the prices.

As regards the prices of storage vegetables such as carrot, head cabbage and onion it should be noted that they include the crop from two different seasons. In the early part of 2011 crop from the year 2010 was still being sold and it was not until the summer when the first early vegetables came to the market when the conditions of the crop season 2011 began to influence the prices.

In the early part of 2011 the supply of storage vegetables was lower than the year before due to the smaller yields in 2010. For example, the quantities of onions were 11%, carrot 15–25% and head cabbage 10–20% smaller than the year before.

Finnish head cabbage was in high demand in Russia because of the poor crop harvested there. The domestic supply in

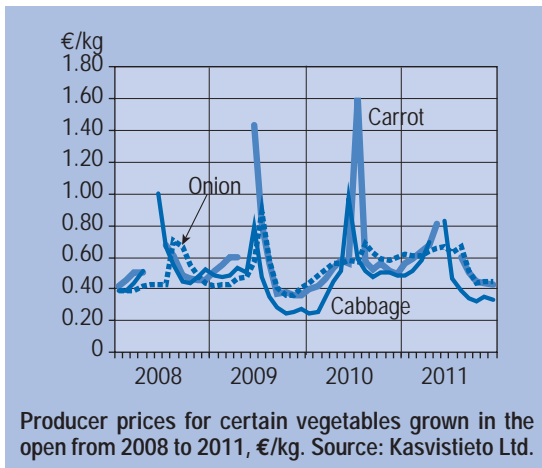


Russia was further reduced by the poor storage conditions as frost destroyed some of the stored cabbages. Cabbage export to Russia started in January 2011 balanced the domestic market in Finland as well. The markets of the other storage vegetables were also well in balance and the prices in the early part of the year were higher than in 2010.

Even if strawberries ripened quite rapidly in the warm weather conditions, there was no serious congestion on the market and the price level of the main crop season stayed higher than the year before.

The yield of apples was quite normal. The fruits of summer varieties remained small because of the warm weather, but the autumn and winter varieties were normal in size. In other respects the apple crop did not suffer from the heat and the taste of the apples was excellent.

Greenhouse vegetables, mainly cucumber and tomato, have two clearly distinct price seasons. In winter, i.e. November-March, the crop comes from lighted, year-round production. Due to the additional costs the price is higher than during the summer season, when vegetables are produced in the whole greenhouse area, also without artificial lighting. The supply is much greater in summer, production costs are lower, and thus the prices are also lower.





In the summer almost all basic types of tomatoes on the market are domestic. However, the share of imports is growing as the special types of tomatoes such as cherry tomato, cluster tomato and plum tomato have become increasingly popular. The Finnish supply of special tomatoes has not grown enough to meet the demand. Now the self-sufficiency in tomatoes is about 60% and that in cucumber is slightly higher, about 70%.

### Return calculation

The calculation of the total result of agriculture and horticulture was revised and turned into a total calculation based on profitability bookkeeping. The total calculation of horticulture is supplemented by a return calculation, because in the total calculations not all figures for the different horticultural production sectors can be

presented due to the limited farm data. In both the total calculation and return calculation of horticulture the returns are calculated on an accruals basis. The returns are entered to the year when the crop was produced. In the case of storage products, for example, the value of the crop is entered to the year when the crop was harvested even if it were sold during the following year.

The return calculation of horticulture comprises the value of the crop produced at producer price and the calculated support payments for the horticulture production area and products in storage. Besides these returns, the total calculation includes other revenue items such as investment aids, returns on dealing products, rents and sale of production inputs. The total calculation also includes the costs, while the return calculation is only concerned with the returns.

Return calculation of horticulture at current prices, € million.							
	2005	2006	2007	2008	2009	2010	2011e
<b>PRODUCTION IN THE OPEN</b>							
Vegetables	76.2	82.1	99.7	96.6	102.2	106.9	130.8
Berries and fruits	35.6	37.0	46.7	55.4	54.2	48.1	66.1
Nursery production	34.9	30.8	31.7	30.0	32.1	34.1	34.1
<b>Total</b>	<b>146.7</b>	<b>149.9</b>	<b>178.1</b>	<b>182.0</b>	<b>188.5</b>	<b>189.1</b>	<b>231.0</b>
<b>GREENHOUSE PRODUCTION</b>							
Ornamental plants	96.6	93.8	98.7	99.0	97.5	88.1	82.8
Vegetables	124.3	140.8	135.9	147.7	150.4	151.9	176.1
<b>Total</b>	<b>220.8</b>	<b>234.6</b>	<b>234.6</b>	<b>246.7</b>	<b>247.8</b>	<b>240.0</b>	<b>258.8</b>
<b>Return at producer price, total</b>	<b>367.5</b>	<b>384.5</b>	<b>412.7</b>	<b>428.7</b>	<b>436.3</b>	<b>429.0</b>	<b>489.8</b>
<b>SUPPORT PAYMENTS</b>							
Support for greenhouses	40.1	39.1	38.2	37.3	36.5	36.5	35.6
Storage aid for horticulture products	2.0	1.9	1.8	2.0	2.1	2.1	2.0
Environmental support	13.4	16.9	9.4	9.0	9.0	9.1	9.3
Single payment		7.1	2.9	3.1	3.2	3.3	3.4
LFA support	5.5	7.2	2.9	2.8	2.8	2.9	2.9
Other support	0.9	0.9	0.9	0.9	0.9	0.9	0.9
<b>Total</b>	<b>61.9</b>	<b>73.1</b>	<b>56.1</b>	<b>55.1</b>	<b>54.5</b>	<b>54.8</b>	<b>54.1</b>
<b>RETURN ON HORTICULTURE, TOTAL</b>	<b>429.4</b>	<b>457.6</b>	<b>468.8</b>	<b>483.8</b>	<b>490.8</b>	<b>483.8</b>	<b>543.9</b>

*Sources: Information Centre of the Ministry of Agriculture and Forestry Tike, Support Register and Horticulture Statistics, Kasvistiето Ltd., Finnish Glasshouse Growers' Association.*

# Will berry exports be a success story for Finland?

*Csaba Jansik<sup>1</sup> and Simo Moisio<sup>2</sup>*

Finland's National Food Strategy sets highly ambitious targets for the food industry, doubling the value of the production by 2030 among these. Obvious ways to raise the value of the production include a higher degree of processing (value added) and manufacturing products with even more diverse properties and higher value, but on the Finnish, quite mature food product market this is not enough.

Finnish food exports should grow manifold, because there are opportunities for significant increase in volumes only on the export market. In many sectors, such as meat, dairy and cereal-based industries, rapid growth would be restricted by the short supply of raw material or factors such as capacity, environmental considerations, etc.

## **Berries are the Finnish superfood**

One product group where the raw material supply is not a limiting factor is berries. The world demand for berries, especially wild berries, is growing rapidly. As pure and healthy organic products with a low carbon footprint Finnish berries are well suited for exports.

Recent studies have again proven the beneficial impacts of berries on human health. Besides vitamins, minerals and fibre, there is considerably interest in polyphenols as wild berries are the best source of these. Now that awareness of this has spread around the world, many Asian countries, such as Japan, South Korea and China, have shown a great deal of interest in buying wild forest berries from Finland.

The growing interest abroad and increase in berry exports have contributed to a higher valuation of berries in Finland as well. More and more domestic berries are now being used in both Finnish households and in the food industry.

## **Suited for both daily diet and festive occasions**

The greatest health benefits from berries are derived from the polyphenols contained in them. The health impacts of polyphenols are being studied as regards, for example, cardiovascular diseases, diet-related cancers, diseases of the digestive system, allergies and infections, ageing (dementia, Alzheimer's disease, eyesight) and metabolism (obesity, type 2 diabetes, metabolic syndrome). Diet rich in polyphenols is an efficient way of preventing oxidative stress, which has been proven to expose humans to many diseases.

The polyphenols contained in berries include flavonoids, phenolic acids, tannins, lignans and stilbenes. These, in turn, are composed of numerous ingredients. The ratio of different polyphenol compounds contained in different berry species varies. Polyphenols also give the berries their characteristic colour, ranging from black and blue to red, yellow and orange. The bright colours make the berries even more attractive, which is why apart from everyday diet they are also very well suited for festive foods.

## **Growing world demand**

The amounts of berries exported from Finland are growing. The exact quantities always depend on the previous year's berry crop. The total export volume has been 8–9 mill.

<sup>1</sup>MTT Economic Research

<sup>2</sup>Arctic Flavours Association

kg, of which bilberry represents about a half and the other half is lingonberry. Cloud-berry, cranberry and crowberry are also exported, but in much smaller quantities. In the total wild berry exports of 9 mill. kg in 2011 the share of bilberry was exceptionally low, only about a third.

Wild berries are frozen for export. Most of the bilberries go to the Far Eastern market, while the largest markets for lingonberry are in the EU, mainly in the German-speaking countries. In 2007 the lingonberry exports to Germany doubled from the year before.

The value of exports could quite easily be raised by increasing the value added. Berries can be used to produce more highly processed products which are in high and rapidly growing demand. Frozen berries from Finland are used in China to produce food supplements, powders, juices and other more highly processed end products for the Chinese, Japanese and South Korean market. Because of the labour costs, however, it would be difficult for the Finnish companies to compete with the Chinese ones.

Finnish wild berries do have a certain special advantage and strong image on highly demanding markets, such as those in Japan. Japan has recently tightened the maximum allowable levels of radioactivity. Finnish berries still stay below these, while berries of the many large competing countries do not.

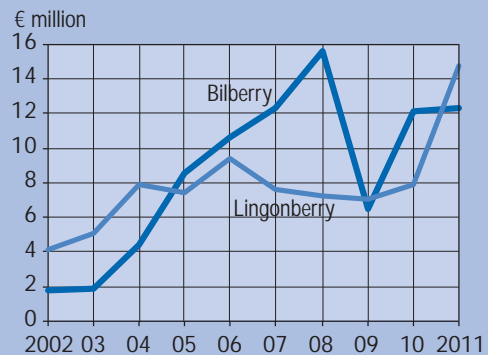
The main obstacle to the growth in wild berry exports is the shortage of resources available for marketing. According to the EU rules, the Member States are not allowed to use national aid for the sales promotion of berries, which is a major disadvantage compared to, for example, the North American competitors. Besides money, marketing also involves skills and human resources, where Finland's competitors, Sweden among them, seem to succeed better.

### Great potential in berry exports

Although at present wild berries represent only a small share of the total value of Finnish food exports, 1.7% in 2011, they could become the hit product of the future. Raw material potential is available practically "for free" and wild forest berries constitute a quite rare product group in that here the northern and peripheral location of Finland is an advantage rather than a major drawback, as in most cases.

Even in poor years the Finnish nature produces about 100 kg of berries per every Finn. Today a growing share of the total annual wild berry crop of about 500 million kg can be utilised. Especially the most high-yielding wild berry species lingonberry, bilberry and crowberry could be used more in Finnish export products containing berries.

Growth in exports can be achieved by increasing the numbers of foreign berry pickers and manufacturing more highly processed berry products. The present obstacles can be overcome through stronger efforts such as investigating the possibilities for collaboration between public funding and companies in marketing and product development.



Value of Finnish wild berry exports in 2002–2011 € million. Source: National Board of Customs, ULJAS database (CN 08119050 and 08119095)

## 2.5. Food market

### Consumer prices

In 2011 the food prices in Finland were, on average, 6.3% higher than the year before. The annual change in the consumer price index was 3.4%, which means that the rise in the food prices was more rapid than the general inflation trend.

The food prices started to rise towards the end of 2010 and in the beginning of 2011 they were already much higher than in the previous year. The prices rose the most in January 2011, when the new agreements between the food industry and retailers entered into force. The processing industry managed to transfer part of the increased costs to the product prices. During 2011 the prices for meat and cereal-based products rose by more than 5% and those of dairy products by almost 4%.

During 2012 the food prices in Finland are estimated to rise by about 4% from the level in 2011. The prices for meat products are expected to rise by more than 5% and those of dairy products by a little less than 4%. The increase in meat and dairy product prices is mainly due to the higher prices of imports. One reason for the higher prices of dairy products is the

**Average consumer prices of some foodstuffs in January from 2010 to 2012, €/kg.**

	2010 January	2011 January	2012 January
Wheat flour	0.56	0.55	0.61
Rye bread	3.55	3.74	3.83
Beef roast	12.40	12.75	14.26
Slivered pork	..	7.41	7.88
Chicken breast fillet	11.08	11.86	12.86
Light milk, €/litre	0.85	0.80	0.86
Emmenthal cheese	12.43	12.70	13.33
Eggs	2.91	3.11	3.44
Butter	4.02	4.00	5.68
Margarine	2.82	2.88	3.12
Tomato	4.73	4.68	3.93
Potato	0.65	0.80	0.67

Source: Statistics Finland, consumer price statistics.

**Development of average consumer price index and the consumer price index of foodstuffs in Finland in 1995–2011, 1995=100.**

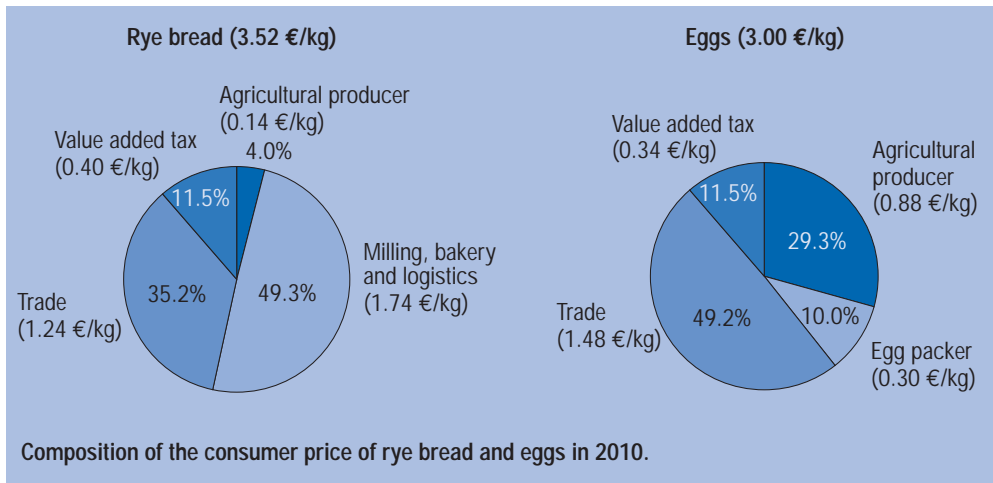
	Consumer price index	Price index of foodstuffs
2011	130.3	130.8
2010	126.0	123.1
2009	124.5	127.7
2008	124.4	125.2
2007	119.6	115.3
2006	116.7	112.9
2005	114.7	111.4
2004	113.7	111.1
2003	113.5	110.3
2002	112.5	109.6
2001	110.8	106.5
2000	108.0	102.0
1999	104.4	101.0
1998	103.2	101.3
1997	101.8	99.6
1996	100.6	98.2
1995	100	100

Source: Statistics Finland.

growing interest in various kinds of higher value-added products. The pressures on the prices of cereal and bakery products are not as great as in the case of meat and dairy products, and these are expected rise by less than 3% during 2012.

During the 2000s the rise in the food prices has been a little more rapid than the trend in the general consumer price index. From 2000 until 2011 the price of food in nominal terms rose by a little more than 28%, while during the same period the general consumer price index rose by about 21%. Relative to the level of earnings, however, food has become much cheaper as the wages and salaries have increased by about 50% since 2000.

Food is still more expensive in Finland than in the rest of the EU mainly because of the value added tax collected on food, which even after the reduction from 17% to 13% is the second highest in the EU-15. Only in Denmark is the tax on food higher than in Finland.



International comparison of food prices is not as straightforward, however. The prices also depend on various kinds of special national characteristics and eating habits. For example, the fact that Finnish consumers value the domestic origin and are willing to pay a higher price for Finnish tomatoes and cucumbers than for foreign ones raises the price level of food shown in the statistics.

It should also be noted that the share of food and non-alcoholic beverages consumed at home in the consumer expenditure of Finnish households has fallen close

to 12%, which is about the same level as in the EU-15.

Besides the trends in food prices, in recent years there has been discussion on the distribution of the price paid by the consumer within the food chain. Studies have shown that the share of the retail sector in the consumer price of food including tax has increased since 1995. The position of the retail sector has strengthened as it is capable of taking advantage of the competition within the processing industry and, through this, in primary production with even stricter terms.

**Average consumer prices of some foodstuffs in 2007–2011, €/kg.**

	2007	2008	2009	2010	2011	Change % 2010–2011
Light milk, €/litre	0.72	0.87	0.89	0.79	0.84	6.0
Butter	4.79	5.78	4.59	3.86	4.66	17.2
Margarine	2.53	2.98	3.11	2.76	3.04	9.2
Emmenthal cheese	10.82	12.13	12.86	12.57	13.13	4.3
Beef roast	10.04	11.79	12.62	12.10	13.54	10.6
Pork fillet	11.40	12.23	12.27	11.80	..	-
Chicken breast fillet	10.67	11.32	11.68	11.28	12.47	9.5
Eggs	2.74	3.01	2.99	3.00	3.25	7.7
Wheat flour	0.41	0.60	0.60	0.52	0.61	14.8
Rye bread <sup>1</sup>	3.15	3.51	3.65	3.52	3.83	8.1
Tomato	3.51	3.63	3.58	3.67	3.18	-15.4
Potato	0.74	0.76	0.76	0.68	0.83	18.1

<sup>1</sup> From 2011 rye bread, portion size.

Source: Statistics Finland, consumer price statistics.

### Consumption of milk products, margarine, meat and eggs per capita in 2000–2010, kg.

	Liquid milk <sup>1</sup>	Butter	Margarine	Cheese	Ice cream (litres)	Beef	Pigmeat	Poultry meat	Eggs
2010 <sup>e</sup>	183.4	2.9	7.5	19.1	13.6	18.6	34.9	18.2	9.8
2009	183.9	3.0	7.5	18.7	12.9	17.8	34.4	17.5	9.5
2008	186.0	3.3	7.5	18.4	12.6	18.2	35.3	17.2	9.4
2007	189.9	2.5	7.5	17.5	13.3	18.7	34.9	17.6	9.5
2006	183.9	2.8	7.5	19.1	13.7	18.5	34.3	15.8	9.3
2005	184.0	2.7	6.6	18.6	14.0	18.6	33.5	16.1	9.4
2004	186.2	2.6	6.6	18.4	13.2	18.6	33.8	16.0	9.4
2003	185.1	2.4	6.8	16.7	13.7	18.0	33.5	15.8	9.3
2002	190.0	3.0	7.6	16.6	13.5	17.9	31.9	15.4	9.7
2001	191.7	3.5	7.8	16.5	13.3	17.9	32.7	14.5	9.7
2000	193.9	3.8	7.7	16.5	13.5	19.0	33.0	13.2	10.1

<sup>1</sup> Including liquid milk, sour milk products and cream.

Sources: Gallup Food and Farm Facts, Information Centre of the Ministry of Agriculture and Forestry.

### Wholesale and retail trade

The strong and steady growth of the sales volumes of daily consumer goods has continued over the past few years. In 2011 the value of the retail sales rose again considerably to € 15.3 billion, which is more than 5% higher than the year before. The volumes increased by 1.1%, which means that the higher value was mainly due to the rise in the prices. Since 1995 the value of the sales of daily consumer goods at nominal prices has risen by almost 78%.

The market structure of the Finnish retail sector has been concentrating for a long time, but before 1995 the pace was quite moderate. In 1980 the two leading chains controlled 58% and in 1995 62%

of the market. In 2000 the combined market share of the two dominant chains S Group and Kesko was 66% but, according to AC Nielsen, by 2011 the share of the two largest chains had exceeded the 80% limit.

The S Group has been expanding very strongly especially since 2005 so that its market share is now 10 percentage points larger than that of Kesko. After the recent cuts in the retail network by 70 units, the market share of Suomen Lähikauppa is a little under 8% and the share of Lidl, which came to the Finnish market about 10 years ago, was 4.8% in 2011. The share of other companies has been decreasing steadily since 1995. In 2010 the number of peo-

### Market shares of retail companies in 2002–2011.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
S Group	31.1	31.1	34.3	35.9	39.9	41.0	42.4	43.2	44.1	45.2
K Group	36.0	35.8	35.3	35.9	33.4	33.9	33.7	34.2	35.0	35.3
Suomen lähikauppa*	12.9	12.7	10.0	10.8	11.9	11.9	11.3	10.2	9.0	7.8
Spar**	8.1	7.4	6.8	6.2	0.5	-	-	-	-	-
Lidl	-	1.8	2.8	3.7	4.1	4.7	5.0	5.1	4.8	4.8
Other companies	11.9	11.2	10.8	9.5	10.2	8.4	7.6	7.3	7.1	6.9
Total	100	100	100	100	100	100	100	100	100	100

\*Earlier Tradeka. \*\*From 2006 M Group: in 2007–2008 included in "Other".

Source: AC Nielsen.



**Trend in the share of private labels in the total value of sales (%).**

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Share in the value of sales	6.7	7.6	8.4	9.2	9.0	9.0	8.6	9.3	10.5

*Source: Finnish Grocery Trade Association/Consumer Agency.*

ple employed in retail sector totalled about 257,000 persons.

