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Prospective Analysis of Agricultural Systems

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Institute for Prospective Technological Studies

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Technical Report Series

Foreword

Consumers are becoming increasingly quality-conscious and concerned about the environmental impact of intensive farming techniques. Farmers have responded by developing systems that depart from mainstream practices, in search for a model of agriculture that is both environmentally and economically sustainable.

The recent Common Agricultural Policy reform of 2003, with the stated aim of establishing an agricultural model in which food quality and safety, environmental friendliness and animal welfare are top priorities, is likely to have an impact on the development of such alternative agricultural systems.

To improve knowledge of the situation and outlook for alternative agricultural systems in Europe, the Directorate General Agriculture requested JRC-IPTS to carry out a research programme on the subject. The first activity launched by JRC-IPTS is reflected in the present report, which aims to provide:

- a working definition of the "alternative agricultural systems" present in the EU.
- a description of their essential elements by using case studies in Member States, and
- a first outlook at the drivers (technological, socio-economical and political) essential for the future evolution of these systems.

The technical specifications of the study were prepared by staff assigned to action AGROFOOD in the Sustainability on Agriculture, Food and Health Unit of JRC-IPTS. The study was awarded to the *Empresa Pública Desarrollo Agrario y Pesquero*, Spain, which has compiled the present final report, edited in collaboration with the SAFH Unit of JRC-IPTS.

ANNEXES to the report are to be downloaded at:

http://www.jrc.es/home/publications/publication.cfm?pub=1202

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Executive summary

Introduction

This report describes the current status of alternative or emerging agricultural systems in the European Union from a common perspective and predicts the scenario for their future development. The study draws upon an analysis of the factors that influence farmers' decisions to adopt specific agricultural systems, as well as on the identification and deeper examination of the key drivers that determine the future of agricultural systems in the EU. Although the study concerned seven Member States (Austria, France, Germany, Italy, Spain, Sweden and the United Kingdom), it included a more detailed analysis of the present scenario in three Community regions (Lower Normandy, Bavaria and Andalusia).

The term emerging (or alternative) agricultural systems is used here to refer to a somewhat non-uniform group of agricultural systems that have arisen from the dynamic adaptation of agriculture to contemporary social, economic, technological and environmental demands.

By contrast, the term mainstream agriculture is used to designate the most general and widespread agricultural system at a given place and time (i.e. the one that can be used as a reference system for comparison).

The principal alternative agrosystems currently coexisting with mainstream agriculture are organic farming, integrated production, conservation agriculture and agriculture under guaranteed quality. Other, less widely used agrosystems in the EU —but significant enough to warrant discussion of their current status here— include precision agriculture, short-chain agriculture, urban agriculture, *agriculture paysanne* and permaculture.

Major alternative agricultural systems in the EU

The European Commission defines **ORGANIC FARMING** as a production method aimed at environmental protection and animal welfare. The Commission's definition distinguishes it from other environmentally sustainable agrosystems by adding that it avoids or substantially reduces the use of synthetic chemicals such as fertilisers, pesticides, additives and pharmaceuticals.

The European Union is the second world region in terms of certified organic land area after Australia. Over one half of this area is used for pasture and forage; this reveals the significance of organic cattle breeding, which must inevitably be land-bound. Italy is the Member State where organic farming is the most prominent in terms of both land area and the number of holdings.

The European Community has comprehensively regulated the production, transformation and marketing of organic products via standard protocols, accreditation procedures and labelling schemes. Consistent with the subsidiarity principle, accreditation functions are decentralised. This makes them the responsibility of national or regional governments, whereas certification and inspection activities are carried out by properly accredited public and/or private bodies. Agri-environmental measures —rural development actions, which encompass direct aid for organic farming— are also decentralised. Such measures are widespread and co funded by the European Union and its Member States.

The presence of a consolidated market that is recognised by consumers is probably the most outstanding achievement of this agrosystem. Although there are no official statistics, the organic market has grown substantially in recent years, so much so that Europe is currently the second largest market for organic produce after the USA.

INTEGRATED PRODUCTION is a holistic land usage model intended to minimise the use of external inputs so as to lessen environmental impacts while preserving or even increasing the agricultural holdings' gross margins.

No Community-wide regulation exists on integrated production. This has led to national and regional authorities developing their own production and marketing standards, which they enforce with the aid of duly accredited qualified certifying bodies.

Despite the absence of specific rules, Community regulations include the possibility of awarding a premium per hectare to farmers using this agricultural system via agri-environmental aid schemes; subsidies, however, are not as widespread as in organic farming —at least as regards producers or regions.

The adoption of integrated production by farmers can bring advantages such as savings on external inputs; however, it involves additional investments in time and training resulting from the need to control and manage the information produced by the holdings themselves.

Except for a few specific regions and labels, the market for integrated production is still in its early stages. Few consumers know what this agricultural system actually is, which has caused some confusion. However, the development of integrated production is being strongly influenced by a number of large retail chains, which are increasingly demanding products that meet requirements very similar to those typically met by this system.

At present, **CONSERVATION AGRICULTURE** encompasses a series of production practices aimed at preserving the properties of soil as a resource. Rather than a self-contained agricultural system, conservation agriculture is therefore a body of farming practices focusing on the preservation of the physical and chemical characteristics of agricultural soils and, ultimately, their capacity to support agricultural activity.

The adoption of conservation agriculture has been found to result in savings in energy and machinery use; this, together with an efficient conservation of the topmost soil layer —which is also the most fertile—, has encouraged a large number of farmers to adopt it. Also, as with organic farming and integrated production, some conservation practices such as direct sowing or minimal tillage are rewarded with subsidies in the form of a premium per hectare within the framework of some agri-environmental projects. Unlike organic products, however, the products of conservation agriculture enjoy no market distinction.

AGRICULTURE BASED ON QUALITY-ENDORSING LABELLINg seeks to guarantee a series of characteristics giving products added market value due to their specific origin, production methods and organoleptic characteristics.

It is in the Mediterranean countries that quality-assured labels and their regulation have traditionally grown to the greatest extent, particularly as regards products bound to a specific origin or traditional production method. By contrast, the Nordic countries, where this agricultural system has evolved much more slowly, have focussed on nutritional properties and food safety. Based on this difference, existing quality-endorsing specifications figures can be classified into two broad categories, namely those that are bound to a specific geographic origin or a traditional production method and those that are not. The former include various national and regional figures in addition to the Community labels for Protected Designations of Origin (PDO), Protected Geographic Indications (PGI) and Quality Wines Produced in Specific Regions (QWPSR). Labels based on traditional production methods (e.g. Guaranteed Traditional Specialities or GTS) could be included in this first group.

Particularly prominent among non origin-bound labels are those certified under standards such as ISO 9000 or EUREP–GAP.

The major European quality labels (PDO, PGI, GTS and QWPSR) are regulated by Community rules. France and Italy are the top two Member States in terms of the number of designations awarded. Cheese is the product type for which there is the greatest number of designations.

The benefits offered by these labels include the preservation of local traditions, social and cultural values, and indigenous animal breeds and plant varieties. This agricultural system also allows consumers to

fulfil their demands for specific characteristics of the products they buy. Obviously, there are also substantial economic benefits for producers as the system has a marketing focus and allows operators to increase the added value of the products.

Other alternative agricultural systems in the EU

These include a series of emerging agrosystems that either do not include one or more of the links in the agri-food chain (from production to market) or have a geographical or marketing scope that is too limited to warrant their discussion alongside those mentioned above.

PRECISION AGRICULTURE is defined as the use of information technologies to match agricultural input usage to the actual or potential crop requirements. Rather than dealing with plots as a whole, the inputs are tailored to each specific zone in a holding. Therefore, this agricultural system focuses on variability —a common trait of most plots— in order to raise gross margins and reduce the environmental impact of farming.

Since its inception in the 1990s, this agricultural system has used leading-edge technologies such as Geographic Information Systems (GIS), yield monitors, Global Positioning Systems (GPS) for directed soil sampling and variable-rate input systems.

While technically feasible, the adoption of precision agriculture in individual holdings can be hindered by limited access to capital, the need to manage sophisticated technology and the absence of local input suppliers. Although plot size can dictate whether precision agriculture techniques are feasible in specific holdings, any holding could theoretically adopt some techniques in the long term.

For the purpose of this study, **SHORT-CHAIN AGRICULTURE** is defined as a body of marketing practices intended to reduce the number of intermediaries in the food chain. It does not, therefore, comprise a self-contained agricultural system, but rather an approach that can be associated with any of the systems described above (e.g. organic farming or agriculture under guaranteed quality).

URBAN AGRICULTURE is agriculture practiced in towns —or their surrounding area— by integrating its economic and environmental aspects into the local urban system. Currently under the umbrella of the FAO (Food and Agriculture Organisation of the United Nations), this form of agriculture, which is as old as cities, is promoted for different reasons in developing and developed countries. Thus, in developing countries it constitutes a means of securing income and supplying many families with food; in developed countries, it revolves around leisure, self-supply and —occasionally— the economy.

The adoption of this agricultural system has positive environmental and food safety implications. The former include the recycling of waste and the latter consumers' increased trust. However, poor management of the system can result in adverse effects such as food contamination or the potential spread of disease.

Rather than an agricultural system proper, ***AGRICULTURE PAYSANNE*** is a body of ideological approaches to the general economic system aimed at balancing its social, economic and environmental dimensions —with special emphasis on the social role of agriculture and on family farming.

Behind the word **PERMACULTURE** (a contraction of "permanent agriculture" or "permanent culture") is an alternative approach to the development of stable agricultural systems that emerged in the mid-1990s. Permaculture relies on environmental principles to design integrated food production systems ultimately leading to community development through the use of appropriate technology.

At present, rather than a set of specific practices, permaculture is an ideological approach that encompasses specific principles and recommendations on matters such as community planning and development, the use of appropriate technologies, and the adoption of concepts and philosophical principles revolving around people and the Earth.

Decision factors currently influencing alternative agricultural systems

Based on the information gathered from the case studies, we examined the **DECISION FACTORS** that influence farmers' choice of a given alternative system. A decision factor here is taken to be an element that exerts a direct influence on farmers' decisions to adopt or retain a given agricultural system. Farmers are aware of these factors and make conscious decisions as to whether to exploit their advantages.

Prior to our analysis, we compiled, checked and refined a long list of tentative drivers from which a final list of 30 was established. These 30 drivers were classified into six different categories or dimensions, which were: economic, structural, socio–cultural, environmental and health-related, scientific–technical and politico–institutional.

This comparative study allowed us to draw some general, non-exhaustive conclusions such as the following: a scenario of clear regulations, the presence of public aid and market distinction in the form of premiums have a decisive influence on producers' decisions to adopt alternative agrosystems. Also, the choice is strengthened by farmers' risk-taking capacity, social recognition or the presence of support associations. On the other hand, some factors that have traditionally dictated adoption decisions (e.g. ideology and holding size) are gradually losing weight in favour of the previous ones. However, environmental consciousness is not yet among the principal drivers leading farmers to choose a given production system.

Evolution and medium-term prospects

A final, structured reflection upon the development of the principal agricultural systems examined over the next 10 years is made. The discussion relies mainly on the authors' own opinions, supported by the contributions of two panels of collaborating experts and the knowledge gathered during earlier stages of this work.

To this end, sixteen **KEY DRIVERS** were identified, the evolution of which is bound to dictate the future of the agricultural systems studied. Also, the significance of each key driver was assessed and its potential evolution towards the proposed time horizon (2013) predicted. The most salient conclusions in this respect are summarised in Table A.

The analysis of these key drivers and their potential development over time enables some predictions to be made about the future of the major alternative agricultural systems.

Thus, **ORGANIC FARMING** is likely to consolidate and continue to grow in terms of land area and market presence. However, according to most of the experts consulted, its growth may be slower or even come to a standstill before the proposed time horizon is reached. Also, organic farming will lose most of its

Table A. Likely evolution of the Key Drivers influencing the development of Alternative Agricultural systems

DRIVER	SIGNIFICANCE	LIKELY EVOLUTION
SPECIFIC AID FOR ALTERNATIVE AGRICULTURAL SYSTEMS	HIGH	• Increasing dedicated support on specific practices or alternative agricultural systems as a whole
DISTRIBUTION AND MARKETING STRUCTURES	HIGH	• An increasing proportion of alternative products will be distributed by large supermarkets • The attitude of the modern distribution structures towards alternative products and the production protocols demanded will be influential here
PRICE OF AGRICULTURAL PRODUCTS	HIGH	• Highly uncertain, but a price drop seems likely • The price gap between the produce of mainstream agriculture and that of alternative systems will shrink

DRIVER	SIGNIFICANCE	LIKELY EVOLUTION
CONSUMERS' SENSITIVITY TO ENVIRONMENT- AND HEALTH-RELATED ISSUES	HIGH	• Consumers' awareness will persist or even increase • Waste-free or environment-friendly products, and functional foods, will gain market share.
FARMER PROFILE	MEDIUM–HIGH	• Improved training and technical qualification, and increased professionalisation and environmental awareness • Ideological aspects will lose weight in shaping farmers' attitudes
DEVELOPMENT AND TRANSFER OF NEW TECHNOLOGIES	MEDIUM–HIGH	• The application and popularisation of existing technologies (information and communication, biotechnology) in the agricultural domain will have a strong impact • Improved food safety and traceability by use of analytical methods, portable testing equipment, intelligent labelling methods, *etc.*
MACROECONOMIC SITUATION	MEDIUM	• A highly uncertain future, albeit with a slight trend towards economic recovery and stability • Spread of deregulation in international trade (agri-foods included)
GENERAL SCHEME OF CAP AID	MEDIUM	• Decoupling will result in more market-oriented farming • Subsidies will refocus on the improvement of farming structures and rural development • Farming subsidies in general will be gradually reduced
HOLDING STRUCTURE	MEDIUM	• General improvement in production facilities and infrastructures, and an increased average holding size • The larger holdings will become more competitive, whereas the smaller or less productive ones will stagnate
COMMUNITY HARMONISATION OF REGULATIONS ON ALTERNATIVE AGRICULTURAL SYSTEMS	MEDIUM	• The scenario for the many labelling schemes and standards that will exist shortly will require clarification • Uncertainty as regards harmonisation, which may result from natural selection by the market, the Community's initiative or the convergence of existing standards
CROSS-COMPLIANCE	MEDIUM	• Strengthening of requirements and convergence on some alternative agricultural systems • Improvement of cross-compliance control methods, both in the field and on the market (traceability)
ACCEPTANCE OF GENETICALLY MODIFIED CROPS BY THE EU	MEDIUM	• GMOs will be gradually accepted by the EU —under precautionary measures, however • Some people will be willing to pay a premium to ensure the absence of GMOs from their diets
FARM TECHNICAL ADVICE ON ALTERNATIVE AGRICULTURAL SYSTEMS	MEDIUM	• Input suppliers will launch new specific products for the alternative systems and provide dedicated advice • Advice and training will be strengthened by service providers, producer associations and public administrations, and also via the new information technologies
AGRI-FOOD DEMAND IN THE ENLARGED EU	MEDIUM–LOW	• Increased demand for foods in general and alternative products in particular, with little influence from the new Member States
AGRI-FOOD SUPPLY IN THE ENLARGED EU	MEDIUM–LOW	• The deregulation of international trade will raise EU supply in general and that of alternative products in particular • The expansion will have no significant impact on the evolution of the supply of alternative products, but will increase adoption rates
DIVERSIFICATION OF RURAL ECONOMY	LOW	• Increased dedication of rural areas to activities typical of the service sector • Increased relevance of part-time agriculture and integration of leisure and tourist activities into alternative systems

Source: own elaboration

"ideological" component and incorporate new, environmentally safe elements among its compulsory practices. In addition, it will be confronted with the need to persuade consumers of its environmental and health-related virtues. Specific public support for this agricultural system and the reorientation of the general scheme of CAP subsidies will continue to be significant here, particularly with a view to facilitating the adoption of this agricultural system by farmers in underprivileged areas. The attitude of retail businesses towards organic products may also be decisive for the future development of this system.

INTEGRATED PRODUCTION is expected to grow rapidly. This agricultural system may even become the standard form of agriculture in the EU (whether under this name or not) and extend its scope to the majority of agricultural holdings in the EU. However, this would require some measure of publicly or privately promoted structural reforms. The current scenario, with a lack of regulatory uniformity and a host of labels and logos associated with various protocols and standards, and a general lack of awareness among the general public of integrated production and its benefits, needs to change if the system is to develop in the future. Its current market position, midway between mainstream agriculture and organic farming, is also something of an obstacle. On the other hand, the high permeability of integrated production to new technologies (as compared with other, more restrictive, agricultural systems) is one of its greatest assets.

CONSERVATION AGRICULTURE will develop considerably over the next few years. The most erosion-prone regions —mostly on the Mediterranean arch— will be keenest adopters. This will continue to be an incomplete system restricted to the agronomic field and will enjoy no market distinction for its produce. This, however, will not hinder its development as many of its practices are bound to be incorporated into the standards of others, both alternative and conventional.

Consumers' increasing demands will continue to drive the expansion of **AGRICULTURE UNDER GUARANTEED QUALITY.** However, there are strong indications that the current proliferation of labelling schemes and quality standards will be unsustainable in the medium to long term. The increasing number of origin-bound quality certificates may lose their meaning unless they are accompanied by objective quality control and assurance measures capable of earning consumers' trust. On the other hand, quality certificates not bound to geographic origin (e.g. ISO, UNE, EUREP–GAP) will be gradually approved and equalised, particularly under pressure from the large distribution and marketing chains. As a result, some form of certification might become the compulsory key to access such marketing channels. Certificates will gradually incorporate stricter requirements in terms of food production (e.g. environmental friendliness, animal welfare, work safety, health safety). This will bring this agricultural system closer to the principles of other systems such as organic farming and integrated production. Technical advances in authentication and traceability procedures might render meaningless some quality labels that rely solely on an appealing commercial image.

In summary, differences from other systems in factors such as price or the presence of subsidies and appropriate distribution channels will help these systems consolidate in the future in much the same way as they are facilitating their development at present.

However, it will be in advances providing a more objective knowledge and authentication of their effects on the environment and human health that they will find the final support of society in general and the agents of the agri-food chain (operators, consumers and public administrations) in particular.

Thus, aspects such as training, information technologies, and technological applications assuring traceability, the detection of residues or the measurement of environmentally significant quantities will revolutionise agriculture as we understand it today.

Those emerging agricultural systems flexible and permeable enough to incorporate technologies capable of providing these services will eventually lead the others.

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* ANNEXES to the report are to be downloaded at:
http://www.jrc.es/home/publications/publication.cfm?pub=1202

1. Structure of the study

1.1. Background

Since its creation, the Common Agricultural Policy (CAP) has been adapted to meet the challenges it has faced over the years. In the context of its successive reforms, Agenda 2000 is a response to the need to achieve a multifunctional, sustainable, competitive agriculture throughout Europe. Also, the recently passed reform of the CAP (June 2003) is intended to establish an agricultural model where food quality and safety, in addition to environment friendliness and animal welfare, are top priorities.

In recent years, agriculture has responded to these changes by adapting itself to the new concerns and demands. One outcome of the process has been the emergence or development of agricultural systems that differ in some way or other from those used in traditional agriculture.

In this framework, the Institute for Prospective Technological Studies (IPTS) commissioned the present study, entitled "Prospective Analysis of Agricultural Systems", from the *Empresa Pública Desarrollo Agrario y Pesquero* via public bidding with the aim of further expanding its knowledge about European agricultural production systems. The commissioning agreement was signed on December 31, 2002. The IPTS is one of the seven scientific institutes making up the Joint Research Centre (JRC) of the European Commission. It was created in 1994 to promote and enable a better understanding of the links between technology, economy and society. Its mission is to provide European policy makers with techno–economic analyses (policy support) and its main objectives are to monitor and analyse science and technology developments, and their impact on the different social sectors.

The study was aimed at delineating and clarifying the current status of "alternative" agricultural production systems in Europe from a common perspective. It also aimed to shed some light on those elements that may be the keys to future developments in agricultural systems in the EU by discussing its evolution.

Towards the achievement of these aims, this report examines the rich and varied —but also heterogeneous and highly fragmented— qualitative and quantitative information available, using, first of all, a descriptive approach. In the second phase of the study, the existing information, once sorted and classified, will be supplemented by contributors in order to illustrate a general view of the future of these systems.

Although the conclusions can be extended to the whole EU, the study focused on the seven Member States for which the Commission has the largest amount of information, namely: Austria, France, Germany, Italy, Spain, Sweden and the United Kingdom.

1.2. Introduction

Throughout the history of civilisation, agriculture has played a crucial role in human and social development. Although the weight of Final Agricultural Production (FAP) in Gross Domestic Product (GDP) continues to fall, agriculture remains highly important, not least due to its being an activity that is closely bound to its local environment. This results in a close relationship with the environment, its having a central role in land organisation and its being a reference of social and cultural identity for rural populations. One other salient feature of agriculture is that it represents the principal source of food. These attributes make agriculture a strategic sector subject to increasing social demands. The new functions European consumers and taxpayers have come to expect from agriculture, and hence the areas the public authorities should promote, include the following:

- Assuring food quality, safety and security.
- Ensuring sustainability and environmental friendliness.

- Promoting harmonious social and economic development in the rural environment.
- Sustaining the rural economic and social fabric so as to avoid rural depopulation.
- Preventing and reducing occupational hazards.
- Promoting health and animal welfare.

The Community's institutions are aware of the prominent role of agriculture and, from the outset, the Common Agricultural Policy (CAP) has undoubtedly been the most important policy in the European Union. Over the years, CAP has evolved in parallel with the needs of society itself and has been subject to successive adaptations and reforms. Within the framework of these reforms, the Agenda 2000, adopted at the Berlin Summit of 1999, is a major endeavour aimed in this direction. Also, the recently passed CAP reform (June 2003) is intended to facilitate the meeting of the above-mentioned needs by making the award of subsidies conditional on compliance with existing environmental, food safety and animal welfare legislation.

On the other hand, under the auspices of the World Trade Organisation (WTO), the rules of international trade are being increasingly aimed at market deregulation. Simultaneously, the Community market is opening itself to the candidate Member States and the countries on the southern shore of the Mediterranean.

For all these reasons, agriculture is facing increasing competitive pressures, which it has to meet by raising quality and/or reducing costs. At the same time it needs to adapt to the social demands for environmental protection and food safety. Social and cultural changes, in conjunction with the effects of innovation and technological development, have given rise to changes in the forms of production and hence in agricultural systems themselves. In the past few decades this dynamic process has resulted in the emergence of so-called "alternative agrosystems". The new agrosystems differ markedly from one another in the techniques they use, their philosophical principles and their aims. Thus, organic farming — initially closely bound up with the environmental movement— aims primarily to achieve environmental friendliness, whereas the ultimate aim of precision agriculture is greater efficiency (by managing information throughout the production process).

Other agrosystems, such as those under guaranteed quality, are more closely related to marketing and product distinction than to specific production techniques. In the case of protected designations of origin, however, market distinction is achieved by the specification of geographical provenance and compliance with specific production or processing rules.

On the other hand, short-chain systems aim at maximising profits for the farmer by using strategies based on reducing the number of links in the marketing chain. In this way, they also increase consumers' trust in their produce.

The aims and systems described above are not unequivocally related, however. Thus, the adoption of organic farming is also motivated by food safety factors and the ability to distinguish produce on the market. Also, other systems have a combination of aims as their raison d'être; thus, integrated production and reduced input systems aim to reconcile economic and environmental interests in a reasonable way.

Strictly speaking, many of these systems are not new forms of agriculture. The production methods used in agrosystems in each region need to be adapted to both the physical environment and the local cultural, social and economic reality. One example is that of the extensive agro–silvo–grazing systems of Mediterranean Europe, where the environmental conditions and cultural features have led to the implementation of a body of agricultural techniques similar to those used in some of the systems currently described as "emergent".

In this situation, public administrations have strived to respond through legislation and by providing support for initiatives aimed at meeting social needs. Efforts in this direction have differed

markedly between EU regions and emerging systems. Also, the expansion of the new systems has lacked uniformity in space and time, and has involved the incorporation of previously established practices typical of local farming systems. Therefore, a given agricultural system can have many variants or even different names in different countries.

Also, while some agrosystems are very well-defined in terms of their philosophy and of the regulations governing their production, marketing and control structures, others lack even a definition that is acknowledged and accepted by the stakeholders, and are merely a collection of techniques adapted to each specific situation.

All these factors add to the complexity and difficulty of describing agricultural production systems from a common perspective. However, it seems reasonable within the framework of a common European agricultural policy to have public initiatives considering the new conditions. This will allow the promotion and orderly channelling of the positive elements of these emerging systems by having the sector aim at the general goals of the CAP which coincide with those of the new agricultural initiatives.

1.3. Objectives

The **general objective** of this study was to analyse the present and future development of emerging agricultural production systems in the European Union. Its **specific objectives** were as follows:

- To define, describe and clarify, from a common perspective, the present situation of "alternative" or "emerging" agricultural production systems by
  - identifying and defining the alternative systems currently used in EU agriculture;
  - classifying the alternative systems used in seven Member States[1] in accordance with the designations previously established in this study; and
  - describing the essential elements of alternative systems as currently practised in the EU.
- To anticipate the potential future evolution of emerging agrosystems in the EU by
  - pinpointing the factors potentially dictating such evolution; and
  - considering potential contexts for the evolution and their potential implications for agricultural policy.

1.4. Structure and methodology

This report is organised into four chapters. Chapter 1, which you are reading, describes the background of the study, provides an introduction, defines its objectives and, in this section, describes the layout of this report and the methodology used to produce it.

Chapter 2 examines the current situation of the agricultural systems in use in the European Union. It identifies, defines and describes the major emerging agrosystems in the EU, with special emphasis on those in the seven target Member States. Also, it goes deeper into the study of alternative agricultural systems in three European regions[2]. This chapter is divided into three distinct parts. The first includes a section that defines some essential concepts ("agrosystem" included) and another that identifies and defines the principal emerging agrosystems in the EU. The second part of the chapter characterises each of the previously identified systems and the third presents the results of case studies in the three chosen regions.

Chapter 3 analyses the factors that influence the development of the different agrosystems in

1 As already mentioned, the seven Member States examined were Austria, France, Germany, Italy, Spain, Sweden and United Kingdom.

2 The three regions are Bavaria, Lower Normandy and Andalusia; the former is classified as NUTS 1 and the latter two as NUTS 2 in accordance with EUROSTAT nomenclature. http://europa.eu.int/comm/eurostat/ramon/nuts/codelist_en.cfm?list=nuts.

the EU. It pinpoints and assesses the factors that lead farmers to adopt a specific system, which are therefore the factors that may dictate the future evolution of agriculture in the EU.

Finally, *Chapter 4,* to be developed on the third phase, discuss the future of agricultural systems in the EU by analysing potential scenarios for the evolution of each system and its potential influence on European agricultural policy.

The methodology used in the study was determined according to the contents of each chapter.

Producing the first part of Chapter 2 entailed the previous definition of concepts such as agrosystem, production and marketing practices or emerging (alternative) agrosystems, which was followed by their description and distinction from mainstream agriculture in the EU. This part represents the general context of the study and to this end we conducted a comprehensive review of the available literature, which included a variety of primary sources (studies and reports, publications, web pages). We also contacted various bodies in order to obtain more specific information when required.

