

Trends and skills needs in innovative agri-food and forestry-wood chains

Papers presented at Cedefop/Skillsnet workshop

“Future skill needs: innovation in agri-food and forestry-wood chains”

in November 2006 in Portugal

About the workshop

The workshop was organised by the **European Centre for the Development of Vocational Training** (Cedefop), in the framework of its international network on early identification of skill needs “Skillsnet” (www.trainingvillage.gr). The workshop took place in Portuguese Farmers Confederation (CAP) in Lisbon in Portugal on 20 and 21 November 2006.

Background information

The agri-food complex, including the forestry and wood processing sector, is changing fast. The sector is restructuring fundamentally; organizations are operating more and more in networks and chains. The reason for this is to achieve a good trade-off between factors regarding people, planet and profit. Furthermore, there is a lot of research and innovation going on which lead to new products, new production processes, and new ways of marketing oriented towards changing consumer demands. Furthermore, trends like technological innovation, globalization, sustainability, scale enlargement, reducing labour costs, regulations, health protection, risk and hazard management, safety issues, quality management, and even climate change and shifts in power, all influence the present and future tasks of workers involved. These sectors employ over 6 million persons, apart from the 16 million family forest owners, and the many entrepreneurs in micro-enterprises who do not show up in most statistics.

Workshop objective

The main aim of the workshop was to identify the future skill needs in the food and nutrition as well as the forestry and woodworking sector, and new skill needs that are emerging because of new and increasing links with other sectors, including manufacturing and services.

Table of content

About the workshop	2
1. Future skills needs in the agri-food and forestry-wood chains in Europe	6
Martin Mulder, Wageningen University, the Netherlands	
2. The EU rural development policy 2007-2013 and its relevance for skill needs in the agri-food sector.....	51
Ester Hortet Tarroja, DG Agriculture and Rural Development, the European Commission	
3. Scenarios for the future development of the European food and beverage industry	59
Tine Andersen, Danish Technological Institute, Denmark	
4. Changes in the European food and beverage industry and its needs for skills and competences	75
Jan Gravemaker, Aequor, the Netherlands	
5. Innovation and skill needs of workers in the food sector.....	82
Sikke Meerman, Unilever, the Netherlands	
6. Food risk communication: the implications for food safety skills development.....	90
Mary Brennan, University of Newcastle upon Tyne, the United Kingdom	
7. Development in skills needs in organic farming	95
Bas Timmers, Warmonderhof Training Centre, Groenhorst College, the Netherlands	
8. Trends and developments in the fishery sector.....	104
Marianne Raben Olrik, Danish Fisheries Association, Denmark	
9. Future skills needs in the agriculture and food sectors in the Czech Republic	110
Zorka Husová, National Institute for Technical and Voc. Education, Czech Republic	
10. Innovation and skill needs in the woodworking industry	115
Tapani Savisalo, Finland	
11. New skills and qualifications for the trees and timber industry	120
Peter Martin, Lantra Sector Skills Council, the United Kingdom	
12. Summary and conclusions	132
.....Martin Mulder, Sanne Schaafsma, Renate Wesselink, Wageningen University, the Netherlands	

List of tables and figures

Tables

Table 1:	Structure of NACE Rev. 2 sections A and C.....	14
Table 2:	Skills of agricultural consultants	39
Table 3:	Skills of open innovation teams in agri-business	40
Table 4:	EU rural development policy 2007-2013	57
Table 5:	State of drivers in the three scenarios for the food industry 2016.....	64
Table 6:	General trends in skill needs in the European food and beverage industry	83
Table 7:	The volume of the fishery production change in the EU between 1994 and 2004 (in tonnes)	108
Table 8:	Increasing global production	109
Table 9:	Decreasing number of vessels in the fishery industry in Europe.....	110
Table 10:	Decreasing tonnage in the fishery industry in Europe.....	110
Table 11:	Old vessels in the fishery industry in Europe (in %).....	111
Table 12:	Employment change in the fishery sector 1994-2004	112
Table 13:	Competence mapping method	120
Table 14:	Competence mapping: harvesting operator	121
Table 15:	Competence mapping: paper machine operator	122
Table 16:	Competence mapping: sawmill operator	122
Table 17:	Draft STEEP analysis for trees and timber industry.....	127
Table 18:	Skill gaps in the UK forestry workforce.....	132

Figures

Figure 1:	Employment in agriculture in the EU-15 (1995) and the EU-27 (2005) and Norway (in thousands).....	22
Figure 2:	Employment in the food industry in the EU Member States and Norway (1999 and 2004)	23
Figure 3:	Qualification level of workers in agriculture, industry and service sectors	35
Figure 4:	Qualification level of workers in NACE 15 and 20, EU-27, 2005.....	36

Figure 5:	Employment composition by level of education of skilled agricultural and fishery workers in selected EU Member States in 2006 (in millions).....	36
Figure 6:	Number of graduates from agricultural, forestry and fisheries education fields at ISCED levels 3 and 4 in 2004	43
Figure 7:	Organic and in conversion land area (million ha)	102
Figure 8:	Organic certified and in-conversion land area in EU-27 as % of utilised agricultural area	102

1. Future skills needs in the agri-food and forestry-wood chains in Europe

Martin Mulder, Wageningen University, the Netherlands

Abstract

This chapter is about future skill needs in the agriculture, food industry, forestry and wood-working sectors. The chapter starts with the sectors' definitions and explains the main points of the common agricultural policy (CAP) of the European Union (EU). It follows with the description of the socio-economic profile of the sectors and major recent developments. Subsequently, employment trends and prospects in the sectors are presented. Analysis of general, specific and innovative skills required by the sectors is followed by requirements in terms of qualification levels for workers in agriculture, food and wood. Finally, current and expected skill gaps and/or shortages in particular occupations are indicated taking into account supply of skills for the sectors. Conclusions and recommendations are drawn for future training and policy measures. In this chapter, the agri-food sector gets relatively more attention than the forestry-wood sector due to its much bigger and diverse character.

1.1. Introduction and general agricultural policy of the EU

This chapter is about future skill needs in the agriculture, food industry, forestry and wood-working sectors, in short, the food and wood sectors. Many changes occur in these sectors, such as restructuring, product innovation, production process innovation, service orientation, demand-driven production, supply-chain development, and the implementation of measures for increasing sustainability. In the primary sector such changes lead to

- (a) new skill needs in terms of finding new lines of business for those farmers and farming families who close their businesses,
- (b) growth management skills for those who expand their enterprise and who have to deal with larger groups of employees,
- (c) asset management skills for big international farmers who are creating large-scale green houses and who are investing substantial amounts of capital that needs to be supported by venture capitalists,
- (d) diversification skills for farmers who go into regional food production,
- (e) skills and knowledge about tourism, or care-farming, part-time farming for those who develop activities in other sectors next to the farm income.

Much of the production of food and beverage takes place in international chains and networks. The production, packaging and transportation are being controlled by various systems, using mini-transponders.

In other sectors which are related to the provision of food and wood products, innovation and chain development is also taking place, which impose new skills requirements.

Agriculture has been an essential policy area in the European Union, and it still is. Food security and affordable food prices have been the policy aim of the EU for decades. Since the food crises and overproduction problems, food safety, animal welfare and sustainable food production have become key societal concerns (see Box 1). This has led to a renewed European agricultural policy in which sustainability and rural development have a high priority.

Box 1: The common agricultural policy (CAP) of the EU¹

The CAP goes back to the 1950s, and has been the biggest of all the Union's policy areas. The EU has more power in agricultural policy, and it has passed more legislation on agriculture than in any other single policy area.

The CAP created problems because it subsidised production as such, leading to massive overproduction. Therefore, in the 1990s, the CAP was revised.

‘Many important changes to the CAP were made in the 1990s. Production limits helped reduce surpluses and a new emphasis was placed on environmentally sound farming. Farmers had to look more to the market place, while receiving direct income aid, and to respond to the public’s changing priorities.

This shift of emphasis included a major new element – a rural development policy encouraging many rural initiatives while also helping farmers to diversify, to improve their product marketing and to restructure their businesses. A ceiling was put on the budget to reassure taxpayers that CAP costs would not run out of control. In 2003 a further fundamental reform was agreed.

Farmers are no longer paid just to produce food. Today’s CAP is demand driven. It takes consumers’ and taxpayers’ concerns fully into account, while giving EU farmers the freedom to produce what the market wants. In future, the vast majority of aid to farmers will be paid independently of what or how much they produce. In the past, the more farmers produced the more subsidy payments they received. Under the new system farmers will still receive direct income payments to maintain income stability, but the link to production has been severed. In addition, farmers will have to respect environmental, food safety and animal welfare standards. Farmers who fail to do this will face reductions in their direct payments (a

¹ European Communities (2004). The Common Agricultural Policy Explained. http://ec.europa.eu/agriculture/publi/capexplained/cap_en.pdf (accessed 07-03-2007).

condition known as ‘cross-compliance’). Severing the link between subsidies and production (usually termed ‘decoupling’) will make EU farmers more competitive and market-oriented. They will be free to produce according to what is most profitable for them while still enjoying a desirable stability of income.’ (EC, 2004, p.9)

The 2003 reform of the CAP also introduced the “modulation principle”: reduction in direct payments for bigger farms, to finance the new rural development policy².

With the enlargement of the EU to 10 new Member States, in 2004, the CAP faces new challenges, especially the fact that the large agricultural production potential of the new Member States is far from being used to its full extent.

During the last years, important reforms were also introduced in specific agricultural sub-sectors, such as wine, sugar, and fruits and vegetables.

As regards to the wine sector, the Commission called for a root-and-branch reform of the common market organisation for wine, in June 2006. The objectives of the reform are: ‘to increase the competitiveness of the EU's wine producers, strengthen the reputation of EU quality wine as the best in the world, recover old markets and win new ones in the EU and worldwide; to create a wine regime that operates through clear, simple rules – effective rules that ensure balance between supply and demand; and to create a wine regime that preserves the best traditions of EU wine production and reinforces the social and environmental fabric of many rural areas’³ (EC, 2006, p.7).

Concerning the sugar sector, a radical reform was adopted in February 2006. This reform ‘will ensure a long-term sustainable future for sugar production in the EU, enhance the competitiveness and market-orientation of the sector and strengthen the EU’s position in the current round of world trade talks. The key to the reform is a 36 percent cut in the guaranteed minimum sugar price, generous compensation for farmers and, crucially, a Restructuring Fund as a carrot to encourage uncompetitive sugar producers to leave the industry’⁴. (EC, 2006a).

Finally, regarding the fruit and vegetables (F&V) sector, the Commission proposed some reforms in January 2007. ‘The proposals aim to improve the competitiveness and market orientation of the F&V sector, reduce income fluctuations resulting from crises, increase consumption, enhance environmental protection and, where possible, simplify the rules and reduce the administrative burden. The reform would encourage more growers to join producer

² Support to farmers in OECD countries accounted for 29% of farm receipts in 2005. Source: OECD (2006). Agricultural Policies in OECD Countries: At a Glance; https://www.oecd.org/document/4/0,2340,en_2649_33773_36967364_1_1_1_1,00.html (access date: April 27, 2007).

³ (http://ec.europa.eu/agriculture/capreform/wine/index_en.htm) (accessed: April 20, 2007).

⁴ (<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/06/194&format=HTML&aged=0&language=EN&guiLanguage=en>) (accessed: April 20, 2007).

organisations (Pos); offer POs a wider range of tools for crisis management; integrate the F&V sector into the single payment scheme; require a minimum level of spending on environmental measures; higher EU funding of organic production and promotional measures; and abolish export subsidies for F&V'⁵. (EC, 2007).

Source: EC: The Common Agricultural Policy Explained. 2004.

For many people agriculture is synonymous to the primary production sector. However, the agri-food complex is much more than that. It encompasses the primary production indeed, but also trade (wholesale and retail), industry (food processing, machine construction for the agri-food sector), services (logistics, financing, insurance), and public administration (regulation, legislation).

Since World-War II many countries have set up research, development and dissemination systems, also referred to as 'agricultural knowledge systems'. Many national agricultural research organisations were created and intensively worked together in an international framework. Since food policy is a global issue, there is also a strong link with global food supply and development work. The Consultative Group on International Agricultural Research (CGIAR) serves as an umbrella organisation of research centres at global level which supports and conducts agricultural research. Stakeholders in the CGIAR represent over 50 countries, various foundations, and a number of international and regional organisations, such as the European Commission, the Food and Agriculture Organisation of the United Nations (FAO), the United Nations Development Programme, the United Nations Environment Programme, the World Bank, the African Development Bank, and the Asian Development Bank. CGIAR covers various research centres such as the International Food Policy Research Institute, the International Livestock Research Institute, the International Rice Research Institute, and the World Fish Center, the World Agroforestry Centre and the Center for International Forestry Research.

The agri-food sector is a true global sector. Food products are sourced from all over the world. It is not uncommon that the daily food and beverage consumption of a European citizen consists of products (or at least of ingredients) that come from various continents, such as apples from the Fuji islands, bananas from Asia, beef from Latin America, and cheese and ham from Europe.

Although agriculture, food production and forestry are sectors with a strong global character, this report confines itself to the European Union. In the EU, the agrifood complex is involved in a systems innovation process. This means that the traditional 'research-development-dissemination' paradigm is abandoned, and a new holistic, sustainable paradigm is adopted. This paradigm consists of the co-called triple P-philosophy, which states that 'people', 'profit' and 'planet' should be in balance. In other words, sustainable production is key here, which is also indicated as a major policy area in the review of the Lisbon strategy (EU Council 2006). This leads to many changes, even to the closure of agricultural establishments.

⁵ (http://ec.europa.eu/agriculture/capreform/fruitveg/index_en.htm) (accessed: April 20, 2007).

Farms that were created generations ago now are being transformed in service enterprises, for instance for (mental) care, environmental education, tourism, and consultancy, or in private accommodation. This generally indicates the multifunctionality of agriculture and diversification of activities. Boundaries between agriculture, tourism, nature conservation, landscape architecture, land use planning, health care, and services in general are blurring.

1.2. Socio-economic description of the sectors and major recent developments

Agriculture, food industry, forestry and wood working are very broad, and include a number of subsectors. The NACE (rev. 2)⁶ sections A (agriculture, forestry, and fishing), and C (manufacturing) are the following (see Table 1).

Table 1: Structure of NACE Rev. 2 sections A and C

Section A	AGRICULTURE, FORESTRY AND FISHING
01	Crop and animal production, hunting and related service activities
02	Forestry and logging
03	Fishing and aquaculture
Section C	MANUFACTURING
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials

Source: <http://ec.europa.eu/eurostat/ramon>

The food and wood sectors are highly heterogeneous as are occupations in these sectors. This will be elaborated in the next section of this chapter. It is impossible in the framework of this chapter to give a detailed socio-economic description of the subsectors and classes and the developments in those classes. Therefore, this chapter will indicate the most important socio-economic data at sector level, and give an overview of general developments across the sectors.

The latest report of the European Commission ‘European industry: a sectoral overview’ (EC, 2005)⁷ provides the most general and recent socio-economic analysis of the sector. The report

⁶ (<http://forum.europa.eu.int/irc/dsis/nacecpacon/info/data/en/NACE%20Rev%20%20and%20correspondences.rtf>) (accessed April 20,2007).

gives a competitiveness assessment of various sectors, including the food and wood industries (however, not for the agricultural sector separately).

1.2.1. The food industry

Regarding the food industry the report states that this industry is the biggest in the manufacturing sector. It enjoys:

- 13.6% of the total manufacturing turnover,
- € 725 billion production, € 815 billion for the EU 25,
- 13,1% of employment,
- 11,6% value added,
- 1.8% growth in production,
- 1.1% growth in value added over the last 10 years,
- negative employment growth rates,
- positive productivity growth rates,
- relatively low investment rate,
- high labour costs,
- a skewed distribution of the market share: Germany, France, Italy, Spain and the UK have a 70% market share of the EU-25. The new Member States only 7.5%.

The report further states that the EU food industry sector is extremely fragmented and that it consists of a great number of SMEs that have limited access to innovation compared with international companies.

It continues with: ‘Positive but low labour productivity growth (0.8% over 1995-2001, compared to 2.7% in 1990-1995), reflects the difficulty to disseminate ICT in SMEs (19% of companies are using on-line procurement; business to consumer e-commerce is very limited), and limited innovation for the creation of new products and production processes - particularly biotechnology (EU is lagging behind the USA with 30% less biotechnology patent applications in all domains). The EU has engaged to phase out export refunds for Processed Agriculture Products.’ (EC, 2005)

1.2.2. The wood industry

Regarding the wood industry, the report states that this sector holds:

⁷ http://ec.europa.eu/enterprise/enterprise_policy/industry/com_2005/sec_2005_1216.pdf (accessed: April 20, 2007).

- 1.94% of production output out of the total EU manufacturing;
- 2.11% of added value;
- 3.49% of jobs;
- 131,000 enterprises;
- 15% production volume increase between 1998 and 2002;
- an increased labour productivity (largely caused by automation and information technology);
- a decrease in employment (also caused by a shortage of students in vocational education in this sector and the poor image of the sector).

Furthermore, 80% of the wood which is used within the EU for industrial processing and energy is supplied by EU Member States. 65% of the annual EU forest wood growth within the EU is used for industrial processing and energy. Use of wood for industrial processing and energy could be increased without any major impact on the environment⁸.

The report is positive about the strong technology, know-how and skill base, and ‘the proximity and access to one of the world’s largest and most sophisticated markets’. ‘Competitive weaknesses relate to the EU lack of “wood culture”, high factor costs, but globally set prices, all causing low profitability. This can sometimes be exacerbated by over-capacity. The industries main opportunities lie in expanding the use of wood by promoting wood as a lifestyle product, since the main internal threat is the increasing substitution by other materials, out of a failure to properly market the “green” properties of wood. Other advantages may be obtained from geographic clustering and other synergies between sub-sectors, as well as from participating in the supply chains from cost-competitive regions.’ (EC, 2005)

1.2.3. Co-operatives in the agri-food sector

There is a considerable group of farmers and employees who work together in co-operatives. Many farmers need to do so in order to survive, according to General Confederation of Agricultural Co-operatives in the European Union (Cogeca)⁹. The largest co-operatives are multi-billion organisations, like the following five biggest ones:

- (a) Metsäliitto (Finland) in the forestry sector, with an turnover of 8,3 billion Euros,

⁸ It is however important to note that wood would become too expensive in many cases. Deforestation is an issue in Europe where nature conservation and recreation is in conflict with further use of forests for the wood production.

⁹ This information about co-operatives is from Cogeca , the General Confederation of Agricultural Co-operatives in the European Union. E. Baamonde Noche, President of Cogeca, Madrid on 22 November 2005, ‘Agricultural Co-operatives in the European Union’ Source: http://www.copa-cogeca.be/pdf/p_05_227s_1e.pdf, retrieved 06-03-2007.

- (b) Bay Wa (Germany) in the supplies sector, with a turnover of 5,9 billion Euros,
- (c) Arla Foods (Sweden-Denmark) in the milk and dairy sector with a turnover of 5,5 billion Euros,
- (d) Danish Crown (Denmark) in the milk and dairy sector with a turnover of 5,4 billion Euros, and
- (e) Friesland Coberco Dairy Foods (the Netherlands), also in the milk and dairy sector, with a turnover of 4,6 billion Euros.

Cogeca believes that education and training are a fundamental tool to promote necessary changes. They also think that specific training is necessary for members of boards of co-operatives and other elected members. Cogeca supports the development of education and training actions in Member States while recognising the need and convenience of having an European approach, which can be facilitated by international seminars and advanced and specialised training.

1.2.4. General developments in the food and wood sectors

Regarding general developments in agriculture (and fisheries), manufacturing of food, forestry, and manufacturing of wooden products, various trends can be mentioned. The sectors collectively face:

1.2.4.1. Stronger regulation

Food safety is a good example here, but also safe working conditions are at stake, since the primary sector, forestry and fisheries included, is an injury sensitive sector. For food safety, control is getting more and more strict, and is being realised at EU level. This has major implications for work and production processes, including transportation of products from the food and wood sectors. Tighter regulation also implies that entrepreneurs, managers and workers in the sectors need higher skill levels.

1.2.4.2. Globalisation

For example, fresh food is purchased from all over the world, which results in tighter logistics, the improvement of cold chains, e-access to auctions, and competitive targets. In the flower industry, auctions try for instance to reach supermarkets in one day. Global sourcing and trading also leads to increased skill needs, for instance in fields like international market knowledge, national and international trading systems, logistics, and intercultural communication.

1.2.4.3. Sustainability

There is a rising consciousness that the current production and consumption levels are not sustainable, and that the emission of green house gasses needs to be reduced, that energy use based on non-renewable resources need to be cut back, that food miles need to be reduced and that waste has to be processed in sustainable ways. At company level this is referred to as corporate social responsibility. Sustainability also leads to new practices in farms and companies being an additional burden for them.

1.2.4.4. Climate change

Climate change can lead to the introduction of various new (plant and animal) diseases in the EU, which means that producers need to be alert to this, and that where needed, they can take appropriate action.

1.2.4.5. Competition

Competition is very much about price and quality. Winners will be those who can produce at the lowest cost and the highest quality. Cost reduction and quality improvement both demand higher skill levels too. It is not possible anymore to enter the high-end agri-food or forestry-wood sectors as entrepreneur without a thorough knowledge of the field (the products), management, marketing, and corporate strategy in the enterprise.

1.2.4.6. Dealing with the public

The public has diverse expectations of the food and wood sectors. Expectations are amongst others: room for recreation in the countryside, an attractive landscape, animal welfare, diminishing use of chemicals for agriculture, a healthy environment, nature conservation, rural development, living in rural areas, food safety, and diversity. This means that primary producers, but also manufacturers, have to deal with a multitude of new actors. This consumes a considerable amount of time and energy, especially when there are conflicts between the actors. This also requires new and socially more complex skills.

1.2.4.7. Chains and networks

There is hardly any room left for individual and small entrepreneurs who would like to go commercial. For these small-holders, cooperation at cluster level is necessary. A cluster is a conglomerate of private and public organisations around a certain product. Small-holders can work together in co-operatives, who are linked to auctions of large manufacturers, wholesale of retail organisations.

1.2.4.8. *Food crises*

The last decades have shown various food crises, such as foot-and-mouth, BSE, pig pest, and the avian flue to name a few. But also food manufacturers have had various problems with a number of their products, as a result of which they had to recall products from the market. Prevention, food crisis management, and risk communication are essential in this respect, and those organisations which are capable in this have a competitive advantage. To underscore the importance of food for public health, the EU has established the European Food Safety Authority (the EFSA in Parma, Italy)¹⁰.

1.2.4.9. *Technological innovation*

There is a continuing technological innovation going on, both in the food and wood sectors. In crop production, robots are being developed for automatic picking (which is very labour intensive), in food production bio-nanotechnology is being used for health and lifestyle purposes (see Box 2), in the fisheries new technologies are being introduced on vessels, and also in the forestry and wood manufacturing automation is used in e.g. sewing and milling machines. However, the amount of technological innovation is spread unevenly across different sectors and subsectors.

1.2.4.10. *Ageing workforce*

In various subsectors, the workforce is ageing. For jobs which become obsolete this is less of a problem, but for jobs which need new young workers, it is. An example of this situation is the fisheries, in which there is a need for new skilled workers.

Box 2: Examples of practical use of bio-nanotechnology in the food, health and other sectors

Bio-nanotechnology also hits the food sector. In general, nanotechnology enables to place a 40,000 page encyclopaedia on the point of a needle. The inner side of a pack of a yoghurt can be provided with an anti-bacterial surface of nano-molecules which prevents bacteria to attach to them. Or, there are suntan filters on the market which contain nano-molecules of zinc-oxide which stop ultra-violet radiation. In Japan self-cleaning textiles which can be moistened, and the dirt can be shaken off the fabric due to a nano-coating. The car industry uses anti-scratch paints based on nano-molecules. In the food industry, bio-nanotechnology is being used to improve food safety. For instance to sterilize milk without heating it. Or by injecting tiny balls of mayonnaise with water, to create a skimmed variety without losing taste. It is also possible to make nano-coatings around health promotion substances which are decomposed by the acids in the stomach, to lead them further down the digestion system. New coatings for green houses enable light passage and retain warmth. It is expected that in the supermarket, consumers can choose the amount of fat in dairy products, the amount of sugar in syrup. The

¹⁰ <http://www.efsa.europa.eu/en.html>.

next step is to have a nano-installation at home. It is also expected that small devices (comparable with mobile phones) will become available to quickly test whether food is contaminated with bacteria or other disease-causing substances. Nano-technological applications are most advanced in health care, where experiments are being conducted to link mechanical devices to brain cells, enabling paralysed persons to move again.

Source: Peter de Jaeger (2005) *EOS Magazine*, 22, 4, p. 34-38.

1.3. Employment trends and prospects in the sectors

As was clear from the previous section, there is much variation in the food and wood sectors. As stated, this variety is even enlarged by the multitude of occupations which exists within these sectors. The International Standard Classification of Occupations (1988 version) lists over 100 occupations that exist in the agri-food and forestry-wood sectors. These are categorised in:

- (a) elementary occupations, such as farm-hands and labourers;
- (b) service workers and shop and market sales workers, such as shop, stall and market salespersons and demonstrators (in the food retail sector);
- (c) skilled agricultural and fishery workers, such as gardeners, horticultural and nursery growers, and dairy and livestock producers;
- (d) craft and related trades workers, such as agricultural- or industrial-machinery mechanics and fitters and bakers, pastry-cooks and confectionery makers;
- (e) plant and machine operators and assemblers, such as wood-processing-plant operators, and dairy-products machine operators;
- (f) technicians and associate professionals, such as safety, health and quality inspectors, life science technicians, agronomy and forestry technicians and farming and forestry advisers, buyers, and appraisers, valuers and auctioneers;
- (g) professionals, such as biologists, botanists, zoologists, and agronomists;
- (h) legislators, senior officials and managers, such as production and operations managers in agriculture, hunting, forestry and fishing, production and operations managers in manufacturing, supply and distribution managers, research and development managers, managers of small enterprises in agriculture, hunting, forestry and fishing, and managers of small enterprises in manufacturing.

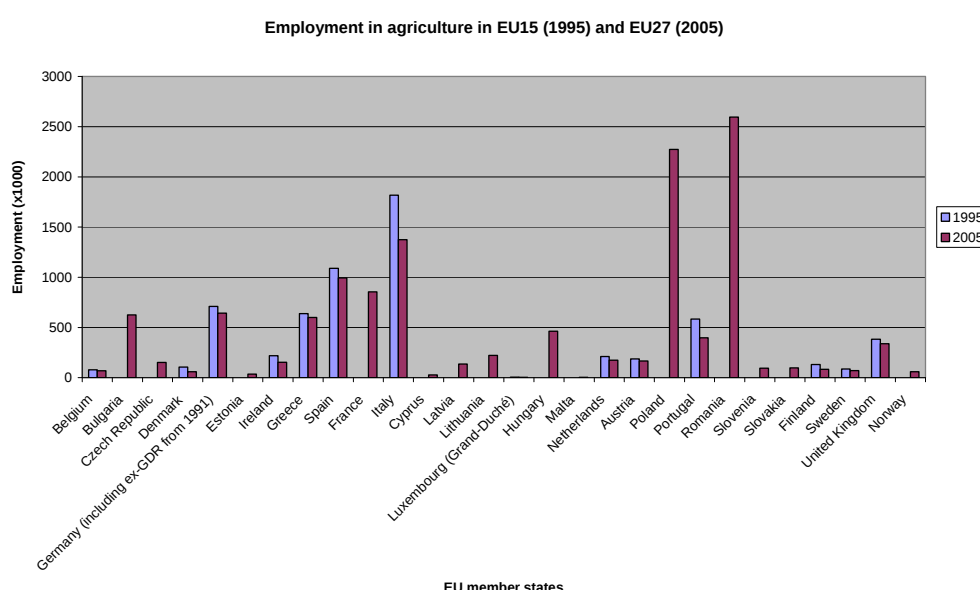
Despite this huge diversity, this chapter will try to present general employment trends and prospects in the sectors.

Although in general employment in agriculture has been decreasing, total employment in the sector in the EU-27 was 9,5 million people in 2005 (compare to 7,3 million in 1995 in EU-15). This can largely be attributed to the fact that in two largest new Member States Romania

and Poland employment in agriculture is much higher than in old Member States (see Figure 1). For the EU-15, the decrease in employment in agriculture between 1995 (7, 3 million) and 2003 (6,3 million) was 13%. The decrease in the EU-25 (i.e. Romania and Bulgaria not counted) between 2003 (9.859.320) and 2005 (9.490.820) was 4%.

It is expected that because of restructuring, much of the subsistence farming in Romania and Poland will also be decreasing, and that many current job holders in agriculture will leave that sector.

Figure 1: Employment in agriculture in the EU-15 (1995) and the EU-27 (2005) and Norway (in thousands)



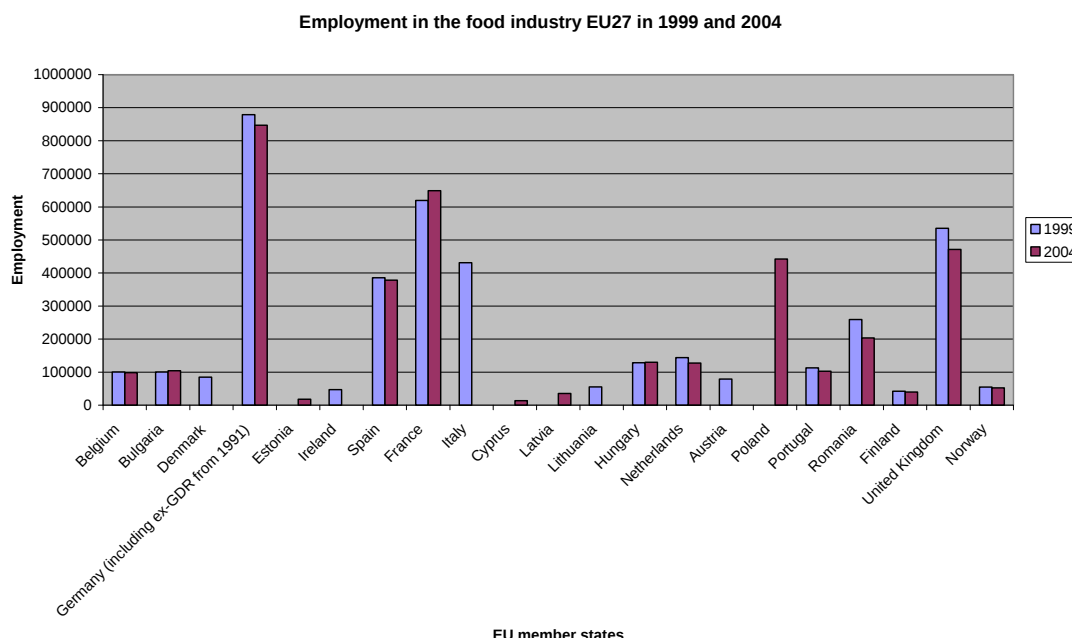
Source: Eurostat EUROFARM data, last updated 19 June 2006¹¹.