The structural change is also reflected in that the Finns are concentrating their food purchases to large retail units which manage an ever growing share of the daily goods sales. By 2008 the share of the sales of hypermarkets had risen from 15 to 25% and in 2011 it exceeded 27% as Kesko opened six and S Group two new hypermarkets. In the beginning of 2012 the number of retail outlets for daily goods – excluding specialist stores and shops in market halls – was 3,216. The number of small retail outlets, so-called village shops, in the rural and sparsely populated areas has halved since 1995.

In the wholesale business there are a total of 1,300 enterprises, but most of these are small and specialised in the import or distribution of certain product groups, such as alcoholic beverages, tobacco or the like. In 2008 the total value of the wholesale market was about € 14 billion.

Two-thirds of the wholesale operations

take place through a wide product range or general wholesale traders. This field is dominated by a few large companies, with two main operative models. The wholesalers of retail trade companies such as Inex Partners, Ruokakesko and Tuko Logistics can best be characterised as procurement agencies because they have a guaranteed clientele within their own group.

The other model is represented by general wholesalers which trade a great variety of products for hotels and restaurants, kiosks or other individual retail units. The largest ones are Heinon tukku, Metro tukku, Kespro and Meira Nova. The share of small specialised wholesale companies of the market is about a third.

The structural changes in the wholesale and retail sectors create serious pressures to the domestic food industry. It is increasingly difficult for the food industry companies to maintain their negotiating power against the concentrating traders. As they aim for higher efficiency in logistics the retail chains are purchasing more and more foodstuffs from large food processors, but the structural changes in the trade sector are a challenge to the large processing companies as well.

According to a survey of the Finnish Competition Authority published in January 2012, from the perspective of competition policy the terms of the contracts between suppliers and retail chains are often in the so-called grey area. The retailers take advantage of their strong position relative to the suppliers in various ways that are to be considered questionable as regards healthy and functioning competition,



## Key figures on the Finnish food industry in 1995–2010.

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Turnover (at current price, billion €)	7.7	7.9	8.3	8.4	8.5	8.9	8.9	9.2	9.7	10.5	10.3	10.1
Turnover (at 2010 price, billion €)	9.7	9.2	9.4	9.4	9.4	9.8	9.7	10.0	10.2	10.7	10.4	10.1
Personnel (thousands)	44.9	39.9	38.6	38.0	38.2	37.5	36.7	35.9	35.7	34.6	33.5	32.6
Real turnover per person (at 2010 price thousand €)	216	231	244	247	247	262	266	278	286	308	311	310

Source: Statistics Finland, Finnish Enterprises 1995–2010.

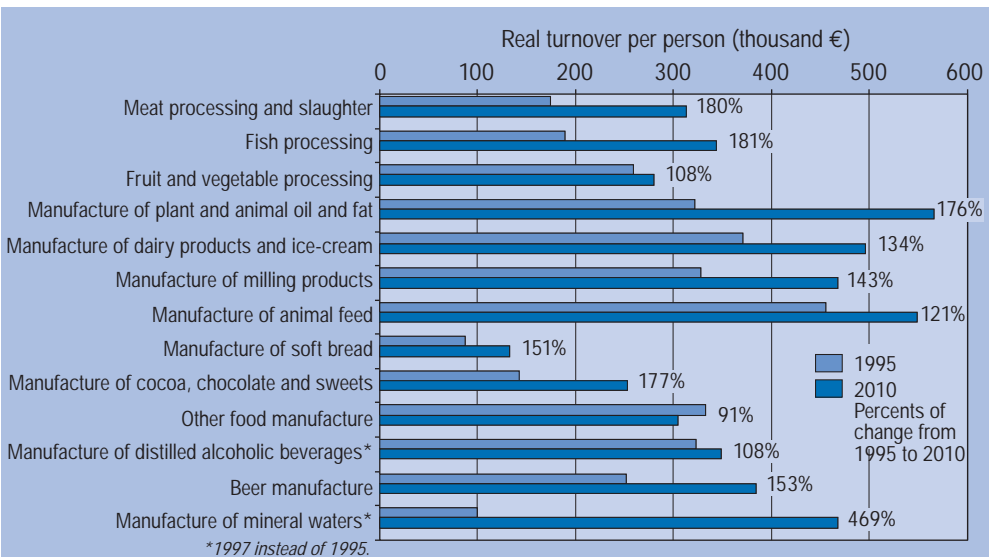
such as marketing or entry fees and transferring the risk to the suppliers.

A significant share of the suppliers who responded to the survey felt that they got nothing in exchange of the marketing or entry fees they had paid to the retailers, besides the chance to get their product on retailers' shelves. Repurchase requirements concerning goods that remain unsold are the most common way to transfer the risk from retailers to the suppliers.

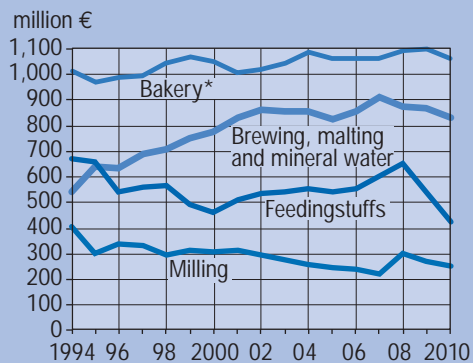
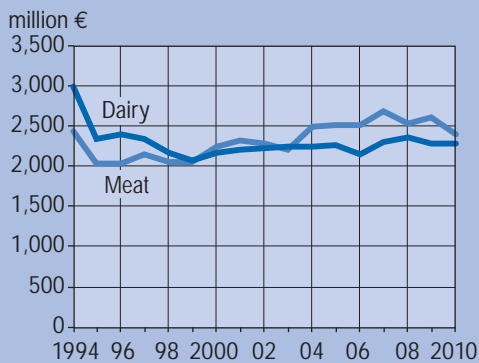
The survey also shows that the increasingly common private label products, combined with the strong position of retailers in managing the product assortments, may involve negative impacts as regards to competition. The prices of the private label

products are often set at a lower level than the prices for industrial brands. The private labels of retailers have gained a significant position, they are occupying more and more of the shelf space and through these the retailers obtain detailed information on the cost structure of products.

Competitive tendering for producing the private label products, threat posed by imports and low price level and narrow product range of hard discounters tighten the competition among the domestic suppliers and push down the profit margins of the production. The processors have responded to the challenges through higher production efficiency, outsourcing of production stages and specialisation.



Trend in the real turnover per labour in food industry by sectors. Sources: Statistics Finland, Finnish Enterprises 1995–2010, calculations by MTT.



\*Includes soft bread, crispbread and biscuit manufacture.

Turnover of Finnish meat and dairy industry and certain other sub-sectors of food industry at 2010 prices.

## Food industry

In 2010 the turnover of the food industry fell by € 184 million to 10.1 billion. The main cause was the weakening market positions on the domestic markets, while during the same time there was considerable growth in exports.

The rapid decrease in the number of people employed in food industry continues. In 2010 the number of staff fell by more than 900 to 32,600. The decrease in staff by more than 3% combined with only a light reduction in turnover kept the real turnover per person at the same € 310,000 as the year before.

There is considerable variation in the development of the turnover per person by sectors, but the figures show some growth in all sectors since 1995. The two main sectors in the Finnish food industry are dairy industry and meat processing.

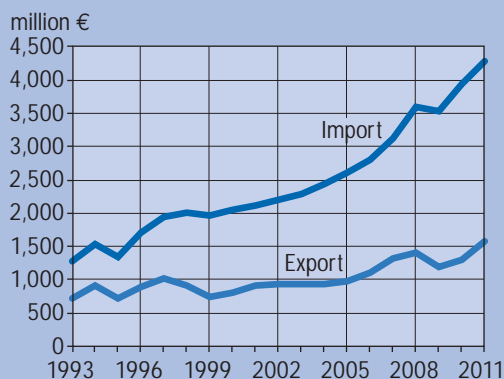
## Foreign trade

The year 2011 was another record year for the Finnish food exports. The value of food exports from Finland rose to € 1,568 million, which is as much as 20% higher than the year before. After having been stagnated in the early part of the 2000s the Finnish

food exports rose to a new level towards the end of the decade. The fluctuations in recent years show, however, that exports are still highly sensitive to market changes in the neighbouring regions. The rapid growth in exports which started in 2006 ended in 2009 as a result of the global economic crisis. In 2010 and 2011 the exports recovered largely thanks to the high demand on the Russian market.

Food imports increased again more than exports. In 2011 the value of food imports to Finland totalled € 4,282 million, which was almost 9% higher than in the previous year.

Despite the rapid growth in exports the deficit of food trade rose by about



Exports and imports of agricultural and food products (CN 01–24) in 1993–2011. Source: National Board of Customs, ULJAS database.

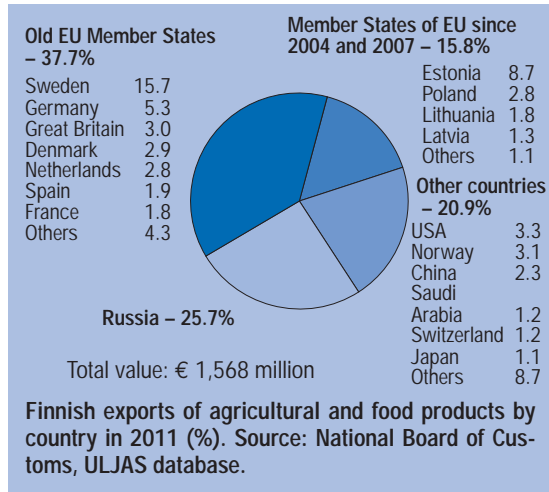
€ 89 million from € 2,625 million to € 2,714 million. Traditionally the deficit has mainly been due to the high import volumes of fruit, vegetables, raw coffee, alcoholic beverages and tobacco. Quite a lot of cheeses and cereal products are also imported. In recent years the Finnish food industry has also been faced with competition in product groups that used to be dominated by the domestic production, such as meat and fish.

The statistics on foreign trade in agricultural products and food include raw materials of plant origin which never end up on the plate. Imports of palm oil for the production of bio-fuel were eight times higher in 2010 than in 2007, but in 2011 the imports fell to less than a half from the year before. The main reason for this was the reorganisation of the raw material structure of bio-fuel production due to environmental and image reasons.

In 2011 there were no major changes in the geographical distribution of agricultural product and food imports. Most of the imports, 61%, still came from the old EU Member States. The share of food imports from the new Member States rose by one percentage point to 10%. Non-EU countries account for less than 29% of food imports.

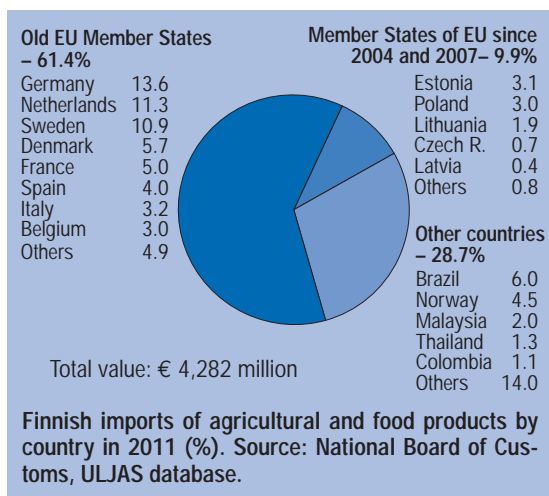
The recovery of the Russian market was the key to the growth in exports. In 2011 the value of food exports to Russia totalled € 403 million, which is 15% higher than the year before. Russia has for a long time been the main destination for Finnish food exports. Its share has varied between 20 and 25%, but in 2011 it was as high as 26%. More than half of the Finnish food exports have gone to the neighbouring countries, and in 2011 this share was about 53% (Sweden 15.7%, Estonia 8.7% and Norway 3.1%).

The most significant single prod-



uct group in food exports is dairy products. In 2011 the value of butter exports totalled € 99 million and the value of cheese exports was € 175 million. These two represented 17% of the total food exports.

The exports of cereal products, the second most important group in food exports, almost doubled in 2011 to € 206 million. The main reasons were the rise in the world market prices for cereals in the crop season 2010/11 and the record high export volumes of wheat and barley. In addition, some of the emptying of the intervention stocks of barley took place in the early part of 2011. Other important export articles are sugar industry products, pig-meat and alcoholic beverages.



### 3. 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.

These are supplemented by national aids, which comprise the northern aid, national aid for southern Finland, national top-ups to the LFA payments and certain other aids.

#### 3.1. Common agricultural policy of the EU

The common agricultural policy has been implemented since the 1960s through common organisations of the markets for specific products. The basic idea is that the fall of the prices within the EU below a certain level is prevented by means of public intervention, while the prices of imported foodstuffs are raised to the EU level through import duties. Oversupplies are exported to third countries by means of the EU export refunds.

The share of expenditure which arises from the common agricultural policy in the EU budget is very high indeed, about 41% of the total budget in 2012. It should be born in mind, however, that in the other sectors the integration does not go as wide and deep and there is no common policy in the same way as is being implemented in the agriculture sector through the CAP.

At present the common agricultural policy is comprised of the so-called first and second pillar. Most of the funding (73%) is allocated to the first pillar, mainly market support and single farm payments. The rest of the funding (27%) is used for rural devel-

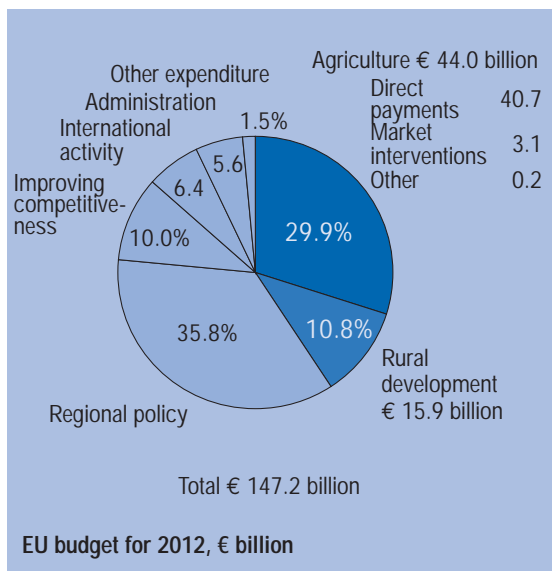
opment measures under the second pillar (Rural Development Programmes).

In the early 1990s most of the CAP funds were still used for export refunds of agricultural products and other market interventions. Since then, however, the common agricultural policy has been reformed several times and piloted into a more market-oriented direction.

#### CAP reforms since 1992

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

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 productiv-



ity of the land, food safety, animal welfare and occupational safety were incorporated into the scheme.

In November 2008 the EU agriculture ministers decided on the latest reform of the common agricultural policy, also called the health check. The decision continues the earlier reforms and strategic outlines, aimed to increase the market orientation of EU agriculture. Decoupled payments will be applied even more widely and some of the remaining production restrictions are abolished to allow the farmers to respond

better to the market demand.

The latest CAP reforms also include the so-called modulation, in which a gradually increasing share of the CAP support is redirected to rural development measures through the EU budget. In 2009 7% of the support payments to farmers who receive more than € 5,000 in direct payments a year was cut, in 2010 the percentage rose to 8%, 2011 to 9% and 2012 to 10%. The cut does not apply to each farm's first € 5,000 of direct payments.

The modulation funds are used for re-

#### Distribution of agricultural support in different Member States in 2010.

Member State	Support received € million	Payments € million	Support received (%)	Payments (%)	Net- support € million	Net support € per inhabitant
Total	54,411	54,411	100	100		
The Netherlands		2,187	1.70	4.02	-1,264	-76
Belgium	672	1,687	1.23	3.10	-1,015	-94
Spain	6,105	5,223	11.22	9.60	881	19
Ireland	1,674	686	3.08	1.26	989	221
Great Britain	4,253	5,664	7.82	10.41	-1,412	-23
Italy	5,324	7,547	9.78	13.87	-2,223	-37
Austria	1,303	1,262	2.39	2.32	40	5
Greece	2,664	1,230	4.90	2.26	1,434	127
Luxembourg	51	147	0.09	0.27	-96	-191
Portugal	1,148	789	2.11	1.45	359	34
France	9,330	9,794	17.15	18.00	-464	-7
Sweden	1,023	1,186	1.88	2.18	-163	-17
Germany	6,928	10,659	12.73	19.59	-3,731	-46
Finland	862	898	1.58	1.65	-35	-7
Denmark	1,094	1,192	2.01	2.19	-97	-18
EU-15	43,354	50,151	79.68	92.17	-6,797	-18
Bulgaria	735	174	1.35	0.32	561	74
Cyprus	62	87	0.11	0.16	-25	-31
Malta	15	27	0.03	0.05	-13	-31
Latvia	253	87	0.46	0.16	166	74
Lithuania	516	136	0.95	0.25	380	114
Poland	4,059	1,453	7.46	2.67	2,606	68
Rumania	1,966	637	3.61	1.17	1,330	62
Slovakia	536	343	0.99	0.63	194	36
Slovenia	231	185	0.43	0.34	46	23
Czech Republic	1,055	647	1.94	1.19	407	39
Hungary	1,456	419	2.68	0.77	1,037	104
Estonia	173	65	0.32	0.12	108	80
EU-12	11,057	4,260	20.32	7.83	6,797	66

Source: European Parliament 2010, European Commission 2007, Eurostat



sponding to climate change mitigation and adaptation, promoting renewable energies, improving water supply and protecting biodiversity.

### **Distribution of EU support for agriculture**

CAP payments are based on the historical support levels in the Member States and, thus, on historical production volumes. In the single payment scheme, dominated by the old Member States, the arable areas of different countries have a different value, depending on how much support they received in the reference years.

The differences between the Member States are considerable: in Greece, for example, the CAP support per hectare is more than € 550, while in Latvia it is less than € 90.

In absolute terms the greatest net recipients are Poland, Greece and Rumania, which all receive over a billion euros more than what they pay. These are followed by Hungary, Ireland and Spain. Obviously all these countries are strong advocates of the large agriculture budget.

The greatest payer of agricultural support is Germany, with net payments rising to more than € 3.7 billion. Other major net payers are Italy, Great Britain, the Netherlands and Belgium. In 2010 the estimated net payments of Finland totalled about € 35 million.

The payments per inhabitants are the highest in Luxembourg, Belgium and the Netherlands, while Ireland and Greece are again the greatest net recipients. The payment of Luxembourg to the EU rises to more than € 190 per inhabitant, while Ireland receives more than € 220 in net support. The net payment of Finland per inhabitant is € 7.

The picture is somewhat different if we measure how much different countries receive for each euro they pay to the CAP budget independent of the absolute size

of the payment and support received by Member States. Luxembourg gets only 35 cents for each euro it pays to the budget, while Bulgaria gets more than four times more in support than what it pays to the EU budget.

Other major net payers include the Netherlands and Belgium, which get back less than half of the payments they make to the budget. Germany gets back about 65% of its payments and Finland more than 90%.

### **3.2. EU support payments in Finland**

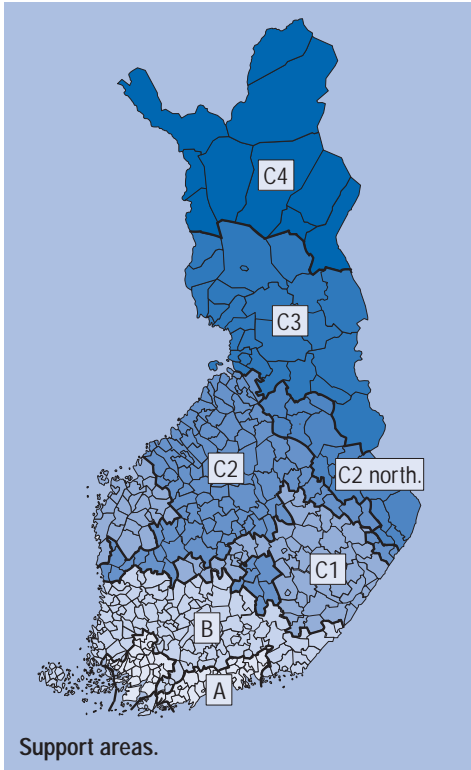
In 2012 the support under the common agricultural policy to the Finnish agriculture will total about € 1,325 million. This consists of the CAP support for arable crops and livestock (€ 539 million), less favoured area (LFA) payments (€ 422 million) and environmental support (€ 363 million). These are 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 they are funded in full from the EU budget. The EU contributes a little more than a quarter of the LFA payments and environmental support. The rest is paid from national funds.

In 2012 the national aid for Finnish agriculture and horticulture will total about € 544 million. The national aid scheme comprises the northern aid (€ 326 million), national aid for southern Finland (€ 75 million), national top-ups to LFA payments (€ 119 million), and certain other national aids (€ 24 million).

Finland has been divided into seven support areas for the allocation of the payments. CAP support, environmental support, LFA payments and the national top-ups to these are paid in the whole country.

Northern aid is paid only in support area C. This has been divided into five ar-



areas for the differentiation of the aid. National aid for southern Finland (so-called aid for serious difficulties) is paid in areas A and B.

### CAP support

Most of the so-called CAP support financed in full by the EU is paid through the single payment scheme adopted in 2003. In Finland the single payment scheme is implemented as the so-called hybrid model. Former CAP payments were converted into payment entitlements, which consist of a regional flat-rate payment and farm-specific top-ups.