The process followed to establish our contacts was as follows: the officials —if any— responsible for each of the agrosystems studied in the Ministry of Agriculture of each country examined were identified and subsequently contacted by telephone or e-mail in order to request the information required from them. Various officials of the European Commission and the representatives of the major European and national associations for each agricultural system were also contacted. Wherever data from different sources were found to disagree, clarification was sought from experts on the subject concerned. It should be noted that, throughout the study, we strived to use information from official sources. This was either collected from web sites or directly requested from our contacts[3].

As regards case studies, following an analogous methodology, we initially produced a description of the country and region concerned, and then placed each agricultural system to be subsequently described in context. Next, we identified the regional contacts and association representatives that could provide us with relevant information for each system. The following step was to visit each of the three regions and hold an interview with the previously identified contacts. The information thus gathered helped us strengthen the general characterisation of the alternative agrosystems studied and examine the target regions in detail. The respective section sets out in detail the methodology followed.

The selection and assessment of the factors that lead farmers to choose one system or another is basically based on the criterion of the agents that have visited the three regions analysed on the case studies. Chapter 3 sets it out in detail.

The fourth and last chapter presents a structured reflection of the authors, supported by a group of collaborating experts, about the future development of the so called alternative or emerging agricultural systems in the EU. This reflection is considered as a first approach, in the absence of more in-depth and more specific surveys about the future of these systems.

3 ANNEX 1 lists the contacts established for each country and at European level.

2. Analysis of the current situation of the agricultural systems in the European Union

2.1. Some previous concepts

The concept of agricultural system

The term agricultural system (or agrosystem) is a concept that has been in continuous evolution over the last few decades. The great number of elements involved in its definition and their interrelations are partially responsible for this evolution.

An extended definition is the one given by Dillon and Hardaker (1993)[4]. According to them an agricultural system is "the system of production used by a farmer as specified by the technology used, resources available, preferences held and goals pursued within a given agro-ecological and socio-economic environment".

As in any economic activity, in the farm various production factors are combined in different proportions with the aim of producing foods and raw materials. This process, which visibly varies between the different existing systems, arises from specific techniques or production practices which could be defined as an ensemble of knowledge, resources and proceedings used by a system to obtain a particular product.

However, the agricultural activity can be understood in a broader sense, determined mainly by the different demands of the society, an agrofood environment in continuous evolution or a globalisation of commercial exchanges.

For this reason, farmers do not carry out their activity in a way determined by their own free will, but their approach to production is conditioned by the need to incorporate trade practices that meet these demands. Such practices are defined as a set of activities required to transport a product from the point of production to that of consumption.

The agricultural system therefore has to take into account both the productive aspect and the commercialisation of the products obtained.

Mainstream or traditional agricultural systems versus alternative or emerging ones

In the arena of discussion about the agricultural systems in Europe, references to the dichotomy between traditional or mainstream systems, on one side, and emerging or alternative ones, on the other side, are frequent. However, there is no clear consensus about the scope of these concepts. As a first approach (Grudens Shuck *et al.*, 1998)[5], we could point out that alternative agricultural systems would be those including:

- Non-traditional crops, livestock, and other farm products;
- services, recreation, tourism, food processing, forestry, and other enterprises based on farm and natural resources;
- unconventional production systems such as organic farming (…); or
- direct marketing and other entrepreneurial marketing strategies.

The term "emerging" makes reference to the new or recent aspects of their implementation. Therefore, emerging or alternative agricultural systems comprises a very heterogeneous group, with unequal level of definition and establishment,

4 Dillon and Hardaker. (1993), quoted in Hesse, J. H. (1997). "Is bullock traction a sustainable technology? A longitudinal case study in northern Ghana". http://dissertation.com/pdf-b/112015xb.pdf

5 Grudens Shuck, N. et al, (1998). "Farming Alternatives; A.Guide to Evaluating the Feasibility of New Farm-Based Enterprises". Ithaca NY: Cornell University. p. 1, NAL S675.N72 no.32.

which has recently emerged as a consequence of the dynamic adaptation process of agriculture to the social, economic, technological and environmental context.

It is still more difficult to define conventional, traditional or mainstream agricultural systems precisely. With regard to the first, the term "conventional" could be at first interpreted as defining a system opposed to alternative agriculture. However, sometimes the name conventional agriculture is used to describe non-organic agriculture exclusively or to define a form of agriculture that is only characterised by the non use of Genetically Modified Organisms (GMOs). If the term is interpreted in this way, it could give rise to misunderstandings, because it would include as conventional some agricultural systems that are considered as alternatives on this study (integrated farming, agriculture under guaranteed quality, etc).

For these reasons, a more precise term will be used in this study: **mainstream agriculture**. From now on, mainstream agricultural systems will be understood as those which, due to its widespread implementation at a specific place and time, can be used as a reference for a comparative analyse against an emerging or alternative agricultural system. Likewise, the concepts mainstream agriculture and traditional agriculture would be understood as synonyms.

Intensive and extensive agricultural systems

Another classification profusely used in agriculture is that which distinguishes between intensive and extensive agricultural systems. Indeed, it is a classical division found in the specialised literature but does not admit only one interpretation due to the wide range of existing farms. In a simplified way, intensity of the employment of production factors (traditionally land, work and capital) is what distinguishes one group from another.

A more intensive use of land[6] is translated, for example, into the absence of fallow land on holdings, production of crops in inert substrates or without soil or even obtaining a number of crops in the same harvest. In terms of the amount of work required, a farm can be considered more intensive the more work is employed. A good indicator of this parameter is Annual Working Units (AWU) per hectare, which reaches some of its highest values in horticulture. The intensive use of capital can be reflected either in the use of machinery, building greenhouses, high density of livestock or the higher financial requirements of the agricultural business. In addition, the use of more inputs in farms (fertilisers, plant protection products, plant growth regulators, etc) is usually linked to the intensification of agricultural production.

A typical intensive farm is small in size has high outputs and requires significant capital investment, whereas an extensive one generally has a larger extension of land, obtains lower outputs and employs fewer chemical inputs or medicines for livestock. This last characteristic makes easier to harmonise agricultural activity with respect for the environment.

However, in practice farms do not generally meet all the typical characteristics of an intensive or extensive system. Rather they tend to combine factors of production in different proportions or intensities.

It is necessary to clarify that in extensive agricultural systems it is possible to find both conventional and alternative agricultural systems, and that this is also valid for intensive systems. However, frequently, there is a trend towards identifying intensive systems with conventional systems and extensive systems with alternative ones.

6 Soil will be understood here as production factor in a wide sense, including both agricultural soil and natural resources used (mainly irrigation water).

- An agricultural system includes agronomic, technological, economic, ecological and social aspects.
- The new conception of agricultural systems includes practices of production and also aspects related with the commercialisation of products.
- Emerging or alternative agricultural systems form a very heterogeneous group, with unequal level of definition and establishment, recently emerged as a consequence of the dynamic adaptation process of agriculture to the social, economic, technological and environmental context.
- Mainstream or traditional agricultural systems could be defined as those which, due to their widespread implementation on a specific place and at a concrete period of time, can be used as a reference for a comparative analysis compared with an emerging or alternative agricultural system.
- The main difference between an extensive and intensive agricultural system lies in the "intensity" in the employment of production factors.

2.2. Main emerging or alternative agricultural systems in the European Union. General approach

2.2.1. Introduction

The following alternative or emerging agricultural systems will be discussed in this document[7]:

- Organic Farming,
- Integrated Farming,
- Conservation Agriculture,
- Agriculture under Guaranteed Quality (Protected Designation of Origin, Protected Geographical Indication, Traditional Speciality Guaranteed, and other quality labels),
- Other agricultural systems less widely used (precision agriculture, short chain agriculture, permaculture, urban agriculture, agriculture paysanne, etc).

2.2.2. Organic Farming

Organic farming has nowadays a number of definitions which try to encompass a complex reality (see **ANNEX 2**). From an integral point of view, Organic Farming could be defined as an approach to agriculture where the aim is "to create integrated, humane, environmentally and economically sustainable agricultural production systems, which maximise reliance on farm-derived renewable resources and the management of ecological and biological processes and interactions, so as to provide acceptable levels of crop, livestock and human nutrition, protection from pests and diseases, and an appropriate return to the human and other resources employed" (Lampkin, 1994)[8].

The aim of Organic Farming would be to achieve a balance between the factors involved in organic production (more or less numerous depending on the definitions consulted), establishing production sustainable values and remuneration of factors, and respecting certain environmental parameters. To put these guidelines into practice, there are a number of voluntary membership standards that delimit permitted practices and the products that can be used (fertilisers, phytosanitary products, etc.).

7 ANNEX 3 includes a list with some terms related to each agricultural system studied.
8 Lampkin, N. H. (1994). "Organic Farming: Sustainable Agriculture in Practice". In N.H. Lampkin & S. Padel (eds.): The Economics of Organic Farming. An International Perspective. p. 3-9 (Wallingford: CAB International).

The European Commission defines Organic Farming "as a method of production which puts the highest emphasis on environmental protection and, with regard to livestock production, on animal welfare considerations". Moreover, the European Commission distinguishes between Organic Farming and other environmentally sustainable agricultural systems adding that "it avoids or largely reduces the use of synthetic chemical inputs such as fertilisers, pesticides, additives, medicinal products, etc".

Although there is a broad consensus about the recognition of terminology set out above, idiomatic differences (see **ANNEX 3**) and the different meanings in each language of these terms have led to some controversies, as, for instance, the case of "bio" products. This name, frequently used in international markets as a synonym of "organic" or "ecological", has been used by many big food industry brands to denote products that were not produced following the Organic Farming guidelines, causing confusion to consumers and indignation among the various organic producer associations.

There are other terms relating to the same agricultural system that began with the historical development of the environmental movement in agriculture. The term **biodynamic agriculture** it encompasses aspects of agronomy, philosophy and respect for the environment. Thus, there is currently a non-profit association, Demeter-International, with representation in 35 countries, that certifies that the products of its members are made following the guidelines of this type of agriculture.

Another more recent term coexisting with organic agriculture is the name **"agroecology",** which is defined as "the application of ecological concepts and principles to the design and management of sustainable agroecosystems providing a framework to assess the complexity of agroecosystems" (Altieri, 1995)[9]. It can be considered as an integrative discipline including elements from agronomy, ecology, sociology and economics (Dalgaard, 2002)[10] more than just an agricultural system.

- Organic Farming avoids or greatly reduces the use of synthetic chemical inputs such as fertilisers, pesticides, additives, medicinal products, etc.
- Although there is broad consensus on the terminology used in the Organic Production system, the idiomatic differences and the different meanings in each language for these terms have caused some controversies.
- There are other agricultural systems that share Organic Farming philosophy but adding differing nuances that can be translated as additional rules or restrictions apart from the ones established by Organic Farming (biodynamic farming, agroecology).

2.2.3. Integrated Farming

It is surprising to note that, although there are a variety of terms referring to this agricultural system, the different definitions share certain underlying ideas. This fact shows the relative consensus which the adjective *integrated* has nowadays[11]. It is considered, in many cases as an intermediate term between mainstream agriculture and organic farming.

The Integrated Farming System (IFS) is defined as a holistic pattern of land use, which integrates natural regulation processes into farming activities to achieve a maximum replacement of off-farm inputs and to sustain farm income. The IFS attempts to make maximum use of on-farm resources in order to minimise the quantities of purchased inputs such as fertilisers and pesticides required to maintain high yields or produce adequate

9 Altieri, M. A. (1995). Quoted in Altieri, "Agroecology: principles and strategies for designing sustainable farming systems". University of California, Berkeley. http://www.cnr.berkeley.edu/~agroeco3/principles_and_strategies.html

10 Dalgaard, T. et al. (2002). "Agroecology, scaling and interdisciplinarity". Revised review article for Agriculture, Ecosystems and Environment (AGEE 1228). http://www.kursus.kvl.dk/shares/soar/200_summerschools/Porter_Agroecology_preprint.pdf

11 During the 70's and 80's decades the term "Integrated Production" referred to vertical integration of agriculture in the commercialisation chain going from producer to consumer.

financial returns; the objective is to reduce costs and pollution, but not necessarily to eliminate use of agrochemicals (El Titi, 1992)[12].

Likewise, from a practical point of view, the terms **Integrated Crop Management** (limited to plant production) and **Integrated Production** (when it is employed as referring to agricultural system, including both plant and animal production) will be considered in this work as synonyms of Integrated Farming.

There are many other definitions of Integrated Agriculture, but they only insist on the same parameters: no prohibition of agrochemicals, but a reduction, as far as possible, of external farming inputs, under sustainable criteria.

The French terms ***Production Raisonnée*** and ***Agriculture Raisonnée*** deserve a specific mention. Even though it is commonly accepted that they correspond to the concept of Integrated Farming in English, some authors (Pervanchon and Blouet, 2002)[13] consider that Agriculture Raisonnée is a first step on the way to the "*système de production intégrée*" (integrated production system) as it is defined by the IOBC[14]: the *Lutte Raisonnée* would be an initial distancing of the *Lutte chimique* (chemical pest control) through the employment of economic threshold and the "reasonably" use of phytosanitary products.

To that effect, the a*griculture raisonnée* appeals to the farmer's technical knowledge of the productive system in order to put into practice a "sensible" agriculture, that, among other possible measures, makes a sustainable use of the resources and that adapt the employment of inputs to the specific needs of each moment.

Another very widespread concept is **Integrated Pest Management** (IPM); as an example, there are national and local programmes carried out by Food and Agriculture Organisation of the United Nations (FAO) through the Global IPM Facility. IPM is "a pest management strategy that focuses on long-term prevention or suppression of pest problems with minimum impact on human health, the environment, and non-target organisms (Flint *et al.,* 2003)[15]". The IPM constitutes an important pillar of IFS and includes the set of practices and/or agricultural techniques used in Integrated Production systems for the control of pests, diseases and weeds. The use of natural enemies in pests control programmes, known as biological pest control, is one of the techniques that are gaining in significance and interest.

It should be noted that the Integrated Farming System incorporates some of the agricultural practices of soil utilisation from so-called Conservation Agriculture. Finally, **ANNEX 2** contains some comments about other agricultural systems related to integrated farming.

- Through a sustainable management, and without the need for excluding chemical-synthesis products, Integrated Production seeks to reduce, as far as possible, the use of inputs in order to reduce environmental impact and to enhance the economic profitability of farms.
- One of the most important pillars of Integrated Farming is the Integrated Pest Management, term which integrates the set of agricultural techniques used in Integrated Production systems for the control of pests, diseases and weeds (example: biological pest, weed and disease control).

12 El Titi, A. (1992) "Integrated Farming: an Ecological Farming Approach in European Agriculture". In: Outlook on Agriculture Vol. 21 No. 1, pp33-39.

13 Pervanchon F., Blouet A., 2002. "Deux qualificatifs à concilier en agriculture: raisonné et intégré. (à paraître dans Cahiers Agricultures)".

14 The "International Organisation for Biological Control" defines integrated production as "a food production agricultural system which makes use to the maximum of natural resources and adjustment mechanisms and which assures in the long term, a feasible agriculture. In this agriculture, biological and chemical methods as well as other techniques are carefully chosen and balanced, having into account the environment, profitability and social requirements".

15 Flint et a. (2003). "Establishing Integrated Pest Management Policies and Programmes: A Guide for Public Agencies". University of California, Division of Agriculture and Natural Resources. http://anrcatalog.ucdavis.edu/pdf/8093.pdf

2.2.4. Conservation Agriculture

Conservation Agriculture, according to the FAO[16] is a form of agriculture "that tries to keep, improve and do a more efficient use of environmental resources through an integrated use of soil, water and available biological resources combined with external inputs helping environmental conservation and a better sustainability of agricultural production".

Other definitions of conservation agriculture arise from the recognition that erosion is a major and increasing cause of soil degradation in many parts of Europe (Ernstsen *et al.*[17], 1995; Blum, 1990[18]). It can be said that "conserving" is the aim of Conservation Agriculture (Navarro, 2002)[19]. Generally, Conservation Agriculture includes practices which reduce, change or eliminate soil tillage and avoid the burning of wastes so as to maintain enough a surface covering of residues throughout the year. These practices or techniques are characterised by their diversity and flexibility, and are compatible with other tendencies like Precision Agriculture, Integrated Farming, Bio-technology or even Organic Agriculture.

It has to be pointed out that, though Conservation Agriculture has been considered as an agricultural system in its own right, it has been already mentioned that the best way to define it is as a set of production practices with a common aim. However, until now, other elements typical of complete agricultural systems, like commercialisation or differentiation of the products in the market, have not arisen.

Apart from the already mentioned soil conservation by reducing erosion, the Conservation Agriculture defenders consider that adopting Conservation Agriculture has some additional advantages such as improved soil fertility and cost saving, which means the reduction of tillage.

One of the terms most commonly used as a synonym of Conservation Agriculture is **Conservation Tillage**. This term covers a broad range of soil tillage systems that leave residue cover on the soil surface, substantially reducing the effects of soil erosion from wind and water.

Some specific practices of conservation tillage are direct sowing (also called direct drilling or no–tillage), reduced tillage (also called minimum tillage or mulch tillage), zone, strip or row tillage, ridge tillage, surface incorporation of crop residues and cover crops[20].

- Conservation Agriculture currently includes a set of production practices which reduce, change or eliminate soil tillage and avoid the burning of residues so as to maintain enough residues surface throughout the year. However, up until now, other elements typical of complete agricultural systems, like commercialisation or differentiation of the products in the market have not arisen.
- Reducing erosion is the main advantage of this type of agriculture but other additional advantages are improvement of soil fertility and the cost savings brought about by the reduction in tillage.
- One of the most commonly used synonyms of Conservation Agriculture is Conservation Tillage, which includes different practices like direct sowing (direct drilling, no-tillage), reduce tillage (minimum tillage, mulch tillage), zone tillage (row tillage, strip tillage), ridge-till or cover crops.

16 http://www.fao.org/ag/magazine/0110sp.htm
17 Ernstsen V., J. Jensen, S.E. Olesen, R. Sidleet. (1995). "Scoping study on establishment a European Topic Centre for Soil. Geological Survey of Denmark", Service Report no 47.
18 Blum, W.E.H. (1990). "The challenge of soil protection in Europe". Environmental Conservation, 17, 72-74.
19 Navarro, E. (2002). "El futuro de la agricultura de conservación: producir conservando". Congreso Internacional Reformas de la PAC y u influencia en el mundo agrícola europeo. http://www.portaldelmedioambiente.com/congresopac/html/descargas/EMILIOROMARTINEZ.pdf
20 Cover crops of spontaneous vegetation or by sowing appropriate species; in perennial woody crops or in between successive annual crops.

2.2.5. Agriculture under Guaranteed Quality

The term quality applied to the agri-food sector is a complex concept whose final aim needs to take the preferences of the final consumer into account. Other important related terms include food safety, sustainability, the environment, animal welfare and nutritional values, among others.

The International Organisation for Standardisation (ISO) defines quality in the basis of how the whole of properties and characteristics offered by a product or service satisfies the declared or implicit consumer needs. In this sense, "quality management" means what the organisation does to enhance customer satisfaction by meeting customer and applicable regulatory requirements and continually to improve its performance in this regard. From this point of view, quality is a subjective notion which is also changes over the time.

To analyse the quality of foodstuffs, the following categories can be mentioned (Ablan, 2000; Niño de Zepeda *et al.*, 1999; Niño de Zepeda y Echevarri, 2001)[21].

a) Quality as ensuring safety, in the sense that foodstuffs cannot damage consumers' health. This corresponds to the basic level that any foodstuff must obey and it is generally controlled in a national level to protect citizens' health. (**Food safety**).

b) Nutritional Quality, which refers to the ability of foodstuffs to satisfy biological needs for energy and nutrients. This factor has taken on considerable significance among well informed consumers who are aware of the preventive potential of a healthy or balanced diet. (**Nutritional Quality**).

c) Quality defined through value attributes. These attributes are factors that go beyond the basic harmlessness or innocuousness of a foodstuff, leading to products standing out in terms of their organoleptic or sensory and composition-related characteristics as well as for the satisfaction obtained from eating foods related to socio-cultural traditions, education and cohabitation needs. Thus, factors as environmental respect throughout the production process are considered (e. g. organic products) as well as respect for social regulations for workers in charge of production (e.g. fair trade) and respect of traditions (e.g. foodstuffs done by traditional methods). (**Organoleptic and consumption quality**).

In this latter sense, the Global Forum of Food Safety Regulators of the FAO/WHO (World Health Organisation), which took place in Marrakech on January 2002, defined food quality as all the attributes that influence the value of a product to the consumer where "food safety" was understood with reference to those hazards that may make food harmful to consumer's health.

Consumer leading role is also pointed out by Spanish Society of Horticulture that considers quality as an ability of goods or services to satisfy express or potential consumer or user needs. Thus, it distinguishes between marketable and consumption quality, defined as the whole set of a product's attributes that determine the degree of acceptance by consumers or by the market; nutritional quality, which is the quality of a food related to its nutritive properties; and organoleptic quality described as the food-quality-related to attributes that can be detected by the senses.

In this study, the agriculture under guaranteed quality approach is not viewed as being related so much with food safety, which is presupposed and compulsory, nor with nutritional qualities but rather with quality defined by value attributes. More specifically, the focus will be on productions that also have an added value, certified by international, national or regional, public or private bodies through a quality label guaranteeing to the consumer that a given foodstuff has one or more outstanding attributes after being submitted to a

21 Ablan, Niño de Zepeda et al., Niño de Zepeda and Echevarri, quoted in Oyarzún and Tartanac. (2002). "Estudio sobre los principales tipos de sellos de calidad en alimentos a nivel mundial", FAO.

voluntary control system (see **ANNEX 2** for further information). This control system can value very different criteria. Those related to a particular region of origin or when products are the result of a traditional method are highly regulated at EU level. Those production methods that pay special attention to the environment and animal welfare, though related to quality, will be studied in different sections (e.g. organic farming and integrated farming).

- Agriculture under quality certification seeks to guarantee a series of attributes that gives their products an added value in the markets on the basis of their origin, production methods and organoleptic characteristics.
- These characteristics are defined in a specification or a more restrictive regulation than the basic and compulsory one. Compliance with these rules is voluntary in nature.
- This type of agriculture is very much market focused. Therefore, identification and differentiation of the products (through logos, labels and quality seals) at the commercial stage as well as advertising campaigns have special importance.
- Control and certification structures and bodies are of particular significance in obtaining these quality seals.

2.2.6. Other agricultural systems

2.2.6.1. Precision Agriculture

Since the beginnings of agriculture, the existence of spatial and temporal variations in soil properties and crop yields has been recognised by almost all producers. This variability —determined by intrinsic factors such as the processes of soil formation and by extrinsic factors such as the historical use of farms— together with the introduction of modern technologies, which allows its magnitude and distribution to be recorded and analysed, has motivated the introduction of Precision Agriculture.

There is no unique definition for the term precision agriculture. Bellow, there are some examples of definitions that will introduce the most important concepts it encompasses:

- Precision Agriculture corresponds to a strategy of management that uses information technologies to collect data from different sources in order to help decisions associated with crop production (USDA, 1997)[22]. Precision Agriculture recognises that agricultural production depends on the soil, climate and the past uses of the soil. It also recognises that productivity varies in space and in time.
- Precision Agriculture is "an integrated information and production-based farming system designed to increase long-term, site-specific, and whole farm production efficiencies, productivity, and profitability while minimising unintended impacts on wildlife and the environment" (U.S. Congress)[23].
- Precision Agriculture can be defined as observation, impact assessment and a timely strategic response to fine-scale variation in causative components of an agricultural production process. The philosophy can be also applied to pre- and post-production aspects of agricultural enterprises. (Australian Centre for Precision Agriculture)[24].

22 "Precision Agriculture in the 21st Century: Geospatial and Information Technologies in Crop Management". (1997). Committee on Assessing Crop Yield: Site-Specific Farming, Information Systems, and Research Opportunities, National Research Council. The National Academy Press, Washington DC.

23 The U. S. Congress defined Precision Agriculture in Public Law 105-185: Agricultural Research, Extension, and Education Reform Act of 1998 (Title IV-Section 403).

24 http://www.usyd.edu.au/su/agric/acpa/pag.htm

Most definitions of Precision Agriculture stress the management of variability which is common within most fields, in order to enhance economic benefits, and to reduce risks to the environment from agricultural production. Precision agriculture uses information technologies to match agricultural inputs with crop needs or potential. Application of inputs is customised for different areas within the field, instead of treating a whole field as a single unit.

- Precision Agriculture is based on the management of variability, which is common within most fields, in order to enhance economic profit, and to reduce the risks to the environment posed by agricultural production.
- Precision Agriculture uses information technologies to match agricultural inputs with crop needs or potential. Application of inputs is customised for different areas within the field, instead of treating a whole field as a single unit.

2.2.6.2. Short-chain agriculture

In Europe, a range of changes affecting the various links in the agri-food chain in one way or another are taking place. Thus, consumers are playing increasingly prominent roles in the decision-making process; as a result, the production, transformation and marketing of agri-food products are being increasingly influenced by their demands. Short-chain agriculture is a recent addition to the combination of approaches that are arising in response to current demands in parallel with the displacement of small retailers by large supermarket and hypermarket chains.

Before describing this form of agriculture, some related concepts need to be made clear. Thus, in short-chain agriculture, a **marketing chain** means a group of intermediaries involved in the process that separates agricultural production from the final consumer, with their relations to one another and the elements of the process.

Graph 1 shows a simplified diagram of a long marketing chain, where each function is performed by a different agent in a compartmentalised manner. Thus, farmers are responsible for production, as other agents are for manipulation or transformation, for example. Also, products are marketed either by wholesalers acting as providers for retailers or by the purchasing departments of supermarkets and department stores. Through vertical integration, farmers can undertake functions other than production. For example, the establishment by producers of a co-operative for the processing and packaging of tomatoes would place them closer to consumers and merge two links in the chain (*viz.* production and processing) into one. Likewise, farmers can take on marketing functions. Short-chain agriculture, also called "short-circuit agriculture", is thus one way of integrating producers vertically in the marketing chain.

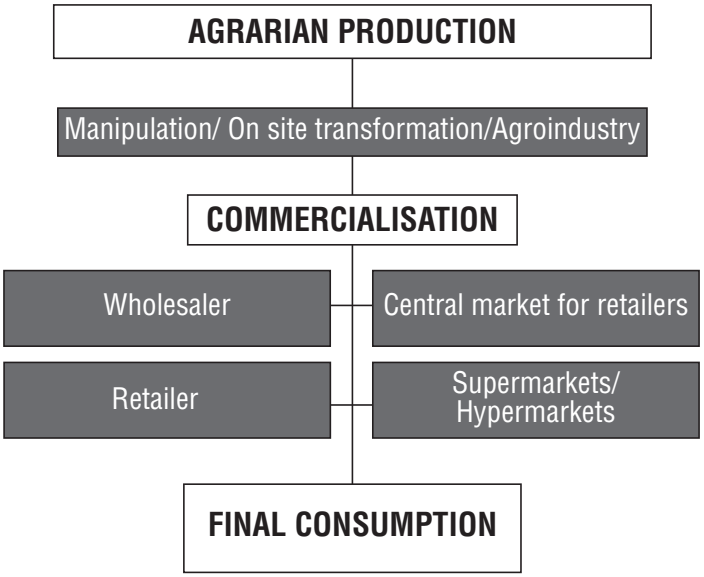
This agricultural system facilitates traceability[25] as it reduces the number of intermediaries. This enables consumers to have a better knowledge of the pathway followed by the products they purchase and thus perceive them as being safer and of better quality.