Note: For 1995, data for Bulgaria), Czech Republic, Estonia, France, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, Slovakia and Norway are not available; Luxemburg: data for 1995: 5,33; Malta: data for 2005: 4,06.

Regarding the food industry, employment figures show that in 2004 4,7 million people were working in this sector in the EU-27. For the EU-25 this figure was 4,4 million, as compared to 4,6 million in 1999. So there is a slight decrease in employment in the food sector in the EU-25.

¹¹ http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996.39140985&_dad=portal&_schema=PORTAL&screen=detailref&language=en&product=Yearlies_new_agriculture&root=Yearlies_new_agriculture/E/E1/E11/eda20240 (accessed April 20, 2007).

Figure 2: *Employment in the food industry in the EU Member States and Norway (1999 and 2004)*



Source: Eurostat database, NACE division 15: Manufacture of food products and beverages¹².

Note: For Denmark: data for 2004 is not available; data for 2002: 85133. For Estonia: data for 1999 is not available; data for 2000: 20307. For Ireland: data for 2004 is not available; data for 2003: 49438. For Cyprus: data for 1999 is not available; data for 1998: 9884. For Latvia: data for 1999 is not available. For Lithuania: data for 2004 is not available; no data for previous years either. For Austria: data for 2004 is not available; data for 2001: 77965. For Poland: data for 1999 is not available; data for 1998: 467255. For Luxembourg: data for 1999 and 2004 is not available. For Greece: data is not available for 1999 and 2004. For Sweden: data is not available for 1999 and 2004. For the Czech Republic: data not available for 1999 and 2004. For Slovakia: data for 1999 is not available; data for 2004 is not available; data for 2002: 46936. For Slovenia: data for 1999 and 2004; For Malta: data for 1999 and 2004 is not available.

Figure 2 shows that the largest employment numbers in the food sector in Europe are in Germany, France, the United Kingdom, Poland, Italy and Spain.

In the EU-25, the employment in the wood sector (manufacture of wood and of products of wood and cork) is stable: there was a slight decrease from 1.20 million in 1999 to 1.19 million in 2003 (Eurostat database: data for NACE 20)¹³. In the EU-27, employment in 2004 was 1.3 million. The Member States with the largest employment in 2004 in this sector are Italy

¹² http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,39140985&_dad=portal&_schema=PORTAL&screen=detailref&language=en&product=Yearlies_new_industry&root=Yearlies_new_industry/D/D0/section_d/division_15/eb_15inp (March 28, 2007)

¹³ http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,39140985&_dad=portal&_schema=PORTAL&screen=detailref&language=en&product=Yearlies_new_industry&root=Yearlies_new_industry/D/D0/section_d/division_20/eb_20inp (March 28, 2007)

(173848), Germany (166602), Poland (142191) and Spain (105686). Together these Member States cover 45% of the employment of the EU-27 in this sector.

From further analyses (based on the 2004 data), which are not mentioned in this chapter because of space limits, it is clear that there is also a wide variation in the employment composition across sectors in different Member States. Italy, Spain and Portugal are the Member States with relatively the largest proportions of employment in crop production. France, Romania and also Spain have the largest proportions of employment in animal farming. Poland and Romania are the only countries with high employment in mixed farming. Germany has the highest proportion of employment in agricultural services and Greece in hunting, trapping and game propagation, including related service activities. For forestry, logging and related service activities, Poland, Romania, and Germany rank highest, directly followed by Latvia, Italy, France, Spain and the Czech Republic.

In total it can be concluded that the employment trends and prospects in the sectors are such that further decline in employment is expected. In the primary sector, the need for quality improvement, cost reduction and food security result in scale enlargements. Whereas the number of farms is reducing, (in the Netherlands the annual decrease of number of farms in the primary sector is on average 1.9% for the period of 1990-1995, 2.8% in 1995-2000, and 3.2% in 2000-2005¹⁴), the farms themselves grow bigger, leading to alternative skill needs (Berkhout and van Bruchem, 2006). In the food production industry, as well as in the wood manufacturing, expensive labour costs are being cut by automate production processes. The developments in the primary sector as well as in manufacturing are similar: process innovation leads to decreasing employment, and many of the remaining jobs become more knowledge intensive. In the high-tech precision horticulture sector this is sometimes referred to as ‘knowledge farming’.

1.4. General, specific and innovative skills required by the sectors

As has been stated in the EU report quoted before (EC, 2005), there are various trends in the food and wood sectors. In the food sector the report identifies ‘... low ICT intensity and weaker R&D investment and innovation compared to main competitors. Innovation for the creation of new products and new production processes is limited, particularly for biotechnology (EU is lagging behind the USA with 30% less biotechnology patent applications, including the Food sector). Initiatives are being taken with the development of

¹⁴ More specifically: ‘Over the last five years, the number of specialised intensive livestock productions in particular has diminished sharply (by over 5% per year), principally due to buying-up schemes to reduce the manure surplus. The numbers of greenhouse horticultural holdings and dairy farms have also fallen sharply, by almost 5% and more than 4% per year respectively. The reduction of the number of specialised arable farms remained limited to 2% per year.’ (http://www.lei.dlo.nl/publicaties/PDF/2006/PR_xxx/PR_06_02.pdf (Accession date: April 30, 2007).

the European Technology Platform on Food for Life that aims at research in nutritional sciences and food technologies in order to deliver novel, innovative food products for national, regional and global markets.’ (EC, 2005, p. 41).

So it can be expected that there will be future skill needs in the field of food product innovation (inventing new products, protecting new products against competition, design production processes for innovative food products, creating new networks and chains for the production, trade, logistics, and sales for these products).

1.4.1. Skill needs in the food sector

Furthermore, the report states that the food industry is a regulated industrial sector in the EU. ‘EU food legislation has developed over many years both to address food safety concerns and to create a single market. ... For some domains (e.g. GMO’s, labelling) the legislation may be seen as a considerable regulatory burden, which might hamper innovation, particularly in an industry dominated by SMEs but this needs to be put into context of ensuring that the legitimate health and safety concerns are taken into account.’ (EC, 2005, p. 41).

Regulation regarding food production and handling is indeed a challenge for food manufacturers and processors, especially in SMEs, and it is expected that future skill needs arise on how to cope with regulations, or even how to excel in complying with regulations and control for marketing and creating high quality brands. This is the market segment with more value added and may be attractive for producers. Branding for higher market segments in itself is not new, but the relation with health and lifestyle is becoming more prominent.

The food industry is also faced with strong environmental regulations, such as *Integrated pollution prevention and control directive* (the BREF¹⁵ for the food and drink sector has been finalised) and *Packaging and packaging waste directive*.

At European level, the report signals the trend towards the reduction of the number of firms, but together with that the advantage of economies of scale. Between 1999 and 2000, the total number of firms reduced by 5.5%. This was to a large extent caused by mergers and acquisitions. This implies skills in future-oriented policy making, corporate strategy, integrated strategic management, management of innovation and change, but also financial management and human resource management. Especially smaller producers and manufacturers have to pass various thresholds to establish professional governance, strategy and management practices. Also political and public sensitivity become increasingly more important, since the business environment is changing from day to day, and entrepreneurs

¹⁵ BREF is a Best available techniques Reference document which Member States are required to take into account when determining best available techniques generally or in specific cases. Reference documents are produced following a set BREF outline and guide as agreed with DG Environment and the Information Exchange Forum. (<http://eippcb.jrc.ec.europa.eu/pages/FActivities.htm>)

have to be alert as to whether they can realise opportunities, also together with colleague-enterprises who recently were or currently are fierce competitors.

1.4.2. Skill needs in the wood sector

As far as the wood sector goes, the report states that much of the advanced technology is in the wood-based panel industry and in the larger sawmills for operational processes and process control purposes. The report also states that: ‘...most of the technological development has been led by the machinery manufacturers and independent research centres, such as university departments of other dedicated establishments. In other areas, such as wooden construction products, much of the R&D lead over the last decades has been in North America, with Europe only more recently developing its own programmes in these fields. Some of the R&D concerns are being addressed by the Forest-Based Products Technology Platform.’ (EC, 2005, p. 103).

About regulations, the report states that there is little sector-specific EU regulation. The main part of the regulation are ‘... phytosanitary directives for the import of roundwood and the import and export of wooden packaging’ (ibid.). However, the sector is affected by environmental regulations. The report lists the following regulations:

- (a) forest resources and raw materials: Forest law enforcement, governance and trade (FLEGT), Strategy on bio-diversity, Natura 2000;
- (b) renewable energy: national renewable energy systems’ implementation, Community biomass action plan; land use planning;
- (c) production processes: climate change – emissions trading, linking directive and post 2012 targets, thematic strategies – recycling, sustainable use of resources, waste issues, integrated pollution prevention control etc.;¹⁶
- (d) products and use: eco-labels, integrated product policy, directive on packaging and packaging waste. (EC, 2005, p. 104).

These regulations create many new skill needs, also in the new Member States, for instance among non-governmental organisations which deal with environmental planning, rural development, integrated pest management, and the implementation of food quality regulations and tracking and tracing systems. Workers in public agricultural sector or private consultancy organisations need new skills to work with multiple stakeholders for transition and transformation of practices and procedures which comply with the new regulations but also create new opportunities for business. Process skills like raising awareness, sharing a sense of urgency, search for collective win-win solutions, dealing with conflict and aggression, and turn-around management are becoming increasingly important.

¹⁶ <http://ec.europa.eu/environment/air/legis.htm#stationary> (access date: April 27, 2007).

When it comes to the wood sector, tropical wood is always a sensitive issue. Concerns about tropical wood are being addressed in the FLEGT action plan.

Summarising, in the food and wood sectors there are many developments which create future skill needs. These have to do with quality, internationalisation, international competition, power blocks and protection, the developments in auctions and the trend towards direct trade (such as coffee with direct supply to multinational food companies and flowers and pot plants which are directly sold to retail chains) and e-trade (an e-auction with regional establishments may be more flexible than one large physical one, and also be more environmentally friendly because it reduces transportation), the cooperation of small producers in cooperatives, and world market and national regulations.

1.4.3. Generic/transversal skill needs

The emergence of new business models also have consequences for workers in the forestry and wood-working industry. This also holds for organisations in other sub-sectors in the agri-food complex. Entrepreneurial, co-operative and administration skills gain in importance. The emergence of the bio-based economy for instance has massive implications for the primary sector as well as the energy sector. This leads to considerations of land-based entrepreneurs to engage in the sustainable energy business, like bio-mass, wind-energy or greenhouse-energy production.

Cultivated land is thus under pressure of change and innovation, but not only because of sustainability claims. There are competing claims on land, such as by the leisure industry, (eco-)tourism, country-side living, health care, regional products, and nature conservation. These developments also lead to new skill needs among workers in rural areas. Will they move into new lines of business? If so, skill needs emerge in such fields as interpersonal communication, hospitality, product innovation, services and care.

Primary production is being diversified to generate more income from other sources, but at the same time there are the farmers who invest and grow, and who create very large farms. These farms employ many more employees, which means that internal organisation and personnel administration, management, international marketing, finance, logistics, etc. are becoming increasingly important. These are completely new fields of skill needs for many farmers, who in many cases are more oriented towards their products than towards integrated farm management. The most competitive farms are growing so big, that a great deal of resources is needed to invest, which creates skill needs in finance and control and asset management (including skills in the field of the construction and property consultancy sectors).

Many of large enterprises in the agri-food and forestry-wood sectors, and surely the largest ones, are working on an international scale. For growing enterprises, this is something new, since many of them produced for the local, regional or national market before. But now, they are faced with international trade, which creates skill needs in fields like international law and

regulations (trade tariffs and barriers, trade regulations regarding quantities and quality control), dealing with importing / exporting organisations and international transportation, creating foreign establishments, communicating with foreign authorities and market organisations (such as export associations), including intercultural communication with local managers and employees, and national, regional and local labour relations.

In the food industry, chain reversal is pertinent. Supply-chain management is not driven from primary production via processing, trade to consumers anymore, but consumer behaviour is the major driving force. This means that workers in the supply-chain have to think backwards (from consumer needs and purchasing organisations) instead of forward (from primary product to sales). This chain reversal is also related to systems innovation in the agri-food sector, by which sustainable production is key. This chain-reversal, and working in networks of organisations, requires skills needs in fields like process innovation, co-operation, interdisciplinary understanding, and collective cost reduction and quality improvement in alliances and innovation projects. These also require skills in political sensitivity, as various stakeholders in these processes can have different (level of) interests. Sustainability as such, including corporate social responsibility and integrity, are also fields of many new skill needs.

In the food industry, an important innovation is ‘hazard analysis and critical control points’ (HACCP), which is a systematic preventative approach to food safety that addresses physical, chemical and biological hazards as a means of prevention rather than finished product inspection. HACCP is used in the food industry to identify potential food safety hazards, so that key actions, known as critical control points (CCPs) can be taken to reduce or eliminate the risk of the hazards.

In the food and wood processing companies new technologies are being implemented to reduce cost and increase quality. In the horticulture sector but also in the forestry sector, automated harvesting systems are being created. This means that there is a move from the labour-intensive harvesting towards operating new devices for harvesting and post-harvest handling (although the bulk of this work is still manual labour for certain crops). Skill needs emerge in the implementation, operation and maintenance of these new devices.

Throughout the agri-food and forestry-woods sectors, quality affects all. There is a constant need for improving quality of products (within set price margins) to be able to compete on global scale. This creates skill needs in quality control, quality management and quality improvement in all parts of the production chain. This goes together with sharpened European quality regulations, which has led to tracking and tracing products and hazard control. These fields also create various new skill needs, including skills in safety and environmental control. It leads for instance to additional administration and certain adjustments which need to be accomplished by the workers in place. Risk communication and food safety management are important skills as well.

The agri-food and forestry wood sectors are under constant pressure from international competition. If products (of sufficient quality) from China are cheaper, they are imported.

Furthermore, as EU regulations regarding nutrition, health, safety and sustainability are getting ever tighter, many farmers and small food and wood processing companies are going out of business (as has been seen before in the mining and textile industry). This economic restructuring leads to many new skill needs. For instance, a farmer who has inherited his farm which has been in the family for over centuries, needs or wants to stop farming. The process towards such a decision and subsequent changes create enormous tension for those who are directly involved, not only because of the financial consequences, but also from a psychological point of view. Proud farmers who have been able to survive for generations, whose professional identity is strongly linked to land-based activities, suddenly have to think of the discontinuous move in their lives. For them, career development advice and entrepreneurial skills as well as adaptation skills are needed. In this view skills in exploring and taking opportunities are becoming increasingly important.

Box 3: Future possibilities for the agricultural sector

Agriculture may disappear in Western European countries such as the Netherlands. Four development scenarios are considered possible for land-based agriculture:

- (i) eroding agriculture,
- (ii) changing agriculture,
- (iii) innovative agriculture, and
- (iv) from land-based to sea-based agriculture.

Based on these scenarios, nine lines of development for the land-based agriculture are:

- (i) sea-based agriculture (agriculture in the sea, which is sea-based industrial production of various wet-land based healthy nutrition: fish, shell-fish, alga, crops),
- (ii) bioport (turning the economy from fossil to biomass energy production, contributing to sustainable energy consumption),
- (iii) demand driven micro-chains (instead of supply-driven bulk-chains),
- (iv) local autonomy (instead of central provisions),
- (v) boundary-crossing food (eating as a way of bringing people of different cultures together),
- (vi) nature at your fingertips (making nature more attractive by partially virtualising it),
- (vii) dying with dignity (about a new experience in the terminal phase; think of hospices in beautiful natural environments with high quality care),
- (viii) value-driven financial arrangements (demand-driven planning of the landscape instead of subsidy systems),
- (ix) convening society (away from the government-regulated market economy to a self-managing network society).

Source: Luttik et al., 2006.

Young farmers need skills in personality development, openness to the interests of other private and public stakeholders, creativity, they need to be environment oriented (also in

terms of what competitors are doing, and what regulations need to be anticipated); furthermore, they need human relations, entrepreneurship, and life-long learning skills.

As far as life-long learning is concerned, the primary sector used to have a public service, which visited farmers to share with them the latest results of research and development. This part of the agricultural knowledge system is now privatised in various countries (such as the United Kingdom, Germany, the Netherlands, Estonia) and delivered on a commercial basis¹⁷. This has major implications for the skills of the former public service workers, who in those cases have to market themselves at commercial rates, but also for end users of the information, who then have to be able to deal with commercially-driven consultants. This changed the whole notion of knowledge, which was perceived as being a collective good which one could acquire at no or low cost, whereas knowledge is now treated as a commodity which has to be paid for. This development has resulted in shared research and development centres of different companies who cannot get sufficient knowledge in a certain specialisation (or can but at a price which is too high), which are seen as incubators of specific innovations. Knowledge-sharing for achieving competitive advantage, but together with that, knowledge-protection against hostile competition, and the field of ensuring intellectual property, are important fields of new skills needs.

1.4.4. Skills needs in food and wood as observed in selected EU Member States

In this section a selection is presented of various future skill needs observatories, projects or organisations which are responsible for the development of occupational profiles or qualification structures in the agri-food and forestry-wood sectors. This overview is kept concise, since many of the sources have a wealth of information on the topic of this report.

1.4.4.1. Austria

In Austria the ‘Qualification barometer’¹⁸ gives information (in German) about labour market trends and qualification needs. Data for the garden, land and forest sectors are depicted. The top five jobs in these fields are given. An increase in employment is forecast for landscape gardeners and horse sector workers, whereas for garden workers, agricultural advisers, and burial and ornamental garden workers employment will remain unchanged.

The top five skills in the fields mentioned are also given. Agricultural economic knowledge, knowledge of occupation-specific law regulations, customer care knowledge, and environmental technology knowledge will be increasingly demanded, which is also the case but to a lesser extent for the crop science.

¹⁷ There is no list of countries in which is specified to what extent the extension system is privatised. See: Rivera, W.M. (1996). Agricultural Extension in Transition Worldwide: Structural, Financial and Managerial Reform Strategies. Public Administration and Development, 16, 151-161.

¹⁸ http://bis.ams.or.at/qualibarometer/top_berufsbereich.php?id=69

1.4.4.2. *Finland*

The Finnish National Board of Education¹⁹ conducted a project ‘Anticipating the quantitative educational needs in vocational education and training’. The project was implemented with the support from the Ministry of Education and the European Social Fund. The objective was to acquire the statistical and other information and to create a calculation model that could be applied to anticipation. On the basis of the results, a national forecast of educational needs was produced, stemming from the needs of working life.

The forecast of changes and natural wastage in the total labour force to the year 2010 by fields of study and levels of education in initial vocational education and in higher (polytechnic and university) education showed a steep decline of employment in agriculture. Employment is expected to increase in almost all main industries with the exception of agriculture. The labour force in agriculture and forestry will also continue to decrease, but at a pace slower than during the last twenty years²⁰ (see more at <http://www.oph.fi/>).

Furthermore, the project indicated that although agriculture will employ fewer and fewer people in the future, the educational need in forestry will remain close to the present level. As the labour force in agriculture and forestry is ageing, education is needed to replace those leaving working life. With the size of agricultural holdings increasing, the intake need in agriculture will increasingly focus on those with a polytechnic degree, since this degree will prove all the more necessary for self-employed people under the pressure of competition (see more at <http://www.oph.fi/>).

1.4.4.3. *Ireland*

In Ireland, the Expert Group on Future Skills Needs (EGFSN) is a body appointed by the Irish Government to advise it on aspects of education and training related to the future skill requirements of the enterprise sector of the Irish economy.

The EGFSN carries out studies into the supply and demand for skills in individual business/industrial sectors and occupations, and, through its reports, puts forward recommendations for averting any anticipated mismatch²¹. The site of EGFSN contains various labour market studies, including a study on skill needs in the food processing sector²² (EGFSN, 2003).

The most critical skills gaps identified were:

¹⁹ <http://www.oph.fi/>

²⁰ The report of this project is downloadable from: Abridged English version of an anticipation publication entitled Vocational education and training 2010, Demand for new labour in 2010 and the dimensioning of vocational education and training.

²¹ (<http://www.skillsireland.ie>).

²² http://www.skillsireland.ie/press/reports/pdf/egfsn0304_food_processing_sector_skills.pdf

- R&D / new product development / quality control skills -
 - (i) skills needed to commercialise new product developments,
 - (ii) product research / new product development skills;
- Processing skills -
 - (i) operative skills (existing technology),
 - (ii) operative skills (new technology/process),
 - (iii) production supervisory skills,
 - (iv) operative skills (craft workers);
- Sales and marketing skills -
 - (i) marketing skills,
 - (ii) language skills,
 - (iii) negotiation skills,
 - (iv) management skills;
- Support skills -
 - (i) training skills,
 - (ii) IT skills,
 - (iii) business planning skills.

1.4.4.4. *The Netherlands*

The Netherlands has sectoral knowledge centres on vocational education that develop or monitor the development of national competence and qualification frameworks. Aequor²³ is the knowledge centre for the food and environment sector. SVO²⁴ is the knowledge centre for the meat sector. CBL²⁵ is the sector organisation for food trade including retail. All these organisations have plenty of information about skills needs in the respective sectors (available in Dutch).

Monitoring skill needs at Wageningen University²⁶ is conducted among alumni. Alumni are being asked to complete questionnaires on a regular basis concerning the relation between their educational programme and the skills needs in the labour market. The research results are specific for the programmes the students took, such as food production technology, landscape, planning and design, environmental technology, molecular sciences, nutrition and

²³ http://www.aequor.nl/aequor/pages/v_english/frmset.asp

²⁴ <http://www.svo.nl/english/home.asp>

²⁵ <http://www.cbl.nl/english/>

²⁶ <http://www.wageningenuniversiteit.nl/UK/>

health, management and consumer sciences, international development, agrotechnology, biology, biotechnology, forest and nature conservation, soil, water and atmosphere, animal sciences, and international land and water management. For the alumni of all programmes, independency, creativity, analytical ability, communication, being able to cope with work stress, interdisciplinarity, adaptability, team work, integrity, and planning are the top ten skill needs. The next ten skill needs are oral presentation skills, critical ability, accuracy, written communication skills, English, recent developments in the field, subject matter knowledge, insight in society, supervision, and diplomacy. Together with commercial skills, collecting information, ICT-skills, interpreting results, methods and statistics, they rank amongst the skills with a score about 3.5 on a 5-point Likert-scale on importance of skills for graduates of Wageningen students. Skill needs that rank below 3.5 are methods and statistics, public decision making, legal regulations, independent research, business economics, environmental issues, German, other language, French, agri-technological knowledge, and Spanish. As will be evident, the skills needs vary considerably across disciplines.

The prevalence of general skill needs (opposite to specific disciplinary skill needs) was confirmed in a survey of skill needs among representatives of (professionally oriented) study associations and organisations (like AIESEC and Integrand). In open focus groups they came up with the following characteristics of graduates which are relevant for the present and future labour market:

- ability to communicate,
- ability to explain,
- ability to listen,
- ability to give feedback on oneself and on another,
- ability to work together,
- ability to explain choices,
- ability to network,
- ability to sell yourself,
- ability to convince,
- ability to write an application letter,
- ability to motivate people,
- ability to make decisions,
- ability to think in frame works,
- ability to clearly define matters,
- ability to see the overall picture,
- ability to manage projects,
- conference/meeting skills,
- have guts,
- self-knowledge,
- insight into character of people,

- strong energy,
- content-specific knowledge,
- have your own goals,
- ambition,
- determination,
- patience,
- ideas,
- bring in ideas,
- be open to other people and other ideas,
- be critical,
- be assertive / ask for attention,
- be self secure,
- be representative,
- persistence,
- be practical,
- thoroughness,
- be precise,
- be solution minded,
- be enterprising,
- be enthusiastic,
- take on everything,
- work hard.

It must be said that in this list, as well as in the alumni research, subject matter or content-specific knowledge also appears but behind this single item there could be a wide variety of skill needs which are specific for the educational programme, such as global positioning systems for supporting harvesting technology and post-harvest logistics, remote sensing technology for studies on climate change, electronic resource planning for global supply chain management, genetic manipulation in plant protection, bio-nanotechnology in food processing, anaerobic processing of bio-waste matter, or multi-actor process facilitation in environmental policy making.

1.4.4.5. *United Kingdom*

The UK is working hard on its skills strategy²⁷ with sector skills councils²⁸. Improve is the sector skills council for the food and drink manufacturing and processing sector²⁹. It has plenty of materials for this sector.

²⁷ <http://www.dfes.gov.uk/skillsstrategy/>

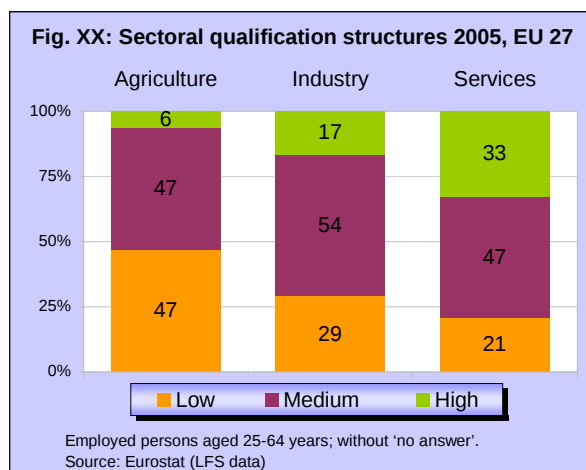
Lantra is the sector skills council for the environmental and land-based industries³⁰. It also has plenty of materials for this sector.

1.5. Qualification levels of workers in agriculture, food and wood

First of all, the qualification level of workers in agriculture can be compared with those of the industry and services sectors (see Figure 3). It can be seen that the share of low qualified workers is the highest in the agriculture sector (47%), whereas this is less than half in the services sector (21%). The industry sector is in between (29% of low qualified workers in the sector). The share of employed persons in the agriculture sector with a high qualification is 6%, whereas this is 33% in the services sector. Again, the industry sector is in between with 17% of highly qualified.

It is remarkable that the share of medium-skilled employees in the three sectors do not differ a lot: they vary from 47% in the agriculture and services sectors, to 54% in the industry sector. So, in all three sectors about half of the employed persons have a qualification at medium level, which makes this the largest group.

Figure 3: Qualification level of workers in agriculture, industry and service sectors



Source: Eurostat database, LFS 2005.

Figure 4 shows the breakdown in percentages of the qualification structure in manufacture of food products and beverages, and in manufacture of wood and products of wood and cork. In

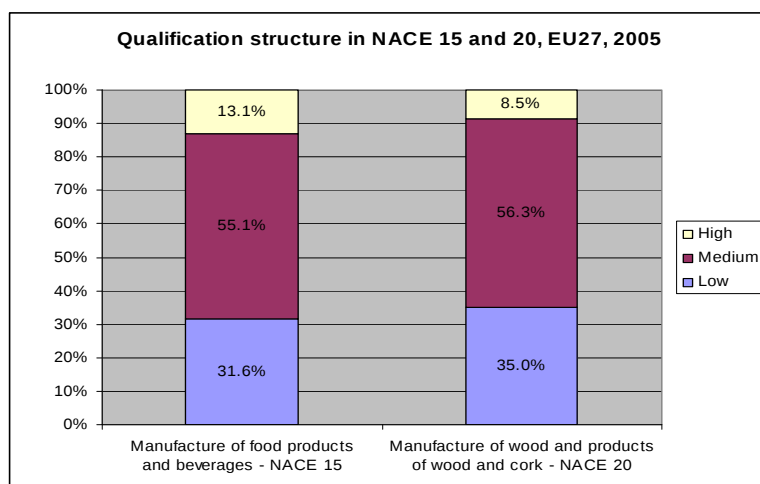
²⁸ <http://www.ssda.org.uk/default.aspx?page=2>

²⁹ <http://www.improveltd.co.uk/>

³⁰ <http://www.lantra.co.uk/>

both cases the level of educational attainment is higher than in agriculture, but overall lower than the average attainment in manufacturing.

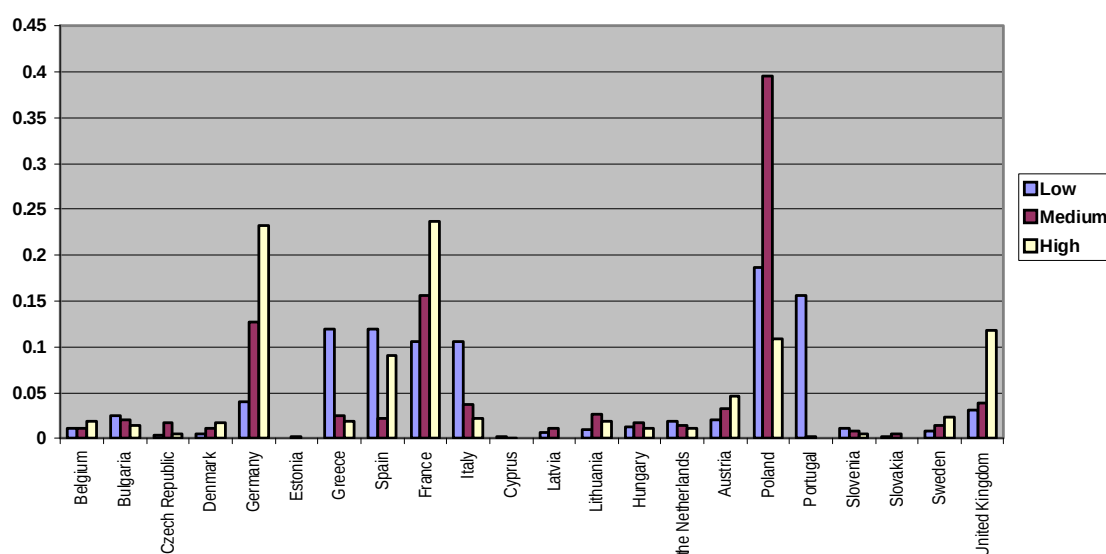
Figure 4: Qualification level of workers in NACE 15 and 20, EU-27, 2005



Source: Eurostat, LFS 2005

A breakdown of the skills levels in the agricultural and fisheries sector in terms of low (ISCED 0-2), medium (ISCED 3-4) and high skills (ISCED 5-6) shows a wide variation of the distribution of skills levels between Member States (see Figure 5).

Figure 5: Employment composition by level of education of skilled agricultural and fishery workers (ISCO 6) in selected EU Member States in 2006 (in millions)



Source: Eurostat, LFS 2006

Lifelong learning in terms of participation in continuing education (also based on Eurostat data of 2002) in the agriculture sector is relatively low compared with industry and services. It is the highest in Finland, the United Kingdom and Denmark, and the lowest in Poland, Spain and Italy.