CAP support has two main components: decoupled single payments and payments which continue to be coupled to the

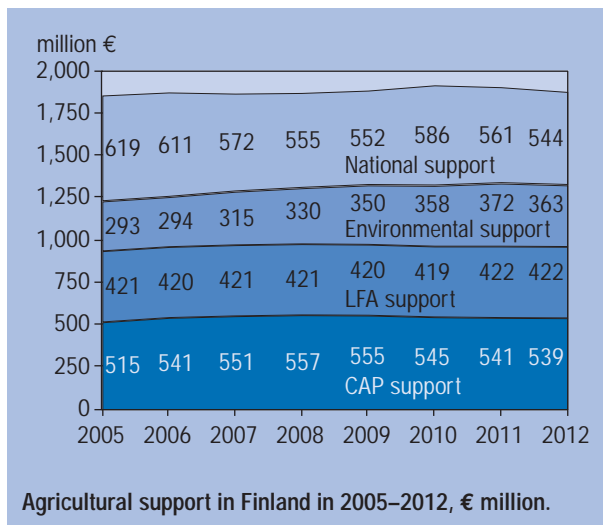
production. In Finland about 90% of the CAP support was decoupled from the production in 2006. The CAP support for arable crops was decoupled almost completely. Under the single payment scheme, however, coupled support is still paid up to € 5.8 million a year for certain arable crops. Coupled support also continues to be paid for suckler cows, male bovines and ewes and starch potato.

According to the cross-compliance conditions included in the CAP support, the arable lands must be kept in good farming condition and minimum requirements for animal welfare and state of the environment must be met. Based on a national decision, any area set aside in Finland as managed, uncultivated arable area must be covered with grass in order to be eligible.

### 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 keep the rural areas populated. In Finland LFA support is paid for the whole cultivated area of about 2.16 million ha.

The amount of LFA support in Fin-



land budgeted for 2012 is € 422 million. The payment is 150 €/ha in area A, 200 €/ha in areas B and C1 and 210 €/ha in areas C2–C4.

A major overhaul of the LFA areas has been started in the EU. The objective of the reform, which should be completed for 2014, is to create a uniform LFA scheme for all Member States that takes the special conditions of different countries better into account.

### Environmental support

Agri-environmental support introduced in 1995 compensates for income losses resulting from the reduction in the production and increased costs as farmers commit to undertake measures aimed to reduce environmental loading caused by agriculture.

The support scheme is comprised of the basic and additional measures and contracts concerning special measures. The main goal is to reduce the load on waters. Besides this, the aim is to restrict emissions into the air, mitigate the risks due to the use of pesticides and protect and manage rural landscapes and biodiversity.

The environmental support scheme is presented in more detail in Chapter 5.3 (pp. 72–73).

### 3.3. National aid

The national aids paid in Finland comprise the northern aid, national aid for southern Finland, national top-ups to LFA payments and certain other payments. The aim is to ensure the preconditions for Finnish agriculture in different parts of the country and production sectors. The principles to be applied in determining the level and regional distribution of national aid were agreed in the membership negotiations. The aid may not increase the production, nor may the amount of aid exceed the total payments before the accession.

#### Northern aid

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

Northern aid consists of milk production aid and aids based on the number of animals and cultivated area. The northern scheme also includes the aid for greenhouse production, storage aid for horticultural products and wild berries and mush-

**Agricultural support based on the CAP in Finland (financed in full and part-financed by the EU), € million.**

	2007	2008	2009	2010	2011 <sup>prelim.</sup>	2012 <sup>estimate</sup>
<b>Total</b>	1,287	1,308	1,323	1,322	1,335	1,324
CAP income support	551	557	552	545	541	539
Natural handicap payments	421	421	420	419	422	422
EU contribution	118	118	118	117	118	118
National financing	303	303	302	302	304	304
Environmental support*	315	330	351	358	372	363
EU contribution	88	92	98	101	107	107
National financing	227	238	253	257	265	256
EU financing, total	757	767	768	763	766	764
National financing, total	530	541	555	559	569	560

\*Environmental support also includes payments relating to animal welfare and non-production investments.

rooms and headage-related payments for reindeer.

Northern aid paid in 2012 will total about € 326 million. The most significant types of aid are the northern aid for milk production (€ 161 million) and northern aid based on livestock units (€ 100 million).

The effectiveness of the northern aid is evaluated every five years. In 2007 the European Commission commissioned an evaluation of how well the objectives set for northern aid have been reached and whether the means applied are still feasible and justified. Based on the results the Commission and Finland discussed the future and development needs of the northern aid in 2008.

As a result of the agreement reached in December 2008, the aids for pig and poultry meat production were decoupled from the production in 2009, but coupled payments continue to be applied in cattle husbandry.

### National aid for southern Finland

The national aid for southern Finland, i.e. support areas A and B, is based on Article 141 of the Accession Treaty. This article has allowed the payment of aid due to serious difficulties resulting from the accession to the EU, but it does not define the concept of serious difficulties in any more detail or limit the duration of the measure.

The Finns have interpreted the article so that it gives the authorisation to the

payment of the aid in the long term, while the Commission has seen it as a temporary solution.

Finland must negotiate with the Commission on the continuation of the aid based on Article 141 every few years. According to the outcome of the negotiations reached in November 2007, Finland may grant both national direct aids and raised investment aid for livestock production and horticulture in southern Finland until the end of 2013.

In the last two years of the period the total amount of aid under Article 141 will be reduced quite radically, with the greatest cuts in the aid for pig and poultry farms. In 2012 the aid under Article 141 to southern Finland will total € 75.2 million, which is 13.6% less than the € 87.0 million paid in 2009. In 2013 the total amount of this aid will be € 62.9 million.

The structure of the aid under Article 141 has also changed. From 2009 onwards decoupled farm payments have been applied in pig and poultry sectors, mainly according to production quantities of 2007. Instead, the aid for ruminants will continue to be coupled to the production all through the current aid period.

The aid under Article 141 also contains investment aids and start-up aid for young farmers. Finland may continue to apply higher investment aids in sectors which are eligible for direct income payments under Article 141 (in particular, investments in dairy and cattle sectors and pig and poultry production).

National aid for agriculture in Finland, € million (aid per production year).

	2007	2008	2009	2010	2011	2012 estimate
Total	571.6	554.7	552.0	586.1	560.8	544.0
Northern aid	328.8	327.4	327.5	335.8	335.2	325.6
National aid for Southern Finland	94.0	93.5	89.6	86.2	83.9	75.2
National supplement to the LFA support	119.6	119.3	119.3	119.0	119.0	119.0
Other national aid	29.2	14.5	15.6	45.6	22.7	24.2

## National top-ups to LFA payments

National top-ups to LFA payments have been paid in the whole country since 2005 based on a tentative agreement reached in the negotiations between Finland and the Commission in 2003. The basic top-up paid for the arable area may not exceed 20 €/ha in areas A, B and C1 and 25 €/ha in areas C2–C4. A raise for livestock not exceeding 80 €/ha is paid for the arable area of livestock farms. In 2009 the payments totalled about 95% of the maximum according to the hectares. The total of the co-financed LFA payments and the national top-ups may not exceed the average of 250 €/ha.

## 3.4. Structural support for agriculture and farm relief services

### Investment aid and early retirement

The agricultural investment aid and early retirement arrangements aim to promote the growth in farm size and reduce production costs. In practice these forms of structural aid comprise subsidised interest-rates, subsidies and state guarantees. In 2012 interest-rate subsidy loans mainly for financing production buildings on farms and acquisition of real estate and movables relating to the setting-up aid for young farmers may be granted up to € 300 million. The interest-rate subsidy accounts for about € 38 million of this.

In 2012 the investments in dairy and beef cattle buildings, setting-up aid for young farmers, building investments in greenhouses and building investments relating to renewable energy production are partly funded by EU subsidies. Subsidies for other types of investments are financed nationally. The early retirement scheme offers the ageing farmers the opportunity to give up the farm or its production. In 2012 the national subsidies included in structural support are estimated to total € 100 million.

Setting-up aid for young farmers supports the transfer of farms to the next generation. In 2011 aid was granted for 535 farm transfers, which is about the same as in 2010. In 2009 aid was granted to 495 transfers, while in 2007 and 2008 setting-up aid was still granted to more than 600 farm transfers.

### Farm relief services

Farmers practising livestock production on a full-time basis are entitled to 26 days off per year. The purpose of the services is to ensure that farming activities continue uninterrupted during the holidays, as well as the availability of substitute help in case of illnesses or accidents. The Ministry of Social Affairs and Health is responsible for the coordination of the service. In 2012 the funds used for the relief services to farmers and fur producers will total about € 226 million.

#### Number of objects of structural support and funds committed to these in 2007–2011.

	2007	2008	2009	2010	2011
Number of decisions on subsidies	8,900	3,473	3,289	2,771	2,537
– building in dairy husbandry	565	224	415	292	295
– building in beef cattle production	316	131	151	106	94
– horticulture investments	330	121	92	67	63
Number of setting-up aids	661	644	495	542	535
Funds committed, € million	187.1	108.5	98.1	95.7	77.3

Source: Ministry of Agriculture and Forestry

## 4. ECONOMIC SITUATION OF AGRICULTURE

### 4.1. Development of results and profitability of agriculture and horticulture

The MTT Economic Research calculates annually the result and profitability development of Finnish agriculture and horticulture. The results are based on the data of the about 1,000 bookkeeping farms, which are weighted so that they indicate the average results of the 42,000 largest agricultural and horticultural enterprises. These account for more than 90% of the output of Finnish agriculture. The individual revenue and expense items and support payments are allocated as returns and costs to the year of production in accordance with the accrual principle. Annual variations in the yields and returns and changes in prices and support payments are thus directly reflected in the annual profitability figures.

#### Uncertainty in the market

In recent years agriculture and horticulture have faced market uncertainty more strongly than before. The rapid rise in raw material prices which started in autumn 2007 led to an increase in the producer prices of agriculture, especially those of cereals and milk. The fall in the prices as a consequence of the economic depression in 2008 and 2009 was equally dramatic. Cereal prices, along with the other raw material prices, started to rise again in the summer of 2010. Milk prices have returned to the earlier level, while meat prices have been more stable.

Despite the fluctuations in the input prices the dominating trend has been upwards, which has increased the costs and weakened profitability. In recent years the share of direct payments in the return has been about 40% on average, which means that the market prices still have a great impact on the income of farmers and

profitability of enterprises. In recent years there has been considerable variation in the yields as well. After two quite good years a record cereal yield was harvested in 2009, but this was then followed by the smallest cereal yield of the decade in 2010.

#### Growing return on crop production

The trend in the incomes and profitability of agriculture was very weak in 2008 and 2009 due to the poor market situation and unfavourable price relations. The financial situation tightened especially on crop and pig farms.

In 2010 the rise in the prices of crop products combined with the quite moderate increase in the costs improved the results of cereal and crop farms. Instead, on pig and poultry farms the results continued to deteriorate and the outlook for the results of 2011 does not seem any better.

The average gross return of agricultural and horticultural enterprises was € 124,000, which is about 11% higher than the year before. The rise in producer prices and especially cereal prices increased the sales proceeds by 9%. The sales proceeds of crop production rose by 17% and those of livestock production by a little more than 3%. The share of support payments rose by 6.5% to € 48,500. In 2010 they represented 39% of the gross return. The support payments also include investment subsidies allocated to the years of service.

#### Costs began to rise

In 2010 the production costs increased by a little more than 6% to the average of € 149,400. On the annual level the input prices rose by about 3%. The rise in the prices accelerated towards the end of the year. The costs of livestock production and building costs increased the most, but the prices of supplies, energy products, feed-



ingstuffs and fertilisers rose as well.

The costs had been deducted, the entrepreneurial income left as compensation for the labour and own capital of the farm family rose from the bottom figures in 2009 by 55% to € 22,000. Entrepreneurial income is the compensation for the use of own resources in agriculture and horticulture, the 2,150 hours' labour input and own capital of € 279,300 invested in agriculture and horticulture.

When these costs are also deducted from entrepreneurial income we obtain the entrepreneurial profit, where all costs of the production are taken into account. This was again negative, € -25,400, but the losses were € 3,200 smaller than in 2009. The costs overran the returns by an average of 20%. The wage claim of own labour has been calculated using the recorded working hours and average hourly wages of agricultural employees (€ 14).

In the results for 2010 the interest rate in calculating the cost of own capital was based on the sum of the risk-free interest rate and farm-specific risk premium. The risk-free interest rate is the return on the five-year Finnish government bonds. The farm-specific risk premium is determined by a certain calculation method on the basis of the variation coefficient of the operating result percentage, equity ratio and relative indebtedness. The average interest rate for 2010 was 6.3%. The interest claim for own capital had been earlier calculated using the fixed interest rate of 5%.

### **Profitability rose from the bottom**

In 2010 the profitability of agriculture and horticulture was clearly higher than the year before, when it was the weakest during the whole 2000s. In 2009 the profitability was very weak for the second year in a row due to the rapid rise in the production costs.

The profitability coefficient is obtained by dividing entrepreneurial income by the sum of the wage and interest claims. In

2010 the profitability coefficient rose from 0.33 to 0.46. This means that the entrepreneurs received 46% of the wages and interest set as the target so that the hourly wages were € 6.5 and the interest on equity was 3.0%.

On dairy farms the profitability coefficient rose from 0.51 to 0.58 and the entrepreneurial income increased by 25%. The gross return grew by 10% thanks to the increase in the farm size, while the rise in the costs stayed at 6%. This led to higher entrepreneurial income as well as profitability. On other cattle farms the profitability coefficient rose to 0.45, which is slightly below the average of the 2000s.

The results of pig farms were bottom low in 2008, but in 2009 they rose close to the average of the 2000s. In 2010 the increase in the returns and costs was about the same, which means that the entrepreneurial income stayed about the same as the year before. The real entrepreneurial income of pig farms in 2010 was on about the same level as in the beginning of the decade.

The market prices of cereals rose by almost 19% in 2010, which enabled the cereal and other crop farms to dig themselves out of the profitability hole they had fallen into the year before. The profitability coefficient of cereal farms rose from 0.02 in 2009 to 0.40 in 2010 and that of other crop farms from 0.31 to 0.50. The entrepreneurial income left per cereal farm was € 11,000 and that of other crop farms was € 12,700.

### **Differences in profitability**

There are no major differences in profitability between farms engaged in the same type of farming in different support areas. The differences in profitability between support areas are largely due to the production structure of the regions. In 2010 the profitability coefficient was 0.36 in area A and 0.38 in area B. In support area C1-C2 the coefficient was 0.53. The best

profitability, 0.67, was reached in support area C2north, while in the northernmost areas the coefficient was 0.40.

The profitability coefficient of the most successful farms (the group 'strong') was 0.83 and the entrepreneurial income reached the average of € 42,500. In the poorest quarter of the farms (the group 'weak') the entrepreneurial income was negative, € -480 per farm, and the profitability coefficient was -0.01. On the 'strong' farms the cultivated areas and livestock numbers were clearly larger than on the 'weak' farms.

There were also considerable differences in profitability between farms representing the same type of farming and economic size. On average-sized dairy farms the profitability coefficient of the 'strong' farms was 0.97, but in the group 'weak' it was as low as 0.38. On the largest dairy farms in the 'strong' group the profitability objective was reached and the profitability coefficient was 1.12. In the weakest quarter of the same economic size, however, the coefficient was as low as 0.33.

### Hourly earnings and return on assets

When the interest claim for own capital is deducted from the entrepreneurial income, the average of € 4,800 euros were left as annual earnings in 2010. When this is divided by the 2,150 hours of labour of the farm family, the hourly earnings comparable to the hourly wages of employees are € 2.3. According to the forecast for 2011, the earnings should fall to the average of € 1,600, with the hourly earnings as low as € 0.7.

When the cost of own labour is deducted from the entrepreneurial income we obtain the net result left as return on equity, which in 2010 was -8,150. When the net result is divided by the amount of own capital, the return on equity is -3.0%. The income tax on agriculture and horticulture has not been deducted as an expense from the net result.

In 2010 the return on assets of agriculture and horticulture was € -5,400. This is obtained by adding the interest paid to the net result. The average assets during the accounting period were € 371,000, and thus the return on assets was -1.4%. Among the production sectors the return percentage varied from 2.2% on poultry farms to -11.3% on farms with sheep husbandry and grazing livestock.

### Solvency

In 2010 the total assets of the enterprises were, on average, € 381,000 of which € 279,300 (73%) was own capital. The growth in the farm size and increased capital intensity has increased the amount of capital. The amount of debt has grown even faster than the total capital, which has led to some decrease in solvency. The amount of debt has more than doubled since 2000 so that in 2010 it exceeded € 100,000.

The equity ratio of agricultural and horticultural enterprises, i.e. the share of equity of the total assets, is quite good, 73%. The equity ratio is the highest on cereal farms, 84%, and the lowest in glasshouse enterprises, 40%. On pig farms the equity ratio is 69% and on poultry farms it is 46%. On these farms the amounts of both capital and debts are above the average.

The amount of debts has grown more rapidly than returns, which is why the relative indebtedness has grown from the about 60% in 2000 to 82% in 2010. This ratio is indicative of the increased financial risk in enterprises, which has partly been reduced by the low interest rates.

There are considerable differences in indebtedness between the production sectors. The indebtedness is the highest on farms with sheep and grazing livestock (124%) and poultry farms (107%). On a little under 10% of the farms the amount of debts is more than double their income.

In the balance sheet the asset items have been valued at their current values and

the investment subsidies or the provisions done have not been deducted from the values. The value of fixed assets is included in full in the depreciation base and in the result calculation the subsidies are allocated to returns alongside depreciations of the corresponding asset items. Thus the key figures calculated from the balance sheets give the true picture of both the amount of capital and solvency and profitability.

### **Liquidity**

Even if the profitability figures of enterprises have been weak in recent years, their cash-based liquidity has not collapsed. In 2010 the cash returns from sales and support payments grew by more than 5% to € 117,800. The short-term expenses of the production increased by 9% from the year before to € 77,300. The cash from operating activities left as the difference between the two was € 40,500, which was 1% less than the year before.

Financial expenses of enterprises decreased slightly while the taxes paid grew, which is why the cash after financial activities fell by 3% to € 32,000. Financial surplus can be used for investments, reimbursement of loans and private household expenditure.

The net amount used for investments was € 21,800 per farm, which is 17% more than in 2009. Due to the increase in investments the amount of new loans taken out rose by 15% and repayments of loans were 35% higher than the year before. The net change in the loans decreased by a half from 2009.

Cash surplus fell by 21% to the average of € 13,500 per farm. This is the amount left from the business activities in agriculture and horticulture to be used for the private consumption of the farm family.

### **Result and profitability forecasts**

The result and profitability figures for 2011 presented here are based on the

farm-specific forecasts calculated from the bookkeeping data. They take account of the changes in product and input prices and support payments as well as in average yields of different crops by region. In the forecast the support payments are the realised payments of 2011. The farm size and production and input structure are assumed to stay the same as the year before, which means that the impact of productivity development is not taken into account in the forecast.

Farm-specific forecasts have been weighted by region, production sector and farm-size class to indicate the average results of the about 42,700 largest farms and horticulture enterprises. The structure of enterprises in the structural statistics of the Information Centre of the Ministry of Agriculture and Forestry is used for the weighting and thus that structural change has been taken into account in the forecast.

The weighting data of the year concerned are based on the results of a specific structural forecast model. The forecast is calculated using the regression analysis based on the time span 1998–2010. According to the forecast, the number of farms continues to fall. Most of the farms that quit production are small, which is why larger bookkeeping farms receive higher weighting coefficients in the calculation. This is how structural change and, through this, profitability development is accounted for in the result forecasts.

### **Preliminary results for 2011**

According to the preliminary results for 2011, the average gross return of enterprises grew by 6.5% to € 131,900. Sales proceeds rose by 8% from the year before to € 81,600 and support payments by about 4% to € 50,300. Production costs increased by 7% from the year before. The growth in the fertiliser and cultivation costs increased the supplies cost by 23%.

The results of enterprises weakened from the year before. The average entre-

preneurial income fell by 14% to € 19,000 and profitability coefficient to 0.40. When the costs of own labour and capital of € 47,300 are deducted from the entrepreneurial income, the resulting entrepreneurial profit is -28,300. The losses increased by almost € 3,000 from the year before.

There was some improvement in the profitability of horticulture in the open and beef production. The profitability of dairy farms stayed about the same thanks to the rise in the producer price for milk. On cereal farms the rise in the supplies cost weakened the profitability from the year before in spite of the higher cereal prices and hectareage yields.

On pig farms the result was the weakest during the 2000s. The quite dramatic rise in the input prices increased, in particular, the feed, energy and fertiliser costs. The producer prices for pigmeat started to rise towards the end of the year, but not enough to ease the financial distress of pig farms.

On poultry and other livestock farms the cost pressures also pushed down the profitability from the year before. The profitability coefficient calculated in the forecast was 0.57 on dairy farms, 0.51 on other cattle farms, 0.22 on pig farms, 0.44 on poultry farms, 0.33 in horticulture in the open, -0.15 in greenhouse enterprises, 0.32 on cereal farms, and 0.43 on other crop farms.