The shortest possible chain between the producer and consumer is that of **direct sales**, where the farmer is also the retailer. This closer relationship with the consumer can be accomplished by direct selling on the farm, on-line selling or trade-fair sales, among others.

Based on the foregoing, short-chain agriculture does not depend on physical distance. Thus, farmers can market their produce through a nearby industry participating in a long (traditional) marketing chain or travel to a trade fair abroad and directly sell it to final consumers through a short chain, for example.

25 ISO defines "traceability" as the ability to recover the history and utilisation or location of an article or an activity through a registered identification.

Graph 1: The agri-food marketing chain.



Source: Compiled by the authors using information from European Observatory LEADER/AEIDL (2000).

It has been suggested that short-chain agriculture cannot be considered a self-contained agricultural system even though it may come close to one in some cases. In fact, it is more of a body of marketing practices intended to reduce the number of intermediaries between the producer and consumer. Similarly to organic farming, this form of agriculture can create a favourable atmosphere for the organisation of farmers and consumers in associations or co-operatives. Also, these marketing practices are not completely new. Thus, direct sales and their variants date back to the very beginning of the marketing of agri-food products. In fact, in many rural communities —even in developed countries—, it is still common for producers to have direct contact with the consumers of their produce. As noted earlier, direct sales is the simplest form of short-chain marketing. There are, however, other variants (particularly in relation to livestock), where the consumer purchases an animal at birth or an early age and entrusts the farmer its breeding, fattening and slaughtering; the farmer delivers the carcass to the consumer, who pays a previously agreed sum in return.

In some industrialised countries (e.g. The Netherlands), short-chain agriculture is viewed as an emerging agro-system because it has successfully attracted the attention of urban consumers, who are increasingly concerned with food safety in a setting where agriculture has become a quasi-industrial activity somewhat remote from the point of consumption. However, this agro-system lacks a distinctive status in the countries examined, where it is occasionally associated with other systems (e.g. ecological farming) or related to marketing practices typical of the rural environment.

For these reasons, this short-chain agriculture has been excluded from the group of agro-systems characterised in Section 2.3 of this report; when mentioned, it is in relation to marketing trends typical of the other agricultural systems.

- Short-chain agriculture is the assumption by farmers of functions other than production within the agri-food chain.
- It is not a complete agricultural system but rather it joins a group of commercialisation practices promoting an approach between producer and consumer within the food chain.

2.2.6.3. Permaculture

The term Permaculture, a contraction of "permanent agriculture" or "permanent culture", was minted in 1978 by an Australian scientist called Bill Mollison. Nowadays, the adjective "permanent" could be assimilated to "sustainable" in the sense of its persistence over time. Thus, "the more recently developed concepts of sustainable development and sustainable agriculture are clearly related to the central notion of permanence at the heart of permaculture" (Holmgren, 1991)[26]. However, it cannot be affirmed that sustainable agriculture and permaculture are equivalent.

Permaculture tries to create permanent living systems that are in use today and that will be able to be used tomorrow, taking into account a philosophy of cooperation with species. It gives a focus to design environments with the stability, diversity and resistance of natural ecosystems, regenerating degraded ground or helping preservation of largely unspoilt areas.

Permaculture is an integrated process of design which results in a sustainable, balanced and aesthetic environment. The design itself pays special attention to the inter-relationships between the elements and the processes within a system, to ensure that is stable, functional and highly efficient. By applying ecological principles and strategies the balance of the life-based systems can be restored.

Clearly, this system is not exclusively restricted in the field of agronomy but it is linked to other disciplines. In this sense it is defined as "a holistic approach to landscape design and human culture. It is an attempt to integrate several disciplines, including biology, ecology, geography, agriculture, architecture, appropriate technology, gardening and community building" (Baldwin[27]).

As a working definition, the one given by Henderson[28] can be taken. He defines Permaculture as "the use of ecology as the basis for designing integrated systems of food production, housing appropriate technology and community development" taking into account that it is only a philosophy developed with some principles and recommendations.

- Permaculture is the use of ecology as the basis for designing integrated systems of food production, housing appropriate technology and community development.
- It is an attempt to integrate several disciplines, including biology, ecology, geography, agriculture, architecture, appropriate technology, gardening and community building.
- It is only a philosophy developed with principles and recommendations that gives a focus to design environments with the stability, diversity and resistance of natural ecosystems, regenerating degraded ground or helping preservation of largely unspoilt areas.

2.2.6.4. Urban agriculture

Paradoxically, an activity in which, according to United Nations Development Programme (UNDP)[29], 800 million persons in the World are involved and 200 millions of them produce with commercial aims and employing 150 million people full time is included among the alternative agricultural systems. However, in spite of its very widespread implementation, it is located outside of rural areas, which gives it a distinctive aspect compared with mainstream production.

Urban Agriculture, which is as old as cities, has not until recently, been studied by scientists. Thus, as

26 Holmgren. (1991). "Development of the permaculture concept. Uncommon Sense" in Permaculture International Journal (issue 44). September 1992. http://www.spacountry.net.au/holmgren/web%20PDF2/10PCdevelop.pdf
27 Quoted in http://collections.ic.gc.ca/permaculture/definition_perm.htm
28 Quoted in http://collections.ic.gc.ca/permaculture/definition_perm.htm
29 UNDP. (1996). "Urban Agriculture: A Neglected Resource for Food, Jobs and Sustainable Cities". New York: UNDP

it has no agreed definition, an approach comparing some descriptions is made in this section.

Initially, geographic criteria were used to define Urban Agriculture, which was considered by Mougeot (1994)[30] as "the growing of food and non-food crops and the raising of animals such as cattle, fowls and fish both within and on the edge of built-up areas". In that sense, researchers such as Rees (1997)[31] include the urban location of the activity as its differentiating factor.: "Urban Agriculture includes any activity associated with growing crops and some forms of livestock in or very near cities for local consumption, either by the producers themselves or by others when the food is marketed."

This criterion, which is nowadays employed in different forums, allows for a ready quantification of urban agriculture but it does not completely reflect its complexity. Therefore, other authors extend the concept to competition for urban resources. According to Moustier (1996)[32], "Urban Agriculture is that form of agriculture carried out within or on the outskirts of a city where non-agricultural use of local resources is a real option". This idea was afterwards adopted by some international organisations like the FAO's Committee on Agriculture which considers that "Urban and Peri-urban Agriculture […] is perceived as agriculture practices within and around cities which compete for resources (land, water, energy, labour) that could also serve other purposes to satisfy the requirements of the urban population."

Taking this idea in a global sense, including competition for resources within a group of interrelations, Mougeot (1999)[33] states that Urban Agriculture " [...] is integrated into the local urban economic and ecological system". In spite of its complex practical application, from now on, when urban agriculture is referred to, the aforementioned territorial, economic and ecologic criteria will be considered. **ANNEX 2** describes some concepts related to this definition of urban agriculture.

Although it adopts the same name, urban agriculture's context in developing countries is substantially different from the one existing in developed countries. In the latter, UA has arisen as an answer to demands related with leisure, food safety, quality, education and urban planning while , according to the *Programme d'Économie Environnementale Urbaine et Populaire* of 1995 (PRECEUP)[34], the reasons why urban agriculture has been implemented in developing countries can be divided into the following:

- Possible nutritional reasons:
  - to produce (higher quality) staple foods,
  - to supplement the food supply with vitamins and/or minerals,
  - to decrease the loss of nutrients by means of greater freshness.
- Possible socio-economic reasons:
  - to obtain (supplementary) cash income,
  - to diversify income,
  - to obtain employment.

Finally, it should be highlighted that a wide range of policies relating to Urban Agriculture have been carried out and greatly determine its development. In Uganda, for instance, (Mougeot,

30 Mougeot, L.J.A. (1994). "Urban food production: a survey of evolution, official support and significance". Habitat 94, 20 September 1994, Edmonton, 42 pp

31 Rees. (1997). "Why Urban Agriculture?". Notes for the IDRC Development Forum on Cities Feeding People: A Growth Industry Vancouver, BC 20 May, 1997.

32 Moustier, P. (Cirad). (1996). "Organisation in the Brazzaville vegetable market". Doctoral Thesis, Wye College, University of London.

33 Mougeot LJA. (1999). "For self-reliant cities: urban food production in a globalizing South". In: Koc M, MacRae R, Mougeot LJA & Welsh J (eds), For hunger-proof cities: sustainable urban food systems (Ottawa: IDRC), pp 11-25.

34 This Programme was founded by the European Commission to support local initiatives in the South and initiate debates, analyses and information exchanges in order to contribute to the definition of improved environmental policies. For further information see http://www.globenet.org/preceup/pages/ang/introduc/intro.htm

2000)[35] it is legitimised and promoted through public appeals. Some industrialised countries, like the Netherlands and Canada, as well as many cities are formulating "green schemes" which include urban farmer support, encourage extensive growing of trees and the elimination of residues (Helmore and Ratta, 1995)[36]. In other countries these activities are tolerated and there are also examples of countries where it is forbidden.

- Urban agriculture is an agricultural system located within or near the cities and forming part of the economy and environment of the local urban system.
- Urban agriculture's model in developing countries is substantially different to the one of developed countries. In the latter, UA is born as an answer to demands related with leisure, food safety, quality, education and urban planning.
- There is a wide range of policies related to this agricultural system, going from promotion and legitimacy to discouragement and prohibition. However, generally UA is not characterised as being regulated.

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2.2.6.5. Agriculture paysanne

Agriculture paysanne is probably one of the most recent terms to be added to the vocabulary of emerging agricultural practices, although it cannot be considered as a complete or widespread agricultural system. Agriculture paysanne is considered to be started at the beginning of the nineties and it is experiencing a media-boom, partly due to its close link to the *"Paysanne Confederation"*. This professional agricultural organisation, founded in France in 1987 and the second most voted at the 2001 elections to the French Agricultural Chambers, has promoted a new way of understanding production in a way that breaks from current structures.

This agricultural system finds inspiration in some agro-social, philosophical, and political tendencies and has created its own ideology from this mixture of influences. As clear records of agriculture paysanne, peasant studies (as a refusal of the industrial agriculture in Russia at the beginning of the 20th century) and the anti-globalisation movements of the end of the 20th century are worth mentioning.

Agriculture paysanne can be characterised as the agricultural production of goods and externalities in the interest of society, whether compensated for by the market or not. In fact, it is more a group of ideological approaches with regard to the general economic system than an agricultural system like the organic or integrated farming. For instance, it has neither special agricultural techniques nor any specific regulation.

It implies an integral vision of the rural circle in which agriculture fulfils certain social, economic and environmental functions. However, it is moving away from other systems with similar aims such as integrated production (agriculture paysanne maintains a breaking approach that integrated farming does not have) or organic farming (its difference from organic production is that it does not specifically ban synthetic chemical inputs)

35 Mougeot LJA. (1999). "Urban agriculture research in Africa: reviewing and enhancing project impacts". Cities Feeding People Report 29. Ottawa: IDRC.

36 Helmore and Ratta, (1995), "The Surprising Yields of Urban Agriculture". Choices, U.N. Development Program, April.

However, this system has become popular due to its relationship with the political action plans of organisations such as the *Paysanne Confederation* and to media coverage of its actions against the use of GMOs. This agro-system entails a strong opposition against an industrial and capitalist agriculture conditioned by multinational enterprises in a context of globalisation.

Though it is especially active in France, agriculture paysanne is also promoted from European forums like the *"European Farmers Coordination"*, a community lobby of agricultural and rural organisations. There is also an initiative on the global level under the name of *"Via Campesina"*.

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2.2.7. Identification of the essential elements that make each of the agricultural systems different

After identifying and defining the different alternative or emerging agricultural systems in previous sections, this section aims to offer a summary of their main distinctive features.

In the following table some of these features or characteristics are shown through marks evaluating every different and previously defined system:

- *Accent*: It sums up in which aspects from the following four presented (quality, environment, profit, food safety and ideology) each system lays particular emphasis or stress.
- *Focus*: It shows the degree of affinity of each system with production and marketing.
- *Restrictions*: It refers to the existence of any type of conditions that should be taken into account to put into practice a concrete agricultural system.
- *Whole system*: When there is an affirmation in a box for a given system, it means that it is a complete system encompassing both production and commercialisation .

2.3. Characterisation of agricultural systems

2.3.1. The agricultural context in the countries examined. Description of their mainstream agriculture

2.3.1.1. Mainstream agriculture in the European Union. General data for the countries examined

Before we undertake the analysis of emerging agrosystems in the European Union, it seems appropriate to describe, in broad terms, the agriculture currently being practised within its territory. This can help place emerging agrosystems within the current agricultural context and establish a reference framework for their comparison.

Rather than examining the agricultural production systems in the EU and the interrelationships involved, this report provides an overview based on related macro quantities and the principal production units in Austria, France, Germany, Italy, Spain, Sweden and United Kingdom.

As might be expected, general agricultural statistics provide global farming data for each country without separate figures for each emerging agricultural system—which is a logical consequence of the difficulty involved in their definition and regulation—. We shall therefore adopt the *initial assumption* that the quantities

Table 1: Summary table of characterisation of agricultural systems.

SYSTEM	ACCENT					FOCUS		RESTRICTIONS	WHOLE SYSTEM?
	Quality	Environment	Profit	Food Safety[37]	Ideology	Production	Marketing		
ORGANIC FARMING	LOW	HIGH	-	MEDIUM	LOW	HIGH	HIGH	Non synthesis chemical input	YES
INTEGRATED FARMING	LOW	MEDIUM	MEDIUM	LOW	-	HIGH	LOW	Rational rules. Specific regulation on integrated production	YES
CONSERVATION AGRICULTURE	-	HIGH	LOW	-	-	HIGH	-	Maintenance of the organic material on soil surface through the year. Tillage reduction	NO
AGRICULTURE UNDER GUARANTEED QUALITY	HIGH	-	MEDIUM	LOW	-	LOW	HIGH	Variable	Variable
PRECISION AGRICULTURE	-	MEDIUM	HIGH	-	-	HIGH	-	No specific restriction	NO
SHORT-CHAIN AGRICULTURE	MEDIUM	-	MEDIUM	MEDIUM	-	-	HIGH	No specific restriction	NO
PERMACULTURE	-	HIGH	-	LOW	LOW	HIGH	-	No specific restriction	NO
URBAN AGRICULTURE	-	LOW	-	HIGH	-	LOW	-	Localisation	NO
AGRICULTURE PAYSANNE	-	LOW	-	-	MEDIUM	-	-	No specific restriction	NO

Source: prepared by the authors4.5. Characterisation of agricultural systems

37 Food safety accent refers to claim on top of EU legal food safety requirement.

used in this section can accurately describe what is meant by mainstream agriculture in this report. As shown later on, mainstream agriculture encompasses most existing agriculture, so this assumption is quite reasonable. Specific remarks and qualifications will be made wherever appropriate, however.

The **Utilised Agricultural Area** (UAA), which measures the total land area used for agricultural purposes in each Member Estate, differs markedly among countries (see **table 2**). Thus, Spain and France are the two countries with the largest area (more than 25 million hectares) devoted to farming; on a lower step in the ranking are the United Kingdom, Italy and Germany, with more than 15 million hectares each. Finally, Austria and Sweden, each with an agricultural land area in the region of 3 million hectares, are at the bottom of the ranking.

The average **UAA per holding** provides some clues about farming structure and production types. Thus, while Italian farms are very small, Spanish and Austrian farms are similar to the Community average. Swedish, German and French farms are larger than the Community average and British farms three times as large.

The economic significance of agriculture can be understood in part in terms of its Gross Value Added in relation to the Gross Domestic Product (**GVA/GDP**). This ratio is very low on average (1.7%) for the Member States, so agriculture contributes very little to the Community's GDP. This is in clear contrast with the proportion of the Community budget devoted to agriculture, which is close to 50% at present.

Above the average contribution of agriculture to the GDP are the countries in the Mediterranean region (particularly Spain); below it are Austria, Germany and, especially, Sweden and the United Kingdom.

Similar conclusions can be drawn about the **share in employed civilian working population**.

Table 2: Key agriculture statistics.

	UAA-(1000 ha)	UAA/Holding (ha)	Share of agriculture in the GDP (GVA/GDP) (%)	Share in employed civilian working population (%)	Crop production/ Agricultural production (%;basic prices)	Livestock production/ Agricultural production (%;basic prices)	EU trade in food and agricultural products[38]	
							Share of imports of food and agricultural products in exports of all products (%)	Share of exports of food and agricultural products in exports of all products (%)
Year	2001	2000	2001	2001	2001	2001	2001	2001
AUSTRIA	3,375	17.0	1.3	5.8	48.0	49.5	4.1	4.3
FRANCE	27,856	42.0	2.2	4.1	57.2	38.8	4.7	7.7
GERMANY	17,038	36.3	0.9	2.6	47.9	49.1	4.8	2.9
ITALY	15,355	6.1	2.4	5.2	63.7	33.9	6.4	5.1
SPAIN	25,596	20.3	3.6	6.5	59.0	39.9	8.2	10.4
SWEDEN	3,054	37.7	0.6	2.6	46.3	51.3	4.1	3.1
UK	15,799	67.7	0.6	1.4	38.5	57.2	5.7	5.1
UE-15	**128,305**	**18.7**	**1.7**	**4.2**	**53.2**	**43.5**	**6.0**	**6.1**

Source: European Commission, 2003[39].

38 For Member states intra + extra trade; for EU-15 extra trade.

39 Agriculture in the European Union: statistical and economic information 2002. Directorate-General for Agriculture. http://www.europa.eu.int/comm/agriculture/agrista/2002/table_en/index.htm

Thus, France, Italy and Spain exceed the European average (4.2%), even though their percentages are gradually falling. The decrease in the number of farmers has been even more marked in Sweden and Germany (where the active population engaged in farming accounts for only 2.6% of the total population) and, especially, in the United Kingdom, where the large average holding size and the scant weight of agriculture in the overall economy have led to only 1.4% of the population being employed in farming occupations.

One other distinct feature of Mediterranean countries —France included even though its agriculture possesses both Mediterranean and continental features— is a greater share of vegetable production relative to livestock production. This is the case for Italy, Spain and France, where crop production clearly prevails over livestock production in relative terms. As a result, livestock production lies above the Community average (43.5%) in the other four countries (Austria, Germany, Sweden and the United Kingdom).

Finally, the average shares of **agricultural produce and foodstuff exports and imports** are in the region of 6% (in terms of value) and similar for the seven Member States examined. Worth special note in this context are the strength of foreign trade in Spain and that of French agricultural exports.

2.3.1.2. Specific features of agricultural production in the countries examined

While useful when defining mainstream agriculture, macroeconomic figures are of little help in characterising agricultural production in a given area. In fact, the description must be completed with its specificities, and its relationship to the population, territory and climate (i.e. with a "snapshot" of what agriculture means for each region at present).

There follows a brief description of the prevailing crops and livestock species in each of the seven Member States examined, the degree of intensification of their production and the relationship to the territory[40].

Specific features of agricultural production in Austria

Austria continues to be a country where agriculture (silviculture included) has an economic weight close to the European average and a large fraction of the population lives in rural settlements. Its most salient feature is that 60% of its total area is in the Alps and 30% of its UAA is used for mountain grassland associated with stock rearing.

Bovine livestock (particularly dairy livestock) accounted for 29% of the Austrian Final Agricultural Production (FAP) in 2001. Also significant are silviculture and porcine livestock (with 16% of the total FAP).

The meadows in large areas of the southern, central and western *Länder* are devoted to the production of dairy and meat cattle. In the North and East, agriculture is more diverse; especially prominent are fruit and vegetables in Burgenland (in the east); and cereals, tubers, and intensive pig and poultry farming, in the northern Länder.

Because of the mountainous Austrian terrain, 70% of the UAA is in Less Favoured Areas.

Specific features of agricultural production in France

France is no doubt the top agricultural power in the European Union in terms of both Final Agricultural Production —it contributes nearly a quarter of Community output— and market presence —with a large variety of products.

France is currently the Community leader in cereal and oilseed yields, and the joint leader with Germany in meat production. Also, the dual Mediterranean and continental nature of its agriculture has taken it to the third position in the wine, vegetable and fruit rankings (1998), with above-average figures in all cases.

40 The information regarding low-intensive systems comes basically from Bignall E. M. and McCracken D I. (1996). "Low intensity farming systems in the conservation of the countryside". Journal of Applied Ecology 33, 416-424. IEEP

Territorially, French agricultural produce varies among regions. Thus, only four regions contribute more than one-third of the country's agricultural value added; one is Champagne–Les Ardennes and the other three are in the West.

Although the West and the Centre maintain a diversified pattern of agriculture, complex agro-systems and meadows devoted to livestock production continue to be the norm. The principal arable crops lie in an imaginary arc connecting the Nord-Pas de Calais region in the North with Aquitaine (between the Atlantic Ocean and the Spanish border). While agricultural land in Corsica and the Alpine regions is almost exclusively devoted to extensive livestock production, perennial crops are particularly important on the Mediterranean coast, in the Southwest and in the Pays de la Loire.

About 25% of the French UAA is under some low-intensity use. Especially significant are extensive milk production (*Jura*)[41], wet grasslands and dry grasslands (including *maquis* and *garrigue*).

Specific features of agricultural production in Germany

Germany is another country among the top EU producers, particularly in terms of cereals (second after France) and meat (first together with France). Its agricultural geography spans from the plains in the North to the mountains in the South —more than 2,000 m high.

One of the most salient events in the recent history of Germany, its reunification, exposed the large structural differences between the East and West. While small and medium-sized farms prevail in the former German Federal Republic (GFR), large holdings are the norm in the new Länder of what was East Germany.

Nearly two-thirds of the German UAA is devoted to arable crops (primarily cereals), particularly in the south and south west. Also, nearly one-third of the remaining UAA is occupied by grassland and meadows. Livestock production is widely distributed across the country, but especially prominent in the south east (Bavaria, southern Thuringia), east (Saxony, Brandenburg) and north east. Bovine livestock production is especially important in Bavaria, eastern Baden-Württemberg and the northern coast.

Germany also cultivates vegetables, both in regions with an especially favourable climate (e.g. the Rhine plain in the West or Lake Constance on the Swiss border) or where the demand is greatest (around the large cities). Vineyards are found along the Rhine banks.

Specific features of agricultural production in Italy

Economically, Italy can be divided into three broad regions: (a) the north and north west of the peninsula, which is highly developed and has economic indicators above the European average; (b) the south and the Islands, which is less developed and includes many "objective 1 regions"; and (c) the Adriatic Strip or "Third Italy", which has grown substantially in the past few decades.

This economic division is consistent with the degree of implementation of agriculture; thus, farming has a greater weight in the less developed areas. Also, the agriculture of the south and the Islands is more markedly Mediterranean, with a greater prevalence of fruit and vegetables, tobacco, olives, etc. While production in the north also has Mediterranean features, it focuses around livestock species and crops typical of continental agriculture.

Also, the fact that 35.5% of the total Italian area is classified as mountainous and 41.6%[42] as hilly clearly reflects the significance of relief on the agricultural sector.

41 For further information about this system see http://www.comte.com/english/index.html
42 Ministero delle Politiche Agricole e Forestali and INEA (2002). "La Agricoltura Italiana Conta 2002".

Italy as a whole was the top EU producer of fruit and vegetables in 1998, with especially large amounts of olive oil and tobacco, among other products. Also, its cereal and meat outputs —which are more significant in continental agriculture— are above the European average. Italy is therefore an agricultural power within the Community.

Of the Italian UAA, 14% is under low-intensity agriculture; especially prominent in this respect are the land areas devoted to the *maremmana breed* and *coltural promiscura*, which are extensive autochthonous production units. Other low-intensity production units include mountain pastures, traditional olive groves, lowland steppes, hill pastures, coppiced woodland grazing and traditional arable crops.

Specific features of agricultural production in Spain

Spain is the most mountainous country in the EU; this, among other factors (climate, holding structure) has resulted in there being a wide variety of agricultural patterns and large regional differences —particularly in the south.

Spain's autonomous communities (regions) exhibit marked differences in production types. Thus, the Cantabrian coast, with an Atlantic climate, focuses on livestock (particularly dairy cattle). On the other hand, Madrid and Catalonia concentrate on intensive livestock (pigs and poultry). On the plains of central Spain, cereal holdings and vineyards are the main production units. Finally, in the south and east, and on the islands, which have a more arid climate, vegetables and fruits, and olive trees, contribute a high proportion of Final Agricultural Production.

Broadly speaking, Spain is a major producer and exporter of fruit and vegetables; also, it is the world's largest producer of olive oil. In addition, it produces meat and cereals in quantities that are above the European average.

According to Bignall and McCracken, 82% of the Spanish UAA is under low-intensity farming. Such a high proportion includes dryland arables, olive groves and extensive livestock. *Dehesa* (an agro-forestry system), cereal steppes —subjected to periodic fallowing— in the central regions and residual transhumance in the north are specific to this Member State. Spain also has some intensive production units such as the plastic greenhouses in the southeast.

Specific features of agricultural production in Sweden

Sweden has only 7% of UAA. Despite its large total area, more than one-half is forestry land and a sizeable fraction of the rest is occupied by mountains, marsh land and lakes. Swedish agriculture consequently has little significance in absolute terms within the EU. In relative terms, silviculture (forestry) contributes three times as much as agriculture to the Swedish GDP. Even so, 20–30% of all rural jobs correspond to these two sectors.

The Swedish agricultural production specialises in cereals —which occupy 45% of all arable land—, dairy products and porcine livestock. However, the most salient feature is the large difference between the north and south as a result of climatic factors.

About 70% of the population is concentrated south of Stockholm, in an area where bread making cereals, oilseeds and beet predominate. These regions, and the central plains, are highly productive —they encompass more than 10,000 ha devoted to vegetable production.

Conditions are not so favourable for agriculture in the north, where fodder crops, meadows and grassland are abundant. Dairy production, historically very important, has recently given way to beef. Reindeer are also important in the north.

Notwithstanding its high agricultural inputs, Sweden possesses a high environmental potential that could be exploited by tourism or rural development initiatives.

Specific features of agricultural production in the United Kingdom

In the last few years, the United Kingdom has seen a marked decrease in the number of agricultural jobs and in the contribution of agriculture to its domestic economy. Even so, agriculture continues to have considerable weight (particularly in relation to meat and cereal production, which are close to the European average).

One of the most salient features of agriculture in the UK is the marked differences among regions, which result from a number of factors.

England maintains a relative equilibrium between the land area devoted to arable and stock farming. Thus, cattle and sheep production prevails in the north, the southeast and the border regions with Wales. On the other hand, arable crops are more important in central, eastern, southern and south-eastern England, where agriculture is much more diversified.

With regard to *Wales*, the centre, north and south specialise in sheep farming, whereas in central-western zones cattle predominate. In the west, dairy farming is very important. Arable farming, much less significant, can be found in the eastern and south-western regions (mainly cereals, oilseeds and potatoes).

Based on a study of the Macaulay Land Use Research Institute, only 5.7% of the land in *Scotland* is fit for arable crops. This has led to the prevalence of cattle and sheep virtually throughout Scotland; especially important are the Scottish Blackface and Cheviot breeds in upland areas. Some dairy farms can be found in the south and west, the best land lying in a narrow coastal strip in the East, where cereals, other arable crops and mixed farming (in that order) are increasingly significant the further north one travels. Despite its territorial predominance, livestock production accounts for only 60% of the Scottish FAP.