As a general conclusion it can be stated that the general skills level of workers in agriculture is a concern, and that the future economy requires workers with a higher initial vocational education level and also actively involved in lifelong learning.

1.6. Skill gaps/shortages in particular occupations at present and expected in the future

Following the general review of the agriculture, food and wood sectors (see above), skill needs will now be analysed along the lines of four key roles:

- (a) entrepreneurship,
- (b) consultancy,
- (c) innovation in chains and networks,
- (d) dealing with expectations of the public.

1.6.1. Skill needs for entrepreneurship

Skill needs for entrepreneurship were studied in a project on greenhouse horticulture (Mulder et al. 2007). The aim of the study was to identify skills and learning activities of entrepreneurs in an innovative context. Skill assessments were conducted, using self-assessment, assessment by an employee and an assessment by an external consultant. Next in-depth interviews were held based on the assessment results, and based on major recent innovation decisions. This was done with fifteen entrepreneurs. In a follow-up study the sample size was enlarged, but the same kind of results were found (Lans et al., 2007).

General characteristics of the horticulture sector are that it is capital and knowledge intensive and highly innovative. Genomics, agro-ecosystems, bio-(nano)technology, ICT-supported climate control, pharmacy, energy reduction, electronic trade, and advanced packaging and logistics – all have their influence on the company development.

In this study, a skill profile was used which was developed by Man et al. (2002) for the field of entrepreneurship³¹.

³¹ In fact the concept of competence was used in these studies, which are in essence general skills, but to avoid misunderstanding, they are referred to as skills here.

This profile consists of skills in the field of opportunity seeing and realising, organisation, technical-occupational competence, relational competence, commitment and conceptual competence. Based on this, various more detailed skills were distinguished.

As was mentioned above, entrepreneurs rated themselves on the skill list, as well as one of their employees did, as well as an external consultant who is regularly in touch with the company and knows the entrepreneur. The study came up with the list of skills which are needed and which are mastered by these entrepreneurs according to themselves and the two other assessors (see the list below). The system innovation implies that the conditions under which horticulturalists (but in general all entrepreneurs in agriculture and the food and wood sectors) have to introduce fundamental changes, because of the renewed EU agreements on agriculture and rural development, regulations about environment, health and safety, control and security.

The following skills are all perceived as being important for the success of entrepreneurs, as well as innovative, especially because of the system innovation mentioned before. The skill are sorted by mastery of the skill field – the highest mastery on the top of the list, the lowest at the bottom (Mulder et al., 2007):

- skills of entrepreneurs,
- learning orientation,
- self-management,
- planning,
- market orientation,
- result orientation,
- networking,
- leadership,
- problem analysis,
- organising,
- conceptual thinking,
- negotiating,
- persuasiveness,
- vision,
- general awareness,
- management control,
- value clarification,
- judgement,
- team work,
- strategic orientation,
- HRM/HRD,

- international orientation.

For example, having a learning orientation means that entrepreneurs consider innovation and change going hand-in-hand with acquiring new knowledge, skills and attitudes. Whereas certain practices were handed over from a parent to a child, and there was little uncertainty about the justification of these practices, practices in the current and future food and wood sectors are predominantly characterised by uncertainty, in which small-holders cannot rely anymore on traditional knowledge alone. Needless to say that entrepreneurs with a positive and active learning orientation (those who ask themselves: ‘Where can I find information? Who can provide the information? What does it say about my situation or problem? Whom can I ask for an advice? Which information/advice is reliable?’) have a competitive advantage.

Given the current business trends, self-management becomes key. As mentioned above, entrepreneurs cannot merely rely on their predecessors anymore, and need to make independent decisions, which can be very complex. They can get much information from various stakeholders in their network, such as suppliers and clients, colleagues, for instance in grower clubs, associations or cooperatives, and banks and insurance companies. To get information that has added value for the firm requires networking skills.

Also, conceptual thinking is important, since entrepreneurs need to explore new opportunities, which requires creativity, but which needs to be accompanied with a better imagination of new combinations of not only products and markets, but also other stakeholders in the cluster, such as research and development organisations or groups, colleague companies within and without the sector. A good example of this kind of innovative thinking is shown by horticulturalists who went into the niche market of mini-vegetables for top-end restaurants, who bypass markets and auctions and who deliver directly to the chefs. Another interesting example is the consumer market which serves organic products of certified farmers in highly urbanised areas, also involving public environmental education, where chefs of restaurants which buy from the same farmers give cooking demonstrations, which go along with the marketing of their restaurants. Establishing these new combinations of stakeholders for mutual benefit, and also sustainability production, requires higher levels of thinking which include notions like multi-stakeholder involvement, interactive business development and process facilitation.

As indicated above, the skills of entrepreneurs are listed in order of the extent in which they are mastered by entrepreneurs. As can be seen, strategic orientation, human resource management and development, and an international orientation are skills which rank the lowest, so these indicate the largest skill gaps, and need more attention. Business development, scale enlargement, larger numbers of employees and global competition all require more professionalism in business management.

1.6.2. Skills needs in agricultural consultancy

The development of agriculture, food manufacturing, forestry and wood manufacturing has been strongly supported by research and development. The success of certain countries in these sectors can be attributed to a large extent to the knowledge systems in these countries, since the work in these sectors is very knowledge intensive. In most countries public extension services were created to inform workers in the food and wood sectors about the latest finding in research. However, marketisation and privatisation also have affected the whole public sector, and the change in philosophy regarding the governance of the primary sector has caused budget cuts in the public extension services for the primary sector. Many extension services decreased their staffs, and many went on as private consultancy companies. New agricultural consultancy enterprises were created too, and the developments ask for new skills of these consultants. It is not sufficient anymore to give product and production information based on the latest research: business process development issues, dealing with a multitude of stakeholders, coping with complex and conflicting regulations and ambitions are getting much more important.

Many studies have been conducted about the role of the extension professional. Shim (Shim, 2006) developed a skill profile for extension workers as consultants. As said, their jobs are gradually moving from state-driven officers to market-driven commercial advisers. Therefore, their skill needs change considerably. Below are the skills (see Table 2)

Table 2: Skills of agricultural consultants

Fundamental skills	Task skills
communicating effectively, building trust, developing network and partnership, promoting teamwork, developing oneself, showing professionalism, demonstrating adaptability, maintaining positive attitude, displaying organisational know-how, thinking strategically and conceptually, managing implementation process and resources, encouraging organisational learning and innovation.	technical knowledge and skills, agri-food complex awareness, client understanding, wider environmental change awareness, analysing and meeting client needs, developing the extension services' programmes, improving clients' performance, fostering clients' learning, supporting clients' social capital generation, evaluating the extension services' programmes.

Source: Shim, 2006

As said before, the changing function of the extension services has also consequences for the primary producers. In the past they used to receive the service for free (given the context of

the 1950s and 1960s dominated by the philosophy of food security, self-reliance, food for everyone, and thus low prices and income support for farmers), but now they have to pay for it. SMEs, however, do not have sufficient funds to do so, and thus other arrangements are being developed to share knowledge. Institutions of practical research, educational institutions and entrepreneurs are working in networks in which collaborative knowledge-sharing and creation takes place at a low cost (Krüger, 2005).

1.6.3. Skills needs for innovation in chains and networks

Organisations in the agri-food and forestry-wood sectors are ever more working in chains and networks. These chains and networks are being ‘conducted’ (in many cases) by the organisations in the end of the chain, in the food sector, very often, the retail business (large supermarket chains). Innovation is seen as a major action to promote business and sector development, and is supported in various countries by public means. In such cases, public organisations are also involved in innovation processes. Substantial funds are being invested in research and development by large organisations, not only to create innovative products within their own organisations, but also with other organisations, within or without the chain (such as the Beertender and Senseo; bio-fuel chains can also be mentioned here). Innovation teams need to have the skills for successful innovation projects. du Chatenier investigates the skills of members of these teams. She is developing an elaborate model of skills and subskills for innovation teams, based on an extensive literature review, interviews and focus groups (du Chatenier, 2007) (see table 3).

Table 3: Skills of open innovation teams in agri-business

Self-management	Project management	Interpersonal management	Content management
the teams is committed to the innovation target; the teams is in balance regarding its collective competence; the team can cope with chaos and change both without and within the team.	the teams can cope with non-hierarchical situations; the teams involves the necessary stakeholders; the team performs and achieves results regarding the innovation.	the teams builds trust amongst its members; the team members can interact with others both within and without the team; the team can cope with power differences between the organisations who sponsor the innovation.	the team has sufficient content-related capabilities; the team members share information and experience; the team member are receptive for new ideas; the team can interpret data, information, views and situations; the teams has sufficient fantasy/imagination; the teams has a vision regarding the innovation; the teams negotiates about conditions, processes, new views, and the realisation of the innovation.

Source: du Chatenier, 2007.

As these are skills for innovation teams, individual team members do not have to possess all skills, as long as the combination of the skills which are mentioned are present in the team (so that there is a balanced team skill).

1.6.4. Dealing with expectations of the public

As has been stated, dealing with various expectations of the public also becomes more and more important. In a review on the public's expectations regarding the green sector and responsive practices in higher agricultural education, conducted in Austria, the Czech Republic, Denmark, France, Germany, Hungary, Ireland, Poland, Romania, Spain and the United Kingdom, various skills were identified by representatives of institutes in these states (Mulder and Eernstman, 2006). These were:

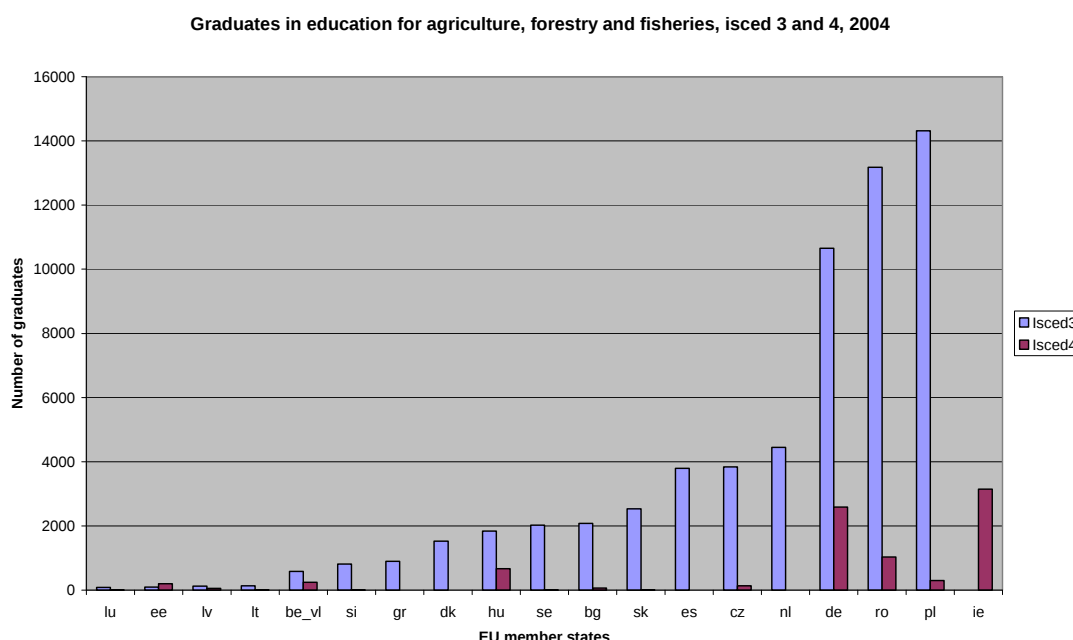
- understand different side-views of an issue / deal with conflicting views;
- get scientific information across to society;
- explain complex problems in 'layman's language';
- use a holistic view when analyzing issues and problems;
- effectively use communication skills;
- communicate in foreign languages;
- establish contacts abroad;
- communicate with people from different cultures;
- participate in discussions on natural resource management in a global context;
- use an innovative/creative approach in problem solving ;
- combine activities;
- use practical and theoretical knowledge and experience;
- speak on farmer's level;
- align information / talk to specific target groups(farmers, consumers etc);
- use an analytical approach in judging situations;
- seeing and understanding connections between phenomena;
- be flexible/agile to effectively act upon trends;
- communicate agriculture in a positive way to the public;
- transfer information to consumers;
- understand motives of stakeholders;
- decide which economic model they want to support;
- see opportunities and make consistent decisions;
- apply the concept of quality;
- apply environmental, health and social issues;
- formulate an informed opinion about genetically modified organisms;
- think critically.

The respondents in this study believed that because of the new expectations of the public, these skills are becoming more important than the mere technical skills.

1.7. Current and potential supply of skills for the sectors

Regarding the supply of skills for the sectors, agricultural education has faced significantly decreasing student numbers during the last fifteen years in the primary sector. The number of graduates from agricultural education in 2004 for the EU-25 at ISCED level 3 was 62976, and at ISCED level 4 - 7064. Again, wide variation between Member States is visible (see Figure 6).

Figure 6: Number of graduates from agricultural, forestry and fisheries education fields at ISCED levels 3 and 4 in 2004



Source: Education statistics Eurostat metadata, 2004³².

The number of graduates in plant sciences is too low given the demand in the market. The number of graduates in organic agriculture is also too low, but mainly in the view of the societal expectations, since there is a lot of public attention for this field, but the consumption of organic products is still low. The number of graduates in gardening and pet care,

³² http://epp.eurostat.ec.europa.eu/extraction/retrieve/en/theme3/educ/educ_grad5?OutputDir=EJOutputDir_333&user=unknown&clientsessionId=28E58A999FEF57749002DEAEC1DF52D1.extraction-worker-1&OutputFile=educ_grad5.htm&OutputMode=U&NumberOfCells=84&Language=en&OutputMime=text%2Fhtml& (extracted: April 23, 2007).

management and marketing increased. But as in other sectors, in the food and wood sectors there is more demand for high-skilled labour, apart from the labour-intensive unskilled jobs in harvesting and post-harvest handling, in many cases done by seasonal workers from lower wage countries. Wherever possible, however, this type of labour is being mechanized and automated.

Also at the higher education level, there are too few students for research. This causes an influx of PhD students from Asia and Africa in western EU Member States.

1.7.1. Responses of institutes of agricultural education

The changes have created many challenges for the agricultural education institutions. Mulder and Kupper (2006) describe how institutes for agricultural education have responded to the challenges. These responses, or scenarios, are

- (a) ceasing agricultural education,
- (b) inter-sectoral cooperation,
- (c) intra-sectoral cooperation.

Three metaphors are being used to describe these scenarios:

- (a) evaporating (closing down, vanishing),
- (b) dissolving (in much bigger colleges that have programmes in non-agricultural domains),
- (c) crystallising (seeking intra-sectoral cooperation).

The concept of 'evaporating' basically means, as mentioned before, closing down schools. This is a process of de-institutionalising agricultural education, and withdrawing this educational service from the local or regional market. Evaporating is preceded by a process of (sometimes slow and gradual) disintegration, such as vanishing energy for cooperative programmes, or cooperation at all, exclusion of certain groups, and decreased services from the administrative bodies. The process of evaporating also brings about a period of isolation, which can have a detrimental effect on the motivation of teachers and support staff in the organisation. Needless to say that all this results in low social cohesion in the organisation.

The concept of 'dissolving' means that the institution for agricultural education will be absorbed by a bigger institution for vocational education or by a broader vocational college. The main cause for this is again the decreasing market demand for graduates of agricultural programmes. The effect of this process is that agricultural education will have less visibility; within much larger institution it can get lost. The advantage however is that the umbrella organisation serves as a shelter for agricultural education, so that there is a perspective for the staff and students involved, unlike the situation in the previous scenario. The dissolving strategy is furthermore characterized by high adhesion, which means a strong interest in programmes of other disciplines to see where opportunities are for innovative programmes.

The concept of ‘crystallising’ means that institutions for agricultural education look for opportunities to work together within the agricultural sector, or to organize their institutions in such a way that they stay independent institutions for agricultural education. Agriculture in this sense should not be taken too literally however, since these institutions also used the chances in the fields of food, nature, environment, life sciences, technology and related social sciences. Sectoral mergers are the way in which this scenario is implemented. There is sufficient labour market demand for the programmes in the merged institutions and there are strong links with stakeholders. Also with new stakeholders, that replaced the older ones who became more or less obsolete. Educational institutions that follow this scenario tend to specialise their programmes, although there is a tension with the trend towards specialisation and sectoral skills and qualifications. The institutions involved also try to seek cooperation within the agricultural education between upper secondary, higher vocational and university level education. Implementation of this scenario results in high intra-sectoral cohesion. The advantage for students is that there is a wide variation in tracks within the domains that are served by the educational institutions.

1.7.2. Initiatives at EU level – sectoral social dialogue

At EU level, the relevant stakeholders are working on the sectoral training policy in the framework of the sectoral social dialogue committees. The Committee of Professional Agricultural Organisations and General Confederation of Agricultural Co-operatives in the EU (COPA/Cogeca)³³ have formulated an opinion concerning the vocational training and on the cessation of farming by agricultural workers in the context of the socio-structural measures proposed by the European Commission already more than two decades ago, in 1979. Later on they formulated an opinion with regard to training for agricultural workers (1982), and an opinion concerning training in agriculture (1993), and they published a joint declaration (by EFA/CES-GEOPA/COPA) on employment in agriculture (in 1995), and a *European agreement on vocational training in agriculture* (2003). In 2004 GEOPA conducted a review and held a conference on the implementation of the European agreement. The evaluation of the implementation of the European agreement of 5 December 2002 in 2004, resulted in country reports (fiches) on the organisation of initial and continuing vocational training in agriculture (regulations, institutions), assessment of skills, validation of vocational skills, transparency of diplomas and certificates, and financing of vocational training. Member States which were included in the study were Austria, Belgium, Denmark, Finland, France, Germany, Greece Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

³³ <http://www.copa-cogeca.be/>

1.7.3. Projects and networks at EU level

A number of projects and networks in the EU aim at improvement of education and employment in agri-food and forestry-wood, and at the rural and sustainability development.

First of all, there have been numerous projects in the framework of the EU programme ‘Leonardo da Vinci’. These were brought together at a conference in 2005 (Coufalik, 2005). For example, several projects aim to develop initial and continuing vocational education and training programmes and employment in the food and wood sectors:

- (a) the project ‘E-rural’ on e-learning for e-business and territorial marketing on-line for integrated rural development³⁴;
- (b) ‘Organicmed’ – the project on training of Mediterranean farmers in organic crop agriculture³⁵;
- (c) training in sustainability use of land and water in the farm³⁶;
- (d) ‘Plus–Hislacto’ – a training course on hygiene in the milk and dairy sector – from production to transformation³⁷.

Various comparability projects are being run under the auspices of the Association for the European Life Sciences Universities, formerly the Interuniversity Consortium for the Agricultural and Related Sciences (ICA³⁸). ICA is a non-profit making organisation and aims to develop concerted actions in the field of higher education and research in agricultural and related sciences in Europe.

Next to that there is the Association of Agricultural Education in Europe (Europea³⁹). Europea is an association of European agricultural colleges and training institutes. The members are predominantly from the secondary vocational educational institutions. Europea also runs various projects for the development of vocational education in the agri-food and forestry-wood sectors.

Furthermore, in the field of agricultural education and extension, the European Seminar of Extension (and) Education (ESEE) brings together experts in these fields in bi-annual conferences to share experiences. ESEE is an informal network and does not maintain a membership list or a website.

³⁴ www.erural.org.

³⁵ www.organicmed.org

³⁶ www.leowater.hit.bg

³⁷ www.teleformacion.biz/leonardo

³⁸ <http://www.ica-europe.info/>

³⁹ <http://www.europea.org/>

Part of the work on agricultural education and extension is published in the *Journal of agricultural education and extension*⁴⁰.

1.7.4. Continuing vocational training

As it has already been mentioned, participation in lifelong learning provided by educational institutions in the food and wood sectors is low. This can partly be explained by the fact that most companies in these sectors are SMEs or micro-companies or farm households. Participation in continuing training by workers in these enterprises on average is quite low, and agri-food and forestry-wood is no exception to that, unlike in case of large food and wood manufacturing companies. In these companies professional human resource management and development prevail, with sufficient resources for further training and education and opportunities for in-company skill development.

Where possible and interesting, sectoral organisations invest in training initiatives to stimulate that sufficient numbers enter initial and continuing vocational training in their sector, that training is sufficiently attractive, or make it more attractive for young students, and they head for European cooperation to achieve advantages of economy of scale and European qualification agreements which facilitate mobility (even if it is limited to cross-border mobility in neighbouring countries).

Public organisations stimulate lifelong learning in the interest of the productivity of national and European sectors. At the European level various non-governmental organisations, which have been mentioned above, but also the European sectoral social dialogue committees which are supported by the European Commission, play a role. Their work leads to various spin-offs, such as the creation of ‘Refope’ – a European network for the fisheries training and employment⁴¹.

Lifelong learning in micro- and small enterprises is characterised by its informal nature. Sectoral and public organisations try to facilitate lifelong learning. This leads to the paradox that by supporting informal learning this kind of learning becomes increasingly formalised, i.e. goal-specific and organised.

The entrepreneurs themselves are a specific target group in terms of lifelong learning. They tend not to use offers from educational institutions. They learn a lot on the contrary from the daily practice in the networks in which they participate or which they create. Other learning activities performed by entrepreneurs include asking a specific question, checking information, conversations, discussions, experiments, observations, performing occupational tasks, receiving feedback, reflection and replication (Mulder et al., 2007). Various travelling metaphors for describing skills acquisition have been brought forward, like travelling,

⁴⁰ <http://www.tandf.co.uk/journals/titles/1389224X.asp>

⁴¹ <http://www.refope.com/index2.html>

trekking and exploring. Based on the research on entrepreneurs the metaphor of ‘climbing’ was added, referring to the high risks involved and the goal to be best in class (or to put in terms of the metaphor: to reach the top the first).

In the innovative work environments with major consequences, such as the decision to enlarge the company and build more hectares of greenhouses for instance, the learning activities that prevail are reflection (20%), observation (15%) and experimentation (11%).

For the future of sectors, or rather clusters, networks and chains in certain regions in the EU, it is essential that some form of cluster support is provided to learning to innovate. Innovation competence is crucial for the future socio-economic success of such clusters. In essence the question is which learning activities may inspire entrepreneurs for innovation. In short, these activities should directly be linked to the primary concerns of micro- and small enterprises. How can my company survive? How can it grow? Or at least – how can it be maintained? What activities will be profitable? Which activities should I invest in? What is the risk of that? How can I avoid risks? What can I learn from mistakes (of others)? What can I learn from successes (of others)?

Based on the notion of inspiring learning environments twelve educational designs were proposed which are specifically aimed at meeting future skill requirements (Gielen et al., 2006). These are:

- the master class (for achieving insight and skills from experts),
- the clinic (to train specific skills),
- workshop (for gaining new perspectives),
- laboratory (for testing the viability of solutions),
- academy (for learning to apply multi-disciplinary applications of scientific insights),
- general rehearsal (for developing a collective routine),
- entrepreneurial café (for creating new networks),
- boxing ring (for improving performance),
- kitchen table (for deepening networks and mutual understanding),
- utopia (for innovation),
- study club (for mirroring company results),
- expedition (for getting self-knowledge, and new standards and values).

These inspiring learning environments can also be used by agricultural education institutions and are currently being tested for applicability and effect.

1.8. Conclusions and recommendations for future training and policy measures

Global trends and challenges in the agriculture sector are reviewed in the OECD report on agricultural policies (OECD, 2006⁴²):

- there is a change in the way support is provided to producers;
- the total support to agriculture decreased;
- there is an implementation of various policy changes (e.g. sugar reform);
- the Hong Kong ministerial agreement of December 2005 stated that parallel elimination of all forms of export subsidies and disciplines on all export measures of equivalent should be in effect by the end of 2013;
- in 2006, opportunity to reform agricultural policy multilaterally by lowering tariff walls and reducing the most distorting forms of support;
- in the EU, agricultural policy marked by the 2003 CAP reform and the enlargement of 2004;
- many countries are exploring the potential for support policies to encourage increased bio-fuel production;
- variations in weather conditions and other events led some countries to provide weather related payments to producers;
- the gap between domestic and world prices not reduced;
- there is a trends towards output-linked support, payments based on inputs are distorting production;
- importance to reduce the environmental damage of agriculture;
- increase in budgetary transfers for general services to the agricultural sector (research, infrastructure, inspection, marketing and promotion);
- water policy reform: overuse of scarce water resources; farming is a major source of water pollution; policies are beginning to shift towards more sustainability agricultural water management.

The global trends also have large impact on agriculture in the EU, also for the labour in the sectors that are reviewed in this study. This contribution concludes with the observation that on the whole, employment in the agri-food and forestry-wood sectors is decreasing, that there is pressure on production costs, and that this makes the primary processes becoming more knowledge-intensive. This stimulates job growth in the higher education segment.

Although employment is decreasing, the economic value of certain clusters should not be underestimated.

⁴² <http://213.253.134.43/oecd/pdfs/browseit/5106051E.PDF> (Accession date: April 30, 2007).

Major drivers of change in the food and wood sectors which are observed are the following:

- more international, national, sectoral and product regulation;
- globalisation in production and trade in agri-food and wood products;
- sustainability as a challenge which can go together with controlled economic growth;
- climate change which will have impact on growth and trade areas;
- competition which is also more global; large chains absorb many small enterprises and have control over large market shares;
- public involvement in the food and wood sectors, caused by concerns about food crises, animal welfare, fair trade and biodiversity;
- technological innovation, varying from agro-technology and robotisation to bio-nanotechnology;
- food and health issue caused by concerns about obesity and diseases of the greying population;
- food safety risk assessment⁴³;
- global environmental change.

For more information about drivers in the agriculture sector see the OECD report (2006)⁴⁴.

Regarding food safety risk assessment, the following drivers are relevant⁴⁵:

(a) Globalization

- (i) food products do not have borders;
 - same ingredients all over the world;
 - similar supply streams;
 - processed foods are ‘international’;
- (ii) increased influence of mass-media/Internet communication to obtain information on safety/quality of food;
- (iii) food chemical safety issues are becoming global;

(b) Technology

- (i) progress in analytical capabilities;

⁴³ EFSA play a key role in this, in fields like food additives, flavourings, processing aids, materials in contact with food, animal health and welfare, biological hazards, contaminants in the food chain, additives and products or substances used in animal feed, genetically modified organisms, dietetic products, nutrition and allergies, plant health, plant protection products and their residues, pesticides, Geographical BSE Risk (GBR) and zoonoses. See: <http://www.efsa.europa.eu/en/science.html> (access date: April 27, 2007).

⁴⁴ https://www.oecd.org/document/4/0,2340,en_2649_33773_36967364_1_1_1_1,00.html#TOC (access date: April 27, 2007).

⁴⁵ This list of drivers is based on <http://www.foodstandards.gov.au/srcfiles/Godefroy-Chem%20Safety.pdf> (Accession date: April 30, 2007).

- (ii) difficulty to apply a ‘zero threshold’ for various chemicals;
- (iii) difficulty of communicating ‘acceptability’ tolerance and risk management strategy to consumers;
- (iv) innovative techniques and processes requiring pre-market approval;
- (c) Demography/society
 - (i) popularity and availability of a larger variety of foods from various sources, worldwide;
 - (ii) educated consumers demanding a high quality information about risks/benefits associated with foods;
 - (iii) high consumer expectations vis à vis government as a regulatory/enforcement authority capability of ensuring the safety and quality of foods;
 - (iv) increased consumer demand for better food choices: social interest to achieve reduced medical costs and better quality of life through safe and better food choices;
 - (v) increasing calls to measure performance of selected risk management strategies on public health outcomes

<http://www.foodstandards.gov.au/srcfiles/Godefroy-Chem%20Safety.pdf>).

Further information on drivers of global environmental change can be found in the European Environment Agency report (EEA 2006⁴⁶). It mentions external drivers such as international trade patterns, changes in consumer preferences and trends in the access to production factors, such as land or labour. Internal driving forces are trends towards specialisation and intensification of agricultural holdings, the changing attitudes of farmers, or the introduction of new technologies, such as precision farming (EEA 2006).

The report also elaborates on the environmental issues (EEA 2006):

- (a) soil (pressures on the soil resource caused by cropping-livestock patterns, farm management practices, tillage practices, the management of soil cover, and intensification/ extensification processes (p. 19);
- (b) air quality and climate change (greenhouse gas emissions from energy, industry, transport, household and agriculture (p. 21);
- (c) water quantity (consumption of water for irrigation) (p. 22-23);
- (d) water quality (nitrogen and phosphorus in surface water) (p. 24);
- (e) biodiversity (a decline in farmland bird populations as indicator of diverse habitats) (p. 26);

⁴⁶ http://reports.eea.europa.eu/eea_report_2006_2/en/IRENA-assess-final-web-060306.pdf (access date: April 27, 2007).

(f) landscape (the role of farmers in shaping and maintaining attractive landscapes) (p. 26).

It is possible to conclude that the following roles are being and will be affected by various driving forces in agriculture, manufacturing of food, forestry and manufacturing of wood products:

- (a) entrepreneurship, which becomes more important because of the decreasing public financial support of agricultural production;
- (b) consultancy, which is changing from a public to a private business-to-business service;
- (c) innovation, which is necessary for delivering value added, because non-(western) EU Member States can produce cheaper.

Furthermore, various generic skills and competencies that become important and need attention have been identified:

- (a) ability to apply basic and advance principles of continuous quality improvement;
- (b) ability to contribute to technical innovation and adapt work processes to realise innovation;
- (c) ability to continuously scan the environment of the organisation for threats and opportunities;
- (d) ability to think and work in the framework of globalisation;
- (e) ability to deal with uncertainty;
- (f) ability to cope with profound change, including turnaround management;
- (g) organisation adjustments caused by scale enlargement;
- (h) networking and contribution to chain development;
- (i) international supply chain management;
- (j) dealing with the various publics.

Also, it can be concluded that it is difficult to give a detailed overview of the future skills needs in the food and wood sectors, since these sectors are extremely diverse, and there is a multitude of occupations. It is interesting though to mention the case of the wood cluster in Tirol whose strategy was developed along six main axis and proved very beneficial for the sector (IRE, 2006⁴⁷, p.15):

- (a) coordination strategy (to promote synergies between wood cluster members, know-how transfer and technology sharing),
- (b) initiation strategy (to start new cooperations and topics in the wood sector);

⁴⁷ Information from <http://www.innovating-regions.org/download/Cluster%5Fworkshop%5FBrussels%5F06%5F05%5F30%2D31%5Fminutes%2Epdf> (access date: April 27, 2007).

- (c) qualification strategy (including an expert forum, workshops and study visits);
- (d) internationalisation strategy (to involve the cluster and its members in international platforms and networks and to promote exports and market research activities);
- (e) identification strategy (to establish a brand name, cluster member identification, a newspaper, and the organisation of events);
- (f) infrastructure and service strategy (to deliver a service package to the members such as consulting services, common infrastructures, etc.).