### **A new typology for farms**

In the profitability bookkeeping results the production types and size classes of farms are specified by means of the Community typology for agricultural holdings. There has been a significant change in this. The earlier typology was based on standard gross margins (SGM) calculated for the agricultural products by regions by deducting certain costs from the sum of the market returns and support payments of each product. Now that an increasing share of the support payments have been

decoupled from the production and it is difficult to allocate the costs to specific products, the new typology has been based on the regional standard output (SO) of the products.

When determining the type of farming and economic size the areas under crops and average numbers of different species of livestock are multiplied by the standard output of the region concerned. The sum of the results gives the economic size of the farm in euros. The type of farming is determined by the products of which the economic size is composed.

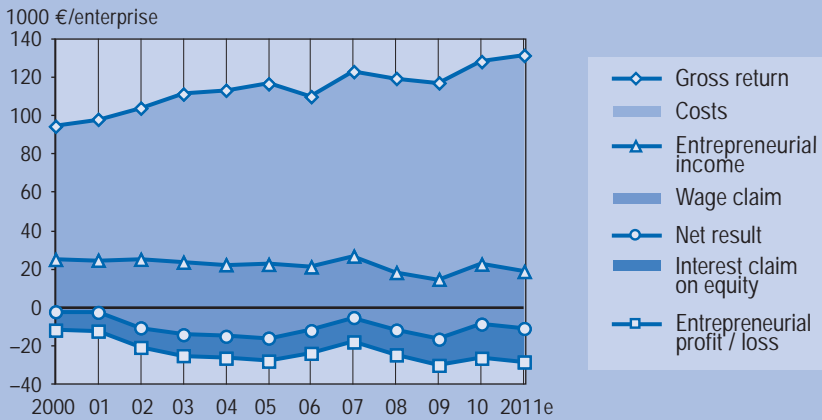
In the new typology a major share of the farms which used to be considered as mixed-production farms are classified into specific types of farming. A number of farms which earlier remained below the minimum economic size to be included in the bookkeeping sample are now included in the sample. The results presented in this chapter have been calculated using the revised typology for the whole period concerned.

### **Results of the total calculation from EconomyDoctor internet service**

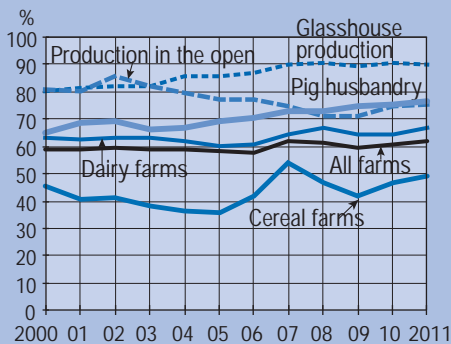
The results and forecasts of Finnish agriculture, horticulture and reindeer husbandry are available in the various online services at the EconomyDoctor website. The results in EconomyDoctor have been calculated from the figures of the bookkeeping farms weighted by the type of farming, economic size and region.

The standard results of agriculture of all EU Member States are available in the FADN Standard Results service and the indicators for profitability and solvency calculated at the MTT Agrifood Research Finland in the FADN Advanced Results service. The FADN data contain the results of more than 80,000 farms, which have been weighted to indicate the economic situation of a total of about 5 million farms within the EU.

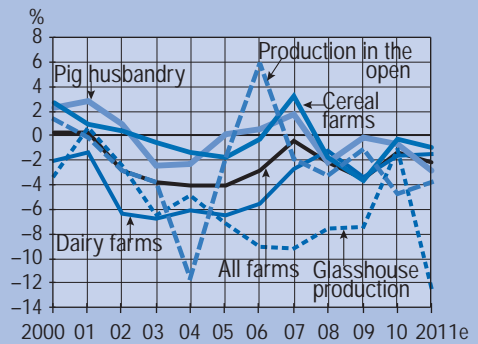
### Entrepreneurial profit



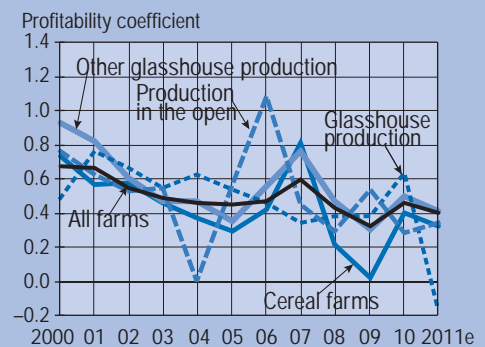
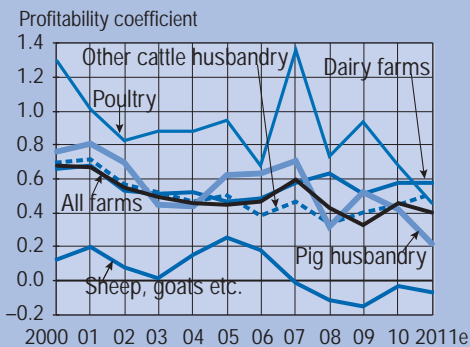
### Sales proceeds



### Return on total assets



### Profitability coefficient by production types



Result and profitability development of agriculture and horticulture enterprises in 2000–2011e.

## 4.2. Economic development of Finnish agriculture and horticulture

The trends in the return and cost items as well as assets of Finnish agriculture and horticulture on the total level are being followed by the total calculation system introduced at the MTT Agrifood Research Finland in 2011. In this system the results for Finnish agriculture and horticulture as a whole are calculated from the farm-specific profitability bookkeeping data by weighting and summing up.

Besides the realised results, preliminary results for 2011 are calculated on the basis of the preliminary farm-specific results calculated by the forecasting system of the profitability bookkeeping (see Chapter 4.1). The results are available in the total calculation of agriculture online service of the MTT's EconomyDoctor website ([www.mtt.fi/economydoctor/total\\_calculation](http://www.mtt.fi/economydoctor/total_calculation)).

### Trends in the result

According to the forecast, in 2011 the gross return of agriculture and horticulture

was about € 5.5 billion and the production costs totalled about € 7.0 billion. Thus the entrepreneurial profit obtained as the difference between the gross return and production costs, which indicates absolute profitability, was negative, –€ 1.5 billion.

When the costs due to farm family's labour input and own capital are excluded from the production costs we arrive at the entrepreneurial income left for these inputs. The forecast for the entrepreneurial income of 2011 is € 627 million, which is 21% less than the year before and 30% lower than in the record year 2007.

In recent years the entrepreneurial income has varied very strongly due to the considerable fluctuations in the product and input prices. As a whole the trend has been decreasing all through the 2000s.

### Specification of returns

The gross return of agriculture and horticulture forecast for 2011 is € 5.5 billion, of which € 2.06 billion, i.e. 37%, comes from support payments. Support payments also include the items of investment subsidies from earlier years targeted to the year 2011. Investment subsidies are allocated as

Economic development of agriculture and horticulture (€ million) and profitability coefficient as well as return on total assets.

Year	Total return	Production cost	Entrepreneurial profit	Entrepreneurial income	Entrepreneurial profit at 2011 prices	Profitability coefficient	Return on total assets %
2011e	5,478	6,991	-1,512	627	627	0.29	-4.1
2010	5,228	6,602	-1,370	797	834	0.37	-3.1
2009	4,870	6,429	-1,558	478	530	0.24	-5.1
2008	5,034	6,468	-1,429	584	664	0.29	-4.2
2007	4,975	6,110	-1,130	894	1,038	0.44	-2.8
2006	4,600	5,908	-1,304	725	865	0.36	-4.7
2005	4,593	5,948	-1,353	797	952	0.37	-5.5
2004	4,459	5,819	-1,358	752	912	0.36	-5.8
2003	4,511	5,812	-1,299	843	1,011	0.39	-5.6
2002	3,970	4,941	-969	856	1,033	0.47	-4.5
2001	4,373	5,154	-779	966	1,188	0.55	-1.6
2000	4,345	5,102	-755	1,017	1,289	0.57	-1.5



returns alongside with the corresponding asset item depreciations. The share of support in the returns has been around 40% all through the 2000s.

The sales proceeds and other returns totalled € 3.8 billion in 2011. Return on livestock accounted for 34% and return on crop production for 12% of the gross return. Return on crop production does not include intermediate products produced and used on the farm, such as fodder.

Return on horticulture represents 10% of the gross return. This includes sales proceeds from purchased products as well. The return on crop production, livestock and horticulture also include the prices of products delivered outside the agricultural sector or used by the entrepreneur.

In the calculation of the result, the individual revenue and expense items and support payments are allocated as returns and costs to the year of production in accordance with the accrual principle. This means that annual variation of the yields and returns and changes in prices and sup-

port payments are directly reflected in the annual results. Transfer of sales or support payments to the next accounting year has no impact on the results.

### Specification of costs

According to the forecast for 2011, the production costs of agriculture and horticulture totalled about € 7.0 billion. The largest cost item, supplies cost of € 2.1 billion, accounted for 30% of the production costs. The depreciation cost of € 1.0 billion, represents about 14% of the production costs.

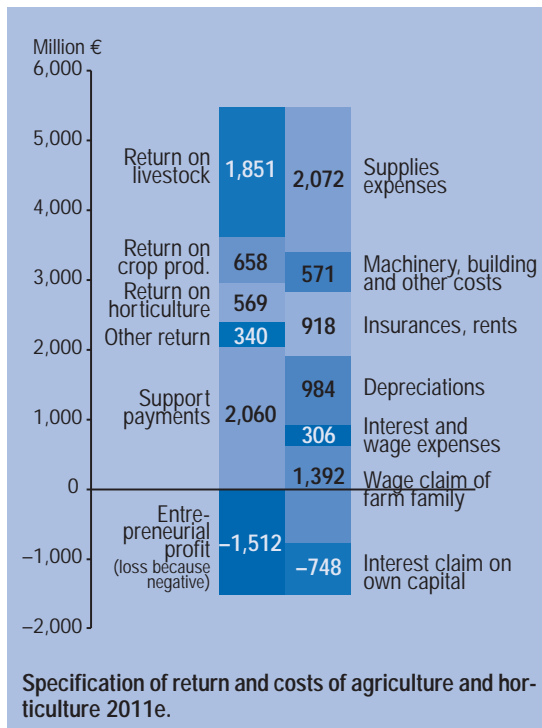
The wage claim cost due to farm family's own work input calculated by the hourly wage claim of € 14.1 was about € 1.4 billion, which is about 20% of the production costs. This would be the cost to the farmer if the work had been done by hired labour. The wage claim cost is the only cost item that has fallen over the past 8 years as the number of labour hours has decreased.

In the revised profitability bookkeeping introduced in the accounting year 2010 the wage claim cost of own capital is calculated using a farm-specific, risk-based interest rate (see Chapter 4.1). The average interest rate of all farms was about 6% and the interest claim cost based on this in the forecast for 2011 amounted to € 748 million.

For a more detailed specification of cost and return items see p. 92.

### Profitability

The entrepreneurial income of about € 627 million in 2011 should cover the costs due to farm family's labour and own capital. The 99 million labour hours at an hourly wage of € 14.1 result in a wage claim cost of € 1.39 billion, while the own capital of about € 12.5 billion gives an interest claim cost of € 748 million.



The profitability coefficient of 0.29 is obtained by dividing the entrepreneurial income by the sum of the wage and interest claim cost. This means that the entrepreneurial income covers 29% of the wage and interest claim cost. The compensation left for an hour of work by the farm family is € 4.1 and the interest on own capital is 1.8%.

If the total wage claim of € 1.39 billion is deducted from the entrepreneurial income of € 627 million, the compensation left for own capital is negative and the return on own capital turns negative as well, to the level of -5%.

In recent years the average profitability coefficient of Finnish agriculture and horticulture as a whole has been around 0.35, with strong variations in the last few years. The profitability coefficient of Finnish agriculture as a whole has been about 0.1 units lower than the average profitability of the 42,000 largest Finnish farms obtained from the bookkeeping results.

turnover rate has stayed about the same during the 2000s.

Of the total assets of about € 12.5 billion, the average of 75% is farmers' own capital. The percentage share of own capital has stayed about the same during the 2000s. By the end of 2011 the amount of external capital in agriculture and horticulture had risen to € 4.1 billion from about € 3 billion in 2004.

Since 2004 the ratio of debts to gross return, i.e. relative indebtedness, has increased from about 70% to 75%, which contributes to a higher financial risk.

Besides debts related to agriculture and horticulture the farm family may also have debts from forestry and other business as well as private household. In balance calculations these are not included in the debts of agriculture and horticulture.

### Weighting system

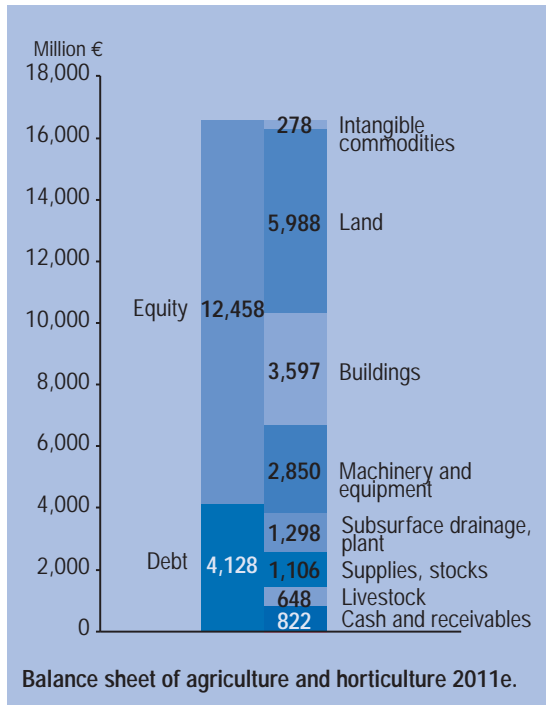
In the total calculation the results for the whole country are obtained by summing up the results of the bookkeeping farms.

### Solvency

At the end of the accounting year 2011 the capital invested in agriculture and horticulture totalled € 16.6 billion. About 85% was invested in long-term objects such as farming land, machinery, buildings and sub-surface drainage.

On the balance sheet the asset items have been valued at the current values and the investment subsidies or the investment reserves are not deducted from the value of assets. Depreciation cost of the fixed assets purchased by means of the investment subsidies is calculated and the subsidies are allocated as returns alongside with the corresponding depreciations in the result calculation.

Agriculture is a very capital intensive industry, where the capital turnover rate (the ratio of gross return to capital) is low, 0.33. The capital



The number of bookkeeping farms is 940 while the total number of farms in Finland is more than 60,000, which means that the figures for each bookkeeping farm are included several times in the calculation in accordance with the weighting coefficient determined for each farm.

The weighting coefficient of the bookkeeping farms vary considerably as the group of bookkeeping farms includes farms representing certain types of farming and economic sizes more than other farms. This is why the weighting coefficient of the types of farms that are more strongly represented in the group of bookkeeping farms typically receive lower weighting coefficients than other bookkeeping farms. There is also some annual variation in the coefficients due to changes in both the bookkeeping farms and Finnish agriculture as a whole.

In the total calculation each bookkeeping farm represents at least one, but typically quite a large number of farms. The aim in determining the weighting coefficients is that the total picture of Finnish agriculture given by the calculation is as close to the reality as possible. The method for calculating the weighting coefficient for the whole 2000s has been revised to make it even better suited for also calculating the results according to the types of farming and support areas.

The revised calculation of the weighting coefficients takes place in two stages. At the first stage initial weighting coefficients are calculated for each farm using the weighting system of the FADN of the EU. In this system the weighting coefficient of a farm in a specific year depends on how large a number of farms it represents in its own type of farming and economic size in its support area. The types of farming and economic sizes are determined for the whole examined period on the basis of the standards outputs introduced in the EU in 2010 (see Chapter 4.1).

The initial weighting coefficients are further adjusted at the second stage by constrained nonlinear optimization so that after having been multiplied by the weighting coefficients and summed up, the number of farms and cultivated areas correspond to the real total number of farms and cultivated area in the whole country. In addition, the weighting coefficients are adjusted so that the numbers of farms by economic size and types of farming in the whole country as well as the cultivated areas in the support areas correspond to the real farm numbers and cultivated areas.

All the constraints mentioned above allow the farm numbers and cultivated areas to differ from the real figures by the maximum of one per cent. This ensures that the results of the weighting correspond to the real distributions by economic size, type of farming and cultivated area better than before.

With due account for the constraints, the changes to the weighting coefficients from the preliminary ones are minimised so that individual bookkeeping farms would not have too great an impact on the final results, while the impact compared to the preliminary weightings should not remain too small, either. In practice the function to be minimised in nonlinear optimization is the sum of squares of the difference between the final and original weighting coefficients. Sequential quadratic programming is used as the optimization method.

The results calculated by means of weighting obviously involve a degree of uncertainty, because the group of farms to which the weighting is applied cannot fully and in all respects reflect the great variety of Finnish farm enterprises. In the revised weighting system, however, the most significant indicators for the extent of farming activities correspond to the reality with considerable accuracy, and the total calculation based on this provides a highly comprehensive and diverse picture of the sector.

## New trends in strawberry production

Anu Koivisto

Strawberry, the favourite berry of the Finns, is an essential element in our perception of the Finnish summer. Summer is also practically the only time when we have domestic strawberries available, except for very small amounts of greenhouse strawberries as a highly special product.

Finnish strawberry production is characterised by strong variations in the supply, both from one year to another and during a single season. Annual variations in the yield are due to winter damages, spring frost, success of pollination in the spring and preformation of flowers for the next year in the autumn. During the strawberry season considerable variations in the supply may be caused by weather factors, especially the temperature and precipitation. After having been in short supply, just a couple of weeks of warm weather may cause strawberries to ripen in quantities that cannot be picked at the ideal time. Sometimes buyers cannot even be found for all of the crop quickly enough.

The prices paid for strawberry adjust to the supply. In the early season the supply is low and the price stays high. As more of the crop ripens the price falls, usually reaching the lowest levels during the main season in July. Towards the autumn the supply starts to fall and the late season prices are again higher.

### Tunnel production – a means for timing the supply

Besides the traditional strawberry production in open fields, in the Nordic countries Sweden, Norway and Denmark the so-called tunnel production, i.e. production of strawberries under cover, has become an increasingly popular. In Finland there is very little tunnel production as yet, but studies and advisory work on this are already being done.

In tunnel production strawberries are cultivated in light-weight tunnels which on the surface look like rows of plastic-covered bow house tents. In the tunnels there is no actual greenhouse technology, such as heating or ventilation, but irrigation is being applied. Strawberries grow on the ground or, alternatively, in boxes or sacks. The plastic is usually removed for the winter so that strawberry plants overwinter in the open under snow cover, which protects them against very low sub-zero temperatures. The main benefit of tunnel production in the northern conditions is that it extends the growing season. In tunnels the spring starts earlier than in the open and continues longer into the autumn.

Among the most important benefits of tunnel production in the north is that it allows to extend the crop beyond the traditional short harvest season in the open. The crop from tunnel production is easy to market in the early summer because the Finns are well aware of the start of the domestic strawberry season and know to expect it. What is more challenging is to get the consumers used to the idea that there are domestic strawberries available also after the summer season, even as late as October.

Besides the tunnels, the use of a greater variety of strawberry plantlets in recent years allows a better timing of the strawberry crop. Frigo plants have become increasingly common. These are large strawberry plants which in the autumn have been lifted for cold storage. A large-sized plantlet is capable of producing a crop in the year of planting, unlike the traditional runner plants, where the first crop is obtained only in next

year after the planting. The frigo plants yield a crop two months after the planting, thus offering an excellent means of timing the crop.

Most of the strawberry varieties cultivated in Finland are single-crop varieties, i.e. they flower once and produce one crop during the growing season. In the more southern countries everbearing varieties which yield a continuous crop are also being used. What is characteristic to these is that they keep flowering and producing berries all through the growing season. Such varieties have been tested in the Finnish conditions, but so far no sufficiently winter-hardy varieties have been found.

### **Clean, high-quality strawberry from tunnels**

The strawberry crop grown in tunnels is better than that grown in the open as regards both the quantity and quality. Strawberry succeeds well in our cool climate, but in most summers there is no harm in additional warmth, which is beneficial for the formation and ripening of the crop. Even if it usually does not rain very much in June and especially July, in most summers the humidity is still too high for strawberries. High humidity in the early unripe stage of strawberries increases the risk of grey mould and thus the spoilage of the crop. Rainfall during the harvesting stage, not to say anything about heavy rains or hailstorms, damage the crop as the berries of the varieties grown in Finland are not very firm. In tunnel production the berries are protected from rains and the damages it may cause.

Tunnel production causes changes in pest control. According to preliminary research results, the numbers of pests in tunnels are lower than in the open fields, probably due to the mechanical obstacles to the spreading of pests created by the tunnel. On the other hand, there are also observations that the pest populations in tunnels differ from those in the open. For strawberry biological prevention can be used against certain pests, such as strawberry (cyclamen) mite (*Phytonemus pallidus*), two-spotted spider mite (*Tetranychus urticae*) and thrips. Biological prevention succeeds better in tunnels than on open lands, because in the partly closed environment the natural enemies of the pests released to the plantation cannot escape as easily as their do in the open. Thus tunnel production may also contribute to reducing the use of pesticides in strawberry plantations.