The situation in *Northern Ireland* looks more extreme, with only 5% of its FAP derived from arable crops. Intensive livestock production, which contributes 18% of the FAP, is important in relative terms here, even though the most prominent production unit is livestock.

2.3.2. Organic farming

2.3.2.1. Historical development

Organic farming dates from the very beginnings of agriculture. In fact, the earliest food producers used techniques that continue to be employed by organic farmers today, so it is not adventurous to state that organic farming is the oldest agricultural system in the world[43].

However, in a more modern context, organic farming was effectively brought into being by various movements in central and northern Europe in the early 20 century in response to the existing agriculture which laid the foundations for an environmentally friendly approach to agriculture.

One of the pioneers of organic farming was the Austrian Rudolf Steiner (1861–1925), who taught his "Agricultural Course" as a series of talks to farmers. The course was held in Koberwitz (a German town at the time) and later had a strong influence that materialised in the birth of *biodynamic farming*. Steiner saw the farm as a living being, an organism[44] consisting of harmonically integrated parts and subject to both material and immaterial influences. He warned about land destruction as a result of the use of chemicals and recommended their replacement with biodynamic compounds based on plants or micro organisms to activate compost in farming soil.

Following Steiner's teachings, the earliest biodynamic farms were established in Austria, Switzerland, The Netherlands, Sweden, Norway and the United Kingdom during the late 1920s and early 1930s. Pfeiffer (1899–1961), a co-worker of Steiner's, published the principles of biodynamic farming in the USA in 1929; this facilitated its popularisation —albeit with a lighter philosophical load— in English-speaking countries.

43 Lampkin (1992), quoted in http://www.healthyag.com/alter_mod.html.

One other branch, called *organic–biological farming*, was founded by the Swiss Hans Müller (1891–1988) and the microbiologist Hans Peter Rusch (1906–1977) in the late 1930s. The term organic–biological farming (*organisch–biologischer Landbau* in German) was coined in 1949. Müller and Rusch advocated the optimum use of natural resources in order to ensure food safety —understood as self-sufficiency— in the future; their approach included the use of fresh humus instead of synthetic agrochemicals, for example.

The principal training centre for organic farmers in Switzerland, Austria and Germany was established in Möschberg, near Bern (Switzerland)[45]. Organic–biological farming relied on a concept similar to sustainability as understood today. It influenced farmers in German-speaking countries mainly and coexisted with biodynamic farming.

The most influential contemporary movement was perhaps that emerging from the work of Sir Albert Howard (1873–1947), who is held by many as the father of modern *organic farming*. Howard, a British colonial officer in India, worked as an agricultural researcher for over 25 years (1905–1931). In 1940, he published a strongly influential book called "An Agriculture Testament" where he reported the results of his experiments. Among others, he drew the conclusion that the presence of crop pests was a sign of inappropriate management; also, he emphasised the advantages of using fresh humus to improve soil structure. Later on (1946), Lady Eve Balfour, inspired by Howard's teachings, founded the Soil Association to disseminate organic practices in English-speaking countries.

Notwithstanding the different initiatives that emerged during the 1940s and 1950s, organic farming as such was then restricted to a marginal movement on a few European farms. The main reason was that the primary aim of post-war farming was to raise agricultural productivity in order to accomplish self-supply —a result that could hardly have been expected from organic farming.

The late 1960s and early 1970s saw a switch in social awareness to the effects of mainstream agriculture on nature. In response, the International Federation of Organic Agriculture Movements (IFOAM) was established in 1972, and the most important ecological research institution, viz. the Research Institute of Organic Agriculture (FiBL), was founded in Switzerland two years later. In 1975, Germany launched the foundation Ecology & Agriculture (SÖL/SOEL) to coordinate the exchange of experience and information in organic farming.

Organic farming grew in a sustained manner from the late 1970s onwards thanks to the firm support of ecologist and environmental protection movements. However, it was only in the 1980s and 1990s that it grew in an exponential manner with its adoption and regulation by a number of European countries. The crucial landmark in this respect for the European Union was the issuance of Council Regulation (EEC) 2092/91 on the production, certification and labelling of organic products.

AUSTRIA has played an active role in the development of the current organic farming model since the beginning. Thus, biodynamic farming and organic–biological farming currents developed in part on Austrian ground (Pohl, 2002)[46], the earliest organic farms being established in Carinthia (Kärnten) in 1927 and 1935. The following years saw a slow, yet sustained growth in land area converted to ecological use. However, the greatest boom occurred in the 1990s, promoted by the support measures instituted by the Austrian government and the country's entry into the European Union.

44 Hence the name "organic farming" used.

45 http://www.organic-europe.net/. This web site contains reports including the history and development of each country examined. The report and authors cited in this section have been extracted from there.

46 Pohl, A. (2002). "Organic Farming in Austria 2002". In: Steffi and Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net/. Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

Organic farming in **FRANCE**[47] dates from later times. As stated above, the earliest organic production movements expanded across English- and German-speaking European countries during the first half of the 20th century; by contrast, such movements had little influence on French agriculture at the time. In fact, the first significant event in this respect was the development of the earliest French standards by the *Nature & Progrès* producers association in 1972; the standards were intended to regulate production by the association members.

This movement raised the awareness of the French government in 1981 and led to the passing of the first specific norms for organic farming in France. However, it was not until 1988 that the first state logo appeared on the market.

With the passing of EEC Regulation 2092/91, France adopted the European directives on organic farming. However, the French government not only applied this legislation, but also instituted its Multiannual Plan for the Development and Promotion of Organic Farming in 1997; the plan was scheduled to last 5 years and provides farmers with subsidies worth 10 million euros.

As opposed to France, **GERMANY** was involved in the birth of ecological currents from the beginning. Steiner's talks in Germany in 1924 led to the establishment of biodynamic farms; these developed slowly in the beginning, but grew substantially after the Demeter Association was founded in 1954.

One should bear in mind that Hans Peter Rusch, the physician and microbiologist who founded organic–biological farming together with Müller, was German. In fact, it was he who laid down the theoretical grounds for this type of production system and his later publications that helped popularise it.

There were successive initiatives in Germany (Haccius and Lünzer, 2000)[48] in subsequent years. Thus, the Association for the Cultivation of Organic Fruit, Vegetables and Field Crops (ANOG) was created in 1961 —ten years before the producers' organisation Bioland was founded. Also, SÖL, which was created in 1975, facilitated the development of IFOAM in its early infancy.

Worth special note in this context are the ecological production standards promoted by German farmers during the 1980s. Their joint effort led to the establishment of the Association for Organic Farming (AGÖL), a federation encompassing six producers' organisations, in 1988.

The blossoming of ecological farming in **ITALY** took place in the 1970s and led to the creation of the National Commission for Organic Agriculture in the mid-1980s (Compagnoni *et al.*, 2000)[49]. This federation of local organisations developed their own standards that were adopted at a national level. Even so, this initiative was somewhat limited compared to the developments that followed the subsequent issuance of Regulation 2092/91.

In **SPAIN**, organic farming started in the very late 1970s (Gonzálvez, 2003)[50], promoted by young people coming from the towns. From then to the mid-1990s, it grew at a low, but sustained rate. A crucial change was brought about by the adoption in 1995 of the horizontal measure regime, which included subsidies for organic producers. One clear reflection of its impact was the fact that the registered area increased by a factor of four from that year to the next. Also, the second half of the 1990s saw an exponential growth of both

47 The account of the history of farming in France has relied heavily on Reynaud and Schmidt (2000). http://www.organic-europe.net/.

48 Haccius, M. and Lünzer, I. (2000). "Organic Agriculture in German". In: Steffi and Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net/. Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

49 Compagnoni, A. et al. (2000). "Organic Farming in Italy". In: Steffi and Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net. Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

50 Gonzálvez, V. (2003). "Organic Farming in Spain 2002". In: Steffi and Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net/. Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

the organically cultivated area and the sector as a whole.

The establishment of the first biodynamic farm in **SWEDEN** in the 1940s was an isolated case. In fact, it was not until the 1980s (Källander, 2002)[51] that a forum for the mutual cooperation of ecological producers called the Co-operation Group for Alternative Agriculture (SAO) was formed. In the same decade (specifically, in 1989), the first public programme to support organic farmers was implemented in response to pressure from the National Association of Alternative Farmers (ARF), which had been created in February 1985.

The year 1995 was a landmark for the Swedish ecological sector, promoted by the entry of Sweden into the European Union; as a result, the applicable Swedish legislation had to be adapted to Regulation 2092/91. In addition, the Swedish government launched its Aktionplan 2000, a plan intended to foster organic production that was co funded with the new European aid in support of agri-environmental measures. All this resulted in a marked increase in certified area, a trend that persists today.

The **UNITED KINGDOM** has been indissolubly linked with the development of European organic farming from the outset. The principal architect of its implementation in the UK was Sir Albert Howard, with his research work from India; in fact, some organic farms on British ground date from the 1930s. However, the organic movement (Soil Association, 2002)[52] only gained consistency and projection with the publication of Lady Eve Balfour's book "The Living Soil" and the establishment of the Soil Association in the 1940s.

This organisation developed the earliest British standards in 1967 and created the first enterprise for the inspection and certification of ecological farming in 1973. New initiatives emerged in subsequent years that consolidated the British organic sector as one of the most important in Europe. This stream of events led to the passing of the Action Plan to Develop Organic Food and Farming in England in July 2002.

- Organic farming can be considered the oldest agricultural system in the world.
- The foundations of modern organic farming were laid between the 1920s and 1940s in central Europe by pioneers such as Steiner, Müller, Rusch and Howard.
- The late 1980s and early 1990s saw an exponential growth in the organically managed land area, which resulted from a switch in consumers' awareness and from the regulation and funding measures adopted by governments, among other factors.

2.3.2.2. Related organisations

The largest international platform for exchange and cooperation in organic farming is probably the *International Federation of Organic Agriculture Movements* (IFOAM), which was created in 1972. The federation currently has 750 members from about one hundred countries; all member associations have an ecological slant. Its duties include the development of basic standards and accreditation criteria for certification programmes.

Within this federation, the *IFOAM EU Regional Group* focuses its activity on Europe. The group encompasses more than three hundred

51 Källander, I. (2002). "Organic Agriculture in Sweden". In: Steffi and Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net. Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

52 Soil Association. (2002). "Organic Farming in the United Kingdom 2002". In: Steffi and Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net/.. Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

members organised around a board. Members include not only associations from the European Union, but also the EFTA (European Free Trade Association) and, since 2003, others from the EU candidate members. Representatives of the group meet regularly with civil servants of the European Commission. In the near future, the regional group is scheduled to work towards the harmonisation of the IFOAM standards and those included in Regulation 2092/91.

In 1963, FAO and WHO launched a joint programme called *Codex Alimentarius* with the primary aim of standardising foods in search of safety. At present, the Codex encompasses not only food standards, but also codes of good practice, maximum permitted levels of residues in foods, and methods for the evaluation of pesticides, additives and drugs, etc. The Codex is included in this section because it has developed specific standards for the production, transformation, labelling and marketing of organic products under the prestigious umbrella of the FAO and WHO.

Demeter-International e. V., founded in 1997 by 19 national Demeter organisations, is currently present on the market in 35 countries; it boasts more than 3,500 certified products and over 100,000 certified hectares. The Demeter logo, which symbolises biodynamic production, was introduced in 1928 and remains the oldest, best known logo for this farming system. One of the principal duties of Demeter-International is to issue the production and labelling standards passed by its member organisations.

Additionally, there have been many initiatives to create associations at the regional and local level in Europe. Supranational organisations are not so common, however.

ANNEX 4 briefly reviews the principal national and regional organisations.

- There are various international organisations involved to a different extent and using different approaches to the ecological agrosystem.
- There have been many associationist initiatives at the regional and local level. Supranational organisations are not so common in Europe, however.

2.3.2.3. Associated production techniques

Organic farmers use a wide range of production techniques that are shared by other agricultural systems. In fact, most ecological practices are not exclusive to organic production, but rather are common to conservation farming and integrated farming, among others. It should be noted that, while organic farming differs among the seven Member States examined, production practices are similar enough to enable joint study.

Because dealing with every possible variant would be beyond the scope of this report, this section deals with selected techniques and restrictions that are grouped into two blocks, namely: crop production and livestock production.

The techniques used in organic **crop production** cannot involve synthetic chemical inputs —a restriction typical of this agricultural system that conditions its development in many ways.

For example, *fertilisation* must meet the nutritional requirements of crops without the use of synthetic chemical fertilisers. The most widely employed practice in this context is probably the use of organic fertilisers of animal origin such as manure, slurry and poultry droppings. Also, organic urban waste is being increasingly used as an amendment, not only in organic farming, but also in urban farming.

Planting leguminous crops increases the amount of nitrogen available in the soil. Any mineral inputs used should be restricted to isolated situations and specific products.

The *phytosanitary control* techniques employed in this context include the following:

- Bait plants, which are used as insect attractants and allow one to identify those situations where the insect density makes

phytosanitary treatment advisable. Any such treatment must obviously avoid the use of synthetic chemicals.

- Repellent plants, which reduce the density of crop pests.
- Physical methods ranging from the removal of the plant parts affected by pests or diseases to traps and barriers.
- Biological pest control, which is defined by OILB as "the use of living organisms or products thereof to avoid or reduce (not eliminate) the losses caused by noxious organisms." Romera[53] distinguishes the following:
  - Antagonistic micro-organisms (viz. bacteria or fungi that act via antibiosis, competition, predation or hyperparasitation mechanisms).
  - Biological control with arthropods, which involves the use of pheromones, insect growth regulators, entomopathogenic or entomophagic organisms, etc.

The block *improvement of the agricultural ecosystem* includes techniques with beneficial effects in the broadest sense that span the different aspects of production:

- Use of varieties adapted to the local cropping conditions.
- Crop rotation.
- Crop association.
- Use of living or dead plant covers.
- Integration of crop production and livestock production on farms in order to exploit their mutually beneficial interaction.
- Minimum tillage, no tillage and manual tillage.
- Energy saving and use of renewable forms of energy.

This is probably the agricultural system with most *restrictions*. By way of example, European Community (EU) legislation has banned genetic manipulation —i.e. GMOs are forbidden— and food irradiation —a restriction which is also imposed on livestock.

Regarding **livestock production**, farmers must comply with the principle of complementariness between soil and animals —which excludes housing the latter in closed barns, for example. Therefore, organic livestock cannot exist in isolation from soil within the EC scope. As with plant production, the prohibition of using synthetic chemicals has narrowed the range of available choices.

Especially prominent among *restrictions* is that imposed on herd density. Thus, the number of animals per hectare cannot exceed the equivalent in manure of 170 kg of nitrogen per ha per year, which minimises any form of contamination. The resulting equivalent would thus be two dairy cows or 580 broilers per ha, for example. Farmers must also comply with cattle housing and transportation regulations that are stricter than those in the general legislation. The specific prohibitions include the use of antibiotics, hormones and growth promoters.

A number of public and private institutions have regulated organic production via certification schemes of voluntary adherence. Candidates must comply with specific procedural patterns contained in the standards in order to be eligible for participation. Because these schemes are by now widely implemented, farmers usually restrict their practices to those allowed —or at least not prohibited— by the standards they adhere to.

- Most of the techniques used in organic farming are not exclusive, but rather shared by other farming systems.
- This is probably the farming system with most restrictions. All of them, synthetic chemical inputs, genetic manipulation and food irradiation are forbidden.

53 http://www.infoagro.com/agricultura_ecologica/agricultura_ecologica.asp.

- Animal production cannot be understood in isolation from soil. Specific prohibitions include the use of antibiotics, hormones and growth promoters.

2.3.2.4. Geographic distribution and land area of the major crops

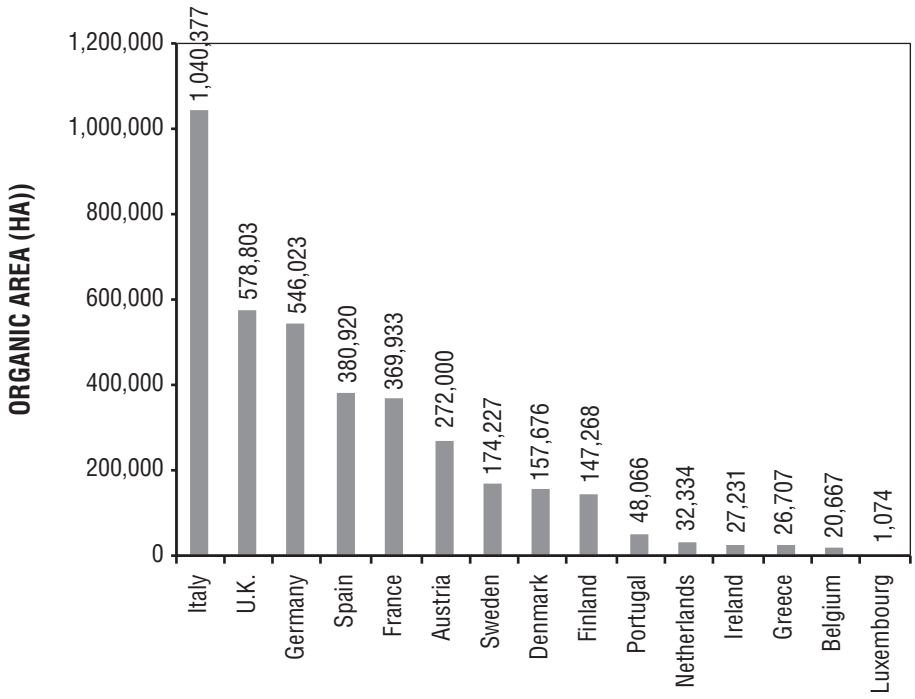
Based on the survey conducted jointly by SÖL[54] and FiBL[55] in February 2003[56], the area under organic farming in the world amounts to 22,811,267 ha. Note that nearly one-half is located in Australia, with 10.5 million ha. Other important countries in this respect are on the American continent (viz. in Argentina with 3,192,000 ha, USA with ca. 950,000 ha and Uruguay with 678,631 ha). However, the European Union as a whole constitutes the second region in the world after Australia.

One other measure of the significance of organic farming is the number of holdings it encompasses (398,804 throughout the world). The countries with the largest numbers of organic farms include Italy, Indonesia, Mexico, Uganda and Peru. This ranking does not coincide with that of the countries with the largest organically cultivated area.

According to official sources[57], in 2000 the **European Union** had an ecological area of 3,823,306 ha (*versus* only 2,287,577 in 1998), which accounted for 3% of the Community's Utilisable Agricultural Area (UAA). Based on preliminary data, the number of organic farms was 132,552 (32% more than in 1998). Despite their still low weight, these organic holdings already account for 2% of the Community's farms.

As can be seen from **graph 2**, the ecological area ranking is topped by Italy, followed by the

Graph 2: Organically cultivated land area (ha) in the European Union in the year 2000.



Source: EUROSTAT, 2003.

54 Stiftung Ökologie & Landbau (SÖL) Foundation Ecology and Agriculture. http://www.soel.de/english/index.html
55 Forschungsinstitut für biologischen Landbau (FiBL) Research Institute of Organic Agriculture. http://www.fibl.org/english/index.php
56 Quoted in Yussef and Willer (Eds), (2003). http://www.ifoam.org/statistic/statistics_studie.pdf.
57 EUROSTAT, 2003. http.//europa.eu.int/comm/eurostat/Public/datashop/print-product/EN?catalogue=Eurostat&product=KS-NQ-03-002-N-EN&mode=download. More recent data which, however, are unofficial or do not encompass every member state, have been published. ANNEX 5 updates some of the figures in the official analysis for each country.

United Kingdom and Germany with similar figures. Forth and fifth in the ranking are Spain and France, respectively.

Regarding the proportion of ecological area relative to UAA, Austria and Italy share the top of the ranking, both with 8%, followed by Finland (7%), Denmark and Sweden (both 6%), the United Kingdom (4%) and Germany (3%).

Especially surprising is the dramatic development in Italy, which is by far the member state with the largest organically cultivated area after Germany and Austria topped the ranking in the early 1990s[58].

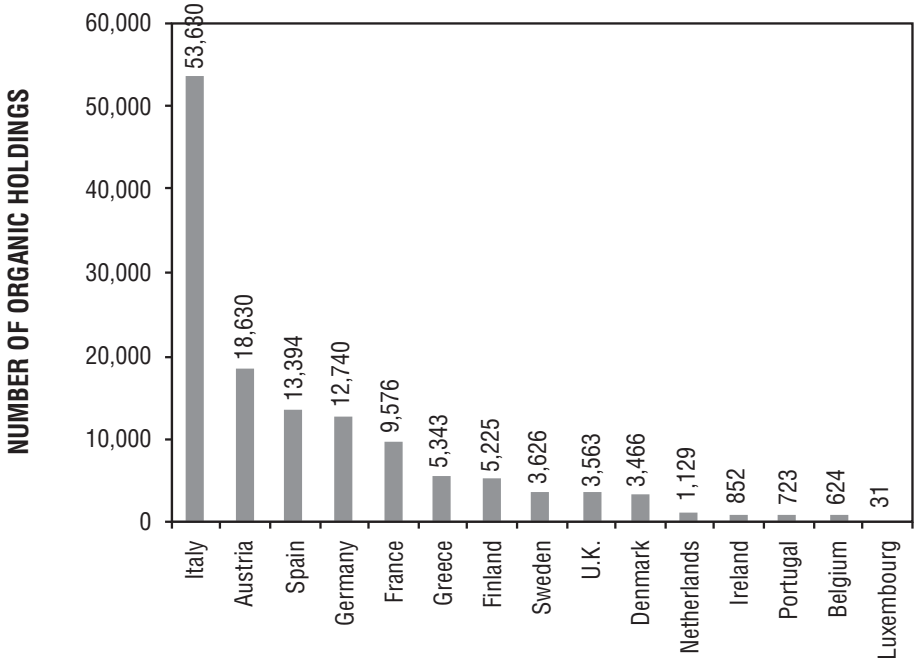
Italy is also the first country in terms of organic holdings (**graph 3**), with more than 50,000 and followed by Austria, Spain, Germany and France. On the other hand, Austria is the first in relative terms, with 9% of ecological farms, followed by Finland and Denmark (both 6%), and Sweden (4%).

Based on the above-mentioned survey[59], the area under organic farming in the European Union in 2001 (*i.e.* the year following that of the EUROSTAT data) totalled 4,442,876 ha (3.24% of the UAA).

As regards crops[60], in 1998, 51.9% of organically cultivated area was devoted to the production of grassland and fodder crops, 20.9% to arable crops, 12.2% to horticulture and 15.1% to miscellaneous crops. The fact that more than one half of the area was used for grassland and fodder crops underlies the significance of ecological livestock in the EU. The survey also estimated that, in 1998, an overall 280,000 dairy cows produced 1,100,000 tons of milk and that there were about 500,000 head of other cattle, 230,000 pigs, 7,000,000 poultry and 400,000 head of sheep and goats.

The spatial distribution of production types varied with farm location (EUROSTAT, 2003).

Graph 3: Number of organic holdings in the EU in the year 2000.



Source: EUROSTAT, 2003 (preliminary data).

58 Foster and Lampkin. (2000). http://www.organic.aber.ac.uk/library/European organic farming.pdf.
59 SÖL/FiBL, 2003.
60 European Commission (1998). http://europa.eu.int/comm/agriculture/qual/organic/facts_en.pdf.

Thus, in northern Europe, cereals, forage crops and pastures and meadows accounted for most of the organically cultivated area; in western Europe, pastures and meadows was the single most dominant crop; and in southern Europe, pasture and meadows, forage crops, cereals and olive plantations were the most important organic crops.

This production system is not so important in the ten candidates to join the EU in 2004. In 2001, the organically cultivated area in such countries amounted to slightly less than 500,000 ha (SÖL/FiBL)[61]. Especially prominent among them were the Czech Republic and Hungary, with a combined ecologically managed area of 323,114 ha. By contrast, ecological farming in Poland —a country with a large farming area—was still at an embryonic stage.

ANNEX 5 provides more detailed land area and geographic distribution data for the seven countries examined.

- Of the nearly 23 million organically cultivated hectares in the world, 10.5 million are in Australia. The European Community as a whole with 3,823,306 hectares is the second world region in terms of organically farmed area.
- taly is the first EU country in terms of both ecological area and number of organic holdings. On the other hand, Austria is the first in relative terms.
- Despite the absence of comprehensive ecological livestock statistics, the fact that most of the land area is devoted to pasture and meadows underlies the significance of animal production in the region.

2.3.2.5. Regulation and subsidies

For the organic farming system to be fully trusted by consumer bodies other than those involved in the production, transformation and marketing of organic products must ensure that these processes conform to specific practices and procedures. The European communities have undertaken this task and passed special legislation on the various aspects of the ecological agrosystem.

In Europe, some national authorities pioneered the establishment of a legal framework for organic farming; this movement, however, only reached community-wide status with the coming into force of Council Regulation (EEC) No. 2092/91 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs. The regulation is organised around three instruments, namely:

- Regulated standards (production rules).
- Certification procedures (compulsory inspections schemes).
- A specific labelling scheme.

In the more than ten years since its coming into force, the regulations have been implemented to a great extent. Thus, virtually the whole organic farming area in the European Union has adhered to the certification schemes of the European Communities. It should be noted that the regulation made no provision for subsidies to provide incentives to organic farmers; these, however, have had access to funding lines for its implementation.

Subsequently, the Council issued Regulation (EEC) 1804/99 supplementing Regulation 2092/91 on organic production of agricultural products and indications referring thereto to include livestock production. As stated in the title, this regulation supplements that of 1991, which focused on arable farming, with references to the production, labelling and inspection of the major cattle species.

Regarding organic *production* rules for farms, Annex I to Regulation 2092/91 and its subsequent

61 The candidate members are Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. No data for Malta are available.

updates have set the organic production principles to be followed in relation to plants and plant products, animals and animal products, and bee keeping and apicultural products. Annex II of the regulation provides a comprehensive list of the products that can be used by organic farmers, as well as their description, composition requirements and usage.

The organic sector has been legitimated by establishing a specific *control* and *inspection* scheme operated by public authorities and/or authorised private bodies in the EU Member States. The scheme is described in greater detail in the following section.

Although, as noted earlier, Regulation 2092/91 made no provision for *subsidies* to organic producers, the following year the Council issued EEC Regulation 2078/92 to support environmentally compatible production methods, in to which organic farming fitted quite well. With the passing of Agenda 2000, this funding line has been strengthened; in fact, EC Regulation 1257/99 includes funding provisions for agri-environmental measures[62].

Unlike other EC farming subsidies, agri-environmental measures are co funded by the European Union and its Member States in a proportion that varies with the specific region —in objective 1 regions, for example, the Community co funds up to 75% of subsidies. In addition, the national governments —and the regional ones in those countries where management is decentralised— have a wide margin for manoeuvre when setting the level of subsidies, which can vary with production type, zone, *etc.* The maximum amounts that can be granted have been established by the Council and can only be exceeded in exceptional situations specified in the regulations. Such amounts are as follows:

- 600 €/ha for annual crops.
- 900 €/ha for specialised perennial crops.
- 450 €/ha for other land uses[63].