The detailed stratification of the sectors, and the limited employment in the sectors, cause a significant challenge for agricultural education: it faces small number of students and it has to cater for a wide variety of subsectors, classes and occupations. Because of this, the following is needed:

- (a) enhanced national and international cooperation;
- (b) specialisation, which requires tough choices regarding what programmes to delete from the syllabus, and what programmes to strengthen;
- (c) e-learning, and interactive specialised courses (this can be done regionally, nationally and internationally, and is already taking place);
- (d) creation of new programmes, which are service-oriented;
- (e) creation of broad introductory programmes in agriculture and life sciences (since part of the students do not want to specialise early in their programmes, and others do);
- (f) sectoral agreements for continuing vocational training, such as agreements on training targets, funds, investments, qualified training suppliers, number and quality of training places, guest lecturers, internships of teacher, quality control of examinations, skills identification, and occupational profile research;
- (g) sectoral future oriented training initiatives need to be implemented to support the current development of necessary knowledge, skills and attitudes.

As stated, there is large variation between sectors and occupations. The variation is even larger when the differences between the Member States in the EU-27 are taken into account. East and West, and North and South differ considerably. The EU policy regarding agriculture and rural development results in reform of agriculture and food production. In the new Member States this leads to massive reorientation regarding employment. This is a new market for skills suppliers.

Bibliography

Berkhout, P.; van Bruchem, C. (red.). *Landbouw- Economisch bericht 2006*. Den Haag: LEI, 2006. http://www.lei.dlo.nl/publicaties/PDF/2006/LEB/LEB_H07.pdf (Date of access: April 27, 2007).

Coufalík, J. (Ed.). *Compendium of projects for agriculture*. Prepared with the support of the European Commission (DG Education and Culture). NTF. Prague: National Agency of the Leonardo da Vinci programme in the Czech Republic, 2005.

Council of the European Union. *Renewed EU sustainability development strategy*. Brussels, 9 June 2006.

du Chatenier, E. *Competenties voor open innovatieteams*. Wageningen: Wageningen University, Chair Group of Education and Competence Studies, 2007.

EEA. *Integration of environment into EU agriculture policy. The IRENA indicator-based assessment report*. Luxembourg: EUR-OP, 2006.

EGFSN. *The demand and supply of skills in the food processing sector*. Dublin, 2003.

European Commission. Press release. *CAP reform: EU agriculture ministers adopt groundbreaking sugar reform*. Reference: IP/06/194, 21/02/2006. 2006a.

European Commission. Press release. *CAP reform: fruit and vegetable reform will raise competitiveness, protect producers from crisis, increase consumption, improve environmental protection and simplify rules*. Reference: IP/07/75, 24/01/2007. 2007.

European Commission. *The common agricultural policy explained*. 2004.

European Commission. *Towards a sustainability European wine sector*. Communication from the Commission to the Council and the European Parliament, 2006.

European Commission. *European industry: a sectoral overview*. Commission staff working document. Brussels, 2005.

Gielen, P.; Biemans, H.J.A.; Mulder, M. *Inspirerende Leeromgevingen voor Ondernemers. Aanwijzingen voor ontwerpers en begeleiders*. Leerstoelgroep Educatie- en competentiestudies. 45 p. Wageningen: Wageningen Universiteit, 2006.

IRE. *Innovating regions in Europe*. Proceedings of the IRE workshop 'Regional Clusters as innovation drivers'. Brussels, 30-31 May 2006.

Krüger, K. *Innovation, dissemination of knowledge and the development of competencies. The case of the European dairy industry*. Barcelona: Cirem Foundation, 2005.

Lans, T.; Biemans, H.; Verstegen, J.; Mulder, M. *Learning Out of business? Learning factors fostering the development of entrepreneurial competence of small business owners in horticulture*. Paper presented at the Annual Meeting of the AERA, Chicago, April 9-13. Wageningen: Wageningen University, ECS, 2007.

Luttik, P.; Boosten, G.; Smit, H.; Tersteeg, J. *"Schonelei" for a future of possibilities*. Utrecht: Innovatienetwerk, 2006.

Man, T.W.Y.; Lau, T.; Chan, K.F. The competitiveness of small and medium enterprises - a conceptualisation with focus on entrepreneurial competences. *Journal of Business Venturing*, 2002, 17, 2, p. 123-142.

Mulder, M.; Ernstman, N. The public's expectations regarding the green sector and responsive practices in higher agricultural education. Slavík, M.; Žáková, P. (eds).

Proceedings of the 8th European Conference on higher agricultural education, the public and the agriculture and forestry industries, the role of higher education in questioning assumptions and matching expectations, p. 35-53. Prague: Czech University of Agriculture, 2006.

Mulder, M. et al. Competence development of entrepreneurs in innovative horticulture. *Journal of Workplace Learning*, 2007, 19, 1, p. 32-44.

Mulder, M.; Kupper, H. The future of agricultural education: the case of the Netherlands. *The Journal of Agricultural Education and Extension*, 2006, 12, 2, p. 127-139.

OECD. *Agricultural policies in OECD countries at a glance*. Paris: OECD, 2006.

Shim, M.O. *The development of a competency model for Korean extension professionals*. Seoul: Seoul National University, 2006. Unpublished doctoral dissertation.

2. The EU rural development policy 2007-2013 and its relevance for skill needs in the agri-food sector

Ester Hortet Tarroja⁴⁸, DG Agriculture and Rural Development, the European Commission

Abstract

This chapter introduces the EU rural development policy for the years 2007-2013 of the European Commission, DG Agriculture and Rural Development. It also shows the relevance of the policy development for skill needs in the agri-food sector. The chapter points out that after the common agricultural policy (CAP) in 2003 and 2004, the Agricultural Council adopted a fundamental reform of rural development policy for the period 2007 to 2013. This includes: increasing the competitiveness of the agricultural sector, enhancing the environment and countryside through support for land management and enhancing the quality of life in rural areas and promoting diversification of economic activities. The chapter then goes into the Community Strategic Guidelines for rural development, and the skill needs in agriculture and forestry and in rural areas, as well as rural development measures and its importance for human capital in agricultural, forestry and food sector. As to skill development, the training and information actions for the diversification of economic activities in the rural areas, and complementary to that the European Social Fund, provide funds for training. The chapter is concluded with the description of the next steps in the implementation of the rural development policy 2007-2013.

2.1. The EU rural development policy 2007-2013

With over half of the population in the 25 EU Member States living in rural areas, which cover 90 % of the territory, rural development is a vitally important policy area. Farming and forestry remain crucial for land use and the management of natural resources in the EU's rural areas, and as a platform for economic diversification in rural communities.

The strengthening of EU rural development policy has become an overall EU priority. The conclusions of the Göteborg European Council of June 2001 made this clear, stating that 'during recent years, European agricultural policy has given less emphasis to market mechanisms and through targeted support measures become more oriented towards satisfying the general public's growing demands regarding food safety, food quality, product

⁴⁸ The present article reflects the views of the author but not necessarily the opinion of the European Commission.

differentiation, animal welfare, environmental quality and the conservation of nature and the countryside’.

Following the fundamental reform of the first pillar⁴⁹ of the CAP in 2003 and 2004, the Agricultural Council adopted in September 2005 a fundamental reform of rural development (RD) policy for the period 2007 to 2013 (EC, 2005) on the basis of the Commission’s proposal of 14 July 2004 (EC, 2004).

Reflecting the conclusions of the Salzburg conference on rural development (November 2003) and the strategic orientations of the Lisbon and Göteborg European Councils emphasising the economic, environmental, and social elements of sustainability, the following three major objectives for RD policy have been set for the period 2007–2013:

- (a) increasing the competitiveness of the agricultural sector;
- (b) enhancing the environment and countryside through support for land management;
- (c) enhancing the quality of life in rural areas and promoting diversification of economic activities.

Additionally, the reform integrates the Leader Community Initiative (further referred as ‘Leader’) into mainstream RD programmes and also makes an important step in simplification by bringing rural development under a single funding and programming framework.

The new RD policy of the EU as described in the Council Regulation (EC) No 1698/2005 is characterized by ‘continuity and change’: it continues to provide a menu of measures from which Member States can choose and for which they receive Community financial support in the context of integrated rural development programmes. It changes the way these programmes are developed by fostering the strategic content and the sustainability development of rural areas.

A thematic axis will correspond to each core objective in the rural development programmes. The three thematic axes are complemented by a ‘methodological’ axis dedicated to the Leader approach (Leader axis). A minimum funding for each axis is required to ensure some overall balance in the programme (10% for axis 1; 25% for axis 2; 10% for axis 3 and 5% for the Leader axis which will be 2.5% in the new Member States). Taking into account the EU objectives, Member States can choose rural development measures which they believe will create the highest value added from a range of pre-defined measures.

Member States establish, at national or regional level, their rural development programmes choosing those measures that suit the needs of their rural areas best and taking into account the priorities and strategy chosen in the national strategy plans on rural development. The choice of rural development measures is quite wide as demonstrated in the following table.

⁴⁹ Covering market-related CAP support systems and direct aids for farmers.

Table 4: EU rural development policy 2007-2013

Objective settings	National strategy RD programmes	
Axis 1: competitiveness	Measures:	• human resources, • vocational training and information actions, • young farmers, • early retirement, • use of advisory services (including for meeting standards), • setting up of farm management, • relief and advisory and forestry advisory services, • physical capital, • farm/forestry/investments, • processing /marketing/co-operation for innovation, • agricultural/forestry infrastructure, • restoring agricultural production potential, • quality of agricultural production and products, • meeting standards temporary support, • food quality incentive scheme, • food quality promotion, • transitional measures, • semi-subsistence, • setting up producer groups.
	Funding share:	minimum 10%
	EU co-financing rate:	max. 50/75% ⁵⁰
	Territorial application:	all rural areas
Axis 2: land management	Measures:	• sustainability use of agricultural land, • Mountain LFA, • other areas of handicaps, • Natura 2000 agricultural areas, • agri-environment / animal welfare (compulsory), • support for non-productive investments, • sustainability use of forestry land, • afforestation (agricultural/ non-agricultural land), • agro-forestry, • Natura 2000 forest areas, • forest environment, • restoring forestry production potential, • support for non-productive investments.
	Baseline (agriculture):	cross compliance
	Funding share:	minimum 25%
	EU co-financing rate:	max 55/80% ⁵¹
	Territorial application:	all rural areas
Axis 3: wider rural development	Measures:	• quality of life, • basic services for the rural economy and population (setting up and infrastructure), • renovation and development of villages, protection and conservation of the rural heritage, • economic diversification, • diversification to non-agricultural activities,

⁵⁰ Council Regulation (EC) No 1290/2005 of 21 June 2005 on the financing of the common agricultural policy. OJ L-209, 11/8/2005.

⁵¹ Council Regulation (EC) No 1290/2005 of 21 June 2005 on the financing of the common agricultural policy. OJ L-209, 11/8/2005.

		• support for micro-enterprises, • encouragement of tourism activities, • preservation and management of the natural heritage, • training skills, acquisition and animation, • training and information, • skills, acquisition, animation and implementation.
	Funding share:	minimum 10%
	EU co-financing rate:	max 50/75% ⁵²
	Territorial application:	all rural areas
Leader axis	Implementation:	Leader approach for selected territories within the scope of the 3 thematic axes
	Funding share:	minimum 5% (2.5% in new Member States)
	EU co-financing rate:	max 55/80% ⁵³
	Territorial application:	all rural areas, selected territories

The Regulation on the financing of the CAP provides for the creation of two new funds in 2007, each financing one of the two pillars of the CAP: the European Agricultural Fund for Guarantee (EAFG) for pillar 1 and the European Agricultural Fund for Rural Development (EAFRD) – for pillar 2, the rural development policy.

The European Council agreed in its meeting of December 2005 the new financial perspectives for the period 2007-2013. Within this framework, rural development was allocated 69.75 billion Euros. The Commission approved in September 2006 a Decision (EC, 2006) fixing the total budget for the period 2007-2013 which amounts to a total of 77.66 billion Euros as it includes compulsory modulation to first pillar payments (4% in 2007 and 5% onwards) and cotton and tobacco transfers. The Decision includes a subdivision in budget allocations by year and by Member State. To take into account the accession of Bulgaria and Romania, this Decision will be amended to include their respective allocations.

2.2. Community strategic guidelines for rural development

The basis for future rural development policy is a strategic approach defining the EU's priorities for rural development. On February 2006 the Council adopted the EU strategic guidelines for rural development⁵⁴. These provide the framework on the basis of six community strategic guidelines, according to which Member States shall prepare their national strategy plans on rural development which will help to:

- (a) identify the areas where the use of EU support for rural development creates the most value added at EU level;

⁵² Council Regulation (EC) No 1290/2005 of 21 June 2005 on the financing of the common agricultural policy. OJ L-209, 11/8/2005.

⁵³ Council Regulation (EC) No 1290/2005 of 21 June 2005 on the financing of the common agricultural policy. OJ L-209, 11/8/2005.

⁵⁴ Council Decision of 20 February 2006 on Community strategic guidelines for rural development (OJ L-55/20 of 25/2/2006).

- (b) make the link with the main EU priorities (Lisbon, Göteborg);
- (c) ensure consistency with other EU policies, in particular cohesion and environment;
- (d) accompany the implementation of the new market orientated CAP and the necessary restructuring it will entail in the old and new Member States.

2.2.1. Community strategic guidelines

- (a) Improving the competitiveness of the agricultural and forestry sectors: the resources devoted to axis 1 should contribute to a strong and dynamic European agri-food sector by focusing on the priorities of knowledge transfer, modernisation, innovation and quality in the food chain, and on priority sectors for investment in physical and human capital.
- (b) Improving the environment and countryside: to protect and enhance the EU's natural resources and landscapes in rural areas, the resources devoted to axis 2 should contribute to three EU-level priority areas: biodiversity and the preservation and development of high nature value farming and forestry systems and traditional agricultural landscapes, water, and climate change.
- (c) Improving the quality of life in rural areas and encouraging diversification: the resources devoted to axis 3 should contribute to the overarching priority of the creation of employment opportunities and conditions for growth; the range of measures under axis 3 should in particular be used to promote capacity building, skills acquisition and organisation for local strategy development and also help ensure that rural areas remain attractive for future generations; in promoting training, information and entrepreneurship, the particular needs of women, young people and older workers should be considered.
- (d) Building local capacity for employment and diversification: the resources devoted to axis 4 (Leader) should contribute to the priorities of axes 1 and 2, and in particular of axis 3, but also play an important role in the horizontal priority of improving governance and mobilising the endogenous potential of rural areas.
- (e) Translating priorities into programmes: in their national strategies, Member States should ensure that synergies between and within the axes are maximised and potential contradictions avoided; they will also wish to reflect on how to take into account other EU-level strategies, in particular in the field of environment.
- (f) Complementarity between Community instruments: the synergy between structural, employment and rural development policies needs to be encouraged.

2.3. Skills needs in agriculture and forestry and in rural areas

The situation of the human capital in agriculture varies according to the different Member States but only 17% of farmers in the EU-15 have a basic or upper-secondary education in agriculture, ranging from 3% in Greece to 64% in the Netherlands.

Regarding the skill needs in rural areas in general, human potential is a key factor for the development of rural areas. In the EU-25, 70% of adults have reached a medium or high education level. There are however large variations among Member States (from 23% to 89%). In many countries the level of education is lower in rural areas than in urban areas, even if this pattern is not systematic (in average in urban areas, almost 20% have tertiary education; in rural areas only 15%). Tertiary education can lead to out-migration of skilled individuals from rural to urban areas for better employment opportunities.

Life-long learning is a good instrument to improve the skills of workers and favour economic development, particularly in rural areas. It is already largely applied in Scandinavian countries and the United Kingdom where more than 20% of adults participated in training in 2004. The dynamism of population and their willingness to be actors for their development is also essential. Leader actions cover 14% of the EU-15 population and more than 20% in some Member States (such as Ireland, Portugal, Luxemburg, Austria, Greece and Finland).

2.4. Rural development measures and its importance for human capital in agricultural, forestry and food sector

The above-mentioned skill needs can be addressed through the rural development programmes, specially in axis 1 (through the measure ‘Training and information’) and in axis 3 through information and training actions for the diversification of economic activities in rural areas.

2.4.1. Human capital measures in improving the competitiveness of agri-food and forestry (axis 1)

The measure ‘Training and information actions’ has been enlarged in scope in comparison with the previous programming period. In 2007-2013 it will cover all adult persons dealing with agricultural, food and forestry issues. The activities covered by the training are both the agricultural and forestry competitiveness and the land management and environment objectives.

The design of this measure in the rural development programmes should take into account that the evolution and specialisation of agricultural and forestry require an appropriate level of technical and economic training, including expertise in new information technologies, awareness in the field of product quality and sustainability of natural resources.

To implement training and information actions in the 2007-2013 programming period, Member States should take into account the experiences with the previous programming period. At the time almost all MS chose the training measure except Estonia, Malta, Portugal (who implemented training through the European Social Fund) and Slovenia. The funding during that period still represented a small part of the RD funding: 0,7 of the programmed

expenditure in the rural development programmes of the EU-15 (in 2000-2006) and 0,4% in the rural development programmes of the EU-10 (in 2004-2006).

The areas covered by the training measure during the past programming period were: management of farms, strategic training, marketing, agri-environment, diversification, information technologies. The training measure was used in combination with other rural development measures such as setting up young farmers (training was in some cases a pre-condition to receive the aid), agri-environmental measures, investments in farms etc.

Concerning the organisation of training, it was implemented in a different manner in Member States: some of them let participants to apply for training courses in the market and then the participants were reimbursed, whereas in the majority of cases Member States organised calls for proposals to set up specific training courses.

The mid-term evaluation of the training measure demonstrated its relevance and recommended its extended use in combination with other RD measures.

2.4.2. Training and information actions for the diversification of economic activities in the rural areas (axis 3 and 4)

Training and information actions will be available for the rural population to achieve the objectives of increasing economic diversification and improving the quality of life of rural areas. Also support will be provided for skills acquisition and animation of rural areas (studies of the areas, measures to provide information about the area, training of staff involved in the preparation and implementation of a local development strategy and promotional events and training of leaders).

The beneficiaries of these information and training actions are the economic actors operating in the fields covered by axis 3. These training actions cannot include training which form part of normal education programmes or systems at secondary or higher levels.

Axis 4, the implementation of the Leader approach, can also contribute to cover training needs of the population in rural areas to diversify economic activities. The Leader approach is designed to help rural actors improve the long-term potential of their local areas. It is aimed at encouraging the implementation of integrated, high-quality and original strategies for sustainability development for local areas, drawn up and implemented by broad-based local partnerships, called 'Local action groups' (LAGs). LAGs implement local development strategies aimed at achieving the objectives of one or more of the three thematic axes and have been active in training and information provision.

2.4.3. Complementarity with other funds: the European Social Fund

Training actions financed through the rural development programmes covering skill needs in the agri-food and forestry sectors and economic diversification in rural areas will be

complementary and act in synergy with structural funds programmes financed by the European Regional Fund and European Social Fund which will also finance training actions.

2.5. Next steps in the implementation of the rural development policy 2007-2013

EU Member States are currently (December 2007) finalising the national strategy plans for rural development and finishing their rural development programmes which should be approved by the European Commission in 2007. It will be up to the Member States to decide to which extent they include information and training actions to tackle as much as possible skill needs in the agri-food and forestry sectors and in the rural areas in general.

Bibliography

European Commission. Commission decision of 12 September 2006 fixing the annual breakdown by Member State of the amount for Community support to rural development for the period from 1 January 2007 to 31 December 2013. OJ L-261/32, 22/9/2006.

European Commission. Commission proposal for a Council regulation on support for rural development by the European agricultural fund for rural development (EAFRD). COM(2004)490 final: 14.07.2004. http://europa.eu.int/eur-lex/en/com/pdf/2004/com2004_0490en01.pdf.

European Commission. Council decision of 20 February 2006 on Community strategic guidelines for rural development. OJ L-55/20 of 25/2/2006.

European Commission. Council regulation No 1290/2005 of 21 June 2005 on the financing of the common agricultural policy. OJ L-209, 11/8/2005.

European Commission. Council regulation No 1698/2005 of 20 September 2005 on support for rural development by the European agricultural fund for rural development. OJ L-277, 21/10/2005.

3. Scenarios for the future development of the European food and beverage industry

Tine Andersen, Danish Technological Institute, Centre for Business and Policy Analysis, Denmark

Abstract

This chapter briefly presents three different scenarios for the future development and state of the European food and beverage industry by 2016. The scenarios are built using input from a comprehensive mapping of facts, figures and trends in the European food sector, four company case studies and two cluster case studies.

The scenarios describe the European food industry in terms of industry structure, role and nature of innovation in the sector, market and consumers and competence profiles. All scenarios assume that international trade and international division of work will continue to expand. In all scenarios, SMEs face (different) challenges. Also common to the scenarios is a diminishing demand for unskilled labour in the food sector and a growing demand for specialists.

3.1. Introduction

Scenarios are methods whereby we can arrive at a robust, innovative, and future-oriented best practice. Often set in a 10-15 year perspective, scenarios can act as a navigation tool and early warning systems in our current realities.

The three alternative scenarios presented here were commissioned in 2006 by the European Monitoring Centre for Change as an element in a dossier on the future of the European food industry. The scenarios are intended to provide realistic, internally consistent, and plausible pictures of alternative futures. They take their titles from popular music and are entitled:

- (a) scenario 1 'Rock your body',
- (b) scenario 2 'Stayin' alive',
- (c) scenario 3 'We are the world'.

The scenarios are drawn on extensive desk research, the results of which together with statistical and economic data are presented in a mapping report⁵⁵, and on interviews with key staff and management in four food companies and two food industrial clusters.

Five main drivers were identified as a result of this research:

- (a) the development of the world economy,
- (b) consumer demand for high value-added food products,
- (c) product and process innovation in the sector,
- (d) globalisation of production and trade,
- (e) governments' approach to healthy food habits.

Out of 32 possible combinations of these drivers, three scenarios were chosen which stood out as very different, while each individual scenario was considered to be both plausible and thought-provoking. The table below shows how the drivers combine to create the three scenarios.

Table 5: State of drivers in the three scenarios for the food industry 2016

	'Rock your body'	'Stayin' alive'	'We are the world'
The development of the world economy	Positive	Negative	Positive
Consumer demand for high value-added products	Rising	Stagnating	Rising
Product and process innovation in the sector	High	Low	Low in some parts of the sector, high in other parts
Globalisation of production and trade	WTO	Regional/bilateral	WTO
Public administration's approach to healthy food habits	Few initiatives	Many initiatives	Many initiatives

⁵⁵ The mapping report, as well as the case and cluster case studies and the full scenario descriptions can be accessed at EMCC's website, www.emcc.eurofound.eu.int/content/source/eu06026a.html.

3.2. Scenario 1 ‘Rock your body’

The name of this scenario signals that one of the important drivers in this scenario is a growing emphasis among European consumers on the role of nutrition in staying fit and healthy well into old age. However demand for traditional food products is still on the rise due to growth in the emerging economies. This scenario is characterised by global, competitive and market driven environment for food products. In this environment there is room for many different kinds of companies.

3.2.1. The state of the economy

The global economy is doing well. Europe has seen fundamental restructuring of the industries, reforms of welfare systems and public initiatives aimed at increasing the competences of the European workforce.

The global transport infrastructure is well-functioning and prices on transport are relatively low. In spite of many obstacles and set-backs, negotiations in the WTO have eventually led to a further liberalisation of international trade. The CAP has been almost completely abandoned in respect of international agreements leading to an inflow of cheap agricultural products from third countries. The large European food manufacturers find that global competition is also in the market for products with a low degree of valorisation as the low cost-to-market means that it is increasingly profitable for enterprises in low cost regions to market their products in Europe and the US.

This development has driven some European manufacturers to focus on high value-added food products that fit the changes in the lifestyle of European consumers leaving markets for low value-added products in third countries for those who are able to organise production and distribution in the location with the lowest cost.

3.2.2. Society and culture

In 2016 an ever increasing number of people live in urban areas close to their workplace. Elderly people taking part in physical activities are seen everywhere. The ‘I-culture’ has been taken to the extreme, and every facet of life (including what you eat) is evaluated on the basis of its ability to strengthen your personal brand.

The ageing population of Europe posed a serious economic challenge for many countries. This has brought about comprehensive welfare reforms in most European countries as well as a host of public initiatives aimed at promoting healthy lifestyle. The campaigns have been successful in raising awareness that nutrition and exercise are important means of preventing diseases.

3.2.3. Consumer preferences

Consumers in Europe and the US increasingly demand high value-added food products such as regional specialities, organic products, and ethnic foods, but the emphasis on individual wellness and health implies that growth is concentrated in the market for functional foods. High quality home cooking that in 2006 was considered to be a strong consumer trend has not developed according to expectations. Even in countries such as Spain and Italy, there is an increasing focus on healthy, but also fast and easy eating. High value-added convenience provides the perfect solution for busy people, if they do not eat out.

Consumer segments are increasingly fragmented, and many food companies find that a key to success is to target product development and marketing at a specific segment defined by age, activity-level, and the bio-diagnosis that every child receives immediately after birth. Hence, every health profile has its own targeted (functional) food, which is much more sophisticated than the functional foods of 2006.

Remaining organic farmers are attempting to ride the health wave by arguing that their products do not contain chemicals. However, it is not considered 'cool' to eat unprocessed fruit or vegetables, as the nutritional content is not precisely defined. Instead, consumers prefer convenient food or ready-made food-to-go, provided that nutritional content and health profile are specified.

3.2.4. Company strategies

The fragmentation of consumer segments is making it possible for a large variety of food companies to operate ranging from the multinational multi-product manufacturers to one-product micro enterprises. The medium-sized, small and micro-enterprises, however, are usually not in a position to compete on the price. Furthermore, production of designer-food demands heavy investments in R&D. The only option, therefore, for SMEs is innovation related to the business model or to new consumer segments.

The global division of work means that production is often situated in China, ICT-business activities in India, and product development in the US, Western Europe, or in Asian countries where there are more specialised scientists than in Europe.

Retailers still dominate the food supply chain, but food companies are finding alternative ways of distributing their products. Many food manufacturers sell their products directly via health and training centres, restaurants, food-to-go chains, schools and company canteens or via the Internet in order to counter the powerful position of global retailers.

Health forums on the Internet and local fitness communities make it possible to access consumers directly and provide advice on nutrition. Loyalty is also promoted through health packages that include discounts on products and membership to clubs and communities etc.

Food manufacturers work with private companies in other sectors to develop nutritional offers to employees as part of corporate social responsibility policies.

The demand for functional food is also booming in North America and Japan. The market opportunities for functional foods in Asia, South America and Africa are on the other hand limited.

As a result, the food companies in Europe have developed in two different directions. Some have pursued innovation in functional health related foods and new distribution channels. Others have pursued efficiency in the production and distribution of foods aimed at markets in the emerging economies.

Important technological developments include robotics and sensor technologies which are used to make the production more efficient. In addition, ICT and radio frequency identification (RFID) technologies are used to ensure integration of production steps across the global supply chain and to support traceability. RFID tags are also used to provide consumers with information on the nutritional value of the products and to suggest easy and healthy recipes via personal mobile interactive devices.

3.2.5. Skill and competence needs on the labour market

The developments outlined above imply that the need for low-skilled workers in the European food sector has been dramatically reduced. Labour intensive production has been outsourced to low-cost countries outside Europe, just like robots have taken over many functions. Automation requires skilled operators and technicians in the production. The increased focus on safety has led to a growing quality management skills and insight into food safety.

Product development and marketing is at the core of business. The demand for market specialists with good product insight has almost exploded.

The globalisation of the food supply chain requires that middle management has to master several languages and possess good cultural skills. Also, international trade and standards has increased the demand for employees with insight into legal issues and concrete knowledge about trade agreements and public regulation.

Both in marketing and management, many functions are outsourced to service providers who specialise in the food sector.

3.3. Scenario 2 ‘Stayin’ alive’

In this scenario the world economy is at the point of stagnation, although some emerging economies are still growing. Consumer focus on price and discount has continued to sweep like a wave through Europe, and in 2016 the European market for high value-added foods like

organic food and drink, food with well-established provenience, or food made from rare raw materials is continuously shrinking.

3.3.1. The state of the economy

The state of the global economy has become increasingly complex. The emerging economies have continued their impressive growth rates, both within traditional industry and in high technology areas.

Global trade continues to rise, but due to failure of the WTO to reach a common agreement on the liberalisation of trade in food and agriculture, trade agreements are regional and/or bilateral. This makes administration of trade agreements very difficult and time consuming for both public and private actors.

Neither individual European countries nor the EU have really been willing to open their own markets. As a consequence, Europe has been caught in the middle between on the one hand a traditional agricultural policy built on subsidies and on the other hand an innovation strategy demanding sizeable investment.

As a result, an increasing share of the wealth in the global economy is created outside Europe, and the emerging economies are becoming more and more interesting and important for global companies.

Governments and the EU try their best to relieve regulative requirements having a negative impact on the global competitiveness of the European industry. But the real political issue is the lack of a clear strategy.

3.3.2. Society and culture

The lack of public resources means that too little investments are made in education and research, meaning that the competences of the labour force are lagging behind other parts of the world. Furthermore, the labour markets of many Member States are still very inflexible compared to those of the emerging economies.

The stagnating economies of many European countries together with a feeling that globalisation is the responsible culprit has led to a more nationalistic thinking and culture in Europe. The majority of the populations (not including farmers) have come to feel that lack of political will to deal with fundamental issues such as the CAP and the labour market has placed Europe in a deadlock with no way forward.

3.3.3. Consumer preferences

Consumer preferences still differ widely across Europe, but the consumer focus on (low) price has spread from the northern and eastern Europe to include southern Europe as well.

The interest in sustainability and organic production never really caught on in the new Member States, and the consumers' demand for these types of food, is declining just like the demand for luxury foods.

This trend is particularly strong in the middle class contrary to the expectations of analysts. With a declining household budget, many consumers choose to cut back on what is perceived as unnecessary luxury. Also, good food and cooking is no longer 'in vogue' and food receives little media attention.

Government initiatives to motivate citizens to change diets towards a healthier living have had limited success in stimulating demand for quality. Instead consumers with a concern for their diet tend to look for easy solutions in the form of brands promising weight loss, food with added vitamins etc.

Although food scandals occur relatively often, most consumers consider them to be unavoidable side effects of the industrial set-up and tend to forget them relatively quickly. Consequently, few consumers are willing to pay a premium for products that are certified as having been produced and distributed according to certain food safety standards.

3.3.4. Company strategies

The focus on price and the consolidation of the retail chains' negotiation power has led food producers to focus strongly on opportunities to cut costs in production and distribution. Since many companies have financial difficulties, few investments are made in R&D and new technology. Instead, those who have the opportunity to outsource or offshore parts of their production do so in order to remain competitive. In this process, some European food producers have decided to locate both production and markets in one of the emerging economies, while management and administration remain in Europe mainly for historical reasons.