### **Tunnel production still not common in Finland**

Why are the tunnels used less in Finland than in the other Nordic countries, in spite of the obvious benefits to strawberry production? One major factor is the higher investment cost caused by the tunnels compared to traditional production in the open. In Finland investments in tunnels are not eligible for financial aid, unlike in Sweden, where investment aid covers 30% of the costs. In Finland the additional costs need to be covered by the higher yield and higher price paid for the crop. Even if the quality of the crop is usually better in tunnel production than in the open, quality pricing is not as yet recognised in the current pricing practices for strawberry in Finland. The price is the same for all of the crop, regardless of whether the quality is good or excellent or whether production takes place in tunnels or in the open.

Profitability calculations show that tunnel production is profitable only if the price and volume of the crop are clearly higher than in production in the open. It remains to be seen what the price will be in the early and late part of the season, if in the future tunnel production becomes more common in Finland.

## 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 providing recreational services. In addition to positive effects, agriculture also has negative impacts on the environment, i.e. the soil, waters and air.

In summer 2011, data were collected for a survey where the Finns were asked to rank the importance of environmental problems on a scale from one (not at all important) to four (highly important). According to the total of 1,860 responses received, the citizens consider preventing the eutrophication of water bodies as particularly important. Preventing the loss of soil fertility ranked second in importance.

#### Soil

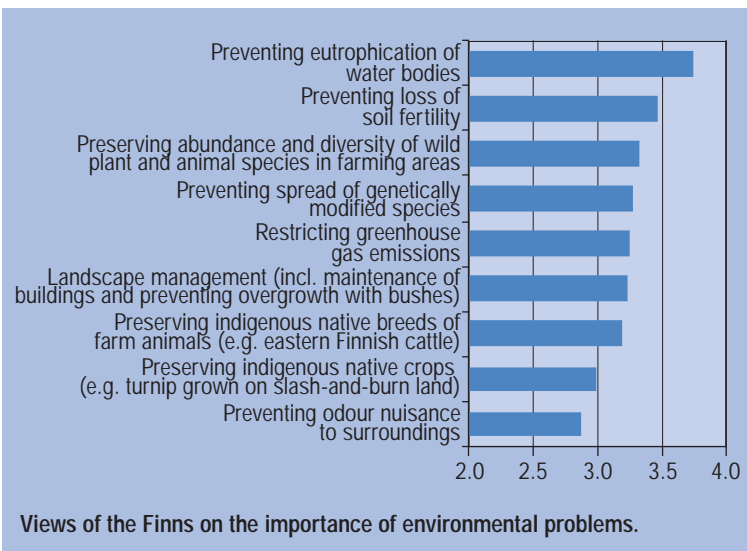
Environmental loading from arable land depends on the soil type, cultivation properties and crop rotations. Finnish soil contains no heavy metals, its average phosphorus level is satisfactory, acidity is increas-

ing, and the amount of organic matter is decreasing. When assessing the ability of the soil to mitigate environmental loading, indicators to be accounted for also include the numbers of soil organisms, activity of symbiotic microbes, and binding and release of nutrients in soil organic matter.

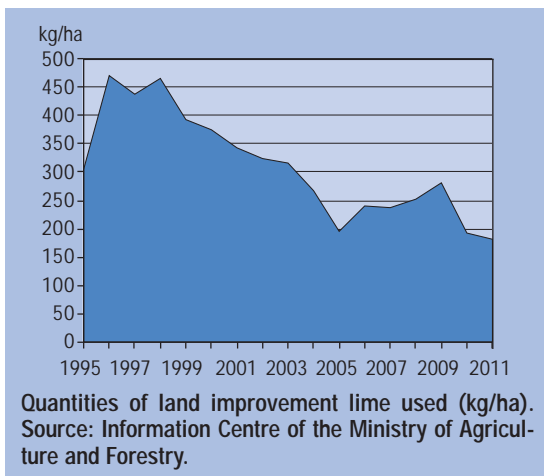
The phosphorus level in arable land is an indicator of both productive capacity and environmental loading. In Finland, the phosphorus levels have been rising up to the present, even if phosphorus fertilisation has been reduced considerably through, for example, the agri-environment scheme. At present, the annual increase in phosphorus through purchased fertilisers is about 6 kg/ha, which is only a quarter of the level in 1995. The amount of phosphorus entering the land in animal manure (about 8 kg/ha) is higher than the amount of phosphorus contained in purchased fertiliser, and no significant reduction has taken place in this since 1995. Studies have shown that some further reduction in total phosphorus fertilisation (purchased fertiliser + manure) would be possible without a decrease in yields, except in parcels where the phosphorus levels are particularly low. In the

light of current knowledge, turning the phosphorus balance of arable lands into a negative one is the most efficient way to permanently reduce the phosphorus loading.

The load on waters from arable farming is also influenced by the soil structure. Soil compaction reduces the permeability of the







soil, which 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.

Only about 7% of the surface area of Finland is arable land. The ownership of arable land is quite decisive in terms of the long-term productivity of the land. Studies have shown that less land improvement work is being done on leased areas than on lands owned by the farmer. The use of agricultural lime, for example, has halved from the levels before Finland joined the EU. Since 2003, less than 300 kg/ha/year of lime has been used for land improvement, which is not enough to maintain the productive capacity of arable lands.

### Loading of waters

Nutrients leach to ditches, rivers, lakes and the sea from arable land, causing eutrophication of water bodies. This can be seen in the turbidity of the water, increased growth of algae and mass blooming of toxic blue-green algae in the summer. Even if the volumes of nutrients used per hectare have been significantly reduced, the eutrophication of waters continues and no improvement in the state of waters has been observed.

The Finnish Environment Institute estimates that about 50% of the nitrogen loading and 60% of the phosphorus loading come from agricultural sources. In the nutrient loading of the Baltic Sea, Finnish agriculture accounts for about 3.8% of the phosphorus and 3.7% of the nitrogen loading. In the loading on the Archipelago Sea and coastal waters, the share of Finnish agriculture is much greater.

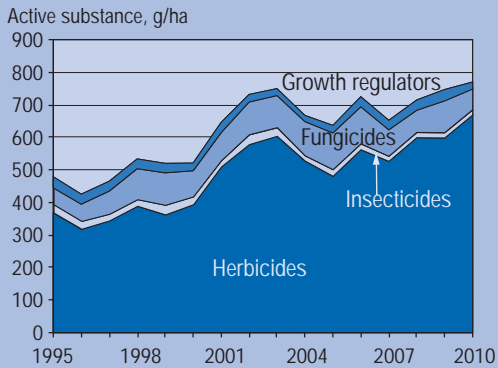
The loading of water bodies is caused by both arable farming and livestock production. Because of the concentration of livestock production, the amount of manure produced is excessive in many places relative to the utilised agricultural area and the needs of the crops cultivated. The phosphorus contained in manure, in particular, has become a problem.

### Use of pesticides

The use of pesticides has been growing steadily since Finland joined the EU. Most of the pesticides used are products intended for preventing weeds (herbicides). The main reason for the growth is increased cereal monoculture and wider use of non-tillage technology. Farmers have also switched over to pesticides which need to be used in larger doses. On the European scale, the quantities of pesticides used in Finland are still quite moderate.

### Emissions to air

Climate change poses new challenges to Finnish agriculture. The measures to adapt to climate change are changing the prioritisation of species and varieties and the relative profitability of different crops and production methods. Agricultural activities are also causing climate change. Greenhouse gas emissions from the agriculture sector represent about 7% of the total emissions in Finland. Most of them are



Use of pesticides (active substance g/ha). Source: Information Centre of the Ministry of Agriculture and Forestry.

due to the digestion of ruminant livestock, decomposition of organic matter in the soil and decomposition of manure. Minor emission sources include nitrogen fertilisation, liming of arable lands and the use of fossil energy in agriculture. A common feature in all emissions from agriculture is that it is difficult to reduce them without significant impacts on the volume of agricultural production.

The agriculture sector is excluded from emissions trading. The objective set for Finnish agriculture is that by 2020 the greenhouse gas emissions should be reduced by 13% from the emission levels in 2005. Through agri-environment measures, efforts are made to transfer peaty arable lands from continuous cereal production to the cultivation of grasses on a long-term basis. In other soil types, less intensive tillage practices or cultivation without tillage should also be preferred.

### Biodiversity in farming environments

Biological diversity comprises the abundance of species, diversity of habitats and intra-species genetic diversity. The decline in biodiversity is considered a serious environmental problem as biological diversity is the foundation for the functioning of ecosystems and ecosystem services,

i.e. benefits to humans derived from nature. Without biodiversity, the ecosystems are not capable of adapting to changes in the environment, such as climate change.

Agricultural production is based on the utilisation of biological diversity. Similarly, many wild plant and animal species have over centuries adapted to utilising agricultural environments created by man. The positive impact of agriculture in enhancing biodiversity was the greatest at the time when animal feed was produced on meadows and natural pastures. The growth of farm size since the 1950s together with increased input intensity and farm-specific and regional specialisation has led to a decline in the biodiversity of farming environments and increased the numbers of threatened species and habitats.

For some wild species, changes in their habitats due to new and more efficient production methods have been too rapid and they have not been able to adapt to the new conditions. Especially organisms which depend on meadows and forest pastures have declined and become endangered due to the decrease in grazing and cattle husbandry. According to an assessment of threatened habitats completed in 2008, the highest share of threatened habitats in the total number of habitats of a certain type is found in traditional biotopes, of which 93% are threatened.

However, habitats maintained by agriculture still retain numerous wild plant and animal species which benefit from farming activities, open arable areas and grazing livestock, as well as from many of the measures related to the agri-environment scheme and non-productive investments.

### Landscape and recreation value of arable environment

The countryside and rural margin areas around towns and cities with arable lands

offer important recreation environments for the Finns. Farming environments are important for outdoor recreation especially in areas with a high share of agricultural land. Farming environments are commonly used for nearby recreation, especially in southern Finland.

On average, the Finns engage in outdoor recreation close to their home 170 times a year, of which 35% takes place in farming environments. This means a total of 230 million times of outdoor recreation per year. Besides nearby outdoor activities, agricultural areas are used for recreation involving overnight stay. The average number of nature trips per year is eight 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 forest activities. Altogether, this means 10 million days a year spent on nature trips in farming environments.

Rural tourism is hoped to become a significant source of livelihood in the countryside, which is why it would be important to consider how the farming environment should be developed to turn it into a real attraction in the rural tourism destinations. Landscape recreation and access to and movement in farming areas can be promoted, for example, through the agri-environment measures. Farming practices which support landscape values and outdoor recreation also contribute to the benefits derived from outdoor activities based on the right of public access ('everyman's right'). Studies have shown that the valuation of agricultural landscape improves, in particular, by the presence of grazing animals in the landscape and renovation of farm buildings located in the open fields. Both of these landscape features are becoming less and less frequent because of the aim for higher efficiency in agriculture and regional differentiation of the production sectors.

## 5.2. Agri-environment in the Commission's proposals for CAP after 2013

The proposals for the reform of the common agricultural policy EU for the new programming period 2014–2020 came out in October 2011. The baseline for environmental protection in agriculture continues to rest on the so-called cross-compliance conditions, comprised of the requirements for Good Agricultural and Environmental Condition and the Statutory Management Requirements.

From the environmental perspective, the most significant element in the proposal is the even stronger emphasis on and recognition of the linkage between agricultural support and the environment as an obligation which is binding on all farmers through so-called greening. The Commission proposes that 30% of the direct payments would be used for greening measures, including crop diversification, permanent grassland and ecological focus areas. As a concrete measure, farmers should designate 7% of their agricultural area as an ecological focus area and arable farming should be diversified to include at least three crops. Permanent grassland area should stay the same as it was in 2003. Organic production is already considered fulfilling the greening conditions, which means that it is entitled to the greening payment without the measures listed above. The proposals are now being discussed and commented on, and they have been criticised quite strongly at least by the farmers' organisations.

The rest of Europe has not applied the environmental payments funded under the previous rural development programmes as widely as Finland has. This means that the upcoming reforms may even have a positive impact on the competitiveness of Finnish agriculture as now all European farmers must commit to actions that reduce environmental loading, which have been a common practice in Finland for

quite some time. Very likely the greening measures proposed by the Commission are going to restrict the production the most strongly in the most intensive farming regions of Europe.

### 5.3. Agri-environment scheme 2007–2013

The Rural Development Programme for Mainland Finland 2007–2013 was approved by the European Commission in 2007. Rural development is funded from the European Agricultural Fund for Rural Development (EAFRD) and from national sources. The total public funding for the seven-year programming period is about €6.6 billion, of which a third comes from the EU. The programme has four axes, of which Axis 2 includes the agri-environment and natural handicap payments, non-productive investments and promoting the welfare of farm animals. The funding for Axis 2 totals about €2.3 bill.

The third agri-environmental programme implemented as from 2007 consists of basic, additional and special measures. Farms in support areas A and B must undertake the basic measures plus one to four additional measures. In area C, no additional measures are required, and no more than two may be selected. The most popular additional measures have been more accurate nitrogen fertilisation of arable crops, different forms of plant cover on arable land in winter and calculation of nutrient balances.

The main objective of the agri-environment scheme is to reduce the load on waters. This is why most of the support is directed to measures which contribute to water protection, while only about 2–3% of the support is used for measures which are primarily targeted at enhancing biodiversity. The role of the agri-environment payments in enhancing biodiversity is, however, greater, because certain measures which are primarily targeted at water protection, such as field margins, filter strips,

riparian zones and wetlands, also contribute to biodiversity.

After the approval of the Rural Development Programme for Mainland Finland, the revision and development of the agri-environment scheme continued in a working group on amending the agri-environment scheme. In 2008, three new special measures were included in the agri-environment scheme: incorporation of liquid manure into the soil, long-term grass cultivation on peaty arable lands and more efficient reduction in nutrient loading. The special measure concerning nature management fields was included in the programme in 2009. It was designed to compensate for the losses in nature and environmental values due to the abolition of compulsory set-aside from the single payment scheme. According to data from the Information Centre of the Ministry of Agriculture and Forestry, in 2011 the total area of nature management fields was 150,393 ha, of which almost 85% was under perennial grasses.

The changes to the special measures in 2010 include the following: The geographical area eligible for the contract concerning the management of multifunctional wetlands was extended to the catchment areas of rivers discharging into the Kvarken and Bothnian Bay. The annual site-specific support for the management of small valuable traditional biotopes (0.3–0.5 ha) was raised to 200 €/site from the earlier 135 €/site. The limits for the maximum acceptable costs of the contracts concerning special measures were revised.

In 2010, non-productive investments concerning the establishment of multifunctional wetlands was raised to 11,500 €/ha and the area covered by this measure was also extended to the catchment areas of rivers discharging into the Kvarken and Bothnian Bay. In small wetland sites (0.3–0.5 ha), the amount of investment aid is fixed at 3,226 €/site. Support for non-productive investments in the first clearing and fencing of valuable traditional biotopes

was differentiated according to the surface area of the biotopes. The amount of the investment support is 1,179 €/ha for sites with the maximum area of 3 ha, 910 €/ha for sites larger than 3 ha but no more than 10 ha, and 750 €/ha for sites of more than 10 ha.

In accordance with the Leader methodology, support for non-productive investments in the establishment of multifunctional wetlands and the first clearing and fencing of traditional biotopes and support for the special measures concerning the management of multifunctional wetlands and traditional biotopes may also be granted to beneficiaries other than farmers.

Winter cereals were approved to fulfil the condition concerning plant cover in winter as from the winter season 2010–2011. The possibility to transfer some of the requirements now included in the basic measures (such as field margins and filter strips) to the cross-compliance conditions has been discussed, but no major changes are to be expected before the next programming period starting in 2014.

### **Evaluation of impacts of agri-environment scheme**

According to the mid-term report of the follow-up study on the impacts of the Finnish agri-environment scheme (MYT-VAS 3) published in 2010, the nutrient loading potential of agriculture measured by nutrient balances has continued to decrease for both phosphorus and nitrogen during the terms of the agri-environment scheme, mainly due to the decrease in the use of artificial fertilisers. The decrease in the nutrient loading potential has not, however, been fully reflected in water loading from agriculture. Nitrogen loading has grown in almost all of the 22 catchment areas of rivers discharging into the Baltic Sea included in the model. The main reasons for this seem to be the growth in arable area, concentration of livestock production implying large quantities of manure

in certain locations, increase in the land application of manure, and increased use of concentrate feed for livestock, which raises nitrogen levels in manure. Instead, the phosphorus drift from the river catchment areas to the Baltic Sea decreased during the whole period covered by the analysis (1985–2006), except in the Archipelago Sea. The measures which have the greatest potential to reduce nutrient loading of waters are fertilisation of arable crops and nature management fields among the basic measures and the additional measures concerning plant cover and fertilisation.

The greatest threat to biodiversity is the decrease in open or semi-open areas which are not used for farming purposes. The measures with the best potential in terms of biodiversity are some of the special measures and non-productive investments. Basic and additional measures alone do not promote the preservation of biodiversity in agricultural environments significantly.

The overall conclusion of the mid-term report is that more regional, sectoral and farm-specific adjustment and customisation of the objectives, measures and support levels of the agri-environment scheme are needed due to the considerable regional differences in the state of agricultural environments and the needs of the society.

### **5.4. Water protection objectives in agriculture**

Nutrient loading from agriculture is non-point source loading from over a million agricultural parcels with highly varied characteristics. Besides physical characteristics, such as slope and soil type, the water loading from parcels depends on the weather conditions and cultivation and tillage practices. According to the Government Resolution on guidelines for water protection (2006), nutrient loading from agriculture should be reduced by at least a third from the average in 2001–2005 (phosphorus by 3,000 t/a and nitrogen by about



30,000 t/a). In addition to this, the EU Water Framework Directive sets even more detailed quality standards for specific water areas. The objective of the Water Framework Directive is to prevent the decline in the status of surface waters and groundwater and guarantee a good chemical and ecological status of waters by 2015.

Fertilisation is obviously one of the principal factors in nutrient loading, which is why it is also used as an indicator of the loading potential. In 1995–2011, the fertiliser sales per hectare of cultivated land decreased from 92.3 kg to 73.9 kg for nitrogen and from 16.1 kg to 5.6 kg for phosphorus. During the same period, there was no decrease in the yields per hectare, which means that the nutrient balances improved considerably. The trend is correct considering both the efforts to reduce nutrient loading and the profitability of agriculture. In Finland, about 90% of the loading occurs outside the growing season. The voluntary agri-environment scheme and changes to the legislation have increased plant cover in winter, which reduces erosion, and less manure is spread on the lands in the autumn.

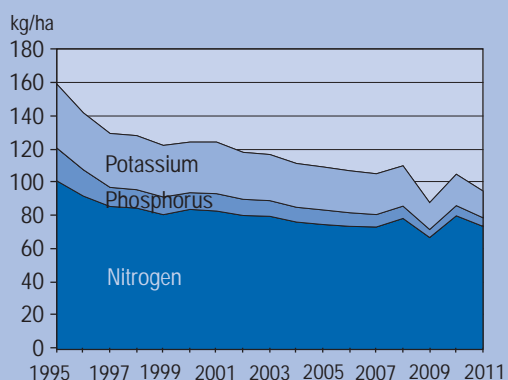
Small adjustments to the main agri-environmental policy instrument, agri-environment support, will not be sufficient to reach the good status of waters set as the objective by 2015. Especially as

regards phosphorus, the soil reacts very slowly to changes and even significant reductions in the annual nutrient balance are not immediately reflected in the loading. The concentration of livestock production and growing unit size are also a problem as regards meeting the objectives because more phosphorus enters the soil in animal manure than what the plants need, which increases the loading potential.

## 5.5. Main topics and future perspectives

### Competitive tendering in environmental protection

Competitive tendering procedures that are voluntary for farmers have been suggested as an alternative to the present agri-environment scheme or to supplement it. As a rule, the procedure is such that the society declares the types of environmental benefits it wishes to promote and invites the farmers to submit tenders on measures concerning these. In their tenders, the farmers express how high a compensation they will claim for the measures to be taken. The society ranks the tenders on the basis of environmental benefits to be gained and costs involved and selects sites to be included in the programme until the funds budgeted for the protection are used. This ensures cost-efficient allocation of the available funds. A study steered by MTT Agrifood Research Finland on the application potential of competitive tendering for targeting environmental protection measures in agriculture was completed in 2011. The project included the piloting of competitive tendering concerning the spreading of gypsum on arable lands to reduce phosphorus leaching. The study showed that competitive tendering could be incorporated into the common agri-environmental policy of the EU.



Use of fertilizers (kg/ha). Source: Information Centre of the Ministry of Agriculture and Forestry.



## **Preservation of genetic resources of agriculture**

In 2011, a project entitled 'Value chain of agricultural genetic resources' by MTT Agrifood Research Finland compiled information on the values related to genetic resources and the willingness of the citizens to support the preservation of genetic resources in Finland. The respondents saw that the most important indigenous breeds to be preserved are the Finnhorse, breeds of cattle and sheep and landrace chicken. Of indigenous plants, the cereal, vegetable, root crop and garden berry varieties were considered the most important. The indigenous plant varieties and animal breeds were seen as a valuable part of the Finnish flora and fauna and landscape and as an expression of local culture. The support for the programme to preserve the indigenous breeds and varieties decreased as the annual costs to households through taxation grew, but more than half of the respondents supported the preservation programme even at an annual tax level of €300.