The subsidies supporting of agri-environmental agreements will be granted on a yearly basis and fixed in terms of the loss of revenue, supplementary costs derived from the agreement and the need to provide an incentive. The cost of the non-productive investments required to fulfil the agreement may also be considered in establishing the amount of each aid. These subsidies are compatible with other agri-environmental subsidies provided payments are made for goals other than organic farming.

One other distinct feature is that eligible farmers agree to maintain agri-environmental measures for at least five years instead of a single season. As per article 1 in Annex I to Regulation 2092/91, in most cases the conversion period must be two years prior to sowing for arable crops and three for perennial crops. This compulsory period for the conversion from mainstream agriculture to organic farming usually raises costs, so subsidies for the conversion of a plot into organic land may exceed maintenance subsidies.

ANNEX 6 describes existing aid and other measures at the national and regional levels.

- The European Community has undertaken the duty of assuring the conformity of organic products with specific practices and procedures. To this end, they have regulated the production, transformation and marketing of ecological products via regulated standards, certification procedures and a specific labelling scheme [Council Regulation (EEC) 2092/91].
- Agri-environmental measures, an accompanying measure for rural development, provide the main funding line for organic producers. They are included in EC Regulation 1257/99 and intended to subsidize the use of environmentally compatible agricultural production methods.

62 It should be noted that organic farms can receive the same aids as any other agricultural farms in the European Union regarding direct payments or price measures.

63 These include grassland, forage and meadows for animal feeding. Payments provide direct funding for organic cattle breeders as animal production must always be bound to the land.

2.3.2.6. Control, certification and labelling

Certification is an indispensable tool for the current organic farming method as the means to ensure conformity of organic products with specific practices and procedures. Quality certification schemes act as third parties which bolster safety and consumer confidence. This, however, does not preclude the persistence of an organic market based on the mutual trust of the farmer and buyer, without the need for certification. Such is the case, for example, with direct sales or when the consumer and producer is the same person (viz. self-supply).

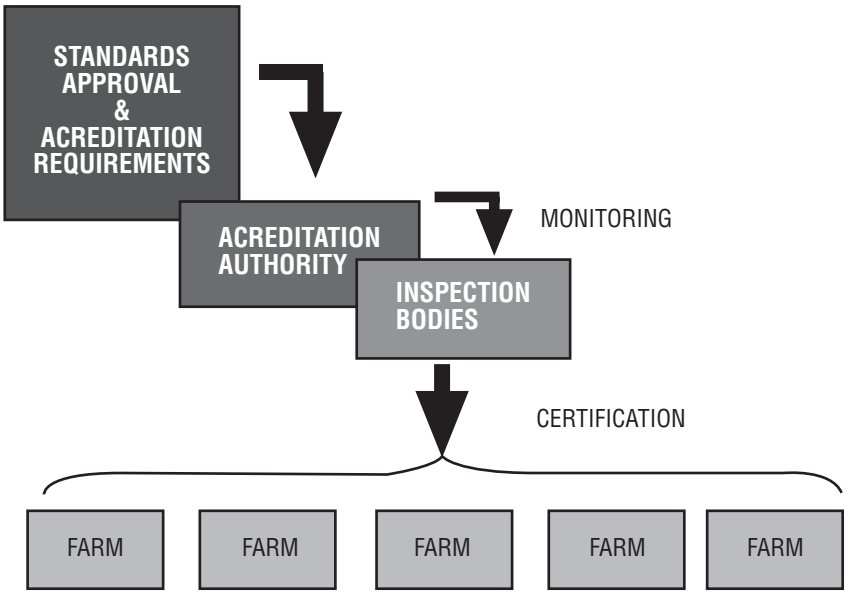
Although the most visible elements for the producer are the controls performed by inspection bodies on farms in order to check that they comply with the standards adhered to, the certification scheme includes other components. **Graph 4** shows a simplified scheme of the more usual steps of the process.

There have been various initiatives from associations and organisations, both in Europe and elsewhere, aimed at assuring compliance with specific patterns. Recently, public administrations have started to regulate production by implementing dedicated policies.

The international organisation IFOAM has its own certification scheme for organic farming. IFOAM passes organic standards (IFOAM Basic Standards)[64] and, in 1991, established the IFOAM Accreditation Criteria for Certifying Programmes. Although it validates accreditation criteria, it does not accredit certifying bodies itself. This task is entrusted to IOAS (The International Organic Accreditation Services, Inc.), a daughter organisation. Thus, IOAS-certified bodies —mostly private— conduct the inspections of organic holdings in each country.

The most important international federation of biodynamic farming associations, Demeter-International e.V., has an International Accreditation Council that is entrusted the harmonisation of certification programmes. Variability among programmes arises from the fact that each member organisation establishes the guidelines for the certification and inspection of biodynamic

Graph 4: General scheme for accreditation and certification in organic farming.



Source: The authors.

64 http://www.ifoam.org/standard/intro_bsdraft03.html.

farms within their scope. In those countries where no Demeter organisation exists, certification is provided by authorised inspection bodies.

Interestingly, the establishment of production and marketing standards does not necessarily imply the availability of an inspection scheme.

For the purpose of this study, the most interesting inspection scheme is that organised around Council Regulation (EEC) 2092/91, which applies to the whole European Union — including the seven countries examined here. This regulation includes the standards to be adhered to by organic operators, namely: the principles of organic production on farms, the products that can be used and the transformation of organically produced farm products.

Based on the scheme of **graph 4**, the European Communities *pass standards and regulate accreditation requirements*. However, the *accreditation power* rests with the respective competent authorities in the Member States. As a rule, the competent authority is the central government; in Austria and Germany, however, the Länder control the certifying activities of authorised bodies[65]. Similarly, the Spanish autonomous communities are in charge of this task.

The Community's terminology distinguishes three different types of inspection systems. Depending on their public or private nature, the *inspection bodies* in **graph 4** can be classified as follows:

- A system of approved private inspection bodies;
- one of designated public inspection authorities; or
- a combination of the previous two.

Since January 1, 1998, approved inspection bodies must meet the requirements laid down in the conditions of standard EN 45011.

Obviously, the most visible aspect of this inspection system for the consumer is labelling and its specifications. The Member States use public and private logos to distinguish organic products. In order to facilitate their identification on the market, in 2000 the Commission, via EC Regulation 331/2000, adopted a specific voluntary, free logo for organic production to be used throughout the European Union on those products meeting the requirements established by the standards. The buyers of such products are assured of the following:

- That at least 95% of the product ingredients have been produced using organic methods;
- that the product complies with the regulations of the official control system;
- that it comes directly from the producer or transformer and is supplied in a sealed package;

- that it bears the name of the producer, maker or vendor, as well as the name or code of the inspection body.

65 http://www.defra.gov.uk/farm/organic/imports/euinspect.pdf.

ANNEX 7 summarises the features of the control, certification and labelling system for each country examined.

- The Community's model for organic certification involves three major functions, namely:
  - The development of standards and accreditation criteria, which is the competence of the European Communities.
  - The accreditation of inspection bodies, which is the responsibility of the respective national or regional governments.
  - Certification and inspection, which are done by public authorities and/or private bodies.
- For inspection bodies to perform the certification and inspection functions established under Regulation 2092/91, they must previously be accredited by the competent authority and comply with standard EN 45011.

2.3.2.7. Specific details of the transition to the system

The transition to organic farming in the European Union has been strongly conditioned by the Community's regulations. Thus, operators wishing to adhere to Regulation 2092/91 must go through a transition process from mainstream agriculture to organic farming that is described in detail in the annexes to the regulation and is identical in all Member States.

Regarding crop production, arable crops in general must comply with the regulated organic principles for at least two years prior to sowing. The period for the conversion of pasture and meadows into forage crops is also 2 years and that for wood crops 3 years. With few exceptions, the conversion period starts when the beginning of the activity is reported and the plot to be converted adheres to a control regime[66].

Animal production cannot be understood in isolation from soil. As a result, the period for conversion of plant area to animal production is the same. All animals in a production unit must be bred in compliance with the regulation —with the exception of physical separation between different species and a few other aspects. As a rule, the conversion periods for the different species are as follows:

- twelve months for horses and cattle;
- six months for small ruminants;
- six months for animals for dairy production;
- ten weeks for poultry for meat production; and
- six weeks for poultry for egg production.

There is also the possibility of simultaneous conversion when the whole production unit (animals, grassland and/or any plot used to feed animals) switches to organic use, which, under some restrictions, will last 24 months.

- The general conversion periods established in the Community's regulations are two years for arable crops and pasture and meadows, and three years for perennial crops.
- The conversion periods for livestock production range from 6 weeks to 12 months.

2.3.2.8. Implications of multifunctionality

Mainstream agriculture, as defined in this report, has brought with it some advantages and

66 The conversion periods in the Codex Alimentarius Organic Guidelines 1999/2001 are similar to those in the EC regulations. The IFOAM Basic Standard 2002, however, establish a minimum of one year prior to harvesting and two for perennial crops.

disadvantages. These have been widely discussed in the scientific literature about the effects of the green revolution, the current agricultural model in Europe and its multifunctionality, and agrosystems in developing countries, among others.

Table 1 in **ANNEX 8** shows some of the negative externalities potentially resulting from mainstream agriculture —no evidence of a two-way cause–effect relationship exists, however. No doubt, these effects have affected the growth and dissemination of organic farming as a means for obtaining more environmentally sensitive foods and products.

In this context, organic production has established a series of production and marketing patterns, among others, that can be viewed as a response to some negative externalities for traditional farming. For a product to be identified as ecological on the Community's market, it should not have been produced using synthetic chemical inputs —a restriction imposed by Regulation 2092/91. Restrictions are even stricter in other aspects as the regulation prohibits the use of antibiotics, hormones and growth promoters; bans genetic manipulation and food irradiation; and makes some animal welfare measures compulsory.

This immediately raises questions such as the following: will these regulations avoid or lessen any of the above-described externalities? Will these ecological practices generate positive externalities on the environment, human health, employment, etc.? The answers to these questions are not so immediate, however.

The European Commission's working document "Analysis of the Possibility of a European Action Plan for Organic Food and Farming" [SEC(2002)1368][67] describes some scientifically proven benefits of organic farming such as the following:

- Improved water quality as a result of restrictions on the use of pesticides;
- low autumn nitrogen residues in soil for almost all relevant crops;
- high organic matter contents in organic soils relative to non-organic land; and
- decreased total CO_2 emissions on organic farms.

Despite the discrepancies in some outcomes, the organic agricultural system provides environmental benefits unaffordable by other conventional systems. However, some consumers buy organic products in the belief that they provide other benefits in addition to generating positive externalities.

Regarding food quality, understood as excellence, the above-mentioned Commission document states that some studies have found a higher content in dry matter, minerals, vitamins and flavour-providing "phytonutrients" in organic products (especially green vegetables), and a lower concentration of potentially harmful nitrate. Other studies, however, have been unable to confirm these conclusions. According to Trewavas[68], hundreds of rigorous tests seem to have failed to reveal better-tasting properties or improved nutritional value. Also, the British Food Standards Agency claims that current scientific evidence does not show that organic food is any safer or more nutritious than conventionally produced food[69]. These two positions reflect the present lack of agreement on the potentially higher quality of ecological products.

According to Piason (1999)[70], one of the three categories into which the consumers of organic products can be classified is that of the health-conscious (viz. people who trust environmentally-friendly farming as a system for the provision of healthier foods). However, one cannot claim that

67 http://www.europa.eu.int/comm/agriculture/qual/organic/plan/consult_en.pdf
68 Trewavas (2001). "Urban Myths of Organic farming". Nature, vol. 410.
69 http://www.food.gov.uk/news/newsarchive/cheltenham.
70 Piason. (1999), quoted in Reynaud et al. (2001). "Organic Agriculture in France 2001". In: Steffi and Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net. Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

organic food is safer than non-organic food since all food products sold in the EU must fulfil the same strict criteria on safety.

The risk of contamination of food with pesticides and nitrates [SEC(2002)1368][71] has been found to be lower in organically produced food. Also, the risk of encountering antibiotic residues is assumed to be lower in organically produced meat since the preventive application of antibiotics is strictly forbidden, and therapeutic use is avoided as far as possible.

In comparison with mainstream agriculture, however, more cases of salmonella in eggs, poultry and pork have been recorded[72]. Also, inappropriate management of manure can lead to the infection of cattle with *Escherichia coli* through hay (Trewavas, 2001)[73]; and mycotoxins from contaminating fungi —which are allegedly carcinogenic— are reported to be higher in organic products.

There is more solid evidence, however, that organic farms are normally more labour-intensive than conventional farms[74]. Although it still challenges generalisation, this conclusion is supported by some studies[75].

- There is substantial evidence that organic farming provides environmental benefits not afforded to the same extent by some mainstream agriculture systems.
- Some studies suggest that organic farms are normally more labour-intensive than are conventional farms.
- It is not possible to claim that organic food is safer than non-organic food. Nor that organic food has better taste properties or improved nutritional value.

2.3.2.9. Product marketing

The main difficulty encountered in studying the marketing of organic products is the absence of relevant official statistics. This gap can be bridged with the estimates periodically published by the International Trade Centre (ITC), the technical cooperation agency of the United Nations Conference on Trade and Development (UNCTAD) and the WTO for operational, enterprise-oriented aspects of trade development. It should be stressed that their data are only estimates.

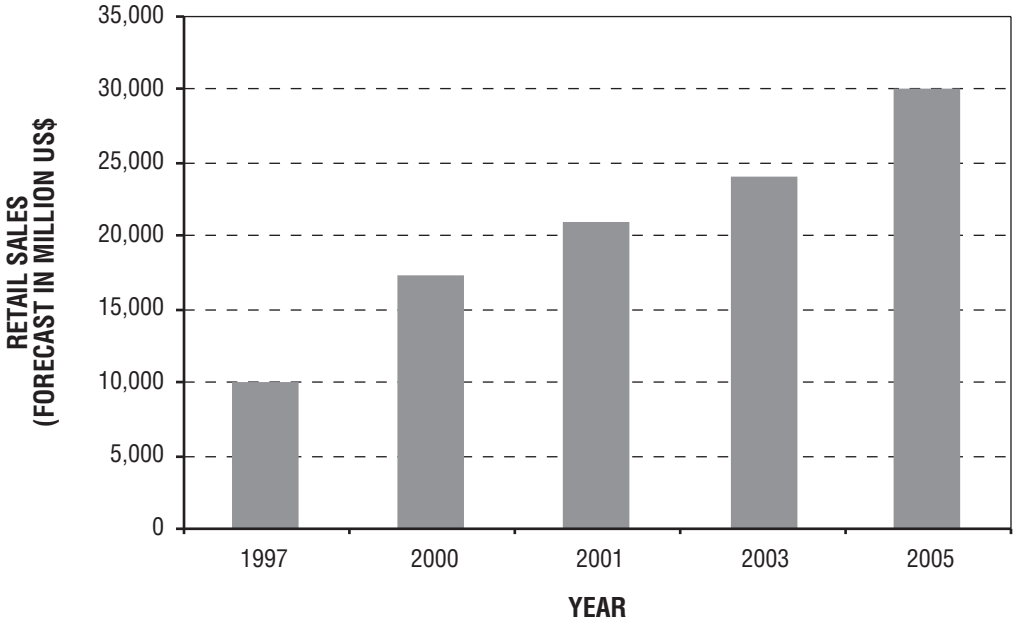
Based on the ITC projections published in December 2002[76], *world retail organic sales* would amount to 23,000–25,000 million euros in 2003 (**graph 5**). However, because of the greatly overstated figure for Japan[77], which included many non-certified products such as so-called "green products", total world retail sails were somewhat overestimated. The USA is the largest organic market in the world, with sales of 11,000 to 13,000 million euros; the European countries in combination occupy the second place, with a turnover of 10,000 to 11,000 million euros and followed, at a long distance, by Canada (850–1,000 million euros), Japan (350–450 million euros) and Oceania (75–100 million euros).

The ITC estimates for the last few years reveal a sustained expansion of the organic market in the world, which is in the process of tripling its figures in less than ten years.

A very high proportion of the total sales in Europe correspond to the European Union market[78]. In fact, four Member States (viz. Germany, United Kingdom, Italy and France, in this sequence) account for more than two-thirds of European ecological trade. Specifically, Germany has traditionally been the country where the organic system has developed to the greatest

71 http://www.europa.eu.int/comm/agriculture/qual/organic/plan/consult_en.pdf
72 http://europa.eu.int/comm/agriculture/qual/organics/facts_en.pdf.
73 Trewavas (2001). "Urban Myths of Organic farming". Nature, vol. 410.
74 http://europa.eu.int/comm/agriculture/envir/report/en/organ_en/report_en.htm.
75 http://europa.eu.int/comm/agriculture/envir/report/en/organ_en/box2.htm.
76 ITC, 2002. http://www.intracen.org/mds/sectors/organic/overview.pdf.
77 Kortbech-Olesen, 2003, quoted in Yussef and Willer (Eds), 2003. http://www.ifoam.org/statistic/statistic_studie.pdf.
78 Switzerland is an exception as it possesses and important ecological market and is the second European country in terms of ecological sales with respect to total sales.

Graph 5: Estimated world retail sales of organic food and beverages.



Source: ITC.

extent and continues to top the turnover ranking. Also, the rapid growth of the British organic market has taken it to the second place in the EU.

Despite the magnitude of the previous figures, the organic market is currently at a deceleration stage, which is logical taking into account the high growth rates of recent years. The situation has been worsened by the presence of potential cases of fraud. **Table 1** in **ANNEX 9** compiles the projections described above.

One other key aspect in the study of organic trade is price formation. Virtually every organic product is more expensive than its mainstream agriculture equivalent, even though the situation may be reversed for specific products or at some times of year[79].

Oddly enough, the premium on organic products does not originate from production costs, but from distribution and processing, which involve relatively small amounts of product. As a result, the substantial premiums paid in some cases do not directly benefit farmers. The real advantage for consumers is that prices might fall due to economies of scale in the future if organic trade grows substantially.

According to Piason (1999), quoted in Reynaud (2001)[80], consumers of biological products can be classified into three categories, namely:

- the politically or ideologically motivated;
- the health conscious; and
- the switchers, who are easily swayed by the media and influenced by price and availability.

The greatest achievement of organic farming is perhaps the very existence of a distinct ecological product market appreciated by consumers. Despite hindrances such as the lack of access to specific products or the absence of a wider choice, the market, judging by the data above,

79 http://europa.eu.int/comm/agriculture/qual/organic/facts_en.pdf.

80 Piason (1999), quoted in Reynaud et al. (2001). "Organic Agriculture in France 2001". In: Steffi and Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net. Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

continues to grow. The most salient feature of the organic product market in the European Union in the late 20th century was the presence of two *marketing models* with a rather different territorial implementation[81], namely:

- Direct sales and specialty shops, which predominate in Belgium, Germany, Greece, Italy, the Netherlands and Spain.
- Supermarkets and non-specialised shops, which are the dominant formulas in Sweden, Denmark, Finland, United Kingdom and Austria.

However, this is a high dynamic sector of the agricultural food system which has experienced major changes in distribution channels. **ANNEX 9** overviews its evolution in the countries examined.

One other aspect for which official data are unavailable is *imports* of organic products across the Community's borders. In any case, such imports are growing in parallel with the development of the market for organic produce. The marketing of such imported products as ecological products can be enabled by:

- having the EU accept the terms of the exporting country as its own (a formula which has so far been adopted by seven Member States); or
- authorising the marketing of products on a case-by-case basis, with December 31, 2005 as the deadline.

- Despite the absence of official statistics, international organic trade has grown in a sustained manner. Europe is the second world market for organic products.
- The usual premium on organic products originates from their distribution and processing rather than from their production.
- The principal distribution channels are direct sales and specialty shops in some Member States, and supermarkets and non-specialised shops in others.

2.3.3. Integrated farming

2.3.3.1. Historical development

The concept of Integrated Farming emerged in 1977 from the meeting held in Ovronnaz (Switzerland) by a group of researchers who signed what has come to be known as the "Declaration of Ovronnaz". These researchers expanded the concept of integrated protection against pests in response to the massive use of synthetic pesticides in Europe and California in the 1950s to include the rational management of the other elements of the agricultural system (*viz.* climate, soil and plant).

The most experienced and authoritative organisation in integrated protection is the International Organisation for Biological Control of Noxious Animals and Plants (IOBC), which has had a certification service for regional integrated farming plans since 1977.

IOBC's efforts to clearly state its position regarding the concept and practice of integrated farming started in the late 1960s to early 1970s and led to the establishment of a Commission on Integrated farming in 1977 and to the development of a procedure for the certification of integrated farming organisations —particularly those involved in the production of apples. In September 1990, the commission undertook the tasks of developing a basic document to define integrated farming, describing the primary approaches to it and establishing technical guidelines and standards for its practice.

In **AUSTRIA**, there has been a long tradition of integrated farming of apples in the South Tirol region. In 1995, many integrated farming schemes were incorporated within ÖPUL (Austria's agri-environment scheme) and became eligible for subsidies. Under this scheme, the environmental performance of farmers is monitored and rewarded to some extent.

Integrated farming in **FRANCE** began in the 1970s. Despite its rather slow initial development, this production system has evolved rapidly and

81 http://europa.eu.int/comm/agriculture/qual/organic/facts_en.pdf.

become a well-known concept in this country in recent years. Lately, efforts by the government and industry have focused on establishing a common formal definition and guidelines with a view to the development of a nation-wide concerted farm certification and product marketing scheme. This has largely been a response to increasing concern over the multitude of schemes that have developed over the years in the different sectors, whether research or commercially driven, and the extent to which these have been properly defined.

The wider drive towards Integrated Farming has been led through a network of demonstration farms coordinated by FARRE[82] (the forum for environment-friendly integrated farming established in 1993). In July 2002, the network comprised 379 farms in 53 regional departments of France and reflected the diversity of French farming.

Several regional and product-specific, independent guidelines were developed from the mid-1990s onwards under the initiative of professional organisations and the support of regional authorities. Some have been amalgamated under the FARRE National Charter, prepared by the organisation's Scientific Council and intended to provide a common reference on integrated farming across France. With the passing of Decree 2002-631, the French civil service has taken on this task.

Integrated farming in **GERMANY** began when growers were required to incorporate the principles of Integrated Crop Management (ICM) into their production systems under German plant protection laws. Most farmers were therefore required to follow basic integrated farming guidelines. For example, the Guidelines for Integrated Fruit Production in Baden-Württemberg were established in the mid-1970s. Early promotion work ensured fast expansion of integrated fruit production in the region and the land area under this production system grew quite substantially until 1999 —after which it has stagnated.

The history of Integrated Pest Management in **ITALY** began in 1976 when the Emilia Romagna region started research into the use of biological and integrated control —particularly of apples. Each Italian region then developed integrated pest management guidelines (*disciplini regionali*) and "positive lists" of products for each crop. In 1986, the Emilia Romagna region promoted a project for expert advisor on integrated pest management and, in 1995, Italy started to implement EC Regulation 2078/92.

At present, the situation is made more complicated by the fact that some local public and private organisations have their own lists of crop protection products and special guidelines for integrated farming. Also, most integrated farming schemes in Italy are operated at the regional level (Emilia Romagna, Trentino and Alto Adige), under EC Regulation 1257/99 in many cases. Retailers have capitalised on a perceived demand for environmentally friendly production by launching own-label integrated farming schemes for fruit and vegetables, which have been followed by meat and fruit juices.

An incipient approach to what is currently known as integrated farming emerged in **SPAIN** in the late 1970s; the movement was encouraged by the knowledge that the massive use of synthetic phytochemicals to control pests and diseases was having some undesirable effects. In this context, integrated pest control fostered natural or artificially induced biological pest control.

After the establishment of ATRIAs[83], Spain followed the same path as the other European countries, *i.e.* it incorporated the rational management of the other elements of the agricultural system into integrated protection.

Notwithstanding the lack of a clear definition and the absence of national regulations in **SWEDEN**, integrated farming is seen as the way forward by many farmers and a host of ICM elements have

82 Forum de l'Agriculture Raisonnée Respectueuse de l'Environnement.

83 Spanish Associations for the Integrated Management of Cotton (ATRIAs) were born in 1979. With the extension of their scope in 1983, they were renamed Associations for Integrated Farming Management but retained the acronym.

already been incorporated into mainstream Swedish agriculture as a result of the high awareness of, and concern for, the environment. The Swedish Seal, introduced in 1995, is a commercial ICM concept for cereals. Grön Produktion, a company owned by the growers' organisations, introduced integrated farming guidelines for field vegetables in 1999. Some food companies (*e.g.* Swedish Nestlé) specify integrated farming techniques in their contracts and Danisco sugar insists on its sugar beet growers following an integrated farming-type protocol. There is also a Swedish network of demonstration farms.

Integrated farming is well developed in the **UNITED KINGDOM**. Private assurance schemes managed by various organisations at the supraregional level have gradually been established. Specifically, distribution chains have adopted these voluntary schemes and encouraged producers to voluntarily meet specific sustainability requirements. At present, they encompass between 65% and 85% of all livestock and crop production in Britain[84].

- The concept of integrated farming consolidated only 25 years ago with the Declaration of Ovronnaz.
- During the 1970s and 1980s, integrated farming evolved as an extension of integrated protection against pests. The process was led by private operators. In the 1990s, public administrations took on a more active role in matters such as regulation or funding.

2.3.3.2. Related organisations

As mentioned above, the most experienced and authoritative organisation for integrated farming is the International Organisation for Biological Control of Noxious Animals and Plants (IOBC), which was established in 1956 as a global organisation affiliated to the International Council of Scientific Unions (ICSU). IOBC promotes environmentally safe methods of pest and disease control, and is a voluntary forum for biological-control workers. At present, IOBC Global comprises six regional sections. The European Union is included in one: the West Palaeartic Regional Section (IOBC/WPRS). Towards the fulfilment of its goals, WPRS collaborates with other international organisations —notably FAO, WHO, the Commission of the European Union and the European Plant Protection Organisation (EPPO).

The European Crop Protection Association (ECPA) is one other body that promotes integrated farming. It represents the crop protection industry and its membership includes both national associations and companies throughout Europe —central and eastern countries included. Its objectives include the promotion of sustainable agriculture, contributing to increase food quality and safety, and helping preserve the environment. Also, it provides information about crop protection and production.

The European Initiative for Sustainable Development in Agriculture (EISA) is an alliance of six national organisations from France (**Forum de L'Agriculture Raisonnée Respectueuse de L'Environnement,** FARRE), Germany (**Fòrdergemeinschaft Nachhaltige Landwirtschaft,** FNL), Italy (L'Agricoltura che Vogliamo), Luxembourg (**Fôrdergemeinschaft Integrierte Landbewirtschaftung,** FILL), Sweden (Odling i Balans) and the United Kingdom (**Linking Environment And Farming,** LEAF) (see **ANNEX 10**). These organisations founded EISA in May 2001 with the common aim of developing and promoting sustainable farming systems —an essential element of sustainable development. It should be noted that EISA provides guidance through its Common Codex for Integrated Farming to those wishing to implement ICM.

84 Wilson, K. (2002). http://www.foodstandards.gov.uk/multimedia/pdfs/FAS_Report.PDF.

- The most experienced and authoritative organisation regarding integrated protection is the International Organisation for Biological Control of Noxious Animals and Plants (IOBC).
- Especially prominent in Europe are EISA (an alliance of six national organisations from as many European countries) and ECPA (which represents the crop protection industry).