Many SMEs have not had the operational capacity and production volume required to offshore their activities. These companies have been bought, merged with other companies or simply gone out of business. Even so, competitive pressure remains on the large manufacturers, particularly from retail chains that will no longer market branded foods but choose to sell all food products as private labels. Some retailers have created their own product development departments, so that knowledge – and hence value creation – is moving downstream into the distribution channels.

As consumer loyalty towards brands is sacrificed for the sake of low price, and as the private label products tend to be cheaper than branded ones, only 'megabrands' such as Coca Cola

are able to maintain high sales. Bearing this in mind, it is no surprise that the majority of food producing companies base their strategy on low price products which demand very little investment in product development and marketing.

3.3.5. Innovation

Generally speaking, there are very few visible product innovations on the market, and most of them are related to low price convenience products. This is not to say that innovation does not take place – it is just not visible to the consumer, since it is related to functional food, genetic modification, and different kinds of ingredient technologies.

Functional foods have experienced significant growth rates throughout Europe. The individual consumer's concerns for his/her own health remains quite high, more so as the public health sector is in decay. The majority of consumers are no longer uncomfortable with the concept of functional food which many see as a shortcut to a more healthy living.

The manufacturers remaining in Europe invest in technologies to lower labour costs, e.g. sensor technologies, wireless communication, and robotics. These technologies demand investments that are only feasible for companies of a certain size. Different initiatives from governments to help small enterprises increase their efficiency through the implementation of new technology have not been very successful.

The large extent of off-shoring and outsourcing has only been possible because technologies for communication, transport and logistics have advanced considerably since 2006, and indeed much R&D effort continues to go into this area.

3.3.6. Skill and competence needs on the labour market

Following the outsourcing of manual operations, and the mergers and closures of industrial operations, very few unskilled jobs are left in the European food manufacturing sector. A number of jobs demanding competences within process technology have been created, but in numbers they do not make up for the jobs that have been lost on the shop floor. The large companies recruit mainly employees with competences in product or process technology (ICT, biotech, chemistry, nanotechnology etc.), employees with knowledge of sales and marketing strategies and operation.

3.4. Scenario 3 'We are the world'

In this scenario ongoing growth has created increased wealth among most European citizens. However, negative ecological side effects of industrial production have led to a very strong focus on sustainability in Europe. Food consumers have divided into two segments – the traditional segment focusing on price and the sustainability segment focusing on process.

3.4.1. The state of the economy

The global economy is doing well. However, economic growth has given rise to ecological problems commanding considerable media attention worldwide. Still more often ecological problems have severe global effects.

While international trade liberalisation has been slowly progressing, the liberalisation process has been accompanied by the creation of a new international trade regime aimed at ensuring fair competition in the global market. The regime covers minimum rules on working conditions, environmental protection, animal welfare and the use of chemicals. Also, the labelling of products is now regulated by the WTO agreement.

As a part of the agreement regional trading blocks have been allowed to set higher standards than the international standards as long as these standards do not discriminate countries outside the trading block. Not least the European legislation on food safety and the use of chemicals is very tough in an international perspective. Also, the labelling of food products according to their nutritional value that has been regulated on the basis of common European standards for some years now is quite unique and extensive in comparison with the labelling requirements in the international agreement. Europe has not completely abandoned the CAP, but the resources are primarily used to support sustainable production and regional development. This has been to the benefit of the SMEs in Europe. The SMEs have also benefited from various European SME support programmes that are aimed at increasing the level of innovation, facilitating export and supporting the use of ICT.

3.4.2. Society and culture

There is a growing popular awareness of the important relationship between individuals and their environment. A growing number of people acknowledge that they are part of an ecosystem and a social system and that they should be responsible to other people across borders and time.

This awareness means that sustainability has become a cross-cutting theme in all public policies. Eating is believed to play a central role for the individual's physical and mental well being. Physical health is important, but only as one dimension of sustainability.

ICT has made it easier for people in knowledge intensive positions to work from home – at least a couple a days a week. Industrial production has moved away from urban areas and low-skilled workers are following in the slipstream of the companies. This has benefited local food producers and manufacturers – people go to the local butcher to buy meat and visit the local farmer to buy vegetables.

Tough regulation on the use of chemicals and the requirements regarding food labelling has made it easier for companies based on sustainability and ecology to compete with traditional food producers and manufacturers. Labelling food products put consumers in a good position

to choose products that have been produced in a sustainable way. Moreover, consumer scepticism towards industrial food production and manufacturing has provided the 'green' segment of food producers and manufacturers with a strong market position.

3.4.3. Consumer preferences

People are very concerned about the effects of growth and industrial mass production on the environment, future living conditions and human health. The years since 2006 have seen several major food scandals. A factor that has had great impact is that still more people in Europe have problems conceiving due to deteriorating sperm quality. The exact source of this development has not yet been pinpointed.

These developments have fuelled a quite negative public opinion regarding industrial manufacturing as such and in particular the food industry. There is little trust in industrially produced food. Consumers prefer to buy food directly from producers that they have a direct relationship with, followed by products accompanied by detailed information about the producer and the production process. Also, consumers prefer products that are 'natural' in the sense that they are composed of few ingredients, the production process is simple, they contain few additives, and 'unnatural' technologies like GMO or radiation are not involved.

However, there is still a large segment of consumers who give preference to price. The two consumer segments are increasingly polarised. While the segment that focuses on price is still the largest, the sustainability segment grows rapidly.

The demand for convenience products has not been severely affected by the sustainability trend, even though consumers in the sustainability segment prefer to cook themselves if they can find the time for it. These families consume high quality convenience in week-days and spend hours in the kitchen in the weekends.

Consumers' trust in food is strongly dependent on the geographical distance to the producers. Hence, imported food is only accepted if the manufacturer can document that international regulation has been respected in all parts of the food supply chain. The international sustainability certificate was intended to serve this purpose, but food scandals are still occurring due to ineffective national control systems and this undermines the credibility of the certificate.

3.4.4. Company strategies

Due to the polarisation of the two consumer segments, an increasing share of companies throughout the value chain is forced to choose which segment to focus on. The largest retail stores such as Wal-Mart are able to serve both segments, but still more consumers within the sustainability segment choose to bypass established retail chains and instead use some of the

new opportunities for shopping. In this segment, 'small is beautiful' and there is a willingness to pay the premium that such an approach will cost the consumer.

Consequently, the food industry has been split up into two very different and often wholly separate value chains working to deliver two very different types of food products to the consumers.

The increasing demand for sustainability products has opened a whole new range of opportunities for the SMEs in Europe. A significant amount of new and existing SMEs are now focussing on high quality sustainable production and are commercially very successful. Some are primarily serving their local/national markets while others have used web-based shops to reach customers all over Europe.

For both producers of sustainability goods and for retailers, reputation is what keeps them in business, so between themselves they have developed a wide range of standards and codes of conduct to which they adhere quite strictly.

The requirement for sustainability means that there is extensive monitoring of the food supply chain to ensure transparency and credibility.

Many 'traditional' manufacturers have developed sustainability product lines, but find it difficult to maintain activities related to both segments since the production set-up and marketing strategies are very different for the two segments.

Since companies have to adhere to the European regulation even if production is located outside Europe, many large manufacturers have found it economically feasible to retain production within Europe. This reduces the opportunities for cutting costs by moving production to third countries. Still, outsourcing is still a very important tool to minimise cost, and much production has been relocated to low cost regions within Europe. Other companies have chosen to abandon Europe entirely in favour of the emerging economies, where the positive economic development has created a demand for western-style food products.

Close and continuous communication with the consumers is at the heart of most companies offering sustainability products, from the farmers who invite consumers in – to manufacturers using the web to interact with their customers.

For those companies that target the discount segment, price is naturally the most important feature. Consumer loyalty schemes are the predominant approach, and generally there has been very little innovation concerning customer relations.

3.4.5. Innovation

Product innovation plays an important role for many companies focussing on sustainability products. One of the main sources of inspiration for innovation is in ethnic and 'historical'

foods unknown or forgotten by the consumers. Such innovations are in line with the sustainability thinking.

Companies focussing on traditional low price products spend very few resources on product innovation. The margins are so low that little is left for investments in innovation, and generally product innovation moves very few market shares in the discount segment. Furthermore the strict rules on chemicals and food quality means that it is difficult to 'create' new products that are better suited for the production and sales processes in the discount value chain.

Process innovation takes place in companies who are eager to cut costs without compromising the quality of their products. So far this has mostly been large companies producing traditional products in Europe for the European market. For these companies, continuous improvement of efficiency in production lines, logistics and communication infrastructure throughout the value chain are important to keep the competitive edge vis-à-vis imported goods from the emerging economies.

3.4.6. Skill and competence needs on the labour market

The positive development in the global economy and the diversified consumer demand for food products in Europe means that the labour market in the food industry is in good conditions. Employment in the food industry is growing, primarily in the sustainability sector which is more labour intensive than the discount sector, and the range of skills and competences in demand is very wide.

In the sustainability sector, the companies tend to use traditional production methods and to a large extent traditional production technology. Consequently, those companies whose customer base is largely local mainly employ craftsmen with a keen knowledge of raw materials and traditional production processes on a relatively small scale.

Those companies who address customers directly request employees with competences within internal and external logistics and Internet marketing. Most of the companies relying on Internet marketing however tend to be quite small and cannot afford to employ experts at post-graduate level. There is, however, a booming demand for employees who possess a diploma in Internet logistics.

Both the companies that rely on Internet trade and those that rely on the retail sector for distribution put considerable efforts into consumer information. Achieving and retaining certificates of sustainability requires a capacity to document the constant evaluation of quality, and this is an important task for middle management.

In the discount sector, emphasis is on process efficiency, including supply chain management. The demand for low-skilled manual labour in this sub-sector is small and decreasing, but there is an increasing demand for skilled process technicians and production engineers. Also,

as markets are increasingly global, language skills are in demand at the middle management level, and as more and more raw materials for food production are traded under spot-market like conditions, the large companies employ an increasing number of traders who specialise in finding the right price for strategic resources on the world market.

Bibliography

3i. *European food and drink report. Emerging markets and the role of private equity*. 2005. http://www.3i.com/pdfs/FD_report.pdf [accessed 23 February].

Cassidy, M. *Productivity in Ireland. Trends and issues*. 2004. <http://www.centralbank.ie/data/QrtBullFiles/2004%2001%20Signed%20Article%20-%20%20Productivity%20in%20Ireland%20Trends%20Issues%20-%20Mark%20Cassidy.pdf> [accessed 22 February 2006].

Center for Alternativ Samfundsanalyse [Centre for Alternative Social Analysis]. *Miljø og forbrugeradfærd - en oversigt over erfaringer omkring påvirkning af forbrugernes adfærd i relation til at inddrage miljøhensyn ved indkøb* (summary in English). 2003. http://www.casa-analyse.dk/files/pdf/Miljoe_og_forbrugeradfaerd.pdf [accessed 9 February 2006].

CIAA (The Confederation of the Food and Drink industries of the EU). *Food and drink industry initiatives on diet, physical activity and health*. 2004. http://www.ciaa.be/documents/brochures/Brochure%20Initiatives%20PDF_final.pdf [accessed 23 February 2006].

CIAA (The Confederation of the Food and Drink industries of the EU). *Data and trends of the food and drink industry*. 2005. http://www.ciaa.be/documents/news_events/Data_&Trends_2005.pdf [accessed 23 February].

Datamonitor. *Insights into tomorrow's ethnic food & drink consumers*. 2005. <http://www.market-research-report.com/datamonitor/DMCM2363.htm> [accessed 15 February 2006].

Direktoratet for Fødevarerhverv [Directorate for Food, Fisheries and Agri Business]. *Sunde, sikre og velsmagende fødevarer gennem bioteknologi - en bioteknologisk forskningsstrategi for fødevarerområdet*. 2004. http://www.netpublikationer.dk/DFFE/3859/pdf/biotekn_strategi_2004.pdf [accessed 8 February 2006].

EFFAT (The European Federation of Food, Agriculture and Tourism Trade Union). *Below cost selling*. Information note. 2004. http://www.effat.org/5/5_1/5_1_1/Files%20EN/GBT-2004-138-ED%20Information%20note%20on%20Below%20Cost%20Selling-EN.pdf [accessed 15 February 2006].

EFSA (European Food Safety Authority). *Trends and sources of zoonoses, zoonotic agents and antimicrobial resistance in the European Union in 2004*. 2006. http://www.efsa.eu.int/science/monitoring_zoonoses/reports/1277/zoonoses2004-levels1-2-part11.pdf [accessed 21 May 2006].

EMCC (European Monitoring on Change). *Sector futures: the future of the food and drink sector*. 2004. http://www.emcc.eurofound.eu.int/publications/2004/sf_fd_1.pdf [accessed 23 February 2006].

EUROP (European Robotics Platform). *Building the European Robotics Platform EUROP*. Sectorial report on industrial robot automation. 2005. <http://www.roboticsplatform.com/> [accessed 23 February 2006].

European Commission. *Background document. Restructuring and employment forum*. 2005b. http://europa.eu.int/comm/employment_social/events/2005/restructuringforum/background_en.pdf [accessed 23 February 2006].

European Commission. *Biotech – genetically modified organisms*. 2004. http://europa.eu.int/comm/external_relations/us/sum06_03/gmo.pdf [accessed 8 February 2006].

European Commission. *CAP reform. Accomplishing sustainability agriculture: the tobacco, olive oil, cotton, sugar and hops sectors*. 2004c. http://www.europa.eu.int/comm/agriculture/capreform/docs/prop2_en.pdf [accessed 31 January 2006].

European Commission. *European industry: a sectoral overview*. SEC(2005) 1216. 2005. http://europa.eu.int/comm/enterprise/enterprise_policy/industry/com_2005/sec_2005_1216.pdf [accessed 9 February 2006].

European Commission. *Life science and biotechnology – a strategy for Europe*. Progress report and future orientations. 2003 http://europa.eu.int/comm/biotechnology/pdf/com2003-96_en.pdf [accessed 8 February 2006].

European Commission. *The European eBusiness report*. 2005c. http://www.ebusiness-watch.org/resources/documents/eBusiness-Report-2005_Exec_Summary.pdf [accessed 23 February 2006].

European Commission. *The social dimension of globalisation - the EU's policy contribution on extending the benefits to all*. COM(2004) 383 final. 2004b. http://europa.eu.int/comm/employment_social/international_cooperation/docs/ilo_com_2004_0383_en.pdf [accessed 10 February 2006].

European Technology Platform on Food for Life. *European technology platform on food for life - the vision for 2020 and beyond*. 2005. <http://www.ciaa.be/documents/brochures/BAT%20Brochure%20ETP.pdf> [accessed 22 February 2006].

Eurostat. The food industry in Europe. *Statistics in focus*, 2004. http://www.eds-destatis.de/en/downloads/sif/np_04_39.pdf [accessed 23 February 2006].

Fearne, A.; Dedman, S. Supply chain partnerships for private label products : insights from the United Kingdom. *Journal of Food Distribution Research*, March 2000. [http://www.kent.ac.uk/kbs/cscr/pdf/Supply%20chain%20partnerships%20for%20private-label%20products%20\(Food%20D.pdf](http://www.kent.ac.uk/kbs/cscr/pdf/Supply%20chain%20partnerships%20for%20private-label%20products%20(Food%20D.pdf) [accessed 20 May 2006].

Forfás. *The demand and supply of skills in the food processing sector*. 2003. http://egfsn.forfas.ie/press/reports/pdf/egfsn0304_food_processing_sector_skills.pdf [accessed 22 February 2006].;

Frewer et. al. Consumer acceptance of functional foods: issues for the future. *British Food Journal*, 2003, 105(10), p. 714-731.

Gehlhar, M.; Regmi, A. *New directions in global food markets*. 2005. <http://www.ers.usda.gov/publications/aib794/aib794c.pdf> [accessed 22 February 2006].

Hughes, D. *The global challenge for the Danish food industry*. Lecture given to Danish Food Forum on June 14th 2005.

Konkurrencestyrelsen [Danish Competition Authority]. *Nordic food markets – a taste for competition*. 2005. http://www.ks.dk/publikationer/konkurrence/2005/foedevare/nordic_food_markets.pdf/ [accessed 23 February 2006].

KPMG Corporate Finance. *Europe's recipe for success...innovate and consolidate*. A survey of European Food Processors. 2000. http://www.kpmg.de/library/pdf/food_survey_fas.pdf [accessed 23 February 2006].

Learning Skills Council Nottinghamshire. *Employers' skills needs analysis Nottinghamshire - food, drink and tobacco manufacturing industries*. 2004. <http://readingroom.lsc.gov.uk/pre2005/quality/reshaping/star-employers-skills-needs-analysis-notts-food-drink-tobacco-2004.pdf> [accessed 21 May 2006].

Lohr, L. Factors affecting international demand and trade in organic food products. In: Regmi, A. (ed.) *Changing structure of global food consumption and trade*, p. 67-79, 2001. <http://www.ers.usda.gov/publications/wrs011/wrs011.pdf> [accessed 22 February 2006].

Mandag Morgen. *Det fede liv. Jagten på fremtidens fødevarer*. 19 December, 2005.

Ministeriet for Videnskab, teknologi og udvikling [Danish Ministry of Science, Technology and Innovation]. *IKT fra jord til bord. Status for anvendelse og fremtidige behov indenfor IKT i jordbrugs- og fødevarerhvervene*. 2005. <http://teknologiskfremsyn.dk/download/106.pdf> [accessed 23 February 2006].

Norwegian Centre for Gender Equality. *Towards a closing of the gender pay gap*. 2002. <http://www.likestilling.no/genderpaygap/EuroDimFinal.pdf> [accessed 23 February 2006].

The Babcock Institute for International Dairy Research and Development. *The dairy sector of Poland: a country study*. 2005. <http://babcock.cals.wisc.edu/downloads/dp/2005-03.en.pdf> [accessed 21 May 2006].

4. Changes in the European food and beverage industry and its needs for skills and competences

Jan Gravemaker, Aequor, the Netherlands

Abstract

This chapter goes into the trends and developments that affect the food production industry. It also indicates the related changes in skill needs. The chapter sets out six strategies that food companies use to cope with the challenges they face. These are strong branding, innovation, niche marketing, being a 'local hero', providing a service orientation, striving towards quality assurance, and reducing costs. The chapter is concluded by an indication of future trends in skill needs in the food sector.

4.1. Introduction

The food and beverages industry is a dominant industry within the manufacturing sector in the EU and in most of its Member States. Its contribution to the EU gross domestic product amounts to around 1.8%, which is about 10% of the whole manufacturing industry. In a number of countries its share and position is considerably more important. Just five countries of the EU-25 account for 70% of the total turnover: France, Germany, Italy, Spain and the UK. However, in terms of turnover per capita, the 'real' giants are Ireland, Denmark and Belgium.

In 2004 the food and beverage industry reached a turnover of € 815 billion and employed about 4 million workers, thus making it the largest employer in the manufacturing sector. The importance of the food industry however is not only based on its economic performance but also on other values and characteristics such as its essential function for public health, its embedded traditions and cultural values, its contribution to agricultural and rural prosperity by creation of added value and connecting the primary sector to consumers and – last but not least – its meaning for every individual human being and citizen of the EU.

The European food and beverage industry is also characterized by a relatively high degree of labour intensity and while traditionally it was a rather stable sector, in recent times the overall share of employment in the EU has dropped quite dramatically. The overall decrease in jobs over the period 1999-2004 amounts to 15.2% of the total workforce, which has gone from 4.4 million to 3.9 million in just five years.

Looking at the size of the companies we see the following picture. A large number of SMEs dominate the food industry: 99% of enterprises are SMEs, and these firms employ 61% of the workers in the industry and account for 49% of the industry's total turnover. More specifically, it is the micro-enterprises (1-9 employees) which make up the largest segment representing 79% of all companies. The small (10-49 employees) and medium-sized (50-249 employees) companies account for 17% and 4% respectively, while the large companies (250+ employees) account for close to 1% percent of all the companies in the sector. (EMCC dossier).

Concerning industrial developments and consequently the changing skills needs, there are considerable differences between the micro and small companies, mostly based on individual craftsmanship, on the one hand, and more industrial, mechanized and automated process-based production plants of medium-sized and large companies on the other, because the role and functions of the employees are different. For example, entrepreneurship is an essential competence for individual entrepreneurs in the micro and small companies. Although there are common factors such as basic skills concerning hygiene and food safety (HACCP), the differences are clear if we look at the most wanted competences by industrial, larger companies. Market developments such as globalization, retail pressure and international competition are quite different for these categories of companies than for small ones due to the fact that micro and small companies are primarily oriented on direct relations with customers/consumers at local or sometimes regional level. Within the framework of this paper we focus on the developments in the medium-sized and large companies.

The European food and beverage sector is faced with an unprecedented number of challenges today, leading to an increase in restructuring activity across the EU. These developments are primarily driven by the need to enhance competitiveness and address local and global changes affecting the industry. The first and most important challenge however is the permanent creation of a sustainable future for the sector, ability to meet the dynamic food and nutrition needs of the changing and growing world population. To achieve this within the present perspective, the following elements are essential.

- (a) The sector must be 'interwoven' with the community. Food is a very natural, basic need, to which people must stay connected. Government involvement in food safety and quality assurance as well as food education and information is extremely important.
- (b) The sector must be trusted and must be open and behave in a communicative and transparent way, for example concerning raw materials, additives, genetic manipulation, sustainable primary production and so on. Risks and failures have to be made clear immediately and supported by fast and clearly communicated recalls, demonstrating and proving the trustworthy care and responsibility of the industry.
- (c) The sector must and will be organized in chains, clusters and networks, not only on behalf of efficiency, but also to share responsibility about food safety and quality by creating closed quality chains, perfect systems for tracking, tracing and efficient logistics.

- (d) Food safety and food quality must be assured and considered so by the consumers.
- (e) The sector needs a variety of entrepreneurial strategies to be able to meet new challenges in different ways.
- (f) There must be a right balance and integration of factors concerning profit, people and planet.

4.2. Trends and developments in the food and beverage industry and related changes in skill needs

As far as trends and developments are concerned different kinds and levels must be distinguished. First we will mention five major general trends and related company strategies. These provide the background perspective for a number of specific trends concerning products, production processes, and management and organization. To these we relate trends in skill needs, focusing in particular on the low and intermediary skill levels.

Main general trends and developments, providing important challenges for the European food and beverage industry, are the following (the order of trends is irrelevant; importance and weight differ per situation – country, individual company, specific branch etc.).

- (a) Globalization. This trend concerns mainly economic aspects such as development on the market for raw materials, technology, equipment and sales. Products and brands are used and sold increasingly globally, thus getting stronger and more vulnerable at the same time, competition is growing on international markets and on the home market as well.
- (b) Internationalization. This term is often used as synonym for globalization, but its meaning is quite different. Internationalization refers to human and cultural factors like taste, culture, migration, internationalization of the labour market. It means people being more exposed to different cultures and backgrounds, on the work floor – to colleagues and customers with varying preferences and tastes.
- (c) Growing retail power. This is in fact about the shifting power in the food chain and/or the reversal of the traditional supply-driven chain into a demand-driven one. The inherent change of power means a lot of new demands and challenges for the producing primary sector and processing industry. ‘Selling what can be produced’ has been changed in ‘producing and (just in time) delivering what can be sold’. This puts a lot of pressure on innovation to keep life-cycle levels up, demands flexibility in the production process and in logistic organization, and cost reduction.
- (d) Food safety. This has certainly been an issue for many years but it is obviously more important now, due to scale enlargement, strong branding, growing communication and involvement of governments. Regulations are being intensified and accountability is much stronger developed than it was before. At the same time industry developed more sensibility about its own responsibility. New ways of conservation and new concepts of

fresh food chains are more critical than before. Related to this the human factor has become more important as a risk factor within the production and logistic chains.

- (e) Sustainability. Growing awareness and growing transparency make a solid company policy and concept at this point inevitable. More companies see this as a possibility to distinguish themselves and their products in a positive way of their nearest competitors. This development goes not only with concrete measures but also with new company codes and values and modern attitudes of the workers.

4.3. Strategies

How do companies cope with or - even better – make use of these trends? Looking at the actual development we see a number of different strategies, such as:

- (a) Strong branding. This is a way to increase added value and to avoid too strong price pressure by large buyers on the market.
- (b) Innovation. Keeping ahead of the competitors and create new product life cycles with higher added value in the first and second stage can be a successful strategy but is also risky. It is a known fact that more than 90% of newly introduced products fail on the market. Fast innovations create short life cycles themselves. Innovation and introduction costs are usually high and the struggle for shelf space is hard. New products often need new investments in production facilities and, due to fast and easy access to information, for instance through Internet, one is only temporarily ahead and competitors follow successful innovations very soon. Nevertheless, many successful innovations and new concepts can be found.
- (c) Niche marketing. Going into a very specialized market area and avoiding by this too strong competition may be a real opportunity for mainly smaller producers.
- (d) ‘Local hero’. This means a strong relation with the regional community and consumers market, often by producing a regional specialty or using specific regional raw materials. There are many examples in the bakery sector, meat and in wine or brewery industry. People’s special interests in the products, special sale channels and involvement in the regional community and networks are at the basis of this strategy. The ‘couleur locale’ of the employees can be of importance for maintaining the regional embedding of the company.
- (e) Service orientation. If the product is not enough distinguished of that of the competitors, companies may try to be better in other areas, such as logistics or services.
- (f) Quality assurance. This is in fact no longer a positive way to distinguish from competitors, but an essential basic condition. A company failure in quality assurance represents a major risk. Such risk has to be excluded in the most imperative ways. This means a high level of well developed quality assurance systems and a high degree of involvement and discipline of the employees.

- (g) Cost reduction. The earlier strategies were mostly aiming at maintaining or extending added value by maintaining price levels. This one aims to create competitiveness by reduction of costs. In almost all cases it is the primary or second strategy in combination with other ones. Companies try to optimize their processes, to minimize stocks of raw materials, packaging materials and produced products, to diminish waste materials and loss of added value etc. Total productive maintenance (TPM), world class manufacturing (WCM) and other branded approaches are examples of this. These approaches can only be successful if employees are strongly involved and contribute to it at their own level. Scale enlargement, process integration, outsourcing and moving production to more low wage countries are other methods to achieve cost reduction.

Against this background specific trends and developments in production, processes, management and organization can be mentioned.

As far as products are concerned the major trends are that of growing attention for aspects of convenience, health, wellness, sustainability/organic products, authenticity and fitness for ‘grazing’ consumption, including the annexed marketing, selling channels, displays and so on. These type of trends are reflected by the transformation of the traditional professional education in product development into that of ‘food design’.

Regarding production and process techniques sustainability trends are that of ongoing mechanization, automation, integration, information technology and in-line quality control and assurance. This trend is directed to higher productivity and means reduction of unskilled and low-skilled labour on the one hand and growing need for workers who are qualified at higher levels on the other hand.

Maybe the most important trends as far as a shift in skill needs is concerned, are those in the field of management and organization. Some of such trends with direct effects on skill needs are: diminishing the number of hierarchic levels, optimization approaches, integration of tasks and responsibilities at operational level (growing complexity), teamwork, flexible production, multi-employability and competence management.

4.4. Trends in skills needs

Within the framework of this paper we just mention qualitative trends. Quantitative trends at EU level are very general. They hardly provide useful information on a national or regional scale because of the obvious differences between them. Qualitative trends are universal, although the food industry in different countries and regions may vary in the stage of development, scale and so on.

Table 6: General trends in skill needs in the European food and beverage industry

Traditional trends	Modern trends
Food technology	Process techniques

Qualification levels 1–2	Qualification levels 3–5
Input thinking	Output thinking
Knowledge	Performance
Vocational skills	Competences
‘Hard’ skills	‘Soft’ skills

Taking in consideration the described trends in industry these shifts in skill demands need little explanation. The development of mechanization, automation and in-line quality assurance mean less contact with the product itself, more technical equipment, distance steering on parameters and process variables. In line with this there is a shift in preference for more technicians such as mechanical and process operators instead of people who are skilled in food technology. There is also a growing need for affective involvement in quality of the product and the process organization. Due to the same causes and the on-going disappearance of simple manual work, for instance in packaging departments, the growing complexity and responsibilities, the shift to the need for higher skill levels is obvious. Remarkable changes are those from input thinking to output thinking, from knowledge-based qualifications (what workers know counts) to performance criteria (what workers show counts) and, related to this, the shift from skills to competences.

Competences are described in literature in different ways. Here we choose the following definition: competences are capacities to be seen as abilities of individuals, teams, units or organizations which enable them to produce the desired performances. Competences are therefore to be defined at different levels which have to be coherent when used within an organization. If the goals and competences of the company, the department and/or the team are set clear, the personal competences of the workers (team members) can be rather easily defined in line with those. Competences are general in itself, but the desired performance, behaviour and success criteria are specific in each context. This makes them fit for use in relation to output and development oriented competence management and assessment procedures.

The shift from traditional ‘hard skills’ to preferences for the so-called ‘soft skills’ was identified during the multimedia conference with representatives of food companies, which was held in the Netherlands in September 2005. Apart from technical and mechanical skills the following competences were identified as most desired:

- (i) quality attitude,
- (ii) learning ability,
- (iii) basic food technology/hygiene,
- (iv) team player,
- (v) commercial feeling (for production workers!),
- (vi) involvement/commitment,
- (vii) entrepreneurship/entrepreneurial attitude,
- (viii) communication,

(ix) problem solving.

What does this mean for technical and vocational training in food technology? In the first place basic food hygiene and technology should not be neglected at all. Qualifications in this field are not mentioned or high ranked very often nowadays because the focus is more strongly directed to the 'new competences', but still they are expected to be present. Process operators are the linking pin between food technologists and product designers and the technical equipment which is used for manufacturing.

Furthermore, technical and vocational schools have to follow very closely the developments and – even more important – trends and perspectives in industry and translate those in their education programmes. Competences contain important attitude aspects (learning attitude, commitment, involvement, attention, communication, teamwork, problem solving, entrepreneurship etc.). The best way to develop these attitudes is through learning by doing, using didactical principles of activated learning and preferably set in a real practical context or simulation. Practical training internships, workplace-based learning and other ways of cooperation with industrial companies in the field of learning and education are necessary instruments.

Bibliography

Daamen, H. *The employee of the future*. Heinz Netherlands.

EMCC dossier on the European food and beverages industry.

Enterprising in sectors, facts and trends 2005 – 2007. EIM, research for company & policy, 2006.

Geerligs, J.W. *Presentation on Competence for food*. Stoas, 2005.

Mulder, M.; Weigel, T.; Collins, K. *Competence development in organisations*. 2006.

Pleijsier, F. *Mainly different, the quality of employees of the future*. EIM, Research for company & policy, 2006.

SER. *Procesgericht produceren*. NL, 2001.