## **Manure, biogas and separation**

Because of stricter environmental regulations, manure has become the most restrictive factor for the growth in the unit size of many farms. A research programme on manure financed by the Ministry of Agriculture and Forestry and completed at MTT Agrifood Research Finland in 2010 searched for solutions to problems caused by manure. Fractioning manure by means of a separator into solid phosphorus fractions and liquid nitrogen fractions would allow fertilisation which is closer to the real nutrition needs of the plants. However, efficient separators are costly and investments in them are not profitable without large volumes of manure to be processed. Biogas production would also require a scale larger than individual farms and other support through, for example, feed-tariffs. Another problem is that animal

manure has been defined as waste in the EU legislation, which means that smoke gases from the incineration process must be analysed and any impurities must be removed. This is why burning manure in farm-scale incineration plants is not an economically feasible option.

## **Cost-efficient discharge reduction in the Baltic Sea**

Each year, the blooming of blue-green algae makes headlines during the best swimming season. Based on the research results, the most efficient way of improving the state of the Gulf of Finland and the Archipelago Sea would be to improve the purification of the wastewater discharges in their major sources, such as Russian and Polish cities. Investments in the treatment of the unpurified wastewaters from St. Petersburg per kilo of nutrients removed would also be more cost-efficient than reducing the loading from Finnish agriculture in the coastal areas of the Gulf of Finland. However, local cuts in the load to the Gulf of Finland would be more rapidly reflected in the sea water quality than the impacts of the cuts in the catchment area of the Main Basin of the Baltic Sea. Thus, cutting the discharges in Finland is important especially for our own coastal waters. External nutrient loading to the Gulf of Finland relative to the surface area is two to three times the average loading of the Baltic Sea.

Early in 2012, the discharges from the fertiliser plant and phosphorus mine in Kingisepp, Russia came into the public spotlight as a new major source of phosphorus loading to the Baltic Sea. According to some estimates, the total phosphorus load from these to the Baltic Sea would be about the same as the current phosphorus discharges from the whole of Finland. The matter is now being investigated and measurements to establish the phosphorus levels in the nearby River Luga are made in Finnish-Russian cooperation.

## Organic farming continues to expand

*Kauko Koikkalainen*

Organic farming already has a strong foothold in Finland, as also indicated by its 8% share in the total cultivated area. However, the market share of organic products is in the order of 1.5%, which means that the production chain does not work as it should.

In 2010 the so-called Country Brand Delegation set a target of having half of the total cultivated area under organic production by 2030. The organic production method should be established as the standard for the development of Finnish agriculture. Efficient organic production and nutrient economy would require closer interaction between plant and livestock production and better organisation of the nutrient cycle.

### Growth rate of organic production should be doubled

According to the Luomu 50 report “Organic production 50” of MTT Agrifood Research Finland, organic farming should increase by 10% a year in order for the organic production area to grow to 50% of the cultivated area by 2030. This rate would be double the rate of the past few years. The objective set by the Country Brand Delegation is challenging, but not totally unrealistic – at least not in all the sectors of agriculture. Increase in organic production would require stronger integration of plant and livestock production so that the potential of organic production could be fully utilised. In the Finnish climate conditions, efficient organic production must be founded on the cultivation of clover grass and utilisation of grass as fodder for ruminants. Supplementary nutrients can be obtained from recycled nutrients derived from organic material. Now first steps are being taken in their study and use.

### Better profitability through organic production

The follow-up of the profitability of organic production shows that at present organic production is more profitable than conventional production. This is mainly due to the slightly higher support payments and higher prices paid for organic products.

The higher support for organic production is being justified by environmental considerations. Organic production can be considered as a beneficial production method in maintaining biodiversity. The efficiency of the nutrient economy in organic production relative to conventional agriculture could be considerably improved through closer interaction between livestock and plant production.

### Not all organic products reach the consumer

Organic farming in Finland is strongly based on cattle husbandry with grass cultivation as the main source of fodder. Today, however, there is a disproportion between the crop from arable farming and organic products offered to the consumer: only part of the organic products end up on the market as certified organic foodstuffs. At the moment, it is quite common that plant production of a farm is organic but livestock production is not. This is because of the stringent threshold rules to start organic livestock production. This means that a major part of the organic fodder produced is used on organic farms as fodder for conventional livestock production. Of the total of about 4,000

organic farms, about 1,600 are livestock farms. Only about 570 out of 1,600 livestock farms meet the criteria for organic production. Reallocation of support is needed to encourage more farmers to engage in organic production.

### There is potential in organic production

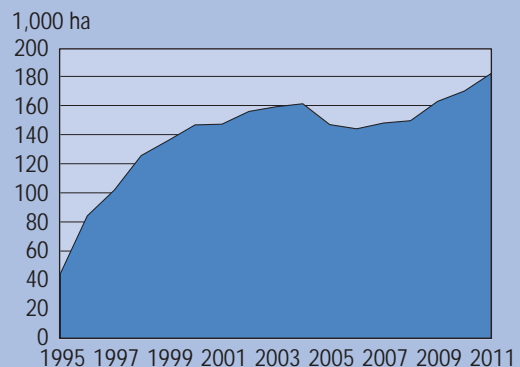
If the target for organic production is set at 50% of the total arable area in Finland, the production must be organised in a way which takes the special characteristics of organic production into account in the best possible way. In cultivation based on the full potential of organic production, the share of grass in crop rotation should be 40%, that of bread cereals 20%, fodder cereals 30% and leguminous cereals 10%. This would make it possible to increase the average yields by about 20% from the present through the more frequent renewal of grasses and larger share of leguminous cereals, which would better ensure the nitrogen intake of plants. The nutrients in animal manure would be utilised more efficiently than before by combining plant and livestock production, which means that as a rule green fertilisation would no longer be needed as a source of nitrogen.

The total yield of organic production would be about 20% lower than the present non-organic production. The 50% share of arable area would cover about a half of the total consumption of bread cereals and 65% of the total milk and beef consumption. Cattle production could be practised almost at the same production intensity as at present and it would be fully self-sufficient in fodder – also in protein. If the aim is to produce organic pigmeat and poultry meat besides milk and beef, up to 20% of the fodder cereal could be used for this without reducing the milk production volume. In this case, most of the pigmeat and poultry meat production would still be conventional. Further increase in the share of fodder cereal in the crop rotation would lead to a considerable reduction in the total yield, because green fertilisation would be required for producing the additional cereal.

### Organic horticulture should be promoted

At present, the area under organic horticultural production is less than 1,000 hectares, which is about 6% of the total horticulture area. Proportionally, the share of organic production is the greatest in the production of berries and fruit, where 12% of the area is under organic cultivation.

In recent years, the organic horticulture area has decreased at a rate of a little under 5% a year. The reasons for this include problems related to cultivation techniques and plant protection and marketing and logistics, as well as too low economic incentives. These can be solved if sufficient resources are found for research, training and advisory services to reduce the risks of individual farmers in taking up and developing organic horticulture.



Development of organic production in 1995–2011.

## 6. RURAL AND REGIONAL POLICY

### 6.1. Changes in Finnish rural areas

Finnish countryside has gone through various significant changes in the past few decades. Changes in the regional distribution of labour have led to increased specialisation both between the Finnish regions and within the rural areas. The role of the other rural industries as employers has become increasingly important because of the constant decrease in the number of farms and jobs in primary production as a result of the structural change in agriculture. The strongest phase of this change was over by the end of the 1970s. The accession to the EU in 1995 reinforced the regional concentration of agriculture. This is a common phenomenon throughout the developing world.

Rather than the structural change in the livelihoods, in recent decades the rural areas have been affected the most strongly by our ways of using space. For the Finns the countryside is first and foremost a place for living and recreation. As the number of jobs in primary production has decreased, the jobs have moved to towns and population centres. In terms of permanent places of residence, however, the trend has been slower. To a growing extent the countryside is the location for secondary, third or holiday homes, or a place visited for leisure activities or work. The Finns are still active users of the countryside, but in a different way than before.

Organising one's life in multiple places, i.e. residing, working and engaging in other activities in several locations on a regular basis, has become an everyday routine for growing numbers of Finns. According to the Rural Barometer commissioned by the Finnish Innovation Fund and carried out by the MTT Economic Research, in 2011 38% of the Finns had a dual identity: they considered themselves as both rural and

urban. This kind of dual identity seems to become increasingly common at the cost of identifying oneself as purely rural or urban.

The majority of the working-age population in the countryside earn their living from services, just like the urban residents. The proportional share of jobs in the industrial sector is slightly higher in the rural than in the urban areas. Most of the rural working-age population commute to other areas for work. In international comparison our way of using space is quite exceptional, which is reflected in the record high number of summer cottages and holiday homes in Finland: there is one holiday home per 10 inhabitants. Another aspect of this exceptional use of space is that the primary place of residence may be in the countryside and the secondary or third home in a town or city.

The countryside is a particularly attractive place of residence especially in areas that are adjacent to urban areas, where the well-being of the Finns is the highest. In such areas the share of working-age population and the income and health status of the population are above the average, i.e. higher than in urban areas or other types of rural areas (rural heartland areas and sparsely populated rural areas). These distinctions are important to allow an accurate analysis of the large rural areas in Finland and proper understanding and anticipation of the various development paths.

In the Finnish rural policy it is very typical to view the countryside in terms of three types of rural areas. The typology of municipalities is based on a multi-stage method where the factors influencing the classification include variables indicating the rural nature of the municipality, areas where people go to work and variables indicating the regional structure, structure of economic activities, farming operations and development problems. The analysis made for the typology of the rural areas

is considered to reflect the socioeconomic situation and development of the areas so well that the typology is also used for the targeting of various development measures, especially under regional and rural policies, and differentiation of the possible support payments.

Compared to other regions of Europe, the share of the rural population is very high and population density is extremely low in Finland. This is why rural development policy and actions are highly significant for the whole nation. According to the typology of municipalities of 2006, the 432 Finnish municipalities in 2005 were distributed as follows: 58 urban municipalities, 89 urban-adjacent rural municipalities, 142 rural heartland municipalities and 143 sparsely populated rural municipalities. In 2005 more than 1.3 million Finns lived in municipalities located in the rural heartland areas and sparsely populated rural areas.

Since the typology of 2006 the structural change of municipalities has progressed rapidly. According to the distribution of municipalities of 2011 and 2012, the total number of municipalities has decreased to 336. In connection with municipal mergers the typology is usually updated so that the type of rural area to which the new municipality is placed is the category to which the more population-rich of the former municipalities belonged. Because an individual municipality cannot belong to more than one type of rural area, municipal mergers weaken the regional accuracy of the typology. As a whole the considerable changes in the municipal structure cause great pressures to develop a typology of rural areas that is based on spatial data to allow the classification of areas independent of administrative boundaries.

Most of the sparsely populated rural municipalities are in eastern and northern Finland, as well as in certain parts of central Finland and on the south-west coast, where there are numerous small archipelago municipalities. Rural heartland munic-

ipalities are typical for the southern and western Finland, while most of the urban-adjacent municipalities are in southern Finland. When the mergers of municipalities are not taken into account, from the typology of rural areas in 1993 the number of rural heartland municipalities has decreased considerably while the numbers of urban-adjacent and sparsely populated rural municipalities have grown. This also tells about the growing differentiation in the development that is taking place in the rural areas.

In general we can say that, on the basis of the socioeconomic situation and development, the challenges for regional development, measured by all indicators, are in practice greater in sparsely populated rural areas than in the rest of the country. Relative to the national average, the development challenges of rural heartland municipalities are also considerable. Instead, in the light of socioeconomic factors the situation and development of urban-adjacent rural areas are far more positive. This is why perceiving the countryside as a single uniform area for rural development purposes gives a very misleading picture.

## 6.2. Finnish rural policy

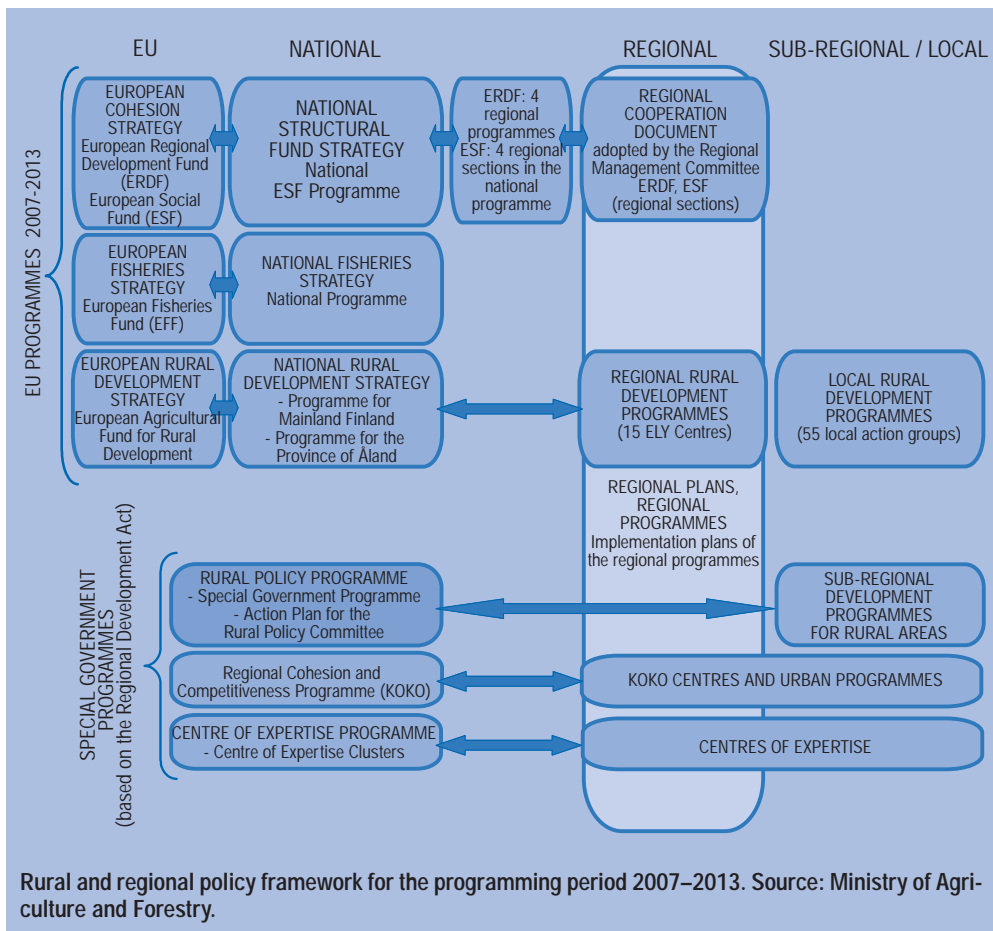
The core objective of regional policy is to ensure balanced regional development. Rural policy, in turn, aims to improve the conditions for living and well-being in the countryside, in particular. National rural policy started to take shape during the 1980s in a situation where the positive impacts of sectoral policies on the countryside were diminishing and there was an obvious threat that the rural perspective was becoming overshadowed by other issues. Resources and ready measures available for rural policy were, however, lacking. As a new policy sector it evolved and adapted to the current circumstances and since then the actors, instruments and priorities of the regional and rural policy have assumed the specific shapes of their own,

different from each other. In rural policy the role of the third sector and local action receive more emphasis than in regional policy, priority is given to structures that ensure the commitment of different actors and reinforce this, and the leverage provided by the financial resources used is very strong. In international comparison Finnish rural policy is exceptionally advanced in terms of both structures and policy instruments.

The Finnish countryside and regions are developed under various rural and regional development programmes implemented on different administrative levels by means of national funding as well as co-funding from the EU. National rural policy has evolved with the special aim of highlighting the rural perspective in all

choices and decisions in the society which have either direct or indirect impacts on the countryside. A few years ago the so-called rural proofing (rural impact assessment) was developed as a new tool to be employed in the preparation of and decisions on all issues in the public sector which may have impacts on the countryside. Rural proofing was introduced on the basis of the recommendations included in the OECD Rural Policy Review on Finland.

In the EU context the development of the rural areas and regions is founded on various kinds of policy programmes, usually drawn up to cover a whole programming period. The current period is 2007–2013. As regards rural development the most important programme is the Rural Development Programme for Main-





land Finland, where the EU contribution to the funding comes from the European Agricultural Fund for Rural Development (EAFRD). The action programmes under structural funds (especially European Regional Development Fund ERDF and European Social Fund ESF) include objectives which also concern the rural areas. In rural and regional policy efforts are made to reconcile the action programmes based on EU policies and the national special programmes approved by the Finnish Government in such a way that the special local characteristics and needs are taken into account as well as possible.

In Finland the rural and regional policy development is steered, in particular, by the Rural Development Strategy, Structural Fund Strategy and Rural Policy Programme. The priorities of the Rural Development Strategy are economically and ecologically sustainable and ethically acceptable agriculture and forestry, developing rural enterprise and reinforcing local initiative. The aim of the Structural Fund Strategy is to reinforce the national and regional competitiveness, employment and well-being. The Rural Policy Programme highlights the impacts of decisions made in various sectors of the society on rural areas and reinforces cross-sectoral rural development.

### **6.3. The role of national rural policy programmes in Finnish rural policy**

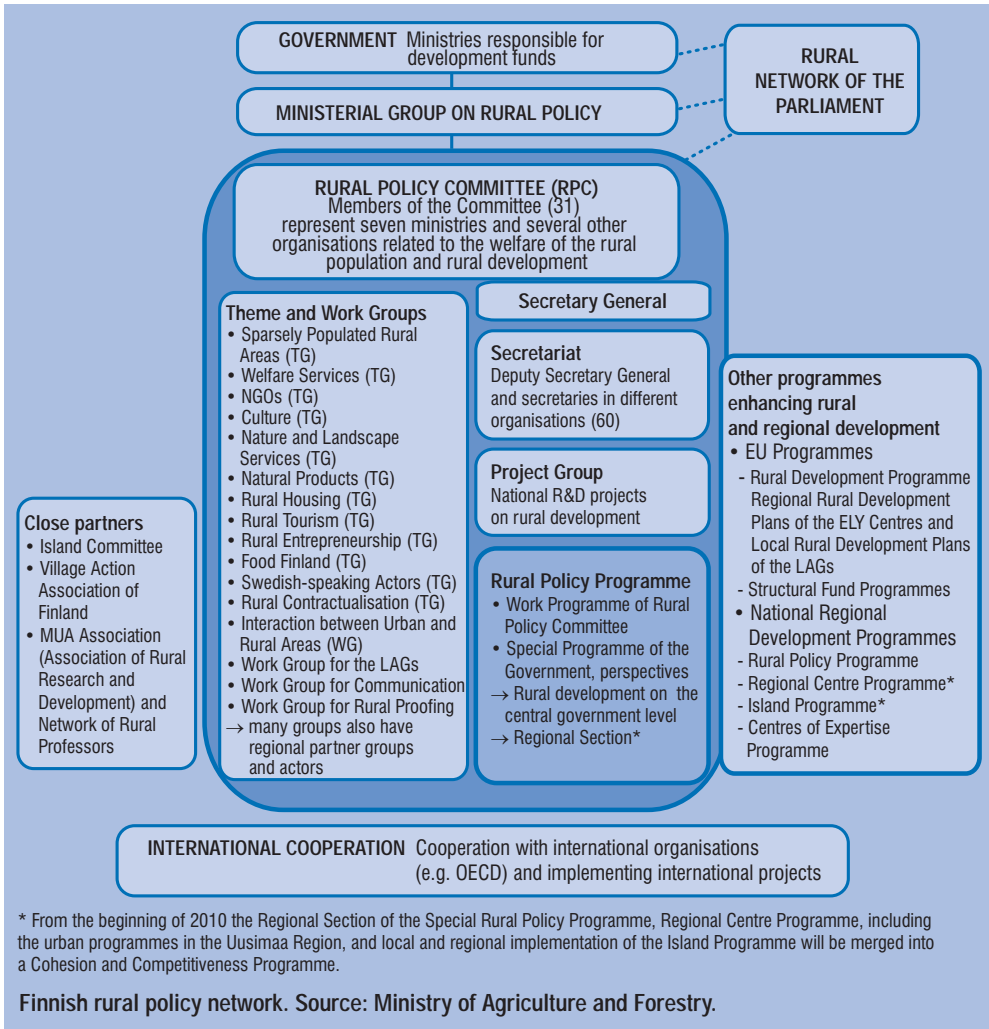
The most important strategic instrument for rural development in Finland is the Rural Policy Programme. The first programme was drawn up in 1991. The fifth Rural Policy Programme for 2009–2013 is entitled Countryside for Vigorous Finland. First and foremost it is the action programme of the Rural Policy Committee, which is responsible for its preparation.

The Rural Policy Programme compiles and steers the rural development actions of both the public and private sector and

the NGOs. It comprises a broad spectrum of strategies and actions which apart from the different administrative sectors and the public sector in general also touch upon various other partners. The objective of the Rural Policy Programme is to ensure that the countryside stays a good place to work and live in, and that the resources and opportunities of the countryside support the well-being and competitiveness of the whole country even better than before.