2.3.3.3. Associated production techniques

Most integrated farming practices are shared by other farming systems. In the integrated farming context, they help reduce supplies—and hence environmental impacts— and increase gross margins. Some of the more common techniques are briefly described below.

Soil management practices include minimum cultivation techniques[85] and, where specific problems with weeds exist, rotational ploughing.

Seed rates occasionally must be higher than in conventional farming. Plant populations must be adequate for the target yield, but not so dense as to promote lodging and diseases.

Means of protection must be not only properly selected, but also thoroughly monitored by taking samples of crops[86] in order to detect potential pathogens or pests and examine their evolution. One of the cornerstones for this type of pest and disease control is estimating risks and tolerance thresholds (*viz.* the pest levels above which some action such as the use of pheromone traps will be required to avoid losses in exceed of the cost of the action itself).

Weed control can be affected by using crop rotations, stale seedbed techniques (stubble crops + contact herbicides), minimum tillage, harrowing and/or a selected herbicide. Herbicide dose rates can often be reduced depending on timing, weed size and crop vigour.

A diverse crop rotation is important as it provides a number of benefits. In selecting a specific crop, one must take into account factors such as farm location, soil type and, obviously, the potential market. The ideal rotation integrates cereals and broad-leaved crops, and should include grass or a leguminous crop. A weed-designated rotation can reduce pest and disease attack but increase some pest problems as a result (*e.g.* slugs after set-aside or rape).

Nutrient inputs must also be managed with the aim of balancing the need for crops and the use of chemical and organic fertilisers. Supply should be adequate to achieve the target yield.

In relation to livestock production, IOBC/WPRS guidelines impose some strict rules or prohibitions on herd density, holding and care, and nutrition such as the following:

- The maximum herd density permissible to avoid excessive amounts of manure, which would offset balanced nutrient cycles.
- All veterinary treatments should be recorded. The nutrient content of feeds must meet the actual requirements of the target animals, especially in relation to phosphorus and trace elements.
- Antibiotic additives (nutritional) and growth enhancers (hormonal) are not allowed.

It should also be noted that the techniques to be used should ensure traceability in the products marketed, that all treatments performed should be recorded and that the use of GMOs in accordance with certain protocols is not forbidden. Also, technical assistance to farmers is one of the distinctive features of this farming system.

As with organic farming, there are voluntary certification systems for integrated farming which

85 Some soil types, however, require more intensive tillage in order to maintain soil structure and establish the conditions required for certain crops.

86 Pérez and Mansilla (1999). "Aplicación de la lucha integrada en el cultivo de la vid". http://www.eumedia.es/articulos/vr/vinos/81luchaintegrada.html.

can be adhered to by following specific protocols that encompass recommended, compulsory and forbidden practices. In order to enjoy the benefits of producing under this system, farmers must restrict their practices to those specified by each standard.

- Most integrated farming practices are shared by other farming systems; those used in each case vary with the specific goal.
- Integrated farming is associated with a reduction in the use of agrochemicals, even though it may involve the use of increased seed rates.
- Traceability, the recording of treatments and technical assistance are three distinctive features of integrated farming. Use of GMOs is not forbidden.

2.3.3.4. Geographic distribution and land area of the major crops

There is little historical data on areas cultivated under integrated farming owing to the existence of a multitude of schemes and guidelines —some countries even have different regional schemes that may in fact not be equivalent.

In addition, there is no official data for areas under integrated farming at present; also, in those cases where such data are available, they do not accurately reflect the actual situation in the country or region concerned. Some farmers are members of no scheme, so they cannot be found in official records even though they are practicing integrated crop management.

The report developed for ECPA in 1999[87] contained the area under ICM guidelines in various European countries. Data was collected from a number of associations, organisations, governments, independent research and advisory bodies, universities, food companies and farmers. **ANNEX 11** summarises the results of the survey and **table 1** gives the land areas under integrated farming in the European Union. As can be seen, the area under ICM in the EU was estimated to be 3,641,420 ha; also, there were considerable differences between Member States in this respect. The United Kingdom was the country with the largest area under ICM (**graph 6**), followed by Denmark and Austria —the latter two were those devoting the highest fractions of their utilisable agricultural area (UAA) to this farming system.

This study revealed that, in 1999, most of the area under ICM in Austria, Germany, Sweden and the United Kingdom was used for cereals and arable crops (see **table 2** in **ANNEX 11**). The second most important crop type under ICM was vines in Austria, vegetables in Germany, sugar beet in Sweden, and oilseeds and pulses in the United Kingdom.

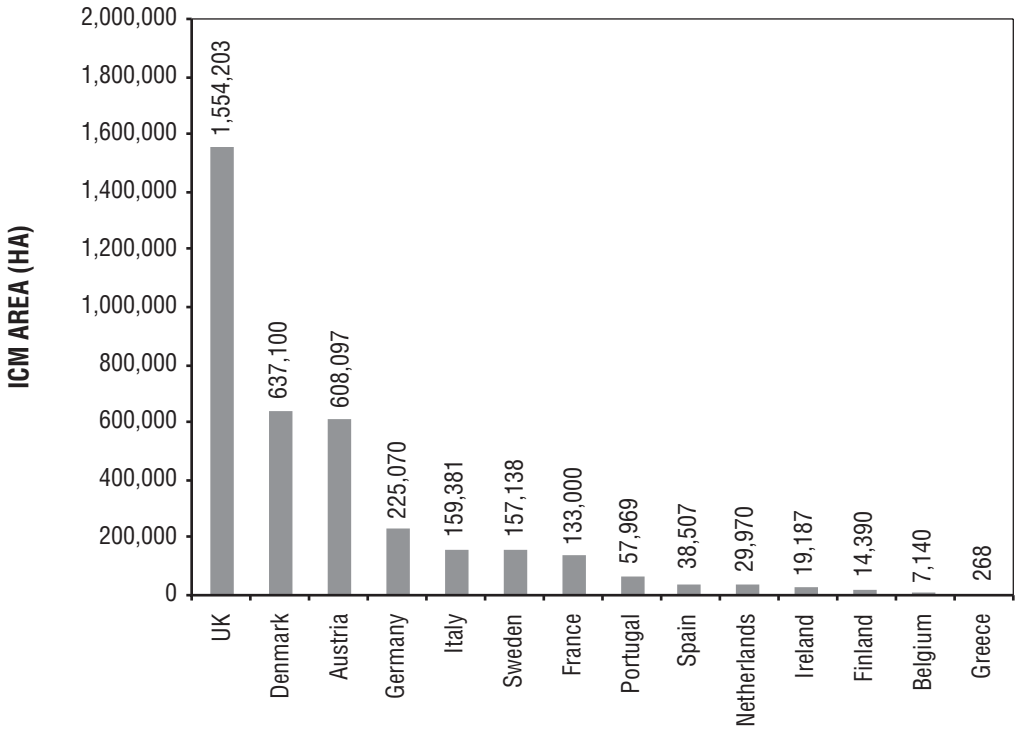
In France and Spain, vegetable crops accounted for most of the respective areas under integrated farming, and so did vineyards in Italy. **ANNEX 11** provides further information about the status of ICM in Spain.

The lack of data on areas and production under ICM is even more apparent if one takes into account that the survey on "Integrated Crop Management Systems in the EU[88]" used the same data as that collected by ECPA.

Available data on integrated livestock production (ILP) is even scantier as this sector was only recently incorporated into this management system. Protocols and regulations are in the process of being adapted with the addition of specific rules for the principal livestock products. Also significant is the fact that none of the seven EU countries examined here distinguish between pasture, meadow or forage crop areas (see **table 2**

87 Hewson (1999). The report was commissioned by ECPA but never published.
88 Agra CEAS Consulting (2002). http://europa.eu.int/comm/environment/agriculture/pdf/icm_finalreport.pdf.

Graph 6: Land area under integrated crop management in the European Union.



Note: No data for Luxembourg is available.
Source: Hewson (1999).

in **ANNEX 11**); this precludes the identification of the principal livestock types in their holdings.

- Based on a survey commissioned by ECPA, the area under integrated crop management in the European Union in 1999 was 3,641,420 ha. Some experts claim that this figure is underestimated as it excludes the area being managed outside well established ICM schemes.
- The Member State with the largest area under ICM is United Kingdom, followed at a considerable distance by Denmark and Austria (in this sequence).
- Livestock production is gradually being incorporated into the integrated farming system; despite the lack or reliable data, it is presumably growing rapidly.

2.3.3.5. Regulation and subsidies

There is no Community-wide qualification and certification scheme for integrated farming in the EU. In this situation, the first to develop specific protocols to standardise the production and marketing of integrated products were private bodies. These were followed by the relevant authorities in each country or region. In some cases, the protocols implemented were inspired by the OILB guidelines.

Since 1995, integrated farming has been adopted as a key factor within the Austrian agri-environmental programme (ÖPUL), which is currently based on EU Regulation 1257/99. Many integrated farming schemes in **AUSTRIA** have been incorporated into this programme and obtained its subsidies.

ÖPUL is the most important subsidy measure under the Austrian Rural Development

Programme, the legal basis for which is the Special Directive of the Federal Minister for Agriculture, Forestry, Environment and Water Management. It is implemented on a private administration basis, and includes both general eligibility criteria and special ones for some measures.

ÖPUL comprises 31 measures which are offered at the federal, provincial or regional level, within the framework of regional projects or at the project-specific level. The measures specifically pertaining to integrated farming are as follows:

- integrated fruit production;
- integrated viticulture;
- integrated farming in vegetable gardening and in field growing of medicinal and spice plants;
- integrated farming in field growing of ornamental plants; and
- integrated farming in protected cultivation.

Each of these lines is subsidised with a premium per hectare tied to a multiannual agreement to implement integrated farming in the holding concerned. The premium may be compatible with the award of other grants associated with measures such as the use of no pesticides or fertilisers. In this way, farmers can receive sums close to those granted to organic producers but always within the bounds established in EC Regulation No. 1257/99 on aid for rural development funded by the European Agricultural Guidance and Guarantee Fund (EAGGF).

The first major development for the widespread acceptance of integrated farming methods in **FRANCE** was the passing by the French Parliament of a law on New Economic Regulation on May 2, 2001. Article 58 of the law inserts a new article (L.640-3) into the French Rural Code that envisages the issuance of a decree on integrated farming (referred to as *"Agriculture Raisonnée"*).

Such a regulation (**Decree 2002-631**, of April 25, on the qualification of farms with the term *"agriculture raisonnée"*) rules that qualification will be used to ensure that an entire farm fulfils the requirements contained in a future *code of reference for integrated farming*. Also, it describes the terms for the award, technical assessment, duration, termination, cancellation and withdrawal of the certification, all of which should be done by a certifying body accredited in accordance with standard EN 45011. The decree also lays the foundations for the establishment of advisory bodies such as the National Commission and Regional Commissions on Integrated Farming and Farm Qualification.

The French Code of Reference for Integrated Farming (*Reférentiel de l'Agriculture Raisonnée*) is a guideline or "reference" document that specifies the acceptable methods of control, farm accreditation and qualification procedures, and establishes the terms of use of the designation *"Agriculture Raisonnée"* and all other equivalent definitions. Issued in May 2002 through an order, it contains a hundred national obligations about farm management and crop and livestock production methods to be fulfilled in order to qualify as integrated (*raisonnée*) farming. It comprises items such as environmental respect, control of sanitary hazards, health and safety at work, and animal welfare.

Decree 2002-631 has been further developed with an order on the composition and operation rules for the Regional Commissions on Integrated Farming and Farm Certification, and another on the composition of the inspection board of the Code of Reference and the National Commission on Integrated Farming and Farm Qualification.

Regarding public subsidies, France provides no direct funding for integrated farming. There are, however, more general subsidies under the rural development regulation that are associated with agri-environmental measures. The National Plan for Rural Development contains 93 regional agri-environmental measures that include integrated farming. Premiums are paid in accordance with such actions and their magnitude varies between areas.

Agri-environmental measures were initially implemented through so-called "Territorial Farming Contracts" (*Contrats Territoriaux d'Exploitation,*

CTE), which have subsequently been replaced by Sustainable Agriculture Contracts (*Contrats d'Agriculture Durable*, CAD).

All farmers and growers in **GERMANY** are required to follow the principles of Integrated Pest Management as part of the country's Plant Protection Law. There are currently ten regional schemes for fruit and vine growing based on IOBC guidelines. However, only Brandenburg, Hamburg, Rheiland-Pfalz, Sachen and Thüringen have supported integrated farming through EC Regulation 1257/99 since 2000. As integrated farming systems grow in number, retailers are recategorising production as "normal", which precludes attaching a premium on their products. Schemes, instead making it a "right to supply".

Most ICM schemes in **ITALY** are operated at the regional level —under EC Regulation 1257/99 in many cases. Some regions have a brand of their own which requires producers to use integrated farming techniques. Producers' organisations typically market under the regional labels, although many have their own brands within them.

This regulation scheme includes a funding line in the form of a premium per hectare under integrated farming within agri-environmental measures. As with organic farming, programmes operate at a regional level, so the scale of subsidies varies among regions. **Table 1** in **ANNEX 12** shows the sums granted by region.

In **SPAIN**, the first state regulation on integrated farming was provided by two ministerial orders of 1983 and 1989. Later on, the different autonomous communities (CCAA) developed their own basic legislation as the area under ICM continued to grow. The pioneering autonomous community in this respect was Catalonia, which issued its earliest regulation in 1992. Some specific technical norms have been published for various products that supplement the existing regulations in each community. The most active regions in this respect have been Catalonia and Andalusia, followed by Navarre and Valencia.

The current state-wide regulation on integrated farming is **Royal Decree 1201/2002**, which defines it as a farming system aimed at the obtaining of products that maximises the use of natural resources and production mechanisms, and at ensuring long-term sustainable agriculture. The decree specifies the production rules and general requirements (in an annex), the use of assurance labels —the term "integrated farming" can only be used on those products complying with the rules established in the decree— and establishes the National Commission on Integrated Farming. Control functions must be performed by certifying bodies accredited by the National Accreditation Entity (ENAC) or a similar organisation, which are scheduled to inspect holdings and facilities at least once a year.

Farmers wishing to adopt integrated farming are eligible for funding under the conditions established in Chapter VI of Regulation (EC) No. 1257/99 on Rural Development. In Spain, this regulation was developed by **Royal Decree 4/2001**, issued by the Ministry of Agriculture, Fisheries and Food on January 12, 2001. The decree established a legal framework to be subsequently developed by each autonomous community. **Table 2** in **ANNEX 12** shows the sums granted by production type depending on whether the land area concerned is devoted to integrated control or integrated farming.

There are other, non-agri-environmental measures such as those instituted by Valencia to fund water, soil, leaf and pest residue analyses in produce obtained under ICM criteria, and those established in Andalusia to improve plant health by fostering the creation of associations for integrated farming treatments (ATRIAs)—which have access to regional funding lines— and the signing of collaboration agreements towards the development of integrated farming.

SWEDEN has issued no national or regional legislation to regulate integrated farming, even though the term is present on the market. Instead, producers have established two certification labels for integrated farming, a term that Swedish consumers associate to national products of increased quality.

Public administrations have played no part in the regulation of integrated farming in the **UNITED KINGDOM**. There are, however, more than twenty private assurance schemes, many of which are similar to integrated farming schemes. Although these assurance schemes are restricted to specific products and/or British regions, their large number and substantial presence on the market has aroused confusion among consumers.

The English Rural Development Programme and agri-environmental measures may become major funding lines for this agricultural system in the future. Already in April 2002, a three-year LEAF grant was awarded to help develop its assurance scheme.

- European Communities have not yet adopted a regulation system to manage integrated farming in the EU. In this context, private operators first, and the competent authority in each country or region then, have developed their own protocols to standardise production and marketing.
- The principal funding line is provided by agri-environmental measures in the Rural Development Regulation. Aids take the form of a premium per hectare, but are not available to all regions or farmers.

2.3.3.6. Control, certification and labelling

The lack of community regulations on integrated farming has resulted in the absence of a unique certification and control system for this agrosystem. By contrast, there have been a number of private and public initiatives at the national, regional and local levels to establish control systems as a means to ensure that products will meet specific sustainability standards.

The voluntary schemes that have come down to the present day were developed by private bodies including farmers associations. Initially, this private leadership pushed public administrations into the background; the situation, however, has changed in recent times. For various reasons, European countries are issuing much legislation on the subject that includes the regulation of certification and inspection of production units under integrated farming. The wealth of initiatives that have emerged is illustrated below with a few selected examples from the public and private sectors.

Within the private sector, the major European integrated farming associations have set up control systems with rather disparate aims and results for their members. In **ITALY**, the National Association for Integrated Farming (*L'Agricoltura che Vogliamo*) has published a Handbook for Integrated Crop Management and Self-diagnosis Systems for Farms, which establishes voluntary production rules that, however, include a single system for self-diagnosis in production control.

SWEDEN has two integrated farming labels that have been developed by the operators themselves. The Swedish Seal, which is managed by producers and marketers, includes a certification system entrusted to independent bodies.

In the **UNITED KINGDOM**, LEAF has a Technical Advisory Council that supervises the activities of its associated independent certifying bodies. Through inspection visits, control bodies check that cultivation units comply with the standards adopted by the association, in which case they are allowed to use the LEAF logo on their products.

The public sector has also issued a variety of regulations. No doubt, one of the most advanced legislation on integrated farming is that of **FRANCE**. The Decree of April 25, 2002 on the qualification of farms with the designation *"agriculture raisonnée"* established a certification system supported by public administrations in the country. In fact, the decree established the legal framework for the development of production standards, the terms of use of the designation *"agriculture raisonnée"* and the creation of a National Commission on Integrated Farming and Farm Qualification (CNAR). All these aspects have been developed in successive orders issued

by the three ministers with competence in the matter[89].

CNAR has also been empowered to authorise certifying bodies, which must comply with standard EN 45011 at the time of accreditation. Thus, a given holding can be qualified as integrated for a period of five years under the decision of the certifying body, which must perform technical inspections in order to ensure that the applicable standards continue to be complied with.

In **SPAIN**, regional legislation was issued in the 1990s to regulate integrated farming through certification schemes managed by authorised independent bodies, ATRIAs or the competent administration itself.

Royal Decree 1201/2002, issued in November 2002, regulated the integrated farming of agricultural products at the national level —restricted to crop production but including transformation. Based on its contents, the Decree will be developed similarly to its French counterpart and the resulting certifying system will be inspired by the French model. However, because Spain is organised in autonomous communities, functions will to some extent be decentralised. At present, certification and control activities are the responsibility of the Spanish regions. In March 2003, there were at least 185,974 certified ha under integrated farming in the country[90].

Based on the above-described examples, the national regulations could lead to the issuance of a community regulation on integrated farming for the whole EU similar to that already established for organic farming.

- There have been a number of public and private initiatives to establish control systems as a means to ensure that specific products will comply with applicable integrated farming standards.
- Current certification and inspection schemes are managed by independent control bodies that must be accredited and authorised similarly as in organic farming.

2.3.3.7. Specific details of the transition process

The transition from mainstream agriculture to integrated farming is taking place in a rather disparate manner in European countries owing to the lack of uniformity among public and private regulations. For example, production handbooks and standards differ in their guidelines; the compulsory, allowed or forbidden techniques they establish; and the duration of the transition period.

In addition to the abundant national, regional and local legislation issued by public administrations, some private initiatives have had a strong impact. Especially prominent among them are the following:

- The EUREPGAP[91] protocols for the different production types;
- the IOBC/WPRS principles and technical guidelines for integrated farming; and
- EISA's Common Codex for Integrated Farming.

The adoption of integrated farming by farmers requires an additional effort in terms of time and labour. Because of its nature, this farming system requires skilled operators and external technical advice. Some standards compel the use of a system to register operations and applications. This, together with the need to ensure traceability in the marketed products, makes management of this farming system time-consuming relative to mainstream agriculture.

89 The Minister of Economy, Finance and Industry; the Minister of Agriculture and Fisheries; and the Delegate Minister of Small- and Medium-sized Enterprises, Commerce, Crafts and Consumer Affairs.
90 According to an internal report of the Ministry of Agriculture, Fisheries and Food. The information pertains to only 8 of the 17 autonomous communities in Spain, however.
91 See ANNEX 2.

Livestock production has been regulated to a lesser extent; however, producers must comply with specific cattle safety, health, nutrition and accommodation rules that are stricter than those for conventional farms.

- The transition from mainstream agriculture to integrated farming is taking place in a rather disparate manner in European countries owing to the lack of uniformity among public and private regulations.
- The adoption of integrated farming by farmers requires an additional effort in terms of time and labour.

2.3.3.8. Implications of multifunctionality

As stated above, OILB defines integrated farming as "a sustainable system for the production of high-quality foods using environmentally-friendly methods while maintaining farming income".

The environmental aims of this farming system can be summarised as follows:

- to preserve resources, with special emphasis on soil conservation and improvement;
- to use supplies in a rational manner; and
- to manage waste properly.

In any case, one should bear in mind that the economic aim of ensuring profits for farmers is similar in importance to the environmental aims. Towards the achievement of these aims, integrated farming uses tools such as biological control and reduced inputs of some substances. Production standard handbooks and technical regulations emphasise the need to reduce the amounts of agrochemicals used without banning them altogether. It thus remains to be seen to what extent the aims have been achieved.

The economic advantages of integrated farming are facilitating the market penetration of its produce, partly as a result of the demands of some retail chains. Some national and regional brands, labels and logos such as AMA in **AUSTRIA**, *Prince de Bretagne* in **FRANCE**, *Prodotti con Amore-Coop* in **ITALY** and LEAF in the **UNITED KINGDOM**, have come to occupy a prominent place on their respective markets, where they are sold at prices exceeding those of conventionally obtained produce.

In addition, there has been a documented increase in the average gross margin per farm in **GERMANY**[92] and the **UNITED KINGDOM**[93]**,** and although yields —and hence profits— are lower, so are —to a greater extent— production costs.

Similarly to organic farming, experiments have failed to show improved organoleptic characteristics or a higher nutritional value in integrated products[94]. Therefore, integrated farming produce cannot be deemed better in quality as defined in terms of the above-described parameters.

The effects of integrated farming have been examined in a number of scientific experiments[95] —probably not as many as in organic farming, however.

Relative to mainstream agriculture, some studies have shown integrated farming to:

- raise organic matter levels in soil (**FRANCE**[96]);

92 El Titi, A. (1998). "Technology transfer of integrated farming systems. A case study on transfer techniques, farmer responses and environmental consequences in Germany". Proceedings of the 1998 Brighton Conference Pests & Diseases. pp 1105 1114.

93 LEAF (1999a). "Integrated Crop Management. Towards a sustainable farming system LEAF arable farm". Years 1, 2 and 3. Linking Environment and Farming, UK. LEAF (1999b). Integrated Farm Management. Towards a sustainable farming system LEAF dairy/arable farm. Years 1, 2 and 3. Linking Environment and Farming, UK.

94 Beer, von E. et al. (1996). "Statewide validation of a control threshold for fungal diseases of leaves and ears in winter wheat cultivars of different susceptibility" (in German). Nachrichtenbl. Deut. Pflanzenschutzd, S. 201- 208.

95 The article by Hewson (1999) includes an interesting compilation of abstracts of relevant studies.

96 Viaux, P. and Rieu, C (1998). "Integrated farming systems and sustainable agriculture in France". In: Integrated Crop Production: Towards Sustainability. BCPC Symposium, pp 297-304.

- reduce surface contamination with nitrogen in autumn (**GERMANY**[97]);
- allow better control of soil erosion (**UNITED KINGDOM**[98]); and
- improve soil structure (the three previous countries).

These effects, however, are seemingly less marked than those of organic farming.

- Integrated farming results in greater environmental and economic benefits than conventional farming. This cannot be said of produce quality as its superiority has not been shown beyond doubt.

2.3.3.9. Product marketing

There is no official data about market access in this farming system. Based on the literature examined, the market for integrated farming has not yet consolidated, even though it exhibits some distinctive features.

Consumers are generally poorly informed about the meaning and implications of integrated farming, so they are reluctant to pay more for its produce. A study conducted by the British Food Standards Agency in the year 2002 confirmed that consumers are uncertain whether the Little Red Tractor (a logo endorsing assurance schemes in the **UNITED KINGDOM**) is related to country of origin, improved production standards or foods of a higher quality. The situation is similar in **SWEDEN**, where consumers identify some integrated farming labels with national products of an increased nutritional or organoleptic quality.

According to some authors[99], this confusion between environment-friendly methods and product quality has originated in distribution channels as a result of the expectations raised by quality foods among consumers. In addition, some public and private logos fail to clearly state that the products concerned have been obtained using integrated farming practices.

Large retail chains play a crucial role in marketing, even though they act differently in some cases. Thus, some distributors in the **UNITED KINGDOM** are reluctant to place integrated products side-by-side with conventional products on their shelves when they are similarly priced as this makes consumers wonder why all produce is not obtained following an ICM scheme if this does not raise prices. One other reason for not marketing integrated produce is the lack of interest among consumers (in **SPAIN**, for example). In some countries of central and northern Europe, however, distributors are leading the movement by promoting these products and informing the public about their environmental friendliness.

The increased environmental sensitivity of the northern countries has attracted exports from the Community's producing regions. **SPAIN** has developed two certification standards for products that are virtually exclusively exported to northern Europe.

- The literature examined suggests that the market for integrated farming remains unconsolidated.
- The distinctive features of integrated farming include confusion among consumers about what this system means and the key role played by the major retail chains.

2.3.4. Conservation agriculture

2.3.4.1. Historical development

As a medium in which to grow plants and as a source of nutrients for them, the upper surface

97 Gerowitt, P. and Wildenhayn, M. (1997). "Ecological and economic effects of extensifying arable farming systems". Results of the Göttingen INTEX Project 1990-94.
98 Jordan, V.W.L. et al. (1996). "Technology transfer of integrated farming systems". The LIFE Project. 3rd edition. 24 pp.
99 Beigbeder et al. (2001). http://www.agriculture.gouv.fr/spip/IMG/pdf/etude.pdf.

of the soil has been a crucial agricultural resource throughout history. There is documented evidence of the use since ancient times of soil maintenance and improvement practices intended to ensure farming productivity remained at economically viable levels.

However, the 20th century witnessed erosion resulting in the loss of particulate matter and its displacement to other areas, partly as a result of excessive tillage and of the use of high-power heavy machinery. Both have facilitated the subsequent leaching of nutrients by the effect of rain or irrigation. Soil losses have also arisen from meteorological phenomena not involving the hand of man. Indeed, the concept of **conservation tillage** emerged as a protective measure against the severe wind erosion farms in the USA were experiencing in the late 1930s[100].

Rather than a global land management system, a number of incipient techniques were developed under the common designation of *minimum tillage*, which is one approach to conservation tillage. Direct sowing, which involves no-tillage and is more popular today, did not emerge as a solid alternative at the time owing to the absence of effective weeding methods and appropriate machinery. Minimum tillage was practiced on more than eight million hectares worldwide by 1961.

The favourable conditions of the time allowed a few farmers to introduce *direct sowing* as a tool for addressing specific environmental problems 25 years ago. However, this technique only became a widespread practice in the 1980s. The land area under direct sowing is estimated to have grown by 700% over the 1990s, and has undergone an important change in relation to its origins, in that its current popularity is the result of its economic profitability rather than of the initial environmental problems it was expected to solve.