Taylor, P.; Thackawray, B. *Investors in people for managers*. Human Capital Management, 2001.

5. Innovation and skill needs of workers in the food sector

Sikke Meerman, Unilever, the Netherlands

Abstract

In this chapter, the food industry, innovation in the industry, skill needs, preparation of graduates for the food and nutrition industry and the commitment of the industry to education and training, are described from the perspective of a very large company with its own R&D facilities, which draws heavily on higher agricultural education for its innovation and research. It introduces the differentiation between certain jobs in an international organisation such as field agronomist, raw material buyer, quality assurance (assistant) manager, specialist (agro-) researcher, upstream supply chain team leader, primary processing or production manager, and operations (site) manager. The skill needs for the respective jobs differ to a certain extent, but also show commonalities.

5.1. Introduction

In the food industry nowadays product cycles are short, competition is intense and the need for innovations is high. The flows of new products to the supermarket shelves are examples of evidence of this high innovation rate. Skill needs of workers in the food industry have developed with the business and are more complex than they have been before.

Skills and innovation are mutually supporting, because skills underpin the ability to innovate and, in turn, innovation drives the demand for better and higher skills, also in the food industry.

Apart from the skills needed for the common areas of working, a food industry agronomist needs to develop skills and competences that contribute to a more interactive role in the continuous change of the business requirements and those of the societal environment. Some of these are: IT-user skills, basic understanding of food processing technology, environmental awareness, knowledge of foreign languages, communication skills, team-working and social competences.

Training curricula should become more attractive and focused on food production chain aspects, rather than only on agricultural disciplines.

5.2. The food industry

The quality of human resources in the food industry is essential for maintaining the world's processed food products supply. The same counts for the safety aspects of the food supply chain. Food regulations are becoming tougher. The current shift to raw material sourcing from developing and emerging countries also brings a challenge here.

With the support of agricultural scientists in the governmental and private sectors, food industrial agronomists nowadays develop ways of implementing a sustainability production (quantity) and ways of improving quality. They develop programmes to support farmers to improve usability of crop yields and responsible labour deployment, seek for safer and more effective ways of pest and weed control, and for more efficient technologies to conserve soil and water.

Sustainable agriculture and corporate social responsibility are high on the list of the food industry objectives today. Food industry agronomists play an important role here.

Some food companies highly refer to the changing face of farming. Sourcing of sustainably produced raw materials is increasingly becoming a part of their mission statement. Main multinational food companies are very active at promoting sustainable agricultural practices, like Nestlé, Danone and Unilever. Together they established a platform called the sustainable agriculture initiative which was joined by other food industries.

Other experts and scientists with an educational background in agriculture have a role to distinguish new opportunities for commodities and to discover niche agricultural raw materials or varieties with a high or specifically desired nutritional value.

Food nutritionists and processing engineers research and implement methods of converting raw agricultural commodities into attractive and healthy food products for consumers in an efficient way.

Today the food industry does not employ many agricultural scientists who work in basic or applied research and development, like plant breeding. Some agronomists, however, do manage or administer research and development programmes, or manage marketing or production operations in food companies.

Job examples in the multinational food industry with an educational background in agriculture are:

- (a) field agronomist (mostly locally based),
- (b) raw material buyer (local, regional or global),
- (c) quality assurance assistant / manager (local, regional or global),
- (d) specialist / agro-researcher (local or global),
- (e) upstream supply chain team leader (local, regional or global),

- (f) primary processing or production manager (local),
- (g) operations (site) manager (local).

Sources from Wageningen University in the Netherlands indicate that 10% of the alumni find a job in the food industry, which is quite significant.

The ambitions of the food industry to put themselves on the foreground of making a contribution to healthiness and vitality are high. For instance, Unilever's mission is to add vitality to life, to meet everyday needs for nutrition, hygiene and personal care with brands that help people feel good, look good and get more out of life. The recent complete make over of the Unilever company logo is an expression of that innovative ambition. It gives the company a new brand identity. More than fifty percent of the icons in the new logo refer to nature, naturalness, agriculture and environment. Commitment and loyalty are key words of workers in the food industry. People are the heart of this type of business. Harnessing, developing and rewarding their skills, energy and commitment is a high priority for Unilever. Unilever is also one of the most culturally diverse companies in the world with top leadership from 25 nations.

Career path of agronomists and nutritionists proceeds from co-workers to assistant managers and managers, directors, business leaders, depending on educational background and work experience.

In the Unilever Vlaardingen R&D centre in the Netherlands, 10% of the management staff graduated from Wageningen University – the main institution which prepares specialists with higher education in agriculture and foods in the Netherlands.

The multinational nature of such food company as Unilever is expressed by the fact that 30% of the staff at Unilever R&D Vlaardingen comes from outside the Netherlands and represents 40 nationalities. Most are engaged in research and development focused either on the improvement of existing products and processes or on developing breakthrough new products and processes for Unilever's food business all over the world.

Employees today join multifunctional teams with clear research and business tasks. In these projects they work together with various specialists from other disciplines, e.g. supply chain, consumer science, packaging, product structuring and marketing. The key word nowadays is 'partnering' instead of being an informant or an assessor. Interdisciplinary communication is important. It is even essential to understand each others drivers.

The relevant driving groups of the foods building for innovation consist of R&D and supply chain. These units are interlinked with supply management, and marketing and sales. The supply chain links which are the most relevant include agricultural production, primary processing, and secondary processing (final consumer products).

Collaboration with external parties is also crucial for exploring and exploiting new scientific developments. An example of a scientific challenge is to identify consumer preferences and

trends and anticipate needs and expectations. Development of great tasteful products with less sodium, no added sugar and less saturated fat is a real challenge nowadays.

The food industry has no monopoly on ideas. Ideas from the external world have to be assessed, embracing an open attitude to innovation as a way of thinking and working. Open innovation will help to accelerate internal innovation to advance technology.

From observations it can be derived that agronomists are rather open to knowledge sharing with external partners as they seem to be less influenced by competition. Most innovations in agriculture are exposed to competitors anyway.

5.3. Innovation

The early innovations at Unilever that stood for a long time were linked with their two main products, which were margarine and detergents. Current innovations concern a range of food product categories such as low fat products, antioxidants, cholesterol reduction, smoothies (fruit and vegetables in a bottle). For instance, soya-based food and drinks are currently one of the fastest growing markets in the world.

The food industry diversified very rapidly over the last three decades, at some point, however, to partly converge to core activities or to leading brands again.

We see growing consumer needs for:

- (a) a healthy lifestyle,
- (b) more variety, quality, taste and enjoyment,
- (c) time as an increasingly precious commodity.

These changing consumer needs are all due to changed circumstances like a prosperous and healthier society and technical progress. Processes have become more complex, not to mention the IT boom.

In the meanwhile environmental consciousness, calls for sustainability and consumer concerns on food have become more apparent. It is needless to say that the impact of the media has played a significant role here. There is food awareness as well as confusion.

The power of the supermarket retailers have become stronger and put a lot of pressure on the food industry to constantly innovate. Legislation on food and food safety has become more complex. Modern ways of transportation have contributed to 'a smaller world'. A wide range of commodities, raw materials as well as finished food products, come from everywhere nowadays. And last but not least, family life has changed dramatically: need for convenience food and out of home meals prevail getting away from traditional diets.

The big challenges for agronomists and nutritionists of the food industry are to create products that refer to the 'back to nature' feeling and freshness. More precise it is about health compounds, clean label, bio-availability, and avoidance of allergenic compounds. Of a more recent nature are trends like nutraceuticals, health and wellness, joyful nutrition, nutrition in a bottle. Innovation in the farming and food sector is a vital issue to which Europe will need to devote significant attention and energy in the coming years.

According to the vision of the European Commission, consumers expect the food they eat to be safe and of high quality. They value a variety of choice. They also expect it to be produced in accordance with good farming practices with respect for the environment and for the welfare of animals. They want to be informed, in a precise and accurate manner, about the composition, nutritional value, durability, origin and, in certain cases, the method of production of the food offered to them.

The way well-educated agronomists and nutritionists of the food industry can meet these complex expectations of accelerated innovation depends on the skills they have developed during their education and training.

5.4. Skill needs

Skills and innovations are mutually supporting, because skills underpin the ability to innovate and, in turn, innovation drives the demand for better and higher skills.

Graduates from agricultural universities and colleges generally have a wide agronomic focus in support of the agri-business sector through production and processing management, marketing, and other economic segments of the agri-industry. They have the flexibility to work effectively in agricultural enterprises having either a production or business marketing educational background.

An important segment of these institutional agronomists make a living largely through the use of communication skills in the first place. All agronomists in universities use these skills in teaching, extension and research, and those in research use these skills when presenting data, theories, and methodologies in written, spoken, pictorial, and graphical forms. Industrial agronomists also need excellent communication skills because the majority of them probably fit most closely the role of an extension agronomist. Knowledge transfer and knowledge management are the vehicles here.

Food scientists and technologists who work in the food processing industry help to meet consumer demand for food products that are healthy, safe, palatable, and convenient. To do this, they use their knowledge of chemistry, physics, engineering, microbiology, biotechnology, and other sciences to develop new or better ways of preserving, processing, packaging, storing, and delivering food.

Some food scientists engage in basic research, discovering new food sources; analyzing food content to determine levels of vitamins, fat, sugar, or protein; or searching for substitutes for harmful or undesirable additives or allergens. They also develop ways to process, preserve, package, or store food according to industry and government regulations. Traditional food processing research into functions involving baking, blanching, canning, drying, evaporation, and pasteurization will continue to be conducted and will find new applications.

Other food scientists in the industry enforce quality assurance procedures, inspecting food processing areas and ensuring that sanitation, safety, quality, and waste management standards are met.

Food technologists generally work in product development, applying the findings from food science research to the selection, preservation, processing, packaging, distribution, and use of safe, nutritious and wholesome food.

Agronomists have traditionally been educated in crop science, phytopathology and entomology, and plant breeding. Food industry workers and scientists in these disciplines study crops and their growth in soils, helping producers of food, feed, and fibre crops to continue to feed a growing population while conserving natural resources and maintaining the environment. Agronomists and crop scientists not only help increase productivity, but also study ways and give directions to improve the nutritional value of crops. The development of technologies that are compatible with the environment is an important challenge nowadays.

Agricultural workers will be needed to balance increased agricultural output with protection and preservation of soil, water, and ecosystems. They will increasingly encourage the practice of 'sustainable agriculture' by developing and implementing plans to manage pests, crops, soil fertility and erosion, and animal waste in ways that reduce the use of harmful chemicals and do little damage to farms and the natural environment. Sustainable agriculture stands for a way of working that considers the environment, economy and social behaviour. Ensuring a sustainable supply of raw materials is essential for the long-term wealth of a food business. Consequently skill needs of the agronomists are not restricted to only agricultural areas of working anymore.

A key factor in the success of any food company, especially one that is innovating and growing, is the quality of its management and leadership. Innovative ideas are often the vision of inspired leaders. As dependency on products of agricultural origin is high, food business leaders need to have a clear understanding of the sector. An open mind for developments and opportunities in the world of agriculture and food production is highly important. On the other hand the ability of agronomists to connect to innovative thinking needs to be enhanced.

The observed trends in agriculture have mainly to do with the shift from small-holder farms to larger operations. At the same time the post-war trend to yield and economic maximisation has been changed to sustainable production in the last two decades. Fresh market sourcing through auctions or middlemen has been replaced by direct trading and e-commerce. Organic

production has claimed a market share that can not be ignored. Abundant water use for agriculture has gradually been replaced by drip irrigation in many countries. Application of pesticides has evolved into integrated pest management. Mechanical harvesting is replacing manual harvesting quite rapidly. IT nowadays is an indispensability tool at larger farm operations and has replaced field books in many cases already. It also opens ways for implementation of sensor techniques for field and crop monitoring. And last but not least local raw material sourcing has been replaced by global sourcing quite dramatically over the last decade.

A self-respecting food company organises its agricultural knowledge management through communities of practice. Members are nominated agro-managers and directors and agro-research managers. Extended members are agricultural or nutritional specialists, but also come from supply management and marketing. Internal communication is through workshops, weblogs and personal contacts. The community of practice is the custodian of agricultural knowledge and responsible for the implementation of a 'good agricultural practice' documented in manuals.

The list of more detailed or specific skill needed depends highly on job type and work level, documented in a job description. Compliance assessment of individual skill needs to certain work level requirements range from 'not applicable' to 'basic appreciation', 'working knowledge', 'fully operational' and 'leading edge'. Internal supply chain and R&D academies help the employee to enhance his skills.

Basic skill requirements for applicants for agricultural jobs in the food industry are in the first place to show evidence of an adequate educational level in common agricultural or nutritional disciplines and some specialisations. IT working knowledge is a basic skill requirement nowadays.

A basic understanding of food processing technology is necessary. Additionally knowledge of the basic contents of quality assurance, environmental behaviour, waste management, farm economics, and (bio-) chemistry is recommendable. Working knowledge of at least two foreign languages, one of which is English, is a mandatory requirement today. Extension training is optional. Social competencies are also very important. Some of today's requirements for agronomists are: communicator, change catalyst, team worker/leader, and social awareness.

5.5. Outlook

A sharp decrease of students in agricultural science areas is a great concern for the food industry. Probably the curriculum should become more attractive and more focused on food production chain aspects as mentioned above. On the other hand the food industry must create a greater interest in communicating their skill and competence requirements.

Bibliography

Anonymous. *Adding vitality to life*. Unilever publication, 2006.

Anonymous. *Unilever environmental and social report*. Unilever publication, 2005.

Byrne, D. *European food sector has to drive innovation*. Nyborg (DK). Informal Agriculture Council, EC Press release, 2002.

Chesbrough, H.; Vanderhaverbeke, W.; West, J. *Open innovation: researching a new paradigm*. Oxford: Oxford University Press, 2006.

Marshall, E.J.P. *Environmental information for agronomists 2002: needs and provision*. Winscombe, Somerset: Marshall Agroecology Ltd.

Taylor, R. *Skills and innovation in modern workplaces*. Swindon: ESRC, 2004.

Tether, B.; Mina, A.; Consoli, D.; Gagliardi, D. *A literature review on skills and innovation. How does successful innovation impact on the demand for skills and how do skills drive innovation?* Manchester: ESRC Centre for Res. on Innovation and Competition, Univ. of Manchester, 2005.

6. Food risk communication: the implications for food safety skills development

Mary Brennan, University of Newcastle upon Tyne, the United Kingdom

Abstract

This chapter starts with the observation that various food crises have had significant impact on food risk perception, and that this has caused a radical change in the rethinking and restructuring of how food risk is analysed, managed and communicated. Food risk communication is discussed as a major field of skills needs. Risk communication is defined as ‘... the exchange of information and opinions concerning risk and risk-related factors among risk assessors, risk managers, consumers and other interested parties’. The chapter then continues with stating that understanding risks is essential and that there is a need for a more informed and skilled workforce. The chapter concludes with a set of key questions which need to be addressed in defining implications of future food safety skill development. Careful attention has to be given to the fact that there will be increasing regulatory and market pressures regarding the food industry.

6.1. Introduction

A succession of high profile crises have rocked the food industry over the last 20 years. These crises have ranged from microbiological (salmonella, E. coli), biotechnological (GMO) to farm-oriented crises (BSE). A consequence has been the radical rethinking and restructuring of how food risk is analysed, managed and communicated within the European Union. In the UK, the BSE crisis precipitated the creation of the Food Standards Agency in April 2000. This was followed in 2002 by the establishment of the European Food Safety Authority.

6.2. Food risk communication

A recurring theme that has emerged from the aftermath of these crises and the subsequent restructuring of the regulatory framework is how food risks were, are and should be communicated in the future to the increasingly diverse and heterogonous European public. This chapter will explore the development of and current thinking on food risk communication and the implications for skill development, in particular food safety skills, in the European agri-food industry.

In 1989 the National Research Council in the USA defined risk communication as:

An interactive process of exchange of information and opinion among individuals, groups and institutions. It involves multiple messages about the nature of risk and other messages not strictly about risk, that express concerns, opinions or reactions to risk messages or to legal and institutional arrangements for risk management (NRC, 1989).

The dominant player in food risk communication activities at the time, both in the US and in Europe, were experts via advisory committees and expert panels. They were perceived as having the only legitimate knowledge and ability required to determine and solve complex scientific and technological risk issues (Scherer, 1991). Stakeholders' knowledge (including in some instances that of the industry) was not considered useful for the management, assessment and communication of food risks both to the industry and the public. The food risk communication process was dominated by a one-way message flow from expert communities to the public. The underlying assumption was that if the average person, who was perceived as largely uninformed about food risk and safety, received enough information about a particular food risk, he or she would respond logically, be persuaded and act in accord with the scientific view (Valenti & Wilkins, 1995). This model of risk communication became known as the 'deficit model'.

Since the 1980's, extensive research and discussion on how food risk communication should be conducted has taken place. This has been supplemented by the increasing awareness and understanding of how different 'publics' perceive and react to food risk situations. In the case of the general public, the identification and creation of the 'hazard – outrage' model by Peter Sandman (Sandman, 1987) fundamentally challenged and exposed the different ways in which different stakeholders view and respond to risk. While the risk perceptions of the expert community (including the industry) were dominated by the hazard itself and the quantifiable probability of it occurring (the risk), public risk perceptions appeared to be determined to a much greater extent by the social and psychological characteristics of the hazard/risk. Bennett (1997) further built on this work in identifying the Bennett 'fright factors', 11 factors which determine how worried and/or unacceptable a risk is to the general public. According to Bennett, a risk is generally more worrying and less acceptable to the public if:

- (a) it is involuntary, rather than voluntary;
- (b) it threatens a dreaded form of death, illness or injury;
- (c) it damages identifiable victims;
- (d) is poorly understood by science;
- (e) is subject to contradictory statements from responsible sources;
- (f) is inequitably distributed;
- (g) is inescapable;
- (h) it arises from an unfamiliar/novel source;
- (i) is man-made rather than natural;

- (j) it causes hidden and irreversible damage;
- (k) it poses particular risk to small children, pregnant women or future generations.

6.3. Paradigmatic shift

The result has been a paradigmatic shift in the way risk communication is viewed amongst the food research community and policy makers. It is now considered more appropriate that risk communication should be viewed less as a process of one/two-way communication and more 'as a discussion between parties with a significant but different stake in an issue' (Valenti and Wilkins, 1995). A revised definition was introduced by the joint FAO/World Health Organisation (WHO) food standards programme in 1998.

Risk communication is the exchange of information and opinions concerning risk and risk-related factors among risk assessors, risk managers, consumers and other interested parties (FAO/WHO, 1998).

According to Baruch Fischhoff (1995), the goals of risk communication should be to

- (a) foster public trust and confidence in the safety of the food supply;
- (b) strengthen the working relationship and mutual respect among all participants;
- (c) promote the appropriate involvement of all interested parties in the risk communication process;
- (d) exchange information, attitudes, values, practices and perceptions of interested parties concerning risks associated with food and related topics.

To further complicate the picture not all risk communication activities will have the same objectives. Rowan (1996) identified six likely risk communication objectives:

- (a) inform,
- (b) educate,
- (c) persuade,
- (d) motivate,
- (e) manipulate,
- (f) coerce.

The objective of the risk communication activity will be determined by the risk involved and the physical, social, economic and political consequences associated with it. Risk communicators, and those feeding into risk communication activities, need to appreciate that the approach, style, content, tone, delivery and level of regulatory and/or legal intervention will need to differ depending on the objective of the risk communication activity.

6.4. Understanding risks

For all stakeholders it is important to understand that communicating risk involves coping with the difference in perceived public knowledge of science, scientific complexity and uncertainty, disagreement among experts on risk characterisation and comparison, assumptions in risk assessment, the role of advocates, the media and public outrage. The process of communicating risk should be fundamentally about empowering individuals and communities (including industry) to appreciate different types of viewpoints about risks, scrutinise beliefs and perceptions about risks and sharpen the skills necessary to make balanced judgements on risks which consequently impact on individuals or communities (Scherer, 1991).

6.5. The need for a more informed and skilled workforce

The food industry has been required to adapt to an increasing array of regulatory requirements and market pressures in the aftermath of the crises that rocked different sectors of the industry. This has resulted in the need for a more informed and skilled workforce, especially for those operating and managing in the food safety and quality control area. Already, significant investment has taken place to consolidate and improve the provision and quality of vocational skills training within the UK food and drinks sector, through the establishment in September 2006 of IMPROVE: The Food & Drink Sector Skills Council. The development of the new food safety qualifications for the food and drinks manufacturing industry has been a significant development from IMPROVE and its array of partners.

6.6. Key questions

The implications for future food safety skill development needs to be considered very careful, in the context of the increasing regulatory and market pressures being experienced by the food industry. To start the dialogue, I suggest that it is important to consider a number of key questions

- (a) Does industry need to concern itself at all with food risk communication and how the public perceive food risk?
- (b) Should industry play a role in communicating food risk or should it be the responsibility of national food safety agencies?
- (c) Is it necessary for all employees in food safety roles to appreciate how the public and other stakeholders perceive food risk?
- (d) Can greater industry involvement in the development and refinement of food risk communication policy benefit the industry?

- (e) What practical skills need to be developed within the industry to empower all those contributing to and/or responsible for food risk communication activities?
- (f) What assistance needs to be provided to the industry, especially small and medium sized enterprises, to encourage and facilitate them to contribute and participate more effectively in food risk communication decision making?

Bibliography

Bennett, P. *Communicating about risks to public health: pointers to good practice*. London: Department of Health, 1997.

FAO/WHO. *Report on a joint FAO/WHO expert consultation on the application of risk communication to food standards & safety matter*. Rome 2-6th February, 1998, Geneva, WHO, <http://www.fao.org/docrep/005/x1271e/x1271e00.htm> (last visited 30/10/06).

Fischhoff, B. Risk perception and communication unplugged: 20 years of process. *Risk Analysis*, 15(2), 1995.

National Research Council (NRC). *Improving risk communication*. Washington, DC.: National Academy Press, 1989.

Rowan, F. The high stakes of risk communication. *Preventative Medicine*, 25, p. 26-29, 1996.

Sandman, P.M. Risk communication: facing public outrage. *EPA Journal*, 13, p. 21- 22, 1987.

Scherer, C.W. Strategies for communicating risks to the public. *Food Technology*, October 1991.

Valenti, J.A.; Wilkins, L. An ethical risk communication protocol for science and mass communication. *Public understanding of science*, 4, p. 177-194, 1995.

7. Development in skills needs in organic farming

Bas Timmers, Warmonderhof Training Centre, Groenhorst College, International Foundation for Sustainable Agriculture Training, the Netherlands

Abstract

This chapter is devoted to organic agriculture – a very promising field for food production and distribution. The chapter states that the roots of organic agriculture go back to the 1920s, and shows that the number of hectares of organic land and land in conversion grew from less than one million in 1985 to over six million in 2005 (EU-25). Other sources, however, present slightly different picture pointing to a minor decline in the total organic land. The chapter then goes into four developments which have a serious impact on the future skills needs: conversion, globalisation, technical developments and developments in agriculture. This also relates to needs identified for projects to support organic agriculture such as market support, social actions and self-sufficiency. The chapter concludes by identifying observation skills and new technologies, management skills and social skills as major future skills needs.

7.1. Introduction

There is no doubt that in the present difficult situation in the sector, organic agriculture is seen by many as a survival strategy. With the environment getting higher up on the global agenda and an ever increasing public concern about health issues the market for these products is steadily growing.

The effect can be illustrated in developments in organic farming and production, and in agriculture in general, leading to a future change in skill needs.

7.2. Organic agriculture

It is often believed that organic agriculture was developed in the 1970's and 1980's in response to a demonstrated need to be careful in using our global natural resources. That may be so, but this was not the first time this happened. The biodynamic agricultural movement was developed as of 1924 in response to the introduction of potassium and phosphorus in agricultural production at the end of the 19th century by Justus von Liebig. Until about 1985 there was very little public and governmental support for the development of organic agriculture, but then in some countries research started to receive funding, advisory services were supported, market development was sponsored and at the turn of the millennium it was

generally accepted as a dedicated way of agricultural production which was better to the environment as compared to conventional production.

Organic products are allowed to be labelled and sold as such only when these products and the way they have been produced are inspected by inspectors of licensed organisations. The EU-commission regulation 2092/91 (of 1991) and consecutive measures were accepted and ratified by the Member States. Based on this ratification the national authorities grant licences to inspecting organisations.

The European regulation was developed in very close collaboration with the International Federation of Organic Agricultural Movements (IFOAM) with its headquarters in Bonn. The European union has in 2000 published it's own (free) logo for organic produce (image 1).

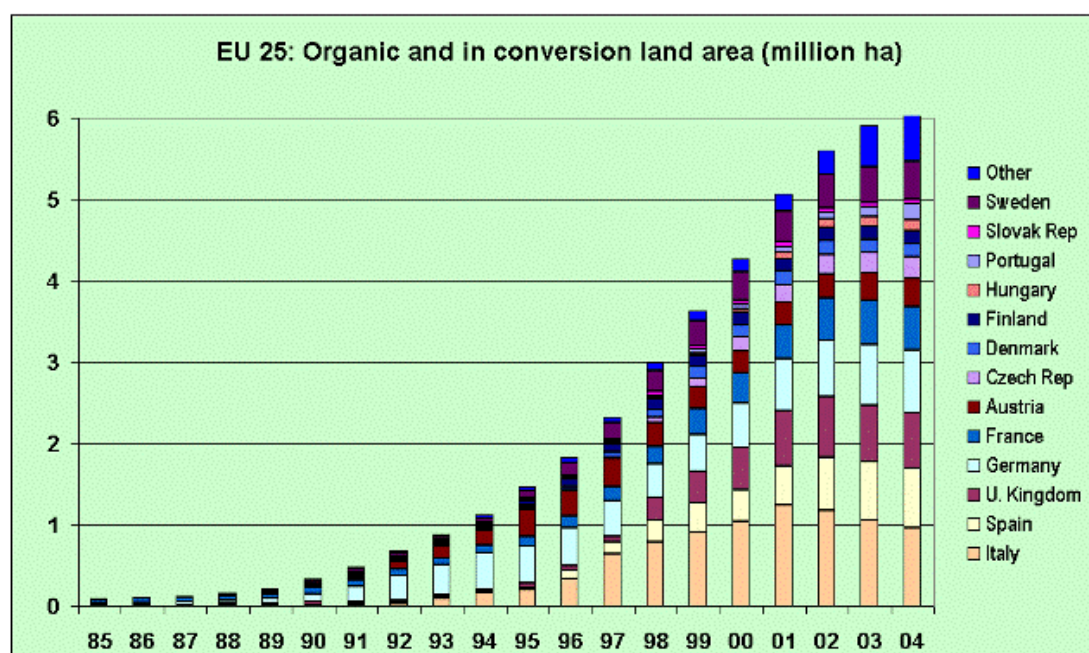
Image 1. EU logo for organic products



Source: http://ec.europa.eu/agriculture/qual/organic/logo/index_en.htm

The increase of production can be illustrated with the following figure 7. It is however evident that since 2001 the rate of growth has been somewhat slowing down. In case of Italy the number of hectares for organic production has even decreased.

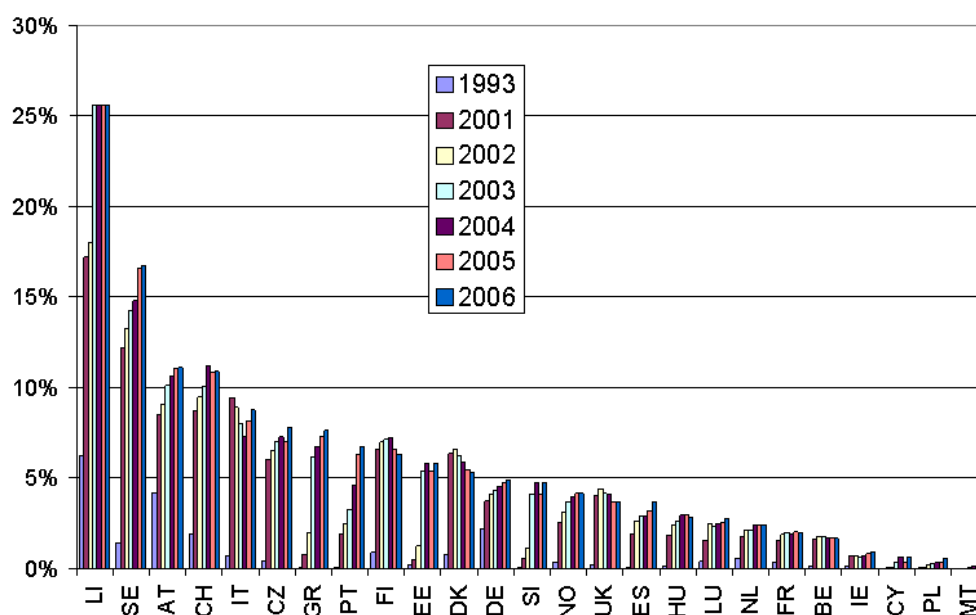
Figure 7: Organic and in conversion land area (million ha)



Source: <http://www.organic.aber.ac.uk/statistics/europe05.shtml>

The following figure illustrates the differences in the share of the organic production among selected EU-countries.

Figure 8: Organic certified and in-conversion land area in EU-27 as % of utilised agricultural area



Source: <http://www.organic.aber.ac.uk/statistics/europe05.shtml>

Since the year 2000 countries have set themselves targets for organic production. Germany was the first country to publish a target of 20% (of organic agricultural production and consumption) by the year 2010. Governments recognised the importance of contributions to the environment and landscape maintenance made by organic farming.

National rural development plans prepared by national governments now also have to provide a target for organic production. These are generally provided for the year 2010. Some of these targets are quite ambitious and the current feeling in the sector is that these set targets will not be met by 2010. Even with the support given for conversion to organic production these aims are not realistic as long as the market is not developing with the same rate.

7.3. Aspects of development

The following aspects of development have a serious impact on the future of the profession and the related skill needs:

- (a) conversion,
- (b) globalisation,
- (c) technological innovation,
- (d) agricultural development.

7.3.1. Conversion

A substantial increase of organic production can only be the result of conventional farmers converting to organic production.

In courses we organise for such farmers in the Netherlands we find that they are very well prepared for the changes in their enterprises, but less so in their personal attitude towards the new way of farming they are going to apply. The conventional farming did not imply observation skills necessary for organic farming: the ability to make day-to-day observations on the plant development, on pests and diseases interfering with the production, not just recognising but trying to understand where it comes from, what causes the influx of this particular pest, estimate the damage that will be done, estimate the effect of possible allowed measures and understand the relationship with soils.

For example, the study of lifecycles of the carrot flies, together with understanding their typical behaviour and finding simple ways of detecting their presence in the carrots allows farmers to take the right decisions with respect to soil tillage, sowing and mechanical weed control which does not expose the carrots to the flies and reduces the damage done by the carrot fly larvae to an absolute minimum.