The Rural Policy Programme contains a comprehensive description of the state and development challenges of the Finnish countryside. The current programme consists of 15 strategic outlines divided by themes, with more than 140 proposals for measures. The strategic outlines are in line with those of the Government Report on Rural Policy.

The Rural Policy Committee, which prepares the Rural Policy Programme, is a cooperative body appointed by the Finnish Government, comprised of representatives of seven ministries and almost 20 other organisations. At the moment the Committee is chaired by the Permanent Secretary of the Ministry of Agriculture and Forestry. In accordance with the Government Programme of Prime Minister Jyrki Katainen, in the beginning of 2012 the operative leadership of the Rural Policy Committee was transferred to the Regional Department of the Ministry of Employment and the Economy, but it still operates on the central government level across administrative branches governed by seven ministries. The task of the Committee is to coordinate rural development actions and promote the efficient utilisation of resources directed to the rural areas. Cooperative arrangements are applied to support national, regional and local rural development work and promote the opportunities to take advantage of the EU co-funded programmes and other rural development tools. The term of the present Committee is from 17 July 2008 until 16 July 2013. It continues the work of the



Finnish rural policy network. Source: Ministry of Agriculture and Forestry.

previous Rural Policy Committees, which were appointed by the Ministry of the Interior and the Ministry of Agriculture and Forestry.

The Finnish Government gave a Report on Rural Policy to the Finnish Parliament in May 2009, prepared in line with the Rural Policy Programme. These reports are issued less frequently than the Rural Policy Programmes and they do not have the same regularity as the programmes. Both documents share the same strategic outlines, but the programme is more concrete as well as more comprehensive than the Government report. The concrete aspects of the programme include

the shorter time span (for the report 2009–2020) and larger number of proposals for measures. Whilst the report is mainly concerned with the central government actors, the programme is also concerned with other levels of public administration as well as with the private and third sector.

The outlines of the Government Report on Rural Policy of 2009 are implemented by the Government Resolution on Rural Policy prepared during 2010 after discussion with the Parliament. The new Government updated the Resolution in autumn 2011, and during 2012 the Government is going to issue an action programme on rural policy in the context of

the Resolution on Urban and Rural Policy.

The Government Resolution on Rural Policy of 2011 outlines and reconciles the rural development objectives and measures in different administrative sectors. The Resolution identifies four main challenges in the operating environment: preparing for more rapid population ageing in the rural than in urban areas, ensuring access to services in the countryside, seeing to the coverage and condition of transport and communications infrastructure, and promoting the viability of economic activities in the rural areas.

According to the Resolution, the viability and competitiveness of the rural areas call for decisions and measures in which the special characteristics of the countryside are recognised and taken advantage of. The effectiveness of the resources available for regional development is improved by ensuring that the actions by different sectors and actors aim at the same direction. For balanced regional development and equal treatment of citizens the development actions must be targeted according to the diverging needs of the regions. The Resolution sets out 18 measures to respond to the challenges faced by the rural areas.

The roles of the Rural Policy Programme and Rural Policy Committee in the field of Finnish rural policy are best understood through the concepts of narrow and broad rural policy. Broad rural

policy comprises the political outlines, decisions and allocation of resources by different administrative sectors which may have any kinds of impacts on the preconditions for rural development. Narrow rural policy, in turn, refers to actions whose specific and defined purpose is to promote rural development, such as the Rural Development Programme for Mainland Finland under the EAFRD and sections concerning the rural areas under the Structural Fund Programmes. The Rural Policy Programme brings together actors involved in the broad and narrow rural policy and provides a comprehensive picture of the rural development needs and the available measures.

The Rural Policy Programme represents the so-called new rural policy paradigm. According to this, a core principle of the rural policy is that it is area-based: the policy is targeted at the countryside and the whole broad spectrum of different actors. The aim is to improve the viability and functioning of the rural areas starting from their own needs, resources and perspectives. The new paradigm is characterised by administration on several levels, where the top-down steering by the central Government has been replaced by interaction among different administrative levels, NGOs and the private sector. The main difference compared to the “old” rural policy thinking is that the country-

#### Comparison between the old and new rural policy paradigm.

	Old paradigm	New paradigm
<b>Objectives</b>	Harmonisation, farm income, competitiveness of farms	Competitiveness of rural areas, enhancing local resources, utilisation of unused resources
<b>Key sector</b>	Agriculture	Several rural livelihoods (tourism, handicraft, processing and manufacturing industry, IT, etc.)
<b>Main instruments</b>	Support	Investments
<b>Key actors</b>	National governments, producers and producer organisations	All administrative levels (transnational, national, regional and local), all local actors and experts (public, private, NGOs)

*Source: Uusitalo 2009.*

side is no longer defined through agriculture. There are large rural areas in Finland with no significant agricultural activities. Agriculture has a role of its own to play in the rural policy paradigm, but this may vary considerably between different kinds of rural areas.

#### 6.4. Socioeconomic role of agriculture in rural areas

Finnish rural thinking was for a long time dominated by agriculture. The reasons for this largely derive from the history. Compared to Central, Southern and Western Europe, the important role of agriculture in preserving the basic population in the rural areas and as the most significant economic activity continued much longer in Finland. In part this was due to political choices, in part the natural geography and demographic aspects. The settlement of immigrants and veterans to small farms after the Second World War increased the number of people who earned at least part of their living from agriculture at the very same time when elsewhere the trend was the exact opposite. In addition, the sparse population, long distances and lack of (urban) centres indirectly related to these slowed down the appearance of new sources of livelihoods alongside agriculture.

Finland is still a very rural country, where agriculture signifies a number of various things, depending on the type of rural area. According to the distribution of municipalities in 2011, in 2010 36%

of the Finnish population lived in one of the three types of rural municipalities. The type of rural areas the Finns now mostly live in is changing gradually. This is also reflected in the policy challenges to which rural development should be capable of responding.

Southern and western Finland, where most of the urban-adjacent rural areas are located, possess the most favourable and diverse natural preconditions for practising agriculture. The local markets function better than in the other types of rural areas, and thanks to the shorter distances it is also easier to work outside the farm. Agricultural production is on the decrease in urban-adjacent rural areas, where the farms are introducing high value added services activities which are not directly linked to agricultural production, such as horse husbandry or farm tourism.

Rural heartland areas, in turn, are strong agricultural production areas or rural areas with diverse activities. The majority of the rural heartland municipalities are also located in southern and western Finland. In rural heartland areas larger centres are a little further away, but there are medium-sized centres at a reasonable distance. The situation is quite good as regards the demand for products and services and off-farm employment.

In the sparsely populated rural areas, mainly in eastern and northern Finland, the natural conditions restrict the practising and opportunities of agriculture the most. More than in the other parts of the

Share of agriculture in the labour force and share of farming as in the total income of farms.

	Urban-adjacent rural areas*	Rural heartland areas	Sparsely populated rural areas	Whole country
Share of agriculture in jobs in 2007 (1988)	4.6% (11.1%)	11.4% (21.7%)	12.0% (22.6%)	3.1% (7.5%)
Share of farm income in total income of farms in 2008	36.2%	41.1%	48.4%	41.2%

\* according to the division of rural areas into three types of 2006 and typology of municipalities of 1 January 2010.  
Source: Statistics Finland.

country, long distances are a major obstacle to both off-farm employment and local marketing of products and services.

According to the employment statistics of Statistics Finland, in the three types of rural areas, based on the distribution of municipalities in 2011, the share of jobs in agriculture was 9% in 2008, while in 1988 it was still 19%. The role of agriculture as an employer varies considerably between the different types of rural areas so that in urban-adjacent rural areas the proportional share of agriculture of the jobs is much smaller than in the other types of rural areas. In addition, in all types of rural areas and the whole country the share of agriculture in the labour force is decreasing constantly. In 2008 the share of agriculture in the total number of jobs in Finland was 3%, while in 1988 it was 7.5%.

In 2008 the share of agricultural income in the total income of farms was 41%. The share of agricultural income of the total income of farms is the greatest in sparsely populated rural areas and smallest in urban-adjacent rural areas. Agricultural income also includes farm forestry and other entrepreneurial activities connected to farming practised by diversified farms under the Agricultural Income Tax Act.

Of the other entrepreneurial activities of diversified farms about two-thirds take place under the Agricultural Income Tax Act and one-third under the Act on the Taxation of Trade Income, i.e. the latter is not shown as agricultural income. This means that part of the earnings included in agricultural income in fact derives from other entrepreneurial activities. About a third of the Finnish farms are so-called diversified farms, i.e. engage in other entrepreneurial activities besides agriculture and farm forestry.

The concentration of farms to fewer and fewer areas continues. In recent decades the number of farms has decreased the most in sparsely populated rural areas, especially in eastern Finland. On the other hand, in eastern and northern Finland the

sparsely populated rural areas, faced with the greatest development challenges, have increased the most. Eastern and northern parts of Finland are also particularly strongly affected by the structural change in agriculture. In these areas agriculture is still a significant employer, which is why the consequences of structural change – substituting machines and more advanced technologies for labour – are felt the most strongly.

### **6.5. Resources of the countryside: bioeconomy and space**

When compared to the rest of Europe, the main distinguishing feature for Finland is the very sparse and scattered population, with quite a narrow belt of urban settlement in the south. In the urban-rural typologies of EuroStat or the OECD, only the capital region belongs to the category of the most urban areas. According to the EuroStat typology, most of the surface area of even Europe as a whole is rural, i.e. belongs to the middle one of the three categories. In the ESPON typology most of Europe represents intermediate area between urban and rural. Finland and other Nordic countries are characterised by extensive forest cover and exceptionally sparse and scattered settlement. In Finland the population density is very low, the share of rural areas is particularly high and the distances between the relatively small towns and population centres are long. As an exception to most other countries with sparse population, almost the whole country is populated, i.e. there is settlement in almost all parts of the country.

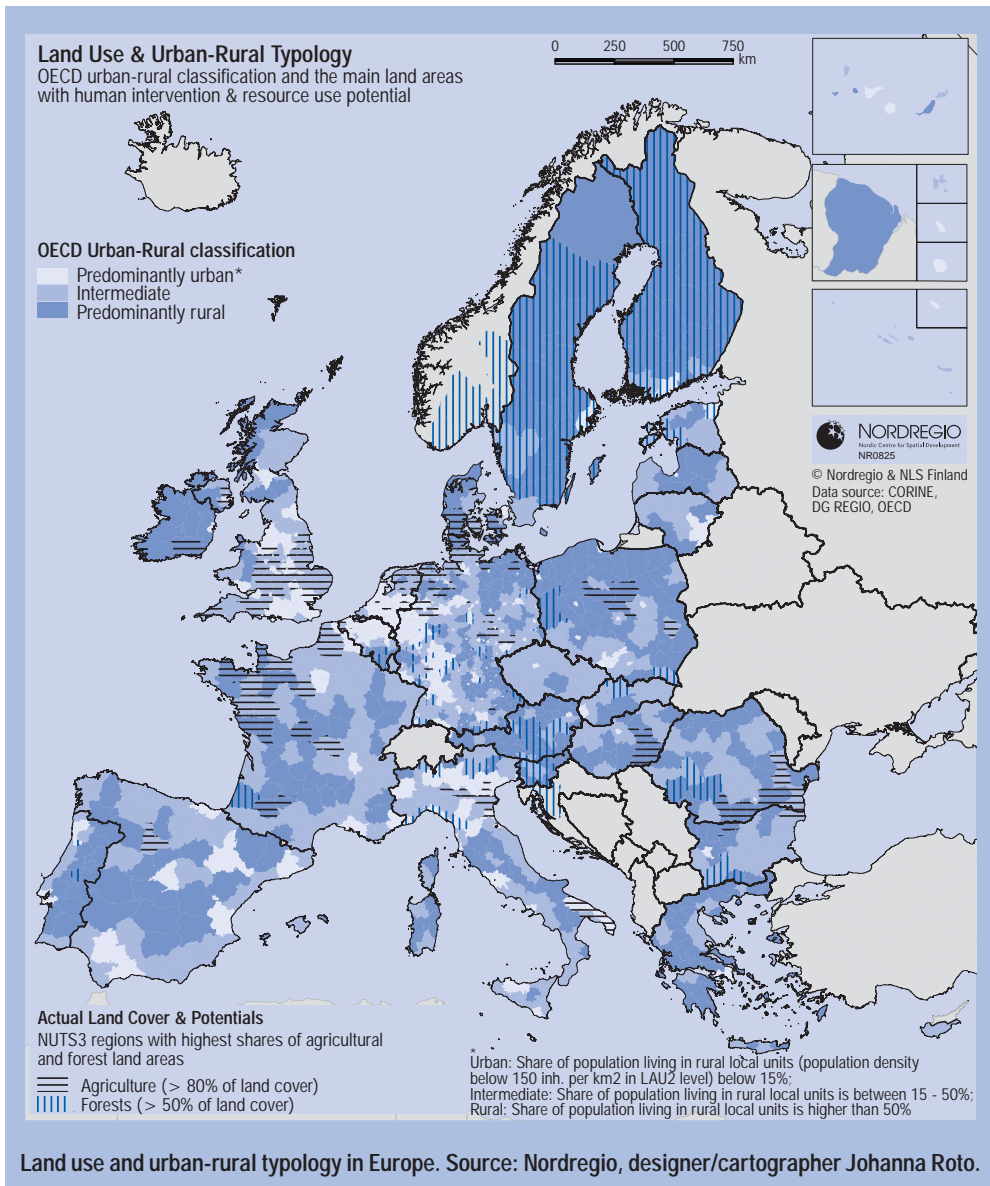
In the global perspective urbanisation of human settlements is proceeding fast. This is mainly due to the population movements in the developing countries, while in the developed world people seek to improve their well-being by moving from areas with high population density to more spacious regions.



The everyday life of the people is constructed in more and more complex ways, which should be better accounted for in the development of regions. While permanent settlement has been concentrating for several decades as reflected, for example, in the growing numbers of people living in population centres, the population density of the centres and community structures have become more scattered. Community structure means the physical and func-

tional entity comprised of the residential, working, service and recreation areas and the transport connections and technical maintenance combining these.

In Finland there is net immigration in the urban areas and urban-adjacent rural areas, but for different reasons. The population gain in towns and cities is primarily based on the growth in immigration to Finland and number of babies born rather than migration between municipalities.



Land use and urban-rural typology in Europe. Source: Nordregio, designer/cartographer Johanna Roto.



Proportionally the population gain was the highest in urban-adjacent rural areas, with birth rate, migration between municipalities and, to a lesser extent, immigration to Finland as the main causes.

Immigrants coming to Finland also live in rural heartland areas and sparsely populated rural areas, especially if there is a reception centre for immigrants or a lot of greenhouse production in the area or it is located close to the eastern border. The share of foreign citizens was considerable in almost all the small municipalities in the Åland Islands (9–11%). Of the rural municipalities in Mainland Finland the share of foreign citizens was the highest in Oravainen (9.4%), Korsnäs (7.8%) and Närpiö (7.0%). For comparison, in the Finnish capital Helsinki foreign residents represent 7.2% of the population.

In sparsely populated rural areas and rural heartland areas the population decreases, but more slowly than about ten years ago. Against the common presumption, the main reason for the decrease is not immigration within the country but the fact that the rate of mortality exceeds the birth rate. The areas concerned are also not becoming depopulated but the settlement becomes thinner and increasingly scattered, which is quite a different thing in terms of the regional policy challenges. Over the past 30 years the total number of squares with permanent settlement has decreased by only a few percentages despite the decrease in the number of residents in areas suffering from population loss.

Although permanent settlement has become increasingly concentrated, the total settled area has grown in Finland in the past 30 years. When holiday homes are also taken into account in the settled km<sup>2</sup> squares, the settled area has grown by more than 10% since 1980. People are seeking more spacious areas to live in, either permanently or part-time, and this is perceived as a significant source of well-being. The role of the countryside is expected to gain in importance in the future, both as

business environments and areas for permanent and free-time residence.

The comparison of the Finnish rural areas to the rest of Europe in terms of economic performance in a research project under the ESPON programme showed that the main rule in regional development according to which good economic performance is strongly linked to good access and concentration of population to urban centres does not apply in Finland. Despite the predominantly rural character and poor access the majority of Finns live in areas with higher than average performance or in growth areas.

The dominant perspective in mainstream regional development thinking, especially in the EU but also within Finland, is that the urban areas are the prime movers in regional development. However, The Finnish geography forces us to also take other development paths into account because in eastern Finland, for example, the towns are too small and far away from each other for them to suffice as the driving force for the whole area. This is why in Finland there is a need for serious consideration of regional development that is founded on the potential of independent rural areas and types of action suited to them. What is needed is practical rural policy that arises from the rural areas themselves and thorough understanding of them. The alternatives to be considered include decentralised energy production and bioeconomy, besides the residence in multiple places described above.

Another recent study under ESPON (Cafe) does not support the view that the structures and operative models of the public sector in the (urban) regions (such as municipalities corresponding to the labour market areas) would as such promote the development of regions. According to the Cafe research project, the economic development of urban areas can be promoted through various systems, but the outcome depends on several other factors besides their administrative structures.

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### Producer price index and index of purchase prices of means of agricultural production (2000=100).<sup>1</sup>

	Producer price index of agriculture <sup>2</sup>	The index of purchase prices of means agricultural production			
		Total index	Goods and services	Investments	Buildings
2011	129.5 <sup>e</sup>	146.0	147.2	141.5	141.5
2010	113.7	130.1	128.1	136.2	134.6
2009	107.2	126.9	124.1	135.2	131.5
2008	119.9	139.5	141.8	134.3	136.6
2007	109.3	122.1	119.1	129.0	132.1
2006	103.2	116.1	113.7	121.6	120.5
2005	98.9	110.8	108.2	116.8	114.0
2004	101.5	107.1	105.1	111.8	109.5
2003	99.0	104.2	102.5	108.1	106.3
2002	103.7	102.8	101.5	105.5	104.6
2001	105.2	102.2	101.8	103.1	102.4
2000	100.0	100.0	100.0	100.0	100.0

<sup>1</sup> Indices are based on EU classifications.

<sup>2</sup> Incl. fur production.

Source: Statistics Finland.

### Structural change in agriculture.

	Number <sup>1</sup> of farms 1,000	Average <sup>1</sup> size of farms, hectares	Number of milk suppliers 1,000	Employed in agriculture <sup>2</sup> 1,000 persons	% of employed
2011	62	37.4	10	80	3.2
2010	63	36.7	11	84	3.4
2009	64	35.9	11	88	3.6
2008	66	35.0	12	88	3.5
2007	67	34.4	13	87	3.5
2006	69	33.3	15	90	3.7
2005	70	33.0	16	91	3.8
2004	72	31.5	17	93	3.9
2003	74	30.6	18	99	4.2
2002	75	30.0	19	106	4.5
2001	77	29.1	21	112	4.7
2000	80	28.0	22	118	5.1
1999	..	..	24	121	5.3
1998	88	25.0	26	120	5.4
1997	90	24.0	28	130	6.0
1996	94	22.9	30	133	6.3
1995	100	21.7	32	141	6.7

<sup>1</sup> A farm refers to a unit with more than 1 ha of arable land that practises agriculture or other entrepreneurial activity.

<sup>2</sup> From 2005 based on new industrial classification TOL 2008.

Sources: Information Centre of the Ministry of Agriculture and Forestry, Statistics Finland.

### Number of animals in June and the average yield per cow.

	Dairy cows 1,000	Yield per cow litres	Pigs 1,000	Hens 1,000
2011 <sup>1</sup>	286	7,859	1,335	3,304
2010 <sup>1</sup>	289	7,896	1,367	3,394
2009 <sup>1</sup>	290	7,850	1,381	2,926
2008 <sup>1</sup>	289	7,767	1,483	3,190
2007 <sup>1</sup>	296	7,796	1,448	3,134
2006 <sup>1</sup>	309	7,646	1,436	3,103
2005 <sup>1</sup>	319	7,505	1,401	3,128
2004 <sup>1</sup>	324	7,404	1,365	3,069
2003 <sup>1</sup>	334	7,251	1,375	3,016
2002 <sup>1</sup>	348	7,117	1,315	3,212
2001 <sup>1</sup>	355	6,932	1,261	3,202
2000 <sup>1</sup>	364	6,786	1,296	3,110
1999 <sup>1</sup>	372	6,443	1,351	3,361
1998 <sup>1</sup>	383	6,225	1,401	3,802
1997 <sup>1</sup>	391	6,183	1,467	4,152
1996 <sup>1</sup>	392	5,993	1,395	4,184
1995 <sup>1</sup>	399	5,982	1,400	4,179
1994	417	5,869	1,298	4,090
1993	426	5,648	1,273	4,025
1992	428	5,613	1,298	3,969
1991	446	5,619	1,344	4,138
1990	490	5,547	1,394	4,845

<sup>1</sup>1.5.

Source: Information Centre of the Ministry of Agriculture and Forestry.