Conservation agriculture is now widely implemented (for example, an overall 72 million hectares are estimated to be under no-tillage at present). This technique is especially prominent in large regions of America and Oceania, and, to a lesser extent, in Europe —where it is expanding rapidly, however. A turning point in its consolidation as a farming system was the I World Congress on Conservation Agriculture, organised by FAO and the European Federation on Conservation Agriculture, and held in Madrid (Spain) in 2001.

- The concept of conservation tillage arose in the late 1930s in connection to minimum tillage as a protective method against the wind erosion phenomena that were affecting agricultural farms in the USA at the time.
- Direct sowing gained widespread acceptance in the 1980s. The land area under this management regime is estimated to have grown by 700% over the 1990s.
- At present, conservation agriculture is widely implemented throughout the world (an estimated 72 million hectares are under no-tillage).

2.3.4.2. Related organisations

The Food and Agriculture Organisation (FAO) of the United Nations has a Conservation Agriculture Workgroup that encompasses professionals from different FAO branches. Its functions include the dissemination of information on conservation agriculture and providing training on related aspects.

In addition, FAO helped establish the Latin American Network for Conservation Tillage more than one decade ago. The organisation was renamed Latin American Network for Conservation Agriculture to explicitly acknowledge that its activities were concerned not only with conservation tillage, but also with the management of every

100 Martínez Vilela and González Sánchez. (2000). "Agricultura de conservación: Situación actual y perspectivas", Vida Rural Magazine, n. 133. http://www.eumedia.es/articulos/vr/cereales/113agricconserv.html.

agronomic factor in accordance with its principles. There are similar networks in Africa (African Conservation Tillage Network, ACT), Asia (South Asia Conservation Agriculture Network, SACAN) and Eurasia (Eurasia Conservation Agriculture Network, ECAN). Worth special note in this context is CAAPAS (the Confederation of American Associations for the Production of Sustainable Agriculture), which operates in conservation agriculture through its producers unions.

In **Europe**, the European Conservation Agriculture Federation (ECAF)[101] was established in January 1999 to provide a forum for national associations engaged in this agrosystem. ECAF is based in Brussels and aims to promote conservation agriculture and to disseminate useful information among its users in addition to fostering education and research on it. At present, it comprises fourteen organisations from Belgium, Denmark, Finland, Greece, Hungary, Ireland, Portugal, Slovak Republic, Switzerland, France, Germany, Italy, Spain and the United Kingdom (see **graph 7**). The activities of the associations belonging to the last five states, which are examined in this report, are briefly described below.

- The principal organisation for the promotion of conservation agriculture in **FRANCE** is the *Association pour la Promotion d'une Agriculture Durable* (APAD), which has agronomists, agricultural technicians, farmers, economists and even some entities among its members. Founded in 1998, APAD's aims include the following:
- To help design and develop agronomic techniques for the preservation of soil, its conservation and the maintenance of its biodiversity with a view to achieving sustainable agriculture.
- To foster research and development activities on related topics.
- To maintain, increase the appreciation for and disseminate these techniques among farmers and the bodies or individuals with the potential to implement and help expand these methods.
- To disseminate available information on conservation farming methods by all available means.

APAD's counterpart in **GERMANY** is *Gesellschaft für Konservierende Bodenbearneitung* (GKB). More than three-quarters of its 185 members are farmers and manage holdings 100–400 ha in size. The members from Eastern Germany, however, have holdings larger than 1,000 ha on average.

In **ITALY**, the Italian Association for Agronomic and Conservative Soil Management (*Associazione Italiana per la Gestione Agronomica e Conservativa del Suolo*, AIGACoS) has become the reference in this respect. Founded in 1998, it is open to all operators wishing to promote research, experimentation, scientific meetings, technologies and extension works, and to all those willing to support the knowledge and dissemination of the soil science technologies associated with sustainable agriculture. It comprises 114 members and has the following main goals:

to facilitate the flow information and communicate, in an innovative manner, the results of scientific research; and

to encourage the management of soil resources by promoting the transfer of technologies in favour of conservation agriculture.

The Spanish Association for Conservation Agriculture – Living Soils (AEAC.SV) is a non-profit-making body based in **SPAIN** and open to any individuals (farmers, technicians) or legal entities (enterprises, public bodies) with an interest in promoting farming practices leading to improved conservation of agricultural soil and its biodiversity. This is a renowned, leading association in Europe that comprises numerary, honorary and protector members; roughly one-half of the numerary

101 http://www.ecaf.org/English/english.htm.

members are farmers and most of the protector members are corporations.

AEAC.SV is deeply involved in research activities, as well as in the organisation of meetings, the dissemination of information, the release of publications and the holding of sessions. It additionally encompasses eight regional associations.

The Soil Management Initiative (SMI) is an independent organisation created to promote the adoption by farmers and advisers in the **UNITED KINGDOM** of systems designed to protect and enhance soil quality. SMI seeks to achieve these goals through information transfer and advice. The organisation was set up as a non-profit-making limited company in January 1999 and draws on the experience and research of its members to provide solutions to pressing problems caused by poor soil management.

- There are several networks for the exchange of experience and cooperation at the continent level in America, Africa, Asia and Eurasia.
- The European Conservation Agriculture Federation (ECAF) encompasses national organisations concerned with this agrosystem. At present, it comprises fourteen organisations from Belgium, Denmark, Finland, Greece, Hungary, Ireland, Portugal, Slovak Republic, Switzerland, France, Germany, Italy, Spain and United Kingdom.

2.3.4.3. Associated production techniques

As stated in describing conservation agriculture in the introductory section, this agricultural system has so far revolved around agricultural production, without reaching other links in the food chain. Accordingly, the associated techniques are restricted to production —specifically, to plant production, where conservation agriculture has its raison d'être.

Graph 7: National bodies under ECAF (June 2002).

Source: ECAF web site. http://www.ecaf.org/English/englis.htm.

Taking into account that the primary aim here is to conserve soil for agricultural production —mainly by keeping residues and covers in the outer soil layer—, one can classify the practices specifically associated with conservation agriculture into three broad categories, namely:

- those involving restrictions and prohibitions;
- those associated with tillage machinery and soil protection; and
- those involving the application of herbicides.

Despite the absence of standards or a widespread reference for farmers, most associations, technicians and researchers concerned with conservation agriculture agree on the inadvisability of using some traditional practices of western farmers. **Restrictions** and **prohibitions** include the burning of stubble and trimmings; and the use of practices involving soil inversion (turnover, mouldboard harrow, disk ploughing) or resulting in excessive pulverisation of surface soil (rotavator, rotary harrow).

At this point, as it will be shown in the section regarding regulations and aid, it is worth mentioning the agro-environmental requirements

to be met in order to be eligible for direct aid from the Common Agricultural Policy (CAP).

The **techniques associated with tillage and soil protection** can be classified into three groups depending on production type, namely: arable crops, wood crops and forest crops.

A. ARABLE CROPS

Experts recommend using a soil cover in excess of 30% and never less than 15%. In addition to extending the spectrum to other production-related aspects, this range affords several choices that can be regarded as subsystems or modes of conservation agriculture[102], namely: direct sowing, reduced tillage, zone tillage and ridge tillage.

With *direct sowing* (*direct drilling* or *no-tillage*), the soil is left undisturbed from harvest to planting except for nutrient injection. Planting or drilling is accomplished in a very narrow seedbed or slot created by coulters, row cleaners, disk openers, in-row chisels or roto-tillers. On the other hand, weed control is accomplished primarily with herbicides of low environmental impact. Cultivation may be used for emergency weed control. This mode is the best environmental choice for annual crops.

Reduced tillage (*minimum tillage* or *mulch tillage*) leaves the soil undisturbed prior to planting. Tillage tools such as chisels, field cultivators, disks, sweeps or blades are used for planting. Weed control is accomplished by using low-environmental impact herbicides with and/or cultivation. With *non-inversion tillage*, the soil is disturbed —but not inverted— immediately after harvest in order to partially incorporate crop residues and promote weed seed/volunteer germination to provide soil cover during the intercrop period; this is chemically destroyed using herbicides with very little environmental impact and incorporated at sowing, in one pass, with non-inversion drills.

Zone tillage (*row tillage* or *strip tillage*) is a management choice between *minimum tillage* and *no-tillage* that involves leaving at least 75% of the field untilled and protecting it with old crop residues while appropriate tillage procedures are followed in the row zones where the next crop is to be planted.

With *ridge tillage*, the soil is left undisturbed from harvest to planting except for nutrient injection. Planting is completed in a seedbed prepared on ridges by using sweeps, disk openers, coulters or row cleaners. Crop residues are left on the area between ridges. Weed control is done with low environmental impact herbicides and/or cultivation. Ridges are rebuilt during cultivation.

B. WOOD CROPS

The principal technique used in connection with this crop type is that of *cover crops*. Appropriate species are sown or vegetation is allowed to grow spontaneously between rows of trees[103] as a measure to prevent soil erosion and control weeds. Cover crops are usually managed with herbicides of very low environmental impact.

C. FOREST CROPS

Some of the techniques employed with the previous two production types (*e.g.* no-tillage with low environmental impact herbicides and plant cover) are applied in forest crops.

The practices associated with the **application of herbicides** warrant some comment. Tillage has traditionally been used as an effective choice for herbicidal purposes, among others. Soil inversion practices successfully bury the outer soil layer to a high depth, thereby preventing growth of seeds and seedlings of weedy flora. Reducing or suppressing tillage therefore detracts from this weeding function, which must be offset with an increased use of herbicides in conservation

102 ECAF (1999). http://www.ecaf.org/English/First.html - 9.
103 Also during the interval between successive annual crops.

agriculture. However, the agrochemicals used for this purpose have a low environmental impact, are non-residual or feature low hazards.

- One can classify the practices specifically associated with conservation agriculture into three broad categories, namely: those involving restrictions and prohibitions; those associated with tillage machinery and soil protection; and those involving the application of herbicides.
- There are some options that can be regarded as subsystems or modes of conservation agriculture: direct sowing (direct drilling or no-tillage; reduce tillage (minimum tillage or mulch tillage); zone tillage (row tillage or strip tillage); ridge tillage; or cover crops.

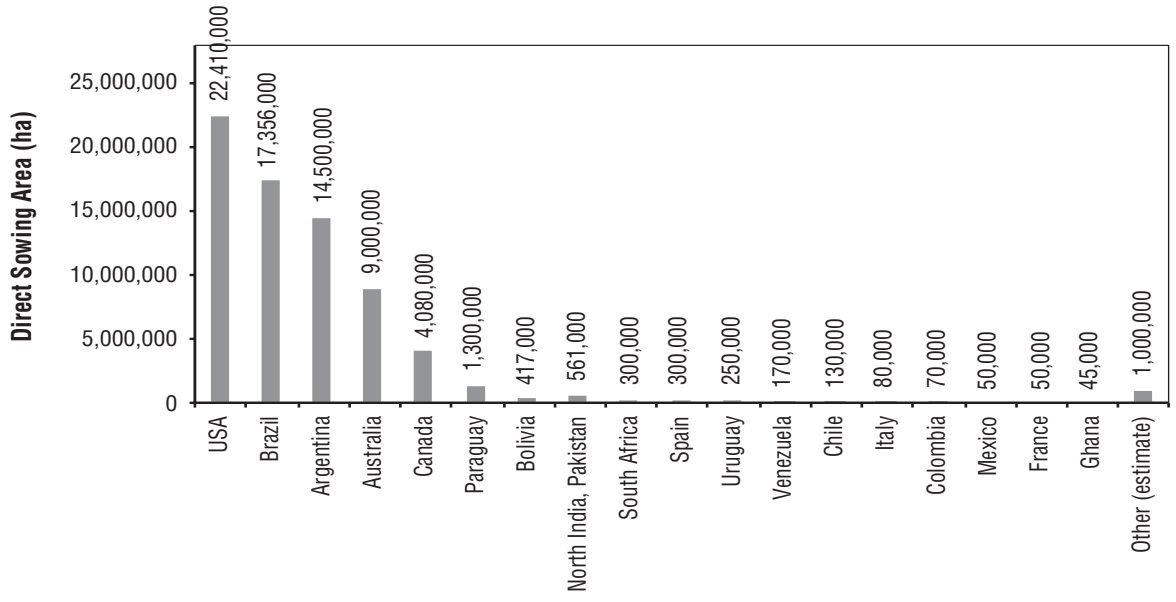
2.3.4.4. Geographic distribution and land area of the major crops

There are few reliable statistics for conservation agriculture except in the USA, so available data are largely in the form of estimates from experts.

The different modes of conservation agriculture have grown dramatically throughout the world over the past decade. With regard to annual crops, this agrosystem was practiced on 78 million ha in 1996 and continues to expand at present. Direct sowing/no-tillage, which is the most widely used conservation technique, grew from 7.5 to 52.7 million ha worldwide (*i.e.* by about 700%) between 1990 and 2000.

The total land area currently under conservation agriculture in the world can be estimated to be in the region of 150 million ha (Martínez Vilela, unpublished data). However, there are more precise estimates for direct sowing. Of the 150 million ha, 72 million are under **no-tillage/direct sowing** (Derpsch, 2003)[104]. Most land under these practices in the world is on the American continent, one-eighth in Australia and the rest in Europe, Asia or Africa. As it can be seen in **graph 8**, the United States has the largest area (22.4 million ha), followed by Brazil (17.4 million ha), Argentina (14.5 million ha), Australia (9 million ha) and Canada (4 million ha). The system has been adapted to grain crops and pulses, and also

Graph 8: Estimated land area under direct sowing (ha) in various countries in June 2003.



Source: Derpsch, 2003. http://www.rolf-derpsch.com/news.htm.

104 http://www.rolf-derpsch.com/news.htm.

to sugar cane, vegetables, potatoes, beets, cassava and fruits (FAO, 2001)[105].

The largest area under no-tillage in absolute terms is in the USA and amounts to slightly over 16% of the country's cultivated land. Also, no-tillage is used to cultivate 52% of arable land in Paraguay, 32% in Argentina and 21% in Brazil (FAO, 2000)[106].

Although soil degradation through erosion and compaction is severely affecting nearly 16% (153.3 million ha) of the land in **Europe**, conservation agriculture on this continent is still at an incipient stage (it involves an estimated < 1–2% of agricultural land only), far behind the above-mentioned countries. In the Mediterranean region, soil erosion affects 50–70% of agricultural land, so the countries concerned are starting to implement conservation techniques.

The most precise estimate for the land area under **conservation agriculture** in Europe is 9.5 million ha, of which only one million ha correspond to land under direct sowing (ECAF, unpublished data).

In **FRANCE**, conservation agriculture is estimated to be practiced on 2.5 million ha, which accounts for 14% of the country's UAA. The area under direct sowing is rather small (in the region of 50,000 ha), however. Based on a survey of the *Institut d'Études de Marchés et d'Opinion*, 15% of French farmers use soil conservation techniques on more than one-half of their UAA, while 6% use them on their entire holdings.

GERMANY has experienced a geometric growth in this respect; thus, its area under conservation agriculture has risen to 2,375,000 ha (about 20% of its UAA). Germany is the first European country in terms of direct sowing, with 354,000 ha under this regime.

ITALY has only 560,000 ha (barely 6% of its UAA) under conservation agriculture; however, direct sowing is already done on 80,000 ha.

Direct sowing is widely implemented in **SPAIN**, with a land area of 300,000 ha. The area under conservation agriculture amounts to 1.5 million ha (10% of the country's UAA). There is no national census of land under this regime, but winter cereals (barley, wheat) are estimated to span the largest area (70% of the total figure), followed by sunflower (20%) and corn (5%). Additional crops including rapeseed, pea, chick pea, sugar beet, flax and cotton, among others, are being incorporated into this agrosystem. Fodder corn and meadows are also being increasingly cultivated under conservation agriculture practices on account of the time savings and more timely sowing they afford. Regarding perennial crops, the cover crop system is currently gaining ground in olive plantations. The system is also being applied to citrus fruits, pear and peach trees, vines and forest crops (*e.g.* eucalyptus, meadows, forest repopulation trees) (Martínez Vilela and González Sánchez, 2000)[107].

Finally, the **UNITED KINGDOM** is the country with the highest proportion of UAA under conservation agriculture in Europe (30%); it has 1,440,000 ha under this regime, of which only 24,000 ha are under direct sowing, however.

Direct sowing has grown at a fast pace in Europe and elsewhere. However, the present growth rate cannot be maintained indefinitely. Thus, according to Trebügge (Chevrier and Barbier, 2002)[108], only 40% of the land area in Western Europe can be placed under conservation agriculture.

105 Press Release 01/59. FAO (2001). http://www.fao.org/WAICENT/OIS/PRESS_NE/PRESSENG/DEFAULT.htm
106 http://www.fao.org/News/2000/000501-e.htm
107 Martinez Vilela, J.A. and E. J. González Sánchez (2000). "Agricultura de conservación. Situación actual y perspectivas". http://www.eumedia.es/articulos/vr/cereales/113agricconserv.html
108 Chevrier, A. and Barbier, S. (2002). "Performances économiques et environnementales des techniques agricoles de conservation des sols : création d'un référentiel et premiers resultants". Grignon, INRA-ESR, 94 p. (Mémoire de fin d'études sous la direction d'A. Revel).

- No-tillage/direct sowing is the most widely used conservation agriculture technique. It is currently practiced on about 72 million hectares of land in the world; this figure amounts to no more than 4% of the world's arable surface, however. The vast majority of land under conservation agriculture is on the American continent; one-eighth is in Australia and the rest in Europe, Asia or Africa.
- The most precise estimate for land area under conservation agriculture in Europe is 9.5 million ha, of which only one million are under direct sowing.

2.3.4.5. Regulation and subsidies

First of all, we should note that conservation agriculture is not specifically regulated by the European Communities or any of the countries examined in this report. There are, however, some initiatives from public administrations in the **European Union** with a direct impact on this agrosystem.

In April 2002, the European Commission issued the communication "Towards a Thematic Strategy for Soil Protection" [COM(2002) 179 final], where it reported on soil degradation processes affecting the Community's territory —of which erosion and the loss of organic matter are closely related to conservation agriculture. Within the framework of the EU's 6th Environment Action Programme, several groups are currently working on the topic and are scheduled to deliver their conclusions by February 2004. The resulting communication might lead to the adoption, after June 2004, of technical measures and legislative and political initiatives aimed at facilitating soil protection.

However, the influence of conservation agriculture is not restricted to non-binding documents. In fact, some current CAP payments are subject to compliance with environmental regulations and several Member States prohibit the burning of stubble and tilling along contour lines, or compel the use of fallow —two typical impositions of conservation agriculture— in order to be eligible for direct subsidies under CAP.

Also, since 1992 the European Union has rewarded farmers striving to preserve natural resources through *agro-environmental measures*, which continue to be supported by Agenda 2000 as a tool for sustainable development within the framework of Regulation 1257/99. Some Member States have established funding lines for "organic farming" or "integrated production" but not for "conservation agriculture"; there is no agro-environmental funding line under such a designation. Some measures, however, do fund specific practices typical of this agrosystem.

National Spanish legislation, for example, has instituted a measure called "Fight against Erosion in Fragile Media", which provides funding in the form of a premium per hectare for

- wood crops on slopes or terraces with a slope greater than 8%; and
- arable crops under direct sowing or minimum tillage.

Current prospects therefore reveal a tendency towards the development of regulations as a means of strengthening available funding lines for conservation agriculture, especially since the CAP's Mid Term Reform —which consolidates the environmental component of agriculture in aspects such as ecoconditionality— was passed in June 2003.

- Conservation agriculture is not specifically regulated by the European Communities —not even at the national level by any of the countries examined. However, some initiatives from public administrations in the European Union have a direct impact on this agrosystem.
- CAP provides some direct funding to farmers complying with restrictions typical of conservation agriculture. There is also some aid for practices such as direct sowing or minimum tillage within the framework of agroenvironmental measures.

2.3.4.6. Control, certification and labelling

Neither public administrations nor private bodies have to date developed a control system to check whether farms comply with conservation agriculture guidelines. Nor have widespread references or standards for the techniques, restrictions and/or prohibitions inherent in the implementation of this agrosystem in Europe been issued.

The absence of control systems and standards makes the certification of produce, plots or holdings under conservation tillage redundant. The European market also lacks quality seals or labels endorsing specific products obtained following conservation agriculture guidelines. However, all these aspects (*viz.* the issuance of standards and control, certification and labelling schemes) would be very easy to develop. Regulating the system could result in the marketing of products endorsed with a conservation agriculture label, which would join existing quality labels for environment-friendly products —perhaps with a slightly lower prestige than ecological farming or integrated farming seals and labels. There is ongoing discussion at the national level about the feasibility of developing a specific label for this production system.

- Neither public administrations nor private bodies have to date developed a control, certification and labelling system to check whether holdings are following conservation agriculture guidelines.
- However, all these aspects would be easy to develop in a system leading to the provision of products under the conservation agriculture label.

2.3.4.7. Specific details of the transition process

The transition from mainstream agriculture to conservation agriculture (*i.e.* the changes to be introduced by farmers in order to develop a stable conservation farming system) has not been regulated or standardised on a broad basis; rather, it presents different features on the American continent and in Europe.

Conservation agriculture has great advantages that are easily perceived by American farmers. Thus, apart from the general advantages such as the reduction of atmospheric pollution through the prohibition of burning stubble and other farming residues or the improved biodiversity obtained, prospective conservation farmers can obtain proven direct benefits for themselves.

Thus, some experiments have confirmed that conservation agriculture results in energy and labour savings thanks to reduced machinery use —which also reduces wear. Also, water retention by soil is improved and erosion reduced as a result. Some authors even claim that, after the transition period, the productivity of a plot under conservation agriculture is similar to that of an identical plot under mainstream agriculture. This reduces costs and/or increases gross margins.

These advantages have facilitated expansion at a very high rate on the American continent. The process has been much slower in Europe, however. Why have European farmers failed to adopt a system that can bring them so clear-cut benefits?

In a survey conducted in Western Europe, technicians and farmers were asked about the main reasons for not using conservation tillage. More than 70% mentioned the lack of technical support, 55% lower yields and 40% the lack of scientific results (Tebrügge, 1997, quoted in Martínez Vilela and González Sánchez, 2000)[109]. In addition to these reasons, whether founded or not, other documents mention specific restrictions perceived by prospective users of the agrosystem such as the following:

- The lack of information readily accessible to producers.

109 Martinez Vilela, J.A. and E. J. González Sánchez (2000). "Agricultura de conservación. Situación actual y perspectivas". http://www.eumedia.es/articulos/vr/cereales/113agricconserv.html

- The system can only be readily adapted to some production types (*e.g.* cereals) and large plots.
- Conservation tillage fosters the appearance of weeds, pests and diseases (especially during the transition process).
- Soil covered with weeds and/or stubble is less "aesthetic" than clear, tilled soil.

However, several studies have already shown that these disadvantages are only apparent; this has encouraged European farmers to gradually adopt the system.

- American farmers adopt the transition process much more easily than European ones. The advantages and disadvantages they are aware of are:

  Advantages: time and labour savings, improved water retention by soil and reduced erosion. All these result in decreased costs and/or increased gross margins for farmers.

  Disadvantages: a lack of information and technical support; lower yields; an increase in weeds, pests and diseases; and the poor "look" of soil covered with weeds and/or stubble.

2.3.4.8. Implications of multifunctionality

The economic and environmental externalities associated with conservation agriculture have by now been examined in a number of studies and experiments. The abundance of data in this respect is partly a result of the close relationship between research and the principal advocates of this agrosystem.

A recent study of the United States Agrarian Research Service in Georgia found conservation tillage to reduce water runoff by at least 10% and to facilitate percolation across soil by up to 50% in some cases. Other studies have revealed that, on average, conservation agriculture (direct sowing/ no-tillage) results in 70% less herbicide runoff, 93% less sediments and 69% less water runoff than mouldboard ploughing (ECAF, 1999)[110]. Likewise, some experiments spanning periods of more than ten years have revealed the organic matter content in soil to be maintained or even increased by the use of conservation techniques (González-Fernández, 1997[111]; Gregorich *et al.*, 1995[112]).

It is also easy to understand that keeping residues of previous crops or plant cover on soil helps prevent erosion, as confirmed by studies conducted by the United States Department of Agriculture (USDA), among other bodies.

However, the most immediate benefits in the eyes of farmers are perhaps those related to the reduction of direct costs. Thus, energy savings were estimated to amount to 73% and labour requirements to be reduced by 69% in a study comparing non-tillage and row tillage with mouldboard ploughing (Conservation Technology Information Center, 2002)[113].

Some authors have even quantified the savings derived from the use of this agrosystem. Thus, a study of the Monsanto Centres of Excellence spanning four consecutive years revealed a profit increase of 11–13% for irrigated plots under conservation agriculture relative to mainstream

110 Conservation Agriculture in Europe. http://www.ecaf.org/English/First.html

111 González-Fernández, P. (1997). "Effect of soil tillage on organic matter and chemical properties", p. 43-49. Agricultura de Conservación: Fundamentos Agronómicos, Medioambientales y Económicos, Asociación Española Agricultura de Conservación/ Suelos Vivos (AEAC/ SV), Córdoba, España, pp. 372

112 Gregorich, E.G., D.A. Angers, C.A. Campbell, M.R. Carter, C.F. Drury, B.H. Ellert, P.H. Groenevelt, D.A. Holmstrom, C.M. Monreal, H.W. Rees, R.P. Voroney, and T.J. Vyn. (1995). "Changes in soil organic matter". Ch. 5. In: D.F. Acton and L.J. Gregorich (eds.), The Health of Our Soils. Towards sustainable agriculture in Canada, CLBRR Research Branch, Publication 1906/E, Agriculture and Agri-Food Canada. http://res.agr.ca/CANSIS/PUBLICATIONS/HEALTH/_overview.html.

113 http://www.ctic.purdue.edu/CTIC/CTIC.html

agriculture. Other authors (Navarro, 2002)[114] have estimated that the savings in dryland arable crops can range from 40 to 100 euros per hectare.

- Conservation tillage generates environmental positive externalities such as reduced water runoff, the preservation or increase of organic matter in soil and the prevention of erosion.
- There is also evidence of decreased production costs and increased profits.
- Although there is abundant literature regarding this type of positive externalities and in spite of their presence in America, it should be thoroughly studied the reasons why there is not such a clear perception of them in Europe.

2.3.4.9. Product marketing

As noted in the previous section, conservation agriculture provides energy and labour savings that result in reduced production costs. In addition, because the most fertile soil layer is preserved, there is no long-term fall in productivity and income can be kept at constant levels. All this allows farmers to sell their produce at reduced prices while keeping profit on a par with mainstream farmers. This is one of the main reasons for the widespread implementation of this agrosystem on the American continent, which is a strong competitor on the world market.

Conservation tillage can make holdings more competitive by allowing producers to lower the price of products that are in principle identical with others not obtained under conservation agriculture. This is a strength on a global market where free trade in agricultural produce is becoming a reality and may reach even higher levels in the near future.

Because this approach is feasible at present, one may also consider a future possibility, namely: the marketing of properly labelled conservation agriculture produce as noted in a previous section. The institution of a control and certification system to regulate the agrosystem in every aspect would no doubt raise production costs —by a relatively small fraction of total costs, however. It would therefore be possible to market products with an "environmentally-friendly" quality label with a fairly small increase in costs.

- Conservation tillage can make holdings more competitive by effect of the reduced price of products theoretically identical to those obtained using other agrosystems.
- There is also the future possibility of marketing properly labelled conservation agriculture produce. This would allow the marketing of products with an "environmentally-friendly" quality seal without raising costs unduly.

2.3.5. Agriculture under Guaranteed Quality

2.3.5.1. Introduction

A large number of public and private food quality endorsement figures exists at the global, European, national and regional levels. What follows is a non-exhaustive classification of the vast amount of existing certification systems.

- Quality protection figures based on the geographical origin of the product: include two types of figures:
  - Protected Designations of Origin (PDO) and Protected Geographical Indications (PGI) of agri-food products[115], as well

114 Navarro, E. (2002). "El futuro de la agricultura de conservación: producir conservando". Congreso Internacional" Reformas de la PAC y su influencia en el mundo agrícola europeo". Córdoba, España, 2002. http://www.portaldelmedioambiente.com/congresopac/html/descargas/EMILIOROMARTINEZ.pdf

115 ANNEX 13 lists the translations of PDO, PGI and TSG into the different Community languages.

as the quality wines produced in specified regions (quality wines psr) and some regional wines, all of which are acknowledged by the European Union. At the national level there are figures such as the *Denomination Montagne* and the former *Label Regional* in France, which are similar to the quality labels established by various autonomous communities in Spain and cannot be identified with a specific geographical origin unless they are tied to a particular PGI.

– Figures also related to geographical origin but having some environmental implications and lying in between organically certified and quality assured products. Such is the case with environment-friendly products from some areas environmentally protected by the European network *Natura 2000*. At the national level, France has developed its *Parc Naturel Regional* label and Spain its *Marca Parque Natural de Andalucía* brand. There is also the *Doñana 21* private label in Spain.

- **Quality designations with no geographical bond** include those for products from industries certified in accordance with ISO 9000 or ISO 14000 at the international level, as well as Traditional Specialities Guaranteed (TSG) in the EU. State-wide, publicly endorsed figures in this category include the *Label Rouge* and *Certification de Conformité* in France; the fruits and vegetables certified in accordance with UNE 155001 in Spain; and *Prodotti Agroalimentari Traditionalli* in Italy. There are also private brands with some state support including the *Little Red Tractor* in the United Kingdom, *AMA Gutesiegel-Geprufte Qualitat Austria* in Austria and *Gütezeichen fur Produkte im Land und Ernährungswirtscha ftlichen Bereich* in Germany.

In addition, there are some large distribution firms that have developed their own quality labels. Thus, a number of large supermarkets promote their own labels among consumers and retailers in some countries use *EUREP-GAP* certificates.

ANNEX 14 describes some of these certificates in detail.

- There exists a number of public and private agricultural food quality assurance figures at the global, European, national and regional levels.
- In Europe, such quality assurance figures include PDO and PGI for agri-food products, and quality wines psr for wines.
- TSG constitutes an EU quality assurance figure with no specific geographical bond.

2.3.5.2. Historical development

Quality is a broad, changing concept that has evolved over time. Specifically, quality protection figures associated with the geographical origin of products have been present in the legislation of some countries, and in bilateral and multilateral agreements, since the late 19th century.

The initially timid protection of designations of origin arose in response to false indications of product origin. The *Paris Convention* (1883) and the *Madrid Agreement* (1891) were two of the earliest **international initiatives** in this context. However, designations of origin were not endorsed at the international level until the *Lisbon Agreement* (1958), article 2 of which provided a final definition for this term[116]. Despite its high judicial quality, the Lisbon Agreement was subscribed by few

116 As per article 2, section 1 of the Agreement designation of origin means "the name of a region, a specific place or, in exceptional cases, a country, used to describe an agricultural product or a foodstuff originating in that region, specific place or country, and the quality or characteristics of which are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors, and the production, processing and preparation of which take place in the defined geographical area".

countries, of which only three (France, Italy and Portugal) are currently EU Member States (López Benítez, 1996)[117].

Wider international consensus was not achieved until 1994, when the *Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS)* was signed by a number of countries on the occasion of the foundation of the World Trade Organisation.

At **Community level**, the Treaty establishing the EEC (1957) made no specific provisions for designations of origin, so these were protected by each Member State on an individual basis[118].

It was in the wine sector that designations of origin were first protected at Community level. In fact, the 1970s witnessed the issuing of various regulations within the common agricultural policy framework that were intended to define and acknowledge Quality Wines Produced in Specified Regions (QWPSR). Thus, the former wine Common Market Organisation (CMO) [Regulation (EEC) No. 823/87] distinguished such wines from table wines. This Community protection scheme was extended in 1989 to all spirituous beverages via Regulation (EEC) No. 1576/89. The 1999 reform of the wine CMO [Regulation (EC) No. 1493/99] maintained the QWPSR figure and introduced that of regional wines.

Other agri-food products were not officially protected at the European level until much later. Regulation (EEC) No. 2081/92 on the protection of Geographical indications (PGI) and Designations of Origin (PDO), and Regulation (EEC) No. 2082/92 on the certification of specific character or Traditional Specialities Guaranteed (TSG), provided a common legal framework for all EU Member States. The former regulation protects geographical names of distinguished quality, whereas the latter establishes a new system aimed at protecting the traditional production or processing of recipes and formulas.

Regarding **national protection** of product quality, quality regulation in the Nordic and Anglo-Saxon countries has traditionally relied on laws about food safety, nutritional characteristics and conformity with specific production standards; by contrast, legislation on quality in Mediterranean countries has focussed on the traditional nature of the production process, the territorial bonds of products and special organoleptic qualities. In fact, countries such as France, Italy, Spain, Portugal and Greece had their own specific legislation on the matter prior to the EC regulation of 1992. **ANNEX 15** overviews the antecedents of quality production figures in some Member States.

- Designations of origin were definitively endorsed internationally by the Lisbon Agreement of 1958. The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), signed in 1994, expanded the number of subscribing states.
- Designations of origin in the wine sector were the first to be protected at Community level. Protection was extended to the agri-food sector at a much later time.
- Quality protection in Mediterranean countries has focussed on the territorial bonds of the products and on their special features; in northern European countries, however, protection has focussed on food safety and nutritional characteristics.

2.3.5.3. Related bodies

Geographical indications are protected internationally by the World Intellectual Property

117 López Benítez, M. (1996). "Las Denominaciones de Origen", Cedecs. Barcelona.
118 Not all European countries included the "designation of origin" concept in their domestic law.

Organisation (WIPO), which manages a number of international agreements that deal partly or entirely with the protection of such indications [particularly the Paris Convention for the Protection of Industrial Property, the Lisbon Agreement for the Protection of Appellations of Origin and their International Registration, and the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS)].

Regarding Community certificates, each Member State has specific bodies to authorise the registration of PDO, PGI and TSG, and others to control the enterprises and products certified under such figures, which are described in greater detail in the certification and control section.

For PDO and PGI to operate properly, every actor in the production process must have a certain logic and organisation. Some bodies in each Member State serve to guide producers and to manage the designations; also, they act as negotiators with the public institutions in charge of certification and control. Such bodies are called *syndicats de défense* in France, *consorzi di tutella* in Italy and *consejos reguladores* in Spain.

Also concerned with quality or origin labels in Europe (and elsewhere) there are bodies engaged in the promotion of certified products. Such is the case with the Centre for the Development of Agricultural and Food Quality Certificates (CERQUA) in France, the *Instituto di Servizi per il Mercato Agricolo Alimentari* (ISMEA) in Italy or Food from Britain in the United Kingdom (for further information see **ANNEX 16**).

A number of private enterprises, foundations and business associations have developed, whether by themselves or with public support, their own quality labels —often based on renowned quality certificates. Such is the case with *AMA Marketing GesmbH*, a private company that has created the quality label *AMA Gutesiegel-Geprufte Qualitat Austria*; *Assured Food Standards (AFS)*, a non-profit-making company set up by the industry — with some government support— as an umbrella body to administer the *Little Red Tractor* scheme in the United Kingdom; *Fundación Doñana 21*, which has developed the brand *Doñana 21* in Spain[119]; the *Asociación Empresarial de la Calidad Agroalimentaria Landaluz*, which has developed the label *Landaluz, Alimentos de Calidad*, also in Spain; and the *Deutsches Institut für Gütensicherung und Kennzeichnung EV*, which is the recognised authority for reliable marking of products and services in Germany and, among others, has developed a specific quality label for agri-food products called *Gütezeichen fur Produkte im Land und Ernährungs wirtschaftlichen Bereich*.

In France, the brand *Parc Naturel Regional* is awarded by its owner, the Ministry of the Environment, to individual regional natural parks.

- Geographical indications are protected internationally by WIPO.
- Each Member State has various bodies concerned with the management, certification, control and promotion of Community quality certifications.
- A number of private enterprises, foundations and business associations have developed their own quality brands or seals.

2.3.5.4. Associated production techniques

As noted earlier, quality-based distinctions require the presence of a protective body defining which products can be endorsed and which cannot. This is accomplished by means of protocols and regulations that describe, by way of contract, the specifications to be met by the products to be certified.

Regarding the quality figures for agricultural products and foodstuffs officially endorsed by the

119 The enterprises adhered to the label Doñana 21 agree to adopt quality assurance and environmental management systems compliant with ISO 9001 and ISO 14001.

EU, Regulations (EEC) No. 2081/92 and 2082/92 dictate that, in order to be eligible for the awarding of a PDO or a PGI in the former case and a TSG in the latter, a product must meet some specifications that include the description of the method by which the product is obtained or produced and the production techniques involved.

Thus, under Regulation (EEC) 2081/92, the specifications must include the description of the method used to obtain the agricultural product or foodstuff and, if appropriate, the authentic and unvarying local methods involved. On the other hand, Regulation (EEC) 2082/92 rules that the specifications must contain the description of the production method, including the nature and characteristics of the raw materials and/or ingredients used and/or the method of preparation of the agricultural product or foodstuff, referring to its specific character.

By way of an example, **ANNEX 17** shows some registration applications for PDO and TSG with a summary of the specifications. Section 4.5 describes the method of obtaining the product in the case of PGI and PDO, and section 4.2 the specific methods of production and manufacture in the case of TSG. The information provided in both cases varies with the product concerned. Thus, for extra virgin olive oil, the section "Method of Obtainment" may include the olive varieties used and their minimum or maximum proportions; the pest control methods employed; a description of the way and date harvesting is done, and the manner the olives are transported and stored; the maximum allowed storage period prior to grinding; the grinding methods used; the maximum oil yield; and the highest temperature the oil paste can be subjected to during oil extraction.

For wine, Regulation (EC) No. 1493/99 establishes that rules for quality wines psr should rely on a series of elements including the cropping practices and winemaking methods to be used. Annex VI to this regulation specifies that the cropping practices required for quality wines psr to be of optimum quality should comply with the regulations issued by each interested Member State and that vine-growing regions will only be able to access irrigation when authorised by the Member State concerned, authorisations being granted on ecological criteria. Regarding winemaking methods, the Annex specifies, among others, that Member States are responsible for defining the special winemaking and production methods for quality wines psr used to obtain each type of wine.

In Spain, *Consejos Reguladores* (regulatory councils) have been entrusted with the task of setting the rules for each product under a quality indication. Regulations include, among others, the production practices to be used to obtain each product.

The awarding of other labels or quality labels such as the above-mentioned *Label Rouge* in France is subject to compliance with specific production practices described in the pertinent protocols. In order to obtain this label, a product must exhibit an increased quality in —mainly— sensory analyses and tests. Because this is a high-standing label, it requires the periodic updating of certification criteria in order to incorporate technical advances and improvements in uncertified products in order to maintain a significant distinction from the latter.

The specific characteristics of the products eligible for the French *Certification de Conformité* are based on objective, measurable, controllable, consumer-significant criteria contained in specifications that can be developed by individual or collective operators. Certified characteristics may relate to product composition, organoleptic or physico–chemical properties, or specific manufacturing rules.

The EUREPGAP protocol has been developed by experts and heavily risk assessed. By adhering to good agricultural practices, food safety is guaranteed. There are a number of other significant benefits such as respect to the environment, and worker safety and welfare. EUREPGAP is based on HACCP (Hazard Analysis and Critical Control Points) principles and, although its scope is limited to pre-farm gate, codes of practice which deal with the interface areas of packaging on the farm and transport from the farm to the processor ensure that a whole assurance chain is provided.

Assuring that the requirements established in the Spanish UNE 155 001 standard are met entails using various tools with very similar aims as the EUREPGAP protocols, namely: consumer protection, environmental respect and producer health and safety. The tools include the control of origin and active material residues, sample collection at any time, the use of recycling cover materials, restrictions on chemicals and the use of effective personal protection equipment during the application of phytochemicals.

Certificates relating to protected spaces such as those awarded by some natural parks or to the produce obtained following the guidelines of the European network *Natura 2000* are usually associated with production techniques typical of organic or integrated farming —or to environment-friendly techniques in any case.

- For a product to be awarded a PDO, PGI or TSG certificate, its production method and techniques must comply with the explicit rules established in its specifications.
- Regulation 1493/99 contains the cultivation practices and winemaking methods to be used to obtain quality wines psr.
- The award of other quality labels is subject to compliance with specific production practices contained in dedicated protocols.
- Certificates relating to protected spaces are associated with environment-friendly techniques which are often typical of organic or integrated farming.

2.3.5.5. Geographical distribution and land area of the major crops

The data reported in this section are Community data for quality protection (*viz.* PDO, PGI and TSG for agri-food products, and quality wines psr and table wines with geographical indication for wines), as well as those for some national certificates (*viz. Label Rouge*, *Label Regional* and *Certification de Conformité* in France, and *Prodotti Agroalimentari Tradizionali* in Italy).

Data about land areas devoted to the obtainment of agri-food products certified with origin or quality labels in the European Union are not uniform. For this reason, the geographic distribution discussed in this section is based on the number of certificates obtained as described in Regulations 2081/92 and 2082/92.

As can be seen from **table 3**, Mediterranean countries, by virtue of their historical tradition in the development of designations of origin and other quality indications, are those awarding the largest number of certificates of this type. The ranking is topped by France (with 22% of all Community certificates), followed by Italy (20%), Portugal (14%), Greece (13%) and Spain (11%). While Germany, with 10%, is close to Spain in the ranking, most of its certificates correspond to mineral water, which, by virtue of the latest reform of Regulation 2081/92, is about to lose its protected status.

Of the three existing types of Community certificates, PDO and PGI are the most important in number; in fact, they account for 59% and 39% of all certificates. TSG, with only 2%, are only anecdotal in the EU, Belgium (with its traditional beers), Spain and Finland contributing most of them (see **table 2** in **ANNEX 18**).

Cheeses, with a total 149 PDO/PGI, and vegetables and fruits (and cereals), with 122 (see **table 1** in **ANNEX 18**), have traditionally accounted for a high proportion of certificates of origin.

The wine sector, which is regulated separately, possesses precise production data (see **table 3** in **ANNEX 18**). The European Union is producing increasing amounts of quality wines at the expense of table wines (see **graph 1** in **ANNEX 18**). Thus, the production of quality wines psr in the last season accounted for 44% of the total wine production; France, with 37%, was again the first producing country, followed by Italy (21%) and Spain (20%) (see **table 3** in **ANNEX 18**).

Table 3: PDO, PGI and TSG, by country, in the European Union (May 2003).

Country	PDO	PGI	TSG	TOTAL	%
Austria	8	4	–	12	2
Belgium	2	2	5	9	1
Denmark	–	3	–	3	0
Finland	1	–	3	4	1
France	63	69	–	132	22
Germany	37	26	–	63	10
Greece	60	21	–	81	13
Ireland	1	2	–	3	0
Italy	80	43	1	124	20
Luxembourg	2	2	–	4	1
The Netherlands	5	–	–	5	1
Portugal	53	32	–	85	14
Spain	42	26	3	71	11
Sweden	–	2	1	3	0
United Kingdom	13	13	1	27	4
TOTAL	**367**	**245**	**14**	**626**	

Source: Compiled by the authors using data from http://europa.eu.int/comm/agriculture/qual/en/1bbab_en.htm

Table 4: Production of Quality Wines Produced in Specified Regions (in thousands of hectolitres) across the European Union over the period 1999–2003.

Country	98/99	99/00	00/01	01/02	02 VS 01	02/03	03 VS 02
Austria	2,109	2,174	2,066	2,027	-1.9%	1,807	-10.9%
Belgium		1	0	1		2	
Denmark	10,193	10,843	10,070	8,592	-14.7%	10,700	24.5%
France	26,426	28,064	26,868	26,449	-1.6%	24,800	-6.2%
Greece	304	337	292	251	-14.0%	251	0.0%
Italy	12,487	12,580	13,000	13,178	1.4%	13,600	3.2%
Luxembourg	144	156	119	125	5.0%	160	
Portugal	1,910	3,746	3,253	4,135	27.1%	1,710	-58.6%
Spain	12,005	12,667	14,649	11,435	-21.9%	13,000	13.7%
UK	3	2	2	2	0.0%	2	0.0%
TOTAL QWPSR	**65,846**	**70,570**	**70,014**	**66,193**	**-5.5%**	**66,030**	**-0.2%**
GRAND TOTAL	**162,562**	**179,117**	**176,006**	**158,555**		**149,427**	
%	40.51%	39.40%	39.78%	41.75%		44.19%	

Source: http://europa.eu.int/comm/agriculture/markets/wine/facts/prod.pdf

ANNEX 19 provides a more comprehensive description of the present status of quality figures in the countries examined.

- Data about land areas devoted to the obtainment of agricultural products under guaranteed quality in the European Union are not uniform; for this reason, their geographical distribution is discussed in terms of the number of certificates awarded.
- France is at the top of the ranking, with 22% of all Community certificates.
- The cheese sector is that receiving the largest number of PDO and PGI.

2.3.5.6. Regulation and subsidies

Geographical indications and quality brands are protected at different levels depending on the origin of the regulations concerned. Thus, some regulations have arisen from international agreements and others from Community-wide, national, or even regional legislation.

Such a broad concept spans different areas of the legal system including Mercantile, Administrative, Private International and Criminal law.

Regulation

The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), included in the Marrakesh Agreement Establishing the World Trade Organisation in 1994, was the first **international** treaty providing wide coverage for geographical indications and having the largest signatory membership on this issue. The TRIPS agreement contains a clear-cut triple distinction in the level of protection, namely: for geographical indications related to all products, for wines and spirits, and for wine only[120] —the latter two being the most highly protected. The level of protection provided by this agreement clearly surpasses —at least as regards wines and spirits— that of the other major multilateral agreement: the Paris Convention (Maroño Gargallo, 2002[121]).

The **Community rules** on the protection and exploitation of agri-food products is essentially contained in two regulations, namely:

- Council Regulation (EEC) No. 2081/92, of July 12, on the protection of geographical indications (PGI) and designations of origin (PDO) for agricultural products and foodstuffs.
- Council Regulation (EEC) No. 2082/92, of July 14, on certificates of specific character for agricultural products and foodstuffs (Traditional Specialities Guaranteed, TSG)[122].

The main goal of Regulation 2081/92 is to lay down common rules on the protection of geographical indications and designations of origin so as to add value to certain specific high-quality products from a demarcated geographical area. The regulation also aims to promote the diversification of agricultural production in a rural development context.

The type of link between product and geographical location is more stringent in the case of PDO, quality or other characteristics being due essentially or exclusively to its geographical environment; for PGI, quality may be attributed to the geographical environment.

Regulation 2081/02 applies to agricultural products and foodstuffs (wines and spirituous beverages excluded)[123]. The latest amendment, adopted through Regulation 693/2003, excluded mineral and spring waters —after a transitional period of ten years— and included wine vinegars, mustard, pasta, wool and wicker.

The primary aims of Regulation 2082/92 are to add value to specific quality products made in compliance with traditional practices; to support rural development (especially in less favoured or remote areas); and to help diversify agricultural production.

120 The TRIPS agreement defines geographical indications as "indications which identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin". This wide-ranging definition covers both designations of origin and geographical indications as understood in Regulation 2081/92, including traditional names that are not strictly geographical designations.

121 Maroño Gargallo, (2002). "La protección jurídica de las denominaciones de origen en los derechos español y comunitario". Marcial Pons.

122 ANNEX 13 gives the translations of PDO, PGI and TSG into other Community languages.

123 The products covered by Regulations 2081/92 and 2082/92 include fresh meat (and offal); meat-based products (cooked, salted, smoked); cheeses; other products of animal origin (eggs, honey, dairy products excluding butter); oils and fats (butter, margarine, oils); fruits, vegetables and cereals; fish, molluscs and fresh crustaceans; beer; beverages made from plant extracts; bread, pastry, cakes, confectionery, biscuits and other baker's wares; and other agricultural products. The products covered by Regulation 2081/92 alone are natural mineral waters and spring waters; natural gums and resins; essential oils; hay; cork; cochineal (a raw product of animal origin); and flowers and ornamental plants.

Certificates of specific character or TSG do not refer to origin, but rather highlight the traditional features of either the composition or the method of production. To be eligible for certification, the agricultural products or foodstuffs concerned must be produced from traditional raw materials, exhibit a traditional composition or be obtained using a traditional production or transformation method.

Community certificates of specific character are awarded to agricultural products and foodstuffs which are common for both Regulations 2081/92 and 2082/92, as well as to others contained in the latter only[124].

The wine sector is not included in Regulations 2081/92 and 2082/92 as it possesses its own rules, namely: Regulation (EC) No 1493/99, of May 17, *on the common organisation of the market in wine*. Title VI of this regulation establishes the rules governing the production of quality wines produced in specified regions (quality wines psr). Quality wines psr include fortified wines (quality fortified wines psr), sparkling wines (quality sparkling wines psr), semi-sparkling wines (quality semi-sparkling still wines psr) and quality wines psr other than the previous ones. Regulation 1493/99 introduced a common set of rules for the production of these wines. The EU Member States must transmit to the Commission a list of the quality wines psr which they have recognised and are empowered to impose stricter conditions on winemaking practices and treatments in order to ensure that the essential characteristics of the protected wines are preserved.

ANNEX 20 lists the rules of application and amendments to Regulations 2081/92, 2082/92 and 1493/99.

Spirits are also regulated separately. Annexe II to Regulation (EC) No. 1576/89 lists the geographical designations for the different spirituous beverages.

There are also regulations on the different Common Market organisations, which, similarly to the wine sector, issue rules on the quality of each product.

Thus, in relation to livestock, Regulation (EC) No. 1760/2000 establishes facultative labelling schemes for cattle that emphasise origin-related attributes such as animal race, natural breeding and slaughtering environment, and natural feeding.

Another protection level on geographical indications contained in the Community Law is provided by Regulation (EC) 40/94 on the Community brand. The regulation also allows geographic indications to be registered as collective guaranteed brands.

ANNEX 21 provides a detailed description of quality protection and food origin as implemented by each Member State.

Aid

Regulations 2081/92 and 2082/92 deal with the Community measure described above, but make no provision for aid to the enable the development and promotion of the certificates concerned. Funding is provided through the regulations described below.

Council Regulation (EC) No. 1257/99, of May 17, on support for rural development from the European Agricultural Guidance and Guarantee Fund included aid to support of the improvement of agricultural product quality among those to be granted by Member States within the framework of rural development actions. In fact, the regulation establishes supports for improving the processing and marketing of agricultural products via actions intended to improve and monitor their quality.

Soon after the previous regulation came into force, the Commission adopted new guidelines for state aid in the agriculture sector that were published in the Official Journal, C series, 28, of February 1, 2000. A series of subsidies intended to encourage the production and marketing of quality

124 The specific products exclusively covered by Regulation 2082/92 are chocolate and other food preparations containing cocoa; pasta (including cooked or stuffed); prepared dishes; prepared sauces; soups and stocks; and ice creams and sorbet.

agricultural products over the period 2000–2006 was thus established.

Based on these guidelines, the Commission would allow subsidies for consultancy and similar support for activities related to the development of quality agricultural products including subsidies granted for the preparation of applications or recognition of designations of origin or certificates of specific character.

In the specific case of subsidies paid to cover the cost of control measures undertaken to ensure the authenticity of designations of origin, or certificates of specific character, the Commission would permit temporary and decreasing subsidies to be paid in order to cover the cost of the controls during the first six years following the establishment of the control system.

The subsidies explicitly envisaged in the guidelines are supplemented by aid for the promotion and publicity of agricultural products within the framework of other Community regulations (*viz.* No. 2826/2000 and 2072/1999). The former establishes a series of measures including public relations and promotional or publicity actions aimed at highlighting the advantages of EU products (especially in terms of quality).

ANNEXES 22 and 23 provide a more detailed description of this Community aid and that of the Member States, respectively.

- Regulations 2081/92 and 2082/92 contain the Community rules about the protection and exploitation of agri-food products.
- The wine sector has its own regulation (No. 1493/99). Spirits are also regulated separately.
- Funding is ensured basically via Regulation 1257/99 on rural development aid.

2.3.5.7.- Control, certification and labelling

Certification

Each quality label has its own award process and certification authority. This section deals mainly with the process leading to the granting of Community certificates.

In order to be awarded a PDO, PGI or TSG certificate, producers and processors must comply with the following registration procedure[125]:

- A group[126] of producers must define the product according to precise specifications.
- The application, including the specifications, must be sent to the relevant national authority.
- The national authority shall examine applications at the national level and, if they meet the requirements, shall transfer them to the Commission —there will be transitional national protection in the meantime.
- As regards control procedures, within a period of six months the Commission shall verify, by means of a formal investigation, whether the registration application meets all the requirements.
- If the application meets the requirements, a preliminary publication in the Official Journal

125 Article 7 of Regulation 2081/92 establishes an accelerated procedure in which, within six months of entry into force of the Regulation, Member States are to inform the Commission which of their legally protected names or, in those Member States where no protection system exists, which of their names established by usage they wish to register pursuant to the Regulation.

126 As per Article 5 of Regulation 2081/92, only a group or, subject to certain conditions to be laid down in accordance with the procedure provided for in Article 15, a natural or legal person, shall be entitled to apply for registration. For the purposes of this Article, "Group" means any association, irrespective of its legal form or composition, of producers and/or processors working with the same agricultural product or foodstuff. Other interested parties may participate in the group. In the case of Council Regulation (EEC) No. 2082/92, Article 7 establishes that only a group shall be entitled to apply for registration. In this way, each registration application must be submitted by a different applicant. As per Royal Decree 1643/1999, applicants in Spain must provide evidence of their professional, economic and territorial bonds with the products for which registration is requested, as producers or transformers acting in the geographical area covered by the designation in question.

of the European Communities will inform those in the Union with a potential interest.

- If there are no objections, the European Commission shall publish the protected product name in the Official Journal of the European Communities.

In order to qualify for a PGI or PDO certificate, a product must comply with a specification containing the following details: name and description of the product; definition of the geographical area; methods of preparation; factors relating to the geographical environment; inspection bodies; details of labelling and any legislative requirements to be met.

Registration is provided by the **European Commission**[127] and, in each Member State, the corresponding **national competent authority**. The competent authority varies among Member States but is usually the Ministry of Agriculture (and some other ministries such as that of Justice in Germany), some regional authorities in each Spanish autonomous community or a special institution or body (*e.g.* the *Institut National des Appellations d'Origine*, INAO, in France). **ANNEX 24** lists the competent authorities in each Member State.

Member States are competent to certify and register wine products