Observation skills are not just important when growing plants, they are also essential for a farmer to relate to his animals. A dairy farmer of 150 cows from just north of Amsterdam was the first organic farmer to buy a milking robot in 1998. He sold the robot in 2000 and when asked why he would say: 'I didn't see my cows, I didn't know them anymore'.

7.3.2. Globalisation

This subject is well presented in other contributions to this volume but it is worth noting that this trend does not bypass the organic agricultural world too. Just two examples for an illustration.

As the result of restructuring in the 1990's of the Hungarian agricultural production, organic sunflower seeds for oil pressing were a well exported product for some years. In about 2000 this however was not the case anymore because the Hungarian farmers had been beaten on price by the Chinese producers, even despite the much higher transport costs.

The EU has a shortage in organic wheat for baking our daily organic bread. The main supplier for organic wheat at present is the Ukraine.

7.3.3. Technological innovation

Although it is evident that investments in agriculture have decreased over the past decade, the research on new technology in this field continues. The major development is precision agriculture, where with the help of new technologies new machines are developed which solve problems that could never be solved before.

For instance, when a machine can identify production plants and weeds by their particular colour and/or the intensity of a particular kind of green, it is possible to build a precision weeding machine that can also cut weeds growing in the row of cultivated plants.

Another example, machines controlled by the global positioning system (GPS) can plant lettuce plants in dead straight rows for 400 meters making the crop maintenance with other equipment much easier.

Other important technological developments are the ever increasing capacities of machines and tractors needed to power them and the ongoing search for new products. This search for new products takes various shapes: new products not for human or animal consumption but as industrial raw materials, new species of plants for consumption with special properties either for production (e.g. not being recognised by the carrot fly as a carrot) or for consumption (e.g. the latest colour for carrots is purple). In this contribution about the organic agriculture development the subject of GMO can only be mentioned as being regarded with the greatest suspicion.

7.3.4. Agricultural development

A number of developments, more or less pronounced, affect agriculture in all European countries and are well worth to be mentioned here.

The structure of agricultural production is changing: the number of farms is decreasing everywhere (thus farms are getting bigger) and many farms have no successor (from within the family) because young people are leaving the countryside for economic and social reasons.

The social fabric of rural life is changing rapidly as well: where farming was a social activity not so long ago, it is now often a job for a single person and his machines; rural villages loose their supporting functions when schools, post offices and libraries close and when finally the greengrocer closes up, all services have to come from somewhere else.

All these developments affect the future of the agricultural professions, be it conventional or organic.

7.4. The European Network for Sustainable Agriculture Education and Training (ENSA)

This future effect was illustrated by the outcome of the survey organised during the conference and last partners meeting of the Leonardo da Vinci project ENSA which was implemented by the Warmonderhof Training Centre of Groenhorst College from 2003 to 2006.

One of the questions in the survey to evaluate the project asked the representatives of 24 partners (training providers and a couple of organic farmers' associations) of 14 European countries, was: 'In future projects I would like to see the following elements...'

The answers provided identified four groups of project needs by these partners:

- (a) market support,
- (b) education development,
- (c) social actions,
- (d) self-sufficiency.

7.4.1. Market support

These suggestions were based on the assumption that an increase in the market for organic products would eventually lead to the conversion of more farms. The kind of projects mentioned were:

- (a) consumer awareness to educate consumers by publicity campaigns on the advantages of organic food;
- (b) environmental public awareness on the environmental effects of organic production;
- (c) food quality: another property of organic food that could be pushed to increase the markets;
- (d) involving top-chefs to increase the use of organic products in hotels and catering;
- (e) training supermarket managers to present organic products with the appropriate advertising and to provide correct consumer information by shop attendants.

7.4.2. Education development

As most respondents work in agricultural education, mostly related to organic agriculture, they are very much aware of the needs of the education and its clients, the future farmers.

As all these respondents have been involved for the past three years in the ENSA project and some partners in other European projects even for a longer period, the international awareness was well reflected in some responses:

- (a) transparency of education standards: progress is being made, information is shared in European projects, but full transparency is far from realised;
- (b) sharing of knowledge: there is a lot of knowledge and information that is, sometimes deliberately, not shared with peers. Even in the EU Leonardo da Vinci projects for vocational education development exchange is often limited;
- (c) deepening organic agriculture knowledge: still more fundamental research towards a better understanding of soils, plants and animals and their relationship is needed for the development of organic production;
- (d) teachers exchange: to open personal horizons and increase professional exchange.

7.4.3. Social actions

There were many suggestions made for projects to improve or enhance the social conditions and functions of the farming community. Often these were supporting further development of changes already initiated:

- (a) community supported agriculture: communities from towns take initiatives to relate directly to a particular farm for some of their needs such as food or a walk in the countryside. In turn they provide support to (e.g. credits) or share responsibility with the farmer (co-ownership);
- (b) eco-villages: in many countries small villages have declared themselves to be an eco-village, promoting organic production and various environmentally friendly activities related to economic activities, often energy, transportation, sometimes even an

- (c) agriculture and care: over 800 farms in the Netherlands provide care to people with needs: people with a handicap either physical and/or mental are offered a protected and well-organised environment where they can develop their often limited abilities. Projects need to be developed for the exchange of experience and training of farmers and other staff supporting these people in need;
- (d) social (re-)integration: farming in many countries have become an isolated job. Projects have been proposed to improve the social fabric of rural societies and to boost the social capacities and self-confidence of the farming community;
- (e) farm succession: support for projects that develop new ways to assist farm succession. When there are no family members interested in taking over the farm, selling up (to your next door neighbour most likely) should not be the only option.

7.4.4. Self-sufficiency

Although it was felt to be slightly outside the scope of the survey and the ENSA project, there were some suggestions made to support projects enhancing independence:

- (a) permaculture, a concept of sustainable self-sufficiency ranging from growing herbs on your windowsill to complete independence for small communities, should be more promoted by international projects;
- (b) growing on private allotments where an increasing independency should be promoted; as one respondent commented, ‘about 60-70% of Moscow’s food is usually grown on ‘dachas’, wouldn’t it be great when this was grown organically?’;
- (c) young people start at school gardens: start young with teaching the basics and getting the satisfaction of growing your own food.

7.5. Development in skill needs in organic farming

There are some tendencies visible in the general picture presented, but there are even more uncertainties, so it is not really possible to come to detailed conclusions on how to change and adapt vocational education to prepare for future needs.

It seems to be clear that the traditional and very static way of agriculture where farms were taken over by the oldest son is rapidly changing in a dynamic industry where businesses are taken over and staff is being replaced as quick as in other sectors. This leads to the suggestion that agricultural education should prepare learners for this more dynamic way of life and even allowing to move between sectors.

The more general suggestions for vocational education and training ISCED levels 2 and 3 more attention should be given to:

- (a) observation skills allowing future farmers to relate directly and personally to the production of their enterprises;
- (b) skills in new technologies to enable operation with new technologies and making decisions on buying in or contracting out.

On management levels (ISCED 4 and 5) it would be advisable to focus training and teaching on:

- (a) management skills – increasing the management and entrepreneurial skills will improve first of all the ability of farmers to deal with globalisation and other external developments and will also allow to attract students to the sector and to increase their mobility across sectors;
- (b) social skills – relate to society. It seems sometimes that agricultural education is targeted exclusively at persons from the sector. A reversed approach, opting to including the agricultural sector within the mainstream of society would be a better basis for the organisation of education. It would grant respect to the producers of our food, it would open up other functions of farming and rural life and it would provide a place in society to the farmers to which they feel entitled but which they feel for a long time has been refused to them.

The point of view for this analysis of future needs was organic farming but looking at the conclusions they seem to be valid for the whole agricultural sector.

8. Trends and developments in the fishery sector

Marianne Raben Olrik, Danish Fisheries Association, Denmark

Abstract

This chapter describes development in the fisheries. It is clearly shown how the fisheries is characterised by a decrease in employment, number of vessels and fishing quota, an increase of the average age of the fishermen, and a large need for young workers. It is indicated that the current larger vessels are high-tech, which implies skill needs in this domain. Another trend is the consumer demand for high quality fish, which has implication for the processing of fish, and related skills. Furthermore, it is stated that shippers need leadership and innovation skills. The fishery sector recruits employees internationally and this indicates communication skills needed. Finally, two networks in the field of fisheries education are described, REFOPE and the Fisheries Circle.

8.1. Introduction

The development in the fishing industry depends on the fish prices, the quality and the quantity of fish. The fish prices are set by the world market today, where the prices earlier were set by local markets.

Consumers have become more powerful and they demand more information about the fish products and production methods.

Fishermen have made their work more effective and there is a tendency to work harder on the price of each fish. For example, many modern vessels today see pack the fish and thereby handle the fish with more respect to the quality.

The quota has declined and today there is more control and regulation than ever before. From 1994 to 2004 the EU production of fish thus declined by 16% (see table 7). However the world total fishery production increased by 29% within the same period of time due to increasing production in Asia, Africa and Australia (see table 8).

Table 7: The volume of the fishery production change in the EU between 1994 and 2004 (in tonnes)

Total fishery products (tonnes)	1994	2004	change
Austria	3,491	2,667	-24%
Belgium	35,106	27,774	-21%
Bulgaria	12,685	10,739	-15%
Cyprus	9,718	3,987	-59%

Czech Republic	22,610	23,912	6%
Denmark	1,886,608	1,132,545	-40%
Estonia	124,097	88,156	-29%
Finland	167,994	147,542	-12%
France	930,901	915,048	-2%
Germany	277,067	319,332	15%
Greece	214,307	190,145	-11%
Hungary	18,206	19,986	10%
Ireland	319,250	338,609	6%
Italy	575,160	396,867	-31%
Latvia	138,665	125,936	-9%
Lithuania	51,036	164,685	223%
Luxembourg	0	0	
Malta	3,260	1,935	-41%
Netherlands	529,306	600,561	13%
Poland	462,532	227,365	-51%
Portugal	273,502	228,188	-17%
Romania	42,651	13,223	-69%
Slovakia	3,488	2,783	-20%
Slovenia	3,133	2,592	-17%
Spain	1,274,020	1,217,326	-4%
Sweden	394,231	275,925	-30%
United Kingdom	963,648	862,136	-11%
EU	8,681,336	7,316,002	-16%

Source: Eurostat

Table 8: Increasing global production

Total fishery products (tonnes)	1994	2004	change
EU-25	8,681,336	7,316,002	-16%
Europe	17,293,795	16,316,593	-6%
Africa	5,667,731	7,869,297	39%
North America	9,066,164	8,969,458	-1%
South America	22,935,204	19,061,243	-17%
Asia	64,654,685	101,558,680	57%
Oceania	968,003	1,476,897	53%
Australia	239,358	280,141	17%
New Zealand	500,916	631,886	26%
All countries in the world	120,716,550	155,416,780	29%

Sources: Eurostat

If we look at the vessels the general tendency is, that the sector pays more attention to safety and vessels therefore have more safety equipment on board. The working conditions have improved on board. For example, most modern vessels have now toilet and bathing facilities on board, and overall working conditions for fishermen when they work are better.

The vessels have a lot of new electronics for fish searching, navigation and other technique on board.

The number of vessels declined by 21% from 1994 to 2004 (see table 9), but the tonnage ‘only’ declined by 12% (table 10). The decrease in the fishing fleet thus especially dropped small vessels from the fishery sector.

Table 9: Decreasing number of vessels in the fishery industry in Europe

Number of vessels	1995	2005
Greece	20,718	18,275
Italy	19,359	14,459
Spain	18,385	13,691
Portugal	11,746	9,955
France	6,598	7,859
United Kingdom	9,655	6,774
Denmark	5,180	3,274
Finland	4,106	3,267
Germany	2,392	2,121
Sweden	2,508	1,640
Malta	:	1,421
Ireland	2,044	1,411
Estonia	:	1,045
Poland	:	974
Latvia	:	928
Cyprus	:	887
Netherlands	1,023	830
Lithuania	:	272
Slovenia	:	169
Belgium	154	121
EU	103,868	89,373
EU-15		83,677

Sources: Eurostat

Note: missing/not available data: ‘:’

Table 10: Decreasing tonnage in the fishery industry in Europe

Gross Tonnage	1995	2005
Spain	607,493	487,397
United Kingdom	270,586	218,713
France	179,207	215,116
Italy	258,540	213,231
Netherlands	180,205	171,988
Portugal	127,880	108,697
Greece	110,224	93,012
Denmark	107,124	91,961
Ireland	60,717	87,753
Lithuania	:	64,404
Germany	76,887	64,075
Sweden	58,220	44,778
Latvia	:	38,541
Poland	:	30,260
Estonia	:	24,216
Belgium	22,870	22,686

Malta	:	19,006
Finland	24,668	17,126
Cyprus	:	9,121
Slovenia	:	1,060
European Union	2,084,621	2,023,141
European Union (15)		1,836,533

Sources: Eurostat

Note: missing/not available data: ‘.’

In 1995 17% of the fishing fleet was more than 25 years old, and in 2005 this number increased to 43% of the fleet (see table 11).

Table 11: Old vessels in the fishery industry in Europe (in %)

Vessels aged 25 years or more (% of the total fleet)	1995	2005
Denmark	21	59
Slovenia	:	59
Portugal	0	56
Sweden	33	55
Ireland	32	52
Poland	:	51
Spain	-	50
Lithuania	:	44
Italy	34	43
Greece	26	41
Cyprus	:	37
United Kingdom	25	36
Malta	:	35
Netherlands	38	35
Latvia	:	33
Finland	14	30
France	-	29
Belgium	-	27
Germany	9	21
Estonia	:	19
EU	17	43

Sources: Eurostat

Notes: missing/not available data: ‘.’

Real zero/zero by default/not applicable: ‘-’

The general trend in the fishery industry in Europe therefore is decreasing production and number of vessels combined with more quality conscious consumers and therefore also a more quality-based production.

8.2. Development on the labour market for fisheries and the seafood industry

If we look at the labour market in the EU in general we face decreasing unemployment rates and growing opportunities for young people on the one hand and demography ‘problems’ due to growing share of elderly workforce and very small young cohorts on the other hand. The fishing sector faces similar problems but even more pronounced because a typical fisherman is old. For example, an average vessel owner in Denmark is 52 years old while the demand for young workers is huge.

The number of workers employed in the fishing sector has declined in most EU countries from 1994 to 2004.

Table 12: *Employment change in the fishery sector 1994-2004*

	1994	2004	Change (%)
Greece	32,704	:	-
Spain	77,962	:	-
Ireland	7,700	:	-
Italy	45,000	:	-
Lithuania	:	:	-
Luxembourg	:	:	-
Hungary	4,300	:	-
Malta	1,780	:	-
Netherlands	3,762	:	-
Austria	2,300	:	-
Poland	11,187	:	-
Slovakia	:	:	-
France	33,629	32,064	-5%
Portugal	31,721	21,345	-33%
United Kingdom	21,874	11,720	-46%
Estonia	11,225	8,430	-25%
Finland	5,566	4,762	-14%
Denmark	6,256	4,197	-33%
Latvia	4,751	4,115	-13%
Germany	4,209	3,904	-7%
Sweden	3,500	1,913	-45%
Czech Republic	2,039	1,849	-9%
Cyprus	1,159	1,123	-3%
Belgium	652	880	35%
Slovenia	174	352	102%

Sources: Eurostat

Notes: Missing/not available: ‘:’

Real zero/zero by default/not applicable: ‘-’

The possibilities in the fishing industry are the opportunity to work with new technologies and electronics and a relatively high income. The fishing industry however faces threats from regulations, a negative image, still the image of relatively poor and insecure working

conditions and, last but not least, a number of other possibilities for young people outside the sector.

8.3. Future skill needs in the fishery sector

The future fishing sector needs motivated young people who dare run a risk and who are willing to learn throughout their life. The entrants also need to have an understanding of safety and a technical know-how. The on-board workers need to possess leadership skills – and not only management – combined with innovative skills. The fishing sector needs to focus on the labour market for fishermen both nationally and internationally.

REFOPE is an European network dealing with education and recruitment. They have registered European training centres at www.refope.com and they are now working on a common safety guidelines for all European vessels. REFOPE also organises seminars and international meetings.

The Fisheries Circle is a Danish network dealing with education and recruitment. They target their advertisements at young people using television, cinema, newspapers and at exhibitions. The Fisheries Circle also produces educational materials for primary schools about fisheries.

The Fisheries Circle also works with values, strategy and quality in the fishery schools. For example, the focus is on skills of teachers (e.g. pedagogy), learning skills, providing traineeships on-board and contacts to the sector.

The Fisheries Circle also produces educational materials for schools and they are just about to start with coaching. The idea is to help the young fishermen to focus on what they aim at in the future and then give them some tools to keep focusing on their goals.

9. Future skills needs in the agriculture and food sectors in the Czech Republic

Zorka Husová, National Institute for Technical and Vocational Education, Czech Republic

Abstract

The contribution pinpoints main trends and priorities in the agriculture and food sectors in the Czech Republic. These go hand in hand with the EU trends and strategy. The national policy programmes take into account the development in the EU and in the Czech Republic. The contribution concludes by the main trends and corresponding skill, competence and knowledge needs in the sectors and discusses vocational curricula of initial education for a better access to and performance on the labour market of current students in the future.

9.1. Introduction

Development of education in the Czech Republic is in harmony with the development in the rest of Europe. Main priorities include development of lifelong learning, connection between initial and further education, recognition of qualifications, transparency of education and mobility within the EU, co-operation with social partners in vocational education and training, guidance and counselling for everybody, effective use of financial resources in accordance with the main priorities of the EU.

The challenges for vocational education and training in the Czech Republic are the same as in other European countries: more flexibility and dynamism to cope with the pace of changes in trade and industry, reflecting technological development and innovation, and reacting to the open global market. One major challenge which plays a key role in vocational education and training is an effective ‘dialogue’ between representatives of work and education about future skill needs - new knowledge, skills and competences. Therefore co-operation is necessary at each level, not only at local, regional and national, but also at European level.

Currently in the Czech Republic there is an on going curricular reform which is based on a two-tier curriculum – the broad-base framework curriculum at national level as the educational standard and the school curriculum at regional level where schools can react to local conditions and focus on specific needs. From this point of view, initial vocational education and training provides students with a broad base on which further education can be built. Within the curricular reform, a system of quality control for vocational education and training, and the framework of qualifications and their recognition are being developed.

One of the most important tools for transparency of vocational education and training, and a tool for the workforce mobility in the EU, is the European qualifications framework (EQF) for lifelong learning⁵⁶. The Czech Republic develops national qualifications framework (NQF) and is a very active participant in the consultation process on the EQF which is under way at present.

9.2. Trends in agriculture and in the food industry in the Czech Republic

In the Czech Republic only 3,2% of economically active are engaged in agriculture and 2,9% in the food industry.

One of the most important conceptual documents of agriculture and forestry is the ‘Conception of agrarian policy in the EU’ which reacts to current and future problems. Thanks to CAP the principles in agriculture in the Czech Republic are compatible with principles and measures stated in the CAP and other measures dealing with agriculture, safety of foodstuffs, environment and development of the country.

From this point of view the priorities in the Czech Republic correspond with the EU strategy based on the European model of agriculture with four main pillars:

- (a) nationwide multifunctional farming promoting corn and milk production (besides traditional commodities), ‘non-commodity outcomes’ (the positive external effects of production, for example, a cleaner water, increased employment in rural areas, contribution to human and social capital in the country, better services in the country, etc.);
- (b) agriculture based on small and medium businesses of a family type;
- (c) matching country development with agricultural development;
- (d) the production of high quality foodstuffs that meet increasingly stricter safety and production standards.

According to the opinion of the European Commission, development of the country should play more important role in the reformed agricultural policy. Rural areas occupy more than 90% of the extended EU and are inhabited by nearly half of its population. Agriculture and forestry are the main types of land use. That is why they play a key role in using and protecting natural resources and contribute to social and economic development of the country. Life in the country cannot be only based on agriculture and forestry. The policy of the country development should also take into account environmental protection in the

⁵⁶ European Framework of Qualifications for lifelong learning (EQF) is realized within the EU program ‘Education and Training 2010’.

country, the quality of produced foodstuffs and its attractiveness for young farmers and new inhabitants.

At present, the whole EU is coping with agricultural over-production. In the Czech Republic, we can also suppose that a certain pressure will be exerted on grassing over and afforesting agricultural areas. A decrease in arable land and an increase in productivity of labour due to new and more sophisticated methods might result in a lower need of workers in agriculture. Significant changes in the structure of economy, especially in the structure of industrial branches are reflected in the labour market demand which influences educational structure.

In the last few years the unemployment rate has increased in agricultural branches at all educational levels and the number of students admitted into agricultural branches has decreased.

Similarly as in agriculture, the document ‘Conception of policy in the food industry’ plays a main role in the development of the food sector in the Czech Republic. The strategy is focused on several important areas:

- (a) food safety (care for public health, hygiene, nutritional value),
- (b) high quality of products (quality raw materials in output, effective control systems),
- (c) bio-products and new products (non-genetically modified),
- (d) close cooperation with farmers,
- (e) small-scale production as well as large-scale production, commercial networking,
- (f) modern technology - environmentally responsible production,
- (g) knowledge of legislation in the relevant field.

Vocational education and training in the agri-food sector has to reflect not only current changes, but also development trends in a short and medium term. The new trends in agriculture and food industry must be taken into account in curricula (basic subject matter for each study field that will represent a common obligatory base) and also sufficient space for schools to accommodate regional needs, school conditions and pupils’ interests.

In the curriculum there is an emphasis on general and vocational competences, to prepare adaptable and flexible workers who after taking further education courses will be able to adapt themselves to the constantly changing labour market.

Vocational education and training in these branches requires more expensive practical training due to certain specificities (e.g. machine operation, welding courses, driving licence courses; chemistry labs, analytical chemistry, biology, microbiology), but it is a key for successful placement in the labour market after training.

9.3. Conclusions

Trends in agriculture in the Czech Republic point to corresponding vocational skill needs:

- (a) encourage sustainable development (and rural development),
- (b) use organic farming,
- (c) grow alternative crops,
- (d) protect landscape,
- (e) respect animal welfare,
- (f) assess quality of products,
- (g) use modern technology,
- (h) support agro-tourism and country development,
- (i) knowledge of new legislation.

In the food industry, the trends and corresponding vocational skill needs in the Czech Republic are:

- (a) produce safe food (use effective control system focused on process and products, strengthen hygiene and safety at work, use system the rapid alert system for food and feed, etc.)
- (b) produce bio-products (non-genetically modified),
- (c) use marketing strategy:
 - (i) high quality foodstuffs,
 - (ii) support products labelled 'klasa',
 - (iii) adaptation to needs of changing society (fast food, prepared meals),
 - (iv) use local agricultural products,
- (d) use modern technology (environmentally responsible production),
- (e) operate safe modern machines and use automation of production,
- (f) use quality raw material in output,
- (g) knowledge of new legislation,

The employers put stress not only on the theoretical knowledge and practical skills but also on key competences and general skills:

- (a) adaptability and flexibility (to be able to adapt to the constantly changing labour market),
- (b) management skills,
- (c) responsibility,
- (d) decisiveness,

- (e) willingness to learn,
- (f) team work,
- (g) language skills,
- (h) ICT skills,
- (i) a deeper economic knowledge (e.g. funding sources, procedures for production cost analyses, economic demand of a particular technology, etc.).

In summary, students should know basics of alternative crops growing principles in agriculture, should respect animal welfare, should be trained in enterprise in agro-tourism, which is one of the ways of countryside renewal and development. With respect to the fact that modern agriculture cannot work without complicated and costly mechanisation, which even private farms are equipped with, future school leavers should know these machines, be able to operate and use them in a save and efficient way.

Students engaged in the food educational branches have to focus on safety of foodstuffs, use of modern technologies and production of new products (bio-products), use of new effective control methods, concentrate on strengthening hygiene and safety at work.

From the comparison of chances of young people on the labour market, it is clear that the higher the qualification, the better the access to and the performance on the labour market.

10. Innovation and skill needs in the woodworking industry

Tapani Savisalo, Finland

Abstract

The writer's background as a long serving employee of a major Nordic forestry company offers a natural platform to discuss wood products industry, i.e. production of sawn timber and further processed goods, and manufacturing of wood-based panel products such as plywood, particle board and fibre board. The particular focus is on small-scale wood products industry in a local business environment. The development of the industry structure is discussed to underline the different way of operating of large-scale industry and small, micro, industry. In mapping competence development and needs of today's industry, competence assessment methods of Spencer and McClelland are used. Three key positions in the industry are analysed, those of a forest worker and a sawmill operator, and a paper mill operator. Finally, industry's expectations from education are summarised.

10.1. Introduction

Although the forestry industry, as most other industrial sectors, seems to be ever consolidating into larger and more powerful entities, it is the writer's firm conviction that there is a room for successful and economically viable small-scale undergrowth in this sector. In this context, less attention is paid to the mainstream forestry, generally marked with sizable capital investment, high-level efficiency, and global distribution for the diversified and sophisticated product range. It is rational that the large units pay less attention to the local scene for the following reasons:

- (a) raw material procurement is regionally coordinated with other mills within the operation,
- (b) high efficiency and specialisation demand operational expertise, which may not be available locally,
- (c) the market specialisation bypasses any local needs.

In many areas of Central Europe, forests are the main natural resource, providing an optimal raw material base for a small wood products operation, e.g. sawmill. Since at the same time there is demand for building materials, notably wood for new construction and renovation, it would seem natural to invest in wood products industry in rural areas. Arguably, there is a need and a place for local operations which are harnessing the local resources and feeding the community around them with the outputs of the mill, and most importantly, generating cash flow which quickly turns in the community, creating various opportunities.

The analysts of the forestry industry, however, would be quick to point out the weaknesses of wood products industry, being a declining sector with modest profit potential, operating in an oversupply situation, squeezed between increasing raw material costs and eroding sales prices, and burdened by ever growing investments to achieve sufficient productivity. Notwithstanding the above, it is conceivability that there are ways to achieve the objectives of a unit in the wood products industry, providing that the entity is able to position itself favourably in a local micro-level competitive situation.

One of the key differences between a large-scale operation and a ‘micro-mill’ is the nature of the cash flow. A large operation due to its wide area of procurement and sales, as well as large investment, will direct its cash flow much further away from the local community: forest owners are largely not local, service providers are usually bigger nationwide sub-contractors, expertise to run the mill has to be acquired further away, etc.

It is suggested that a local ‘micro-mill’ concept should meet the following criteria:

- (a) to harness in a sustainable way the local raw material base,
- (b) to offer community members employment compatible with their education and skill level,
- (c) to offer community members entrepreneurial opportunities,
- (d) to generate output directly useful in the community,
- (e) to be financially affordability in terms of capital expenditure required,
- (f) to have a long term viability in the competitive environment,
- (g) to meet high environmental and social responsibility standards.

In summary, to efficiently convert local inputs into cash and wealth for the local community.

10.2. Skill needs development in the sector

Skills and competencies needed in the woodworking industry have changed as dramatically as the industry itself despite the fact that the raw material and many of the products have not changed much. The skills development has been driven by the following factors:

- (a) increased mechanisation and automation of the production processes,
- (b) higher demand for independent problem solving and decision making,
- (c) entrepreneurial aspect of the work, frequently outsourced.

In mapping of the competences, a method by Spencer et al. (1992) is used (table 13).

Table 13: Competence mapping method

Achievement orientation	General competences
-------------------------	---------------------

Concern for quality and order	
Information seeking	
Technical expertise	
Analytical thinking	
Conceptual thinking	
Teamwork and cooperation	
Interpersonal understanding	
Self-control, stress resistance	
Flexibility	
Initiative	Entrepreneurial competences
Relationship building, networking	
Business-mindedness	
Customer-service orientation	
Impact and influence	Managerial competences
Directiveness	
Developing others	
Team leadership	
Organisational awareness	
Self-confidence	

Source: Spencer et al. (1992)

In the following tables (tables 14-16), the three key positions, i.e. harvesting operator, paper machine operator, and sawmill operator are analysed using the competence map. In each case, the comparison between the two columns illustrates the skills development in the job during the last three decades, before the recent development in the production processes.

Table 14: Competence mapping: harvesting operator

	Forest worker	Harvesting operator
Achievement orientation	+	+++
Concern for quality and order	+	+++
Information seeking	+	+++
Technical expertise	+	+++
Analytical thinking		+
Conceptual thinking		++
Teamwork and cooperation	++	++
Interpersonal understanding	+	+
Self-control, stress resistance	+	++
Flexibility	+++	++
Initiative	+	++
Relationship building, networking	+	++
Business-mindedness		+++
Customer-service orientation		+++

Source: based on Spencer et al. (1992)

Table 15: Competence mapping: paper machine operator

	Paper machine worker	Paper machine operator
Achievement orientation	++	++
Concern for quality and order	+++	+++
Information seeking	+	++
Technical expertise	+	+++
Analytical thinking	+	+++
Conceptual thinking	+	++
Teamwork and cooperation	++	++
Interpersonal understanding	+	+
Self-control, stress resistance	++	++
Flexibility	+++	++
Initiative	+	++
Relationship building, networking	+	++
Business-mindedness		++
Customer-service orientation		++

Source: based on Spencer et al. (1992)

Table 16: Competence mapping: sawmill operator

	Sawmill worker	Sawmill operator
Achievement orientation	+	++
Concern for quality and order	+	+++
Information seeking		++
Technical expertise	+	+++
Analytical thinking		++
Conceptual thinking		++
Teamwork and cooperation	++	++
Interpersonal understanding	+	+
Self-control, stress resistance	++	++
Flexibility	+++	++
Initiative	+	++
Relationship building, networking	+	++
Business-mindedness		++
Customer-service orientation		++

Source: based on Spencer et al. (1992)

10.3. Industry expectations

Given the dramatic and rapid change in the skill needs, it is only natural that higher expectations are directed towards the education system. At the same time, however, the industry itself is taking steps to enhance in-house education and training and to provide specific competences. In the following, the most important skill needs are grouped in three different categories. Typically, the general skills should be obtained within the education

system whereas the industry specific skills should be acquired in a learning situation combined with work. The entrepreneurial skills are an area challenging both the education system and the industry.

General skills:

- (a) maths, science, problem solving, analytical thinking,
- (b) interpersonal understanding, communication and languages.

Industry-specific skills:

- (a) technical competence in
 - process knowledge,
 - product knowledge,
 - maintenance,
- (b) organisational competence in
 - team work,
 - networking,
- (c) managerial potential to develop
 - conceptual thinking,
 - team leadership.
- (d) entrepreneurial skills,
- (e) business mindedness,
- (f) customer orientation.

Bibliography

Spencer, L.M.; McClelland, D.C.; Spencer, S.M. *Competency assessment methods: history and state of the art*. Boston: Hay/McBer, MA, 1992.

11. New skills and qualifications for the trees and timber industry

Peter Martin, Lantra Sector Skills Council, the United Kingdom

Abstract

This chapter is based on the work of Lantra Sector Skills Council (SSC), which is an employer-led body licensed by government the purpose of which is to boost skills and business development across the environmental and land-based sector. It operates across the whole of the United Kingdom. The chapter describes the forestry and arboriculture industries in the United Kingdom (whereas the scope of Lantra is broader), and it goes into the methodology for the development of national occupational standards and vocational qualifications in the United Kingdom. This methodology identifies drivers of change and the impact they have on skill needs. Next to that key functions are listed, as well as national occupational standards (competences). Subsequently, political and policy developments are described concerning forests and woodlands, and the impact of changing business models have on skill needs is mentioned. Three examples of new business models are given: changes in ownership and management within the value and supply chain, more collective activity, and new business opportunities (such as bio-fuel). Next, the chapter is elaborating changing skill requirements and skill gaps. The chapter concludes with Lantra's role in supporting skills development.

11.1. Introduction

Lantra SSC is an employer-led body licensed by government the purpose of which is to boost skills and business development across the environmental and land-based sector. It operates across the whole of the United Kingdom. The 17 industries it represents fall into three main categories: land management and production, animal health and welfare, and environmental conservation.

Within the sector there are approximately 1 million paid workers employed in 230,000 businesses. Two thirds of the workforce are self-employed and over 92% are in businesses employing 5 or fewer workers. This is a sector characterised therefore by micro-businesses. Up to a further 500,000 people act as volunteers on a regular bases in the sector, mainly in the area of animal welfare and environmental conservation. The sector contributes 5.69% to the UK's GDP (Lantra, 2006).

The four key objectives of Lantra SSC are to:

- (a) drive up business performance by raising investment in, and demand for, skills and business development;
- (b) develop and recognise the skills of the workforce;
- (c) raise the quality of entrants to the sector;
- (d) influence governments and their agencies for the benefit of the sector.

11.2. Forestry and arboriculture industries in the UK

Forestry has an economically important, if small, role within the sector. Within the broader trees and timber sector, Lantra has responsibility for forestry establishment and management, harvesting, sawmilling as well as arboriculture. Around 30,000 people are employed in these industries in the UK, with 20,000 being within arboriculture. The trees and timber sector is both economically and geographically less significant in the United Kingdom than in many other European countries (Lantra, 2006). It contributes some 0.5% to GDP and covers 11% of the UK landmass; this compares to a European average of 43% for coverage. Private ownership at 82% is significantly higher than the European average figure of 67%⁵⁷ (Mulder, 2006) cited by the Association of Forest Owners.

Forestry has witnessed a decline in employment in recent years resulting both from mechanisation and under-exploitation of the indigenous resource; only 40% of the potential harvest in England, for example, is being realised. The UK though is the second highest user of timber products and paper across the EU-25 and is therefore a major importer (Jaakko Poyry Consulting, 2006). The industry has witnessed closer links with estate management, game and wildlife management and environmental management indicating a diversified approach to land and use including leisure and tourism, as well as community woodlands accessible to all.

By contrast, employment in arboriculture has seen a significant rise in recent years to the extent that by employment it now outstrips forestry by 2:1. This is largely due to the increased value being placed on parks and open spaces, increased investment by private landowners in gardens and parkland, as well as a more positive public attitude towards environmental enhancement. Arboriculture is closely linked to landscaping and amenity horticulture which allows a further extension of business opportunities. By contrast, only around 10% of the 30,000 employees operate across both arboriculture and forestry (Lantra, 2006).

⁵⁷ The UK figures hide national variation though; 65% of all forestry workers are employed in Scotland, and the forestry; arboriculture employee ratio is 2:3. Woodlands cover 17% of the landmass. There is a greater focus on the commercial value of timber which contributes £630m to the Scottish economy, whilst private ownership is closer to the European average.

11.3. Methodology for the development of national occupational standards⁵⁸ and vocational qualifications in the UK

A key role of Lantra is to define the standards of performance required of competent workers in the sector. These are called national occupational standards (NOS) and they define the skills, knowledge and aptitude required. They are effectively therefore statements of competence. The methodology has been in use in the United Kingdom for around twenty years: NOS have been developed as well as continually updated, for almost all occupations in all sectors at all levels of activity. NOS are the key building blocks of vocational qualifications and curricula. They also have wider uses in human resource development including to define job roles, undertake training needs analysis and review performance.

The methodology used to define and develop NOS is very much a top-down process. A clear view of sector and business drivers is drawn up which provides a baseline understanding of the major discernable changes and trends across the area of activity being surveyed and reviewed. From this an occupational map provides information on the numbers employed, industry trends, job titles, progression routes and other relevant NOS. Various methodological tools can be used to discern trends either when first carrying out standards development or when at review. A STEEP analysis (sociological, technological, environmental, economic, political) is a useful method to plot such trends, and a draft analysis for trees and timber is in table 17.

⁵⁸ Full details of all the National Occupational Standards can be found on Lantra's website: www.lantra.co.uk

Table 17: Draft STEEP analysis for trees and timber industry

	Sociological	Technological	Environmental	Economic	Political
Drivers	More recreation Access to the countryside Increasing demand for land for different purposes Regeneration of rural communities Relative unattractiveness of careers in industry Demand for environmentally certificated products Social enterprises Role of volunteers Demographics	New products New markets Increased mechanisation Increased use of ICT GIS to monitor and manage resources GPS to assist surveying, harvesting Reduced waste Production maximisation	Climate change amelioration Renewability energy New silviculture techniques Forest and resource management Environmental standards (e.g. CAP cross-compliance) Waste management Water run-off reduction Land management Biodiversity	Globalisation New business models; supply chain Expanding labour markets Higher value products Extension into value and supply chain New products Market analysis	Opening up trade, product and labour markets Role of public sector in production Reducing subsidies Climate change Sustainability development Voluntarism /regulated labour and skill markets
Skills impact	Recruitment Retention Atypical career paths Lifelong learning Skills for diversified businesses Recognition of skills of volunteers Recognising skills of migrants Customer and stakeholder relationships	ICT Research and development Materials technology Product development Manufacturer training Lifelong learning Wider recruitment Sales and marketing	Diversified skill base New silviculture skills Environmental management Lifelong learning Knowledge exchange Business diversification Stakeholder relationships Public relations	Business re-engineering Business management Financial management Languages Timber technology Knowledge exchange Sales and marketing Migrant labour skills	Higher level negotiation skills Effective networking Stakeholder relationships Health and safety

Source: www.lantra.co.uk

A functional map of the industry is then derived from this analysis. It gives an overview of the types of major work activities which are carried out in the sector or industry. It describes the outcomes of work in broad terms. These are later refined, and further developed into NOS. As stated previously, the full NOS contain specifications of knowledge, skills, aptitude and performance range.

The key functional categories for trees and timber are:

- manage plant growth and development,
- harvest and process timber,
- carry out arboricultural operations,
- manage people and the organisation,
- manage the work area and surroundings,
- maintain, repair and operate equipment and machinery,
- provide goods and services to customers,
- provide opportunities for sport and recreation.

Below is an example of further disaggregation into NOS key functions for 'harvest and process trees and timber':

- select, mark and measure trees,
- fell and sned trees motor-manually,
- convert and stack wood produce manually,
- fell trees mechanically,
- extract wood products by skidder,
- extract wood products by crane cable,
- extract wood products by horse,
- extract wood products using small motorise equipment,
- process timber on site,
- manage harvesting operations,
- prepare plants for harvesting,
- restore the site after harvesting,
- store plants and plant material,
- transport harvested plants and plant material on the site,
- prepare harvesting plan,
- monitor crops and assess for harvesting,
- manage the harvesting and storage of plants and plant material.

11.4. Political and policy developments concerning forests and woodlands

As the STEEP analysis shows, there are a large number of drivers which influence the future direction of any industry. All economic activity takes place within a political environment and it is therefore imperative to understand this. Forestry has in recent years become more strategically important in the United Kingdom, a point which is exemplified by the recent Scottish forestry strategy which was published earlier in 2006 (Scottish Executive, 2006). Although specific to Scotland, it differs little in terms of strategic direction from forestry strategies for other parts of the United Kingdom.

The three major objectives of the strategy are:

- (a) improved health and wellbeing of people and communities (focussing on community development and access and health);
- (b) competitive, innovative businesses contributing to the growth of the economy (focussing on timber and business development);
- (c) high quality, robust and adaptable environment (focussing on climate change, environmental quality and bio-diversity).

These objectives relate very closely therefore to the key elements of sustainable development of social inclusion, economic development and environmental enhancement. More relevant to this paper they give a strong signal about the future direction of business development (in its broadest sense) within the forestry environment as well as the implication for future skill needs.

These go far beyond the creation of more economic value from timber and timber products. They reflect extensive diversification into businesses more associated with tourism and social enterprises, as well as an increased requirement for sensitive land management to ensure inter alia carbon sinks, effective water run-off, flood and soil management, and the conservation of flora and fauna. This growing, multiple use of land and forests is not without its tensions in what has often been a very traditional industry dominated by private ownership.

11.5. Impact on skills of changing business models

One point that comes out clearly from the above analysis is that different business models are developing rapidly in the industry. These will have a major impact on business development and require a considerable growth in business management and entrepreneurship. Three examples of these differing models demonstrate the following:

- (a) changes in ownership and management within the value and supply chain: this is well illustrated by Savisalo (2006) in this volume, which showed how large timber companies are divesting themselves of many ancillary functions and subcontracting these to

- (b) more collective activity: whilst 82% of forests are privately owned, in England they account for only 40% of the harvest. To better exploit their resources, a new partnership is now proposed which will better support development of the supply chain, research, training, new technologies, product and market development, finance. Again, this mirrors collective activity in other industrial sectors which has gone much further down this route;
- (c) new business opportunities: there has been a recent change in the English government policy towards the use of wood-fuel where it is now proposed to create an extra 2 million tonnes annually by 2020. This will require extensive use of under-managed woodlands and far more intensive use of residues. New business models which embrace continuous production and supply (to support district heating) as well as logistics will be required. As with the example above this diversification will be supported by government who see these developments as key to economic development of the current forestry resource.

11.6. Changing skills requirements and skills gaps

The current review of the NOS which Lantra is carrying out has indicated that the changes outlined in business practices above are having a significant impact on the design and content of the NOS. Lantra's research⁵⁹ has included surveying employers as to what skills they believe will be required to meet both present and future challenges.

Across the sector as a whole the nine highest rated skill requirements were:

- customer relationships,
- communication,
- planning and organising,
- technical skills,
- literacy,
- numeracy,
- environmental management,
- wildlife management,
- computing/ICT skills.

⁵⁹ All references in this section, except where indicated, are from Lantra (2006). Sector Skills Agreement; Stage 3 Report, Trees and Timber. England.

Of these categories it was only literacy and numeracy where the skill level requirements was not thought to rise over a three year period.

This list is not dissimilar to that presented by Savisalo (2006) in this volume. The highest rated skill requirements identified in his paper were:

- technical skills,
- adaptability,
- ICT,
- management,
- interpersonal,
- entrepreneurship,
- communication,
- languages.

There is in the UK list a greater concern for skills for life as there is a focus on wider, non-commercial activities. Business development, technical skills, communications and management are, however, essential features of both. There is a developing consensus therefore where skills development to meet future business needs should be focused.

The UK research has also looked specifically at the sub-sectors of arboriculture and harvesting to ascertain whether they have any specific requirements. Within arboriculture, greater emphasis in the standards is now to be placed on:

- conservation,
- botanics,
- tree inspection and surveying,
- report writing,
- best value contracting,
- health and safety,
- risk management.

It is interesting to notice that whilst demand for the majority of the core, technical skills has not significantly changed over the past five years, the same cannot be said for those other skill categories associated with the changing business environment in which arboriculturists now operate.

There have also been significant changes to skills requirements in forestry:

- business skills concomitant with new operating environment,
- contracting,
- sales and marketing,
- use of technologically advanced, multi- purpose equipment,

- extensive application of ICT,
- differential felling techniques to meet changing demands,
- multi-skilling due to remote working and smaller operating units.

Once again, changing skill needs reflect closely the changing business environment, but the focus in this instance is equally on changes resulting from technological developments as on business models.

The current NOS review has also highlighted where skill gaps (skills that the existing workforce do not possess) in the industry are, or where employers will in future need to recruit people with different skill sets. These are summarised in table 18.

Table 18: Skill gaps in the UK forestry workforce

Semi-skilled staff	Skilled staff	Owner/manager
Basic skills	Key skills	Business and management
Health and safety	Materials technology	Public relations
Technical skills	Contracting and compliance	Higher level negotiating
Self-management	Supervisory management	Personnel management
ICT	Customer care	Budget and financial control
Legislative compliance	Habitat management	Sales and marketing
Manufacturer training	Customer/stakeholder	Commissioning and
Team working	relations	contracting

Source: www.lantra.co.uk

It is noticeable that, whilst many of the current workforce are very experienced, they lack key or core skills. These skills include literacy, numeracy, ICT, team working and self-management. Workers not proficient in these skills will be less able to undertake effective workforce development in the other areas outlined above.

A major element of the current policy initiatives by governments across the United Kingdom is to provide basic and key skills for those adults requiring this development. Whilst this can be often provided in a work-related manner within large companies, the median size of companies in the industry militates against this.

Effective engagement with micro-businesses in order to raise demand for skills and business development continues to stand out as a challenge for a country where skill policies are based on the voluntarist principle. Lord Leitch's recently published report commissioned by Her Majesty's Treasury on the UK's skill needs to 2020 (HM Treasury, 2006) entitled 'Skills prosperity for all in the global economy – world class skills' indicated that if there had not been significantly increased investment in skills and business development by 2010 then the government would consider introducing new forms of regulation on business.

This relative inertia within small and micro businesses towards skills development was well illustrated in the national employers skills survey (NESS) carried out in England by the Learning and Skills Council⁶⁰ (LSC) in 2005. (The LSC is the body in England responsible for funding all post-compulsory school age education outside universities.). The NESS survey revealed that 28.6% of companies in this sector reported that skill gaps were having a major impact on business performance and a further 57.1% reported that they were having a minor impact.

The impact of these skill gaps included loss of business to competitors, difficulty meeting quality standards and increased operating costs. While companies listed increased workforce development and trainee development programmes as actions they were taking to overcome these gaps, it is salutary to note that the third action listed was ‘nothing’.

11.7. Lantra’s role in supporting skills development

Lantra has a number of roles in supporting skills and business development. Although our broad aim and role remains constant across the United Kingdom, the actual delivery will vary as education and skills are now responsibilities of the devolved administrations.

Apprenticeships have a long tradition in the UK education system as in many other countries. They offer employment to young people (and increasingly to adults who are seeking to change career) and combine both work-based and off-the-job learning. Apprenticeships have varying levels and although they are usually seen as a route into employment, advanced apprenticeships (where available) also allow entry into higher education.

Lantra has regularly updated these programmes to include more general education and life skills than previously, in order to mitigate the skill gaps now identified. Two challenges remain though: on the employer side, it remains challenging to identify small employers willing or able to provide the full range of experience required to complete the apprenticeship. Likewise, this career does not immediately appeal to young people often with little experience or knowledge of the sector.

In order to improve recruitment of young people into the sector, Lantra is currently developing and implementing new range of work-related curricula for students between the ages of 14-19 (although the specific ages vary by country). These offer contextualised learning combining general and vocational education but are not as occupationally specific as apprenticeships. They prepare students both for higher education and entry to employment. A pilot scheme run by high schools in rural parts of Scotland has enjoyed considerable success and this is now being introduced more widely across the UK.

⁶⁰ Learning and Skills Council (2006). National Employment and Skills Survey 2005. Coventry, England.

Alongside that, Lantra invests heavily in career information. Complementing public sector advice services, we have recently established a new career website which contains a range of support, information and signposting to learning opportunities. This can be viewed at www.ajobin.com. A complementary site for adult careers has also been established and can be viewed at www.acareerin.com.

Moving onto lifelong learning, there has been a tacit recognition that despite the fact that the sector is often highly skilled this is not reflected in the level of formal qualifications achieved. External skill recognition is now increasingly important for a range of reasons such as quality assurance, risk management, market differentiation, conforming with regulations. To support the industry, Lantra has now developed a new web-based system for recognising skills, identifying development needs and sourcing learning provision. This can work at both individual, business unit and industry level. Built around job roles, the online competence framework supports a tiered approach to quality assurance ranging from self-certification to accredited learning.

The online competence framework⁶¹ is a cross-sector tool which supports a wide range of human resource functions. Two particular advantages though are the ability to recognise learning at module level, which is more appropriate for micro-businesses. Allied to this is the fact that it allows equal recognition for work-based, experiential and informal learning as it does for more formal learning. It is therefore fit-for-purpose and pilots have indicated that it does indeed support and stimulate learning.

The other feature is that the online competence framework supports trans-EU movement of labour and skill recognition between different EU countries and education systems. Although initially this is at self-certification level, mapping of comparative national qualifications will facilitate recognition of accredited learning. This is a significant enhancement to the present EQF proposals which only offer comparison by qualification level rather than content. A job-shop facility is also being developed.

The value of the innovative system is now being recognised across the EU-25, where the online competence framework is being assessed in order for it to form the basis for 'Agripass'. The framework clearly is also of value in supporting employment within the agri-wood sector and Lantra would be delighted to discuss its application with any organisation interested in using it.

Bibliography

HM Treasury. *Prosperity for all in the global economy*. Leitch review of skills final report. London: Her Majesty's Stationary Office, 2006.

⁶¹ Full details can be found on Lantra's website: www.lantra.co.uk.

Jaakko Poyry Consulting. *Woodland and forest sector in England*. A mapping study carried out on behalf of the England Forest Industries Partnership. England, 2006.

Lantra. *Sector skills agreement, stages 1-3*. England: Lantra, 2006.

Mulder, M. *Short position paper*. Prepared for the workshop organised by Cedefop, Lisbon, 2006.

Savisalo, T. *Innovation in the woodworking industry; skills needs of workers in the sector*. Prepared for the workshop organised by Cedefop, Lisbon, 2006.

Scottish Executive. *The Scottish forestry strategy*. Edinburgh, 2006.

12. Summary and conclusions

Martin Mulder, Sanne Schaafsma and Renate Wesselink, Wageningen University, the Netherlands

12.1. Summary

This report reviewed the future skill needs in agri-food and forestry wood chains. In this report, the European policy perspective regarding the rural development policy 2007-2013 was presented by Ester Hortet Tarroja of the European Commission, DG Agriculture and Rural Development. She outlined that there are three objectives in the rural development programmes, which are:

- (a) to improve the competitiveness of the agriculture and forestry sector,
- (b) to improve the countryside and the environment by supporting land management,
- (c) to diversify economic activities and to improve the quality of life in rural areas.

She mentioned the human resource actions which are planned such as training and information for broadening the scope of adult workers in the agriculture, food and forestry sectors and activities to cover competitiveness and sustainability of the sectors, which is needed given the Lisbon strategy of the EU.

Jeremy Wall⁶², also of the European Commission, from DG Enterprise and Industry, presented an analysis of the supply and demand of education and training in relations to the EU wood sector and key related occupations. He pointed at the fact that, unlike agriculture, the forest-based sector does not fall under EU sectoral policy but that it has its EU forest action plan, which is based on the principle of subsidiarity. The objectives of the forest action plan include

- (a) to improve long-term competitiveness of the forest sector,
- (b) to contribute to the quality of life by preserving and improving the social and cultural dimensions of forests and forestry.

The intention is that the forest action plan will provide a framework for coordinated forest-related actions at Community and Member State levels. There are key actions on education and training, aiming at company owners and workers.

The employees' organisations were represented by Arndt Spahn, agricultural secretary of EFFAT, the European Federation of Food, Agriculture and Tourism trade unions, which is the representative body of 2.6 million European workers in 128 national trade unions in thirty-

⁶² Contribution of Mr Wall has not been made available by the time when this compilation was published.

seven European countries. He stated that to identify skill needs in the sectors, one would have to stick to the existing sectors, like agriculture, forestry, horticulture, aquaculture, services, consulting and research. Furthermore he distinguished various roles of workers in organisations, like the head of enterprise, foreman, educated worker, low-skilled worker and unskilled worker.

This point was well taken, and repeated later, for instance by Peter Martin, who is the executive director of Lantra, the SSC for the environmental and land-based sector in the United Kingdom. He also stressed the importance of emerging business models which have a significant effect on skill needs. Examples of new business models he gave, are value and supply chain integration (resulting in, for instance, company/business re-engineering or collective activity), commissioning and contracting, diversification (with new business opportunities), the professionalisation of arboriculture and community enterprises. For the semi-skilled staff, he sees basic skills, health and safety, technical skills, self-management, ICT, legislative compliance, manufacturer training and team working as important skills for semi-skilled staff, whereas key skills, new silviculture skills, materials technology contracting and compliance, supervisory management, customer care, habitat management and customer/stakeholder relations important skills are for the skilled staff. For owners/managers these skills are business and management, public relations, higher level negotiating, personnel management, budget and financial control, sales and marketing and commissioning and contracting.

These differences were confirmed in various other contributions. One specific example was given of the current creation of a new enterprise in the north-western part of the Netherlands of over 100 hectares. Needless to say that the leadership of this enterprise needs competence in more than technology; financial skills for instance in the field of asset management and human resource skills are essential in these context.

Tine Andersen of the Danish Technological Institute presented a sector study (www.emcc.eurofound.eu.int/content/source/eu06026a.html), which she did for EMCC European Monitoring Centre for Change, based in Dublin, Ireland. This study resulted in three future scenarios of the agri-food sector, which were named after pop-songs: 'rock your body', 'stayin' alive', and 'we are the world'. These metaphors can be summarised with the following labels:

- (a) sunrise scenario (unlimited growth of subsectors resulting in crises),
- (b) sunset scenario (regarding decreasing or even vanishing subsectors, of which the work may move to countries like China),
- (c) the scenario of controlled growth for sustainable development.

The first scenario is characterised by weak job growth and little or no room for people with only basic skills. Food safety and hygiene standards are fully observed, and specialised process technology skills are needed, as well as skills in quality management. The second scenario is characterised by job loss. Large companies have the ability to handle processes

involving technologies like ICT, biotechnology, chemistry and nanotechnology. There is room for employment of people with basic skills. The third scenario is characterised by job growth. In sustainable primary sectors and the production industry good craftsmen are needed with competence in the field of raw materials which are in demand. Companies prefer employees with a diploma of which is relevant for the food industry complemented with additional courses on sustainability issues. In the discount sub-sector this scenario foresees a small and even decreasing demand for low-skilled manual labour.

Various other contributions are included in this report, from the perspective of a sectoral employers organisation, specific companies, research and education. So the issues are presented from a multiple stakeholder perspective, the stakeholders in this case being the primary sector, industry and services, sectoral dialogue partners, public administration organisations at various levels, researchers, educational institutions and experts in support organisations. As expected beforehand, the sectors included in this workshop were heterogeneous, which is visible in the various NACE categories which are used. Specialised sectors obviously ask for specific skills. There are however various common innovations and trends and comparable challenges, which lead to the need of generic or transversal skills. Examples of general innovations and trends are economic restructuring, backward chain integration, networks or even netchains, scale enlargement, entrepreneurship, cost reduction, quality, standardisation, bionanotechnology, genomics, ICT, tracking and tracing, precision automation, sustainability, the bio-based economy, organic production, lifestyle related to health, 'glocalisation', multifunctional land use, waste management, service orientation, multidisciplinary, diversification (including the emergence of new business models), upskilling, and knowledge circulation and cooperative knowledge production.

Diversity also holds for the wide set of occupations in agri-food and forestry wood chains regarding job level, skill level, field of study, and field of work. However, there are many generic skill needs, especially on the soft skills side, such as communication and working with colleagues from other fields or cultures.

An important pitfall in the sectoral approach of skill needs analysis is that it may lead to a tunnel view, like with pig farmers who had to close down their business earlier said: 'But we will go on!' If they would have accepted the urgency of their problems earlier, they could have changed their business gradually into a new multifunctional way of farming, or start-up in a new sector of the economy like agri-tourism, agri-services, or even outside agriculture (e.g. in Poland there is a lot of attention for the restructuring of the agricultural sector and support for creating new business, or as independent workers). Given the fact that the agri-food system in Europe has to transform and restructure, it is very important to think about cross-sectoral skills needed for agility and cross-sectoral employability of workers. The green sector, in other words, should in this respect think out-of-the-box.

12.2. Conclusions and next steps

The contributions to this report reveal numerous differences between sectors, jobs and skills needed for these jobs. There are the primary sectors of agriculture, forestry, horticulture and aquaculture but also the sector of the industry which is quite different from the primary sector. There are also various services around these sectors which are growing, like consultancy companies, extension services and research (academic/ practical).

There is not only heterogeneity within the sectors, but also between the levels of workers. Heads of enterprises are interested in entrepreneurship and business development. Managers and supervisors are managing larger operations relating to the scale enlargement. Then there are the permanent workers and seasonal workers for whom technical and communication skills are important.

The question is how does future work influence the skills of workers? There is a trend on upgrading skills, even though low skilled workers are still needed.

There is also heterogeneity in educational levels, low skilled, medium skilled and high skilled levels and we see the double qualification structure in the educational system appearing in different countries.

If we want to define the skills needed in future, we need to concentrate on higher levels as on low skilled levels there is not much new to develop and learn.

But as the future cannot be predicted, defining future skills is not an easy task.

There are different scenarios possible:

- (a) the sunrise sectors with economical unlimited growth which leads to crisis and disasters;
- (b) the sunset sectors in which there is no future;
- (c) the sustainability/ development scenario with controlled growth regulated by all stakeholders together – the government, the public and the social partners.

The third scenario would be socially and collectively the best scenario pushed by public responsibility. If we want to define new skills we should deliberately opt for this scenario. Sunrise and sunset sectors will always be there, but when defining new skills we should look at the third scenario as this is for the public good, and education too.

There are many trends and developments such as sustainability, safety, globalisation and internationalisation, whereby globalisation is more about the global markets and trade, while internationalisation is more about intercultural work. Also chains become increasingly more important and scale enlargement is a trend in different sectors.

From the workshop discussions several trends can be distinguished:

- (a) upgrading skills, a higher level of skills needed;

- (b) a shift from knowledge towards performance;
- (c) even though hard skills should be present as a basis, more attention is paid to the development of soft skills.

Given the diversity and segmentation, the different growing sectors, sub-sectors and niche sectors reflect developments on a variety of common themes, such as skills related to sustainability, chains and networks. A growing number of companies work together in production processes, which has influence on skill needs.

Expectations of the public (policy, society and consumers) regarding agri-food and forestry and woodworking from the perspective of the European or national administrations, the sector organisations and the social dialogue organisations include:

- (a) service orientation: producing is more and more fulfilling a demand instead of only producing and selling;
- (b) scale enlargement;
- (c) standardisation and regulation;
- (d) waste management;
- (e) cross-sectoral broadening: companies and entrepreneurs need to communicate with various stakeholders of different sectors;
- (f) diversification and the requirements of business models.

For all themes, different skill needs can be formulated.

For the agricultural sector the following skills are experienced as being important within the context of current changes in the sector:

- (a) innovative skills on interdisciplinary level;
- (b) need to go beyond the borders of the own company and own skills;
- (c) entrepreneurial skills;
- (d) consultancy skills;
- (e) skills to develop and maintain one's employability;
- (f) skills related to sustainable development;
- (g) waste management skills;
- (h) people management (interpersonal skills).

A combination is needed of social (gamma) and hard (beta) skills. The question is if these can or should be integrated in one person.

The more technology, the more need of hard skills on a higher level. There should be paid attention to the development of soft skills, but not at the cost of attention to hard skills.

Within agro-forestry a methodology could be developed to develop skills. A goal is to combine competitiveness with sustainability. In order to do this a package could be developed which consists of an institutional framework including entrepreneurs, stakeholders and a mutual facilitator, leaders and financing bodies, mechanisms and means. This then could be offered to the sector. Next, small, medium or even micro enterprises should develop a set of core traditional processes/services and a set of innovative ones. Skills which could be in focus are:

- (a) adaptability,
- (b) openness,
- (c) receptiveness,
- (d) communication,
- (e) entrepreneurship (internal i.e. being responsible for safety and people, and external i.e. technical skills and management),
- (f) networking,
- (g) know how to learn to learn.

Also, attention should be paid to the coaching skills of the teachers, facilitators and coaches.

To be able to develop a construction of this kind, there need to be knowledge about technology, know-how, distribution and efficiency.

Regarding entrepreneurship, it must be mentioned that entrepreneurial skills are not only important for managers and directors, but also for the employees and the levels below the academic level.

Summarizing current developments, there are three important aspects to mention:

- (a) SME's grow into bigger companies towards multinationals. This puts emphasis on skills like teamwork, 'intrapreneurship', collaborative skills, communication and management. Also, an open attitude is very important for larger companies as they are so standardised that there is little room for innovation. A challenge for such companies is to be open to other innovative companies;
- (b) enlargement of the companies leads to outsourcing to be able to keep its flexibility, to have the opportunity to shift from one supplier to another. This means splitting up integrated chains and requires relationship skills, attention to efficiency and a quality product and organizing skills (e.g. being precise with quality standards);
- (c) for small companies there is the possibility of the niche market, where a direct contact with customers and communication skills are important and where it is all about 'selling emotions'. As the products are made by the companies themselves, hard skills in the sense of basic craft skills remain a prerequisite.

Even though the sectors in this report are very heterogeneous, facing many challenges, there are also similarities. Especially as far as softer and broader skills are concerned, the differences between the sectors are small, while the harder skills can be more sector specific.

This brings some challenges for the field of education and training. The most important task of education and training is to provide companies with competent workers and entrepreneurs. Second, from the point of view of the company it is important to have the right skills for the right jobs and to make it possible for people to use their skills and to contribute to innovation and be employable. The third challenge would be to prepare people to switch between jobs and sectors as people cannot expect anymore to work in the same sector or occupation the whole life. The education and training system should provide the development of skills which facilitate this move.

Especially the smaller and more traditional agricultural enterprises will not be able to cope with the current structure changes which will result in dismissing employees. It is important to identify the skills needed for people to enable them to find new jobs in other sectors.

The agricultural sector is very heterogeneous and a vast majority of companies are small. This means that the problem of training should not only be solved by policy makers. The question is how policy could prevent the deployment of workers which are only there to produce and have no access to continuing training and have no influence on human resource development practices in the company. Here we see the danger of a certain polarisation inside the sector between low-skilled people on the one hand and high-skilled people in modern and growing companies on the other hand.

These aspects make it important to continue this work. Not only to identify skill needs and how the future environment would look like, but also the roles and the appropriate methods which must be applied not only by policy makers but by all stakeholders in the sector. To continue this work it is necessary to exchange more information in a structural way and possibly to form a specific network. For policy makers it could be useful to organise study visits in companies to give an insight in current developments and needs.