### Sales of fertilizers, kg/ha and hectare yield, f.u./ha.

	Nitrogen kg/ha	Phosphorus kg/ha	Potassium kg/ha	F.u.yield (incl. straw) f.u./ha
2010–11	73.9	5.6	16.1	..
2009–10	80.3	6.5	18.9	..
2008–09	67.1	5.3	16.2	..
2007–08	78.5	7.8	24.3	..
2006–07	73.5	7.9	24.6	..
2005–06	73.9	8.6	25.3	4,673
2004–05	75.0	9.2	25.9	4,826
2003–04	76.5	9.3	26.4	4,630
2002–03	80.0	9.8	27.8	4,478
2001–02	80.5	10.1	28.3	4,692
2000–01	83.2	10.8	31.1	4,531
1999–00	84.2	10.4	30.5	4,900
1998–99	81.0	11.0	31.1	3,146
1997–98	85.0	11.4	32.6	2,980
1996–97	86.0	11.8	32.5	3,816

Source: Information Centre of the Ministry of Agriculture and Forestry.

**Results of the total calculation of agriculture in 2004–2011e at current prices, € million.**

<b>RETURNS, € million</b>	2004	2005	2006	2007	2008	2009	2010	2011e
Farms represented	71,906	69,557	69,635	67,415	66,224	64,316	62,951	61,712
Farms in sample	903	947	952	977	968	959	940	940
<b>GROSS RETURN, € million</b>	<b>4,459</b>	<b>4,593</b>	<b>4,600</b>	<b>4,975</b>	<b>5,034</b>	<b>4,870</b>	<b>5,228</b>	<b>5,478</b>
<b>Return on crop production</b>	<b>419</b>	<b>391</b>	<b>397</b>	<b>742</b>	<b>481</b>	<b>398</b>	<b>601</b>	<b>658</b>
Rye and wheat	80	59	80	163	90	59	131	141
Barley	105	95	111	263	160	124	147	159
Oats, other cereals	49	47	71	129	88	54	101	112
Oilseed crops	16	18	31	28	23	42	57	64
Grass fodder	36	32	17	72	45	30	72	76
Potato and sugar beet	120	127	73	77	64	73	65	79
Leguminous plants and other	13	14	14	10	12	16	28	27
<b>Return on livestock</b>	<b>1,556</b>	<b>1,587</b>	<b>1,573</b>	<b>1,627</b>	<b>1,837</b>	<b>1,756</b>	<b>1,757</b>	<b>1,851</b>
Return on cattle husbandry	1,084	1,064	1,099	1,134	1,254	1,200	1,166	1,245
Return on pig husbandry	259	337	302	294	312	329	307	309
Return on poultry	196	167	142	171	228	154	189	195
Return on sheep, goats, horses, etc.	17	19	29	28	42	73	95	102
<b>Return on horticulture</b>	<b>442</b>	<b>444</b>	<b>448</b>	<b>443</b>	<b>478</b>	<b>471</b>	<b>582</b>	<b>569</b>
<b>Financial return</b>	<b>14</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>16</b>	<b>12</b>	<b>12</b>	<b>12</b>
<b>Other return</b>	<b>171</b>	<b>219</b>	<b>204</b>	<b>229</b>	<b>252</b>	<b>253</b>	<b>250</b>	<b>327</b>
<b>Support payments total</b>	<b>1,857</b>	<b>1,940</b>	<b>1,964</b>	<b>1,923</b>	<b>1,971</b>	<b>1,980</b>	<b>2,027</b>	<b>2,060</b>
CAP support total	484	509	544	544	564	562	573	614
Natural handicap and environment payments	748	750	748	776	791	814	820	833
National and investment subsidy	626	680	673	603	616	604	633	613
<b>COSTS, € million</b>								
<b>PRODUCTION COST</b>	<b>5,819</b>	<b>5,948</b>	<b>5,908</b>	<b>6,110</b>	<b>6,468</b>	<b>6,429</b>	<b>6,602</b>	<b>6,991</b>
<b>Supplies costs</b>	<b>1,516</b>	<b>1,566</b>	<b>1,571</b>	<b>1,605</b>	<b>1,796</b>	<b>1,790</b>	<b>1,789</b>	<b>2,072</b>
Fertilisers, liming	178	183	188	192	210	302	203	268
Other crop production costs	300	301	278	300	316	318	305	334
Fuels	179	206	238	224	291	242	254	333
Electricity	113	105	131	133	153	156	219	256
Purchased fodder cost	455	427	416	432	515	445	441	533
Livestock cost	292	344	321	324	311	328	367	348
<b>Machinery cost</b>	<b>876</b>	<b>906</b>	<b>919</b>	<b>995</b>	<b>1,098</b>	<b>1,084</b>	<b>1,065</b>	<b>1,098</b>
Depreciations on machinery	528	543	557	591	656	638	600	596
Other machinery costs	348	363	362	404	442	446	465	502
<b>Building costs</b>	<b>315</b>	<b>317</b>	<b>335</b>	<b>380</b>	<b>394</b>	<b>372</b>	<b>409</b>	<b>410</b>
Depreciations on buildings	262	261	277	321	328	312	342	341
Other building costs	54	56	59	59	66	60	67	69
<b>Other cost</b>	<b>723</b>	<b>746</b>	<b>769</b>	<b>779</b>	<b>822</b>	<b>830</b>	<b>865</b>	<b>965</b>
Insurances	253	260	279	282	284	286	302	308
Rents	102	101	106	110	116	126	126	127
Other depreciations	44	45	46	48	48	48	47	47
Other costs	323	340	338	340	374	370	390	483
<b>Labour costs</b>	<b>1,782</b>	<b>1,795</b>	<b>1,665</b>	<b>1,633</b>	<b>1,590</b>	<b>1,613</b>	<b>1,611</b>	<b>1,590</b>
Wages paid	170	154	161	170	177	181	195	198
Wage claim	1,613	1,641	1,504	1,463	1,414	1,432	1,415	1,392
<b>Interest costs</b>	<b>606</b>	<b>618</b>	<b>649</b>	<b>718</b>	<b>767</b>	<b>740</b>	<b>865</b>	<b>856</b>
Interest expenses	108	109	124	157	168	136	113	108
Interest claim on own capital	498	509	525	561	599	605	752	748
<b>FINANCIAL RATIOS</b>								
RETURNS, € million	4,459	4,593	4,600	4,975	5,034	4,870	5,228	5,478
PRODUCTION COST, € million	5,819	5,948	5,908	6,110	6,468	6,429	6,602	6,991
Entrepreneurial profit, € million	-1,358	-1,353	-1,304	-1,130	-1,429	-1,558	-1,370	-1,512
Entrepreneurial income, € million	752	797	725	894	584	478	797	627
Profitability coefficient	0.36	0.37	0.36	0.44	0.29	0.24	0.37	0.29
Return on assets %	-5.8	-5.5	-4.7	-2.8	-4.2	-5.1	-3.1	-4.1



## Agricultural support<sup>1</sup>.

### SUPPORT FINANCED COMPLETELY OR PARTLY BY THE EU IN 2012, €/ha or €/unit

Aid area	A	B	C1	C2	C2north	C3	C4
<b>DECOUPLED CAP PAYMENTS, €/ha</b>							
Single payment (regional flat-rate payment), €/ha	249.26	203.04	203.04	168.43	168.43	168.43	168.43
Farm-specific top-ups:							
Farm specific top up for bulls, €/livestock unit	44.10	44.10	44.10	44.10	44.10	44.10	44.10
Farm specific top up for steers, €/livestock unit	31.50	31.50	31.50	31.50	31.50	31.50	31.50
Farm specific top up for starch potato, €/tonne	12.38	12.38	12.38	12.38	12.38	12.38	12.38
Additional payment for milk, €/tonne of the reference quantity	17.14	17.14	17.14	17.14	17.14	17.14	17.14
Farm specific top up for sugar beet, €/tonne	92.82	92.82	92.82	92.82	92.82	92.82	92.82
Farm specific top up for timothy <sup>2</sup>							
<b>PROTEIN AND OILSEED CROPS PREMIUM<sup>3</sup></b>	50	50	50	50	50	50	50
<b>STARCH POTATO PREMIUM</b>	560	560	560	560	560	560	560
<b>CAP LIVESTOCK PREMIUM, €/animal</b>							
Beef premium, bulls and steers	240	240	132	132	132	132	132
Beef premium, suckler cows and suckler cow heifers	160	160	80	80	80	80	80
Dairy cow premium	150	150	-	-	-	-	-
Ewe premium <sup>4</sup>	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Quality premium for slaughter lambs <sup>5</sup>	23	23	23	23	23	23	23
<b>LFA SUPPORT, €/ha<sup>6</sup></b>							
LFA <sup>7</sup> - basic payment	20	20	20	25	25	25	25
- additional payment for livestock farms	80	80	80	80	80	80	80
<b>ANIMAL WELFARE PAYMENT, €/LU</b>							
	Basic conditions			Additional conditions			
Bovines	50.00			17.00–57.00			
Pigs	16.00			4.00–23.00			
<b>ENVIRONMENTAL SUPPORT, €/ha</b>							
	Crop producing farm			Livestock farm			
Cereal, oilseed crops, protein crops, grasses	93			107			
Group 1 horticultural crops (outdoor vegetables etc.)	450			450			
Group 2 horticultural crops (berries and fruits)	438			438			
Nature management fields (perennial grasses)	170			170			
Nature management fields (biodiversity)	300			300			
Certain seed spice plants	181			181			

**Additional agri-environment measures: support areas A, B and C:** reduced fertilisation 10 €/ha, more accurate nitrogen fertilisation of arable crops 23 €/ha, manure spreading during growing season 27 €/ha, plant cover in winter and reduced tillage 11 €/ha, nutrient balances 18 €/ha.

**Additional measures only for areas A and B:** plant cover in winter 30 €/ha, intensified plant cover in winter 45 €/ha, crop diversification 24 €/ha and cultivation of catch plants 13 €/ha.

**Additional measures for horticulture (support areas A, B and C):** more accurate nitrogen fertilisation of horticultural crops 90 €/ha, use of cover for perennial horticultural crops 256 €/ha and use of pest monitoring methods 144 €/ha.

**Contracts concerning special agri-environment measures:** support level 56–450 €/unit of payment.

<sup>1</sup> Includes payments for main products, which means that the table does not cover all support payments.

<sup>2</sup> The farm specific top ups for timothy paid in the whole country total 1.15 mill. €. The support is allocated according to a reference quantity which depends on the average support granted in 2007–2009.

<sup>3</sup> The premiums total 6.5 mill. €. The final level of the premium is determined according to the approved total area. Protein crops which entitle to the premium are field pea (food and fodder pea), field bean and sweet lupin. Mixtures containing more than 50% of the protein crop seed in the total amount of seed sown are also eligible. Premium is paid for the following oilseed crops: winter oilseed rape, winter turnip rape, spring oilseed rape, spring turnip rape, sunflower, oil flax, oil hemp and gold of pleasure (*Camelina sativa*). The premium is subject to the condition that at least 10% of the arable area of the farm is under the eligible crops or mixtures.

<sup>4</sup> Milk production animals 8.4 €/animal. In addition, supplement to less-favoured farming areas 3.5 €/ewe.

<sup>5</sup> Premium is granted on the basis of slaughterings notified to the sheep and goat register for lambs with a carcass weight of at least 18 kg.

<sup>6</sup> In LFA scheme livestock farm is a farm with minimum stocking density of 0.4 LU/ha or the farm has at least 10 LU and the minimum stocking density is 0.2 LU/ha for the whole commitment period

<sup>7</sup> Top-ups to LFA payments are cut due to payment ceilings. In 2009 the payments were 98.3% of the maximum per hectare.

	2007	2008	2009	2010	2011	2012
Unit	€/unit	€/unit	€/unit	€/unit	€/unit	€/unit
<b>NATIONAL SUPPORT FOR AGRICULTURE AND HORTICULTURE</b>						
<b>NATIONAL AID FOR SOUTHERN FINLAND, NORTHERN AID AND AID FOR CROP PRODUCTION</b>						
<b>Aid per livestock unit</b>						
Aid for animal husbandry, suckler cows						
A and B	€/LU	77	73	83	83	83
C1	€/LU	295	295	300	300	300
C2	€/LU	295	295	300	300	300
C2north. and archipelago	€/LU	371	371	376	376	376
C3	€/LU	446	446	451	451	451
C4	€/LU	631	631	636	636	636
Aid for animal husbandry, male bovines >6 months						
A and B	€/LU	199	187	187	187	187
C1	€/LU	414	414	414	414	422
C2	€/LU	422	422	422	422	430
C2north. and archipelago	€/LU	498	498	498	498	506
C3	€/LU	574	574	574	574	582
C4	€/LU	759	759	759	759	767
Aid for animal husbandry, ewes and goats						
A and B	€/LU	194	184	184	184	184
C1	€/LU	390	390	390	390	390
C2	€/LU	398	398	398	398	398
C2north. and archipelago	€/LU	474	474	474	474	474
C3P1–P2	€/LU	664	664	664	664	664
C3P3–P4	€/LU	745	745	745	745	745
C4P4	€/LU	956	956	956	956	956
C4P5	€/LU	956	956	956	956	956
Aid for animal husbandry, pigs						
A and B	€/LU	199	174	*)	*)	*)
C1	€/LU	210	210	**)	**)	**) **)
C2	€/LU	213	213	**) **)	**) **)	**) **)
C2north. and archipelago	€/LU	293	293	**) **)	**) **)	**) **)
C3	€/LU	293	293	**) **)	**) **)	**) **)
C4	€/LU	293	293	**) **)	**) **)	**) **)
Aid for animal husbandry, hens						
A and B	€/LU	201	172	*)	*)	*)
C1	€/LU	201	204	**) **)	**) **)	**) **)
C2	€/LU	204	207	**) **)	**) **)	**) **)
C2north. and archipelago	€/LU	290	293	**) **)	**) **)	**) **)
C3	€/LU	357	360	**) **)	**) **)	**) **)
C4	€/LU	357	360	**) **)	**) **)	**) **)
Aid for broilers and fattening poultry hens						
A and B	€/LU	187	157	*)	*)	*)
C1	€/LU	185	171	**) **)	**) **)	**) **)
C2	€/LU	190	177	**) **)	**) **)	**) **)
C2north. and archipelago	€/LU	277	263	**) **)	**) **)	**) **)
C3	€/LU	277	263	**) **)	**) **)	**) **)
C4	€/LU	277	263	**) **)	**) **)	**) **)

\*) As from 2009 support paid as decoupled payment according to the farm-specific reference quantity of 2007. From 2009 the amount of support decreases by about 6.5% when aid per hectare for livestock farms is taken into account. In 2012 the payments were cut by 20%. The support level is 110 €/LU.

\*\*) As from 2009 support paid as decoupled payment according to the farm-specific reference quantity of 2007. The same amount as in 2008 is paid up to 200 LU. In support areas C1 and C2 this corresponds to 286 sows or 867 fattening pig places (with an assumed three production batches a year), 16,000 hen places and 42,000–43,000 broiler places. For LUs exceeding 200 the payment is the same as in support areas A and B. In 2012 payments were cut by 6–10% on farms with less than 200 LU and by about 20% on farms with more than 200 LU. On small farms the support level is 171 €/LU in area C1, 254 €/LU in area C2, 263 €/LU in area C2 north and 281 €/LU in areas C3 and C4.

	Unit	2007 €/unit	2008 €/unit	2009 €/unit	2010 €/unit	2011 €/unit	2012 €/unit
<b>Northern aid paid for slaughtered animals</b>							
Male bovines C3–C4							
P1–P2	€/animal	131	131	131	131	131	131
P3–P4	€/animal	182	182	182	182	182	182
P5	€/animal	333	333	333	333	333	333
Heifers							
A and B	€/animal	135	144	114	144	144	144
C1	€/animal	269	269	269	299	299	299
C2	€/animal	269	269	269	299	299	299
C2north. and archipelago	€/animal	318	318	318	348	348	348
C3	€/animal	360	360	360	390	390	390
C4	€/animal	446	446	446	476	476	476
<b>Production aid for milk</b>							
A and B	cents/l	3.5	3.2	3.1	3.1	3.2	3.1
C1	cents/l	8.4	8.3	8.1	8.0	8.0	8.0
C2	cents/l	9.0	9.1	8.7	8.7	8.7	8.7
C2north.	cents/l	10.1	10.1	10.0	9.7	9.7	9.7
C3P1	cents/l	13.1	13.1	13.0	12.7	12.7	12.7
C3P2	cents/l	14.8	14.8	14.7	14.4	14.4	14.4
C3P3–P4	cents/l	17.4	17.4	17.4	17.0	17.0	17.0
C4P4	cents/l	22.1	22.1	22.2	21.7	21.7	21.7
C4P5	cents/l	31.1	31.3	31.4	30.9	30.9	30.9
<b>Aid for crop production</b>							
C1 area <sup>1</sup>							
Wheat	€/ha	57	47	47	47	47	38
Rye	€/ha	112	112	112	150	150	150
Malting barley	€/ha	70	70	70	-	-	-
Oil seed plants	€/ha	100	100	100	120	120	120
Starch potatoes	€/ha	133	133	133	133	133	133
Vegetables grown in the open	€/ha	348	348	348	348	348	348
Other arable crops excl. cereals	€/ha	100	100	100	120	120	120
C2 and C2north. areas <sup>1</sup>							
Wheat	€/ha	57	47	47	47	47	38
Rye	€/ha	112	112	112	150	150	150
Malting barley	€/ha	70	70	70	-	-	-
Oil seed plants	€/ha	27	27	27	47	47	47
Starch potatoes	€/ha	133	133	133	133	133	133
Vegetable grown in the open	€/ha	348	348	348	348	348	348
Arable crops excl. cereals	€/ha	27	27	27	47	47	47
C3 and C4 areas							
Vegetable grown in the open	€/ha	348	348	348	348	348	348

<sup>1</sup> C area Northern aid.

	Unit	2007 €/unit	2008 €/unit	2009 €/unit	2010 €/unit	2011 €/unit	2012 €/unit
<b>Aid for special crops in southern Finland</b>							
A and B areas							
Starch potatoes	€/ha		105	100	100	100	100
Vegetable grown in the open	€/ha		105	100	100	100	100
<b>Aid per hectare of livestock farms</b>							
A and B areas	€/ha		33	30	30	36	37
<b>National aid for sugar beet</b>	€/ha	267	350	350	350	350	350
<b>General area payment C2–C4</b>							
Cereals and other arable crops							
C2, C2north and archipelago	€/ha	30	30	30	33	33	33
C3	€/ha	46	46	46	49	49	49
C4	€/ha	97	97	97	100	100	100
Other crops							
C2, C2north. and archipelago	€/ha	35	35	35	33	33	33
C3	€/ha	51	51	51	49	49	49
C4	€/ha	102	102	102	100	100	100
<b>General area payment for young farmers C1–C4</b>	€/ha	36	36	36	36	36	36
<b>Aid for greenhouse products A and B</b>							
over 7 months	€/m <sup>2</sup>	11.3	11.3	11.0	10.9	11.4	11.1
2–7 months	€/m <sup>2</sup>	4.1	4.0	4.0	4.4	4.4	4.1
<b>Aid for greenhouse products C1 and C2</b>							
over 7 months	€/m <sup>2</sup>	11.3	11.2	11.7	12.3	11.1	11.4
2–7 months	€/m <sup>2</sup>	4.8	4.3	4.3	4.7	4.9	4.4
<b>Aid for greenhouse products C2P</b>							
over 7 months	€/m <sup>2</sup>	11.3	11.3	13.2	11.7	12.3	11.4
2–7 months	€/m <sup>2</sup>	4.3	4.3	4.3	4.7	4.9	4.4
<b>Aid for greenhouse products C3–C4</b>							
over 7 months	€/m <sup>2</sup>	11.3	11.3	11.2	11.7	12.3	11.4
2–7 months	€/m <sup>2</sup>	4.3	4.3	4.3	4.7	4.9	4.4
<b>Northern storage aid for horticulture products</b>							
A and B							
Storages with thermo-control system	€/m <sup>3</sup>	11.0	13.6	14.2	14.2	14.2	14.2
Storages without thermo-control system	€/m <sup>3</sup>	6.8	8.4	8.8	8.8	8.8	8.8
C areas							
Storages with thermo-control system	€/m <sup>3</sup>	14.2	14.2	14.2	14.2	14.2	14.2
Storages without thermo-control system	€/m <sup>3</sup>	8.8	8.8	8.8	8.8	8.8	8.8
<b>Conversion coefficient of livestock units in national aid</b>							
Livestock unit							
Suckler cows	1	She-goats	0.48	Farmed mother mallards and pheasants	0.013		
Suckler cow heifers, over 2 years	1	Sows, boars	0.7	Horses			
Suckler cow heifers, 8 months–2 years	0.6	Chickens, incl. mother hens	0.013	- breeding mares (horses and ponies)	1		
Bulls and steers, over 2 years	1	Broilers	0.0053	- Finnhorses, at least 1 year	0.85		
Bulls and steers, 6 months–2 years	0.6	Broiler mothers	0.025	- other horses 1-3 years	0.6		
Ewes	0.15	Mother geese, ducks and turkeys	0.026				
<b>Establishment of livestock units for fattening pigs, young breeding sows, young breeding boars, turkeys, geese, ducks and farmed mallards and pheasants</b>							
13 slaughtered fattening pigs	1 LU	585 slaughtered ducks		1 LU			
13 young sows or boars sold for breeding	1 LU	1,375 slaughtered farmed mallards		1 LU			
223 slaughtered turkeys	1 LU	1,375 slaughtered farmed pheasants		1 LU			
325 slaughtered geese	1 LU						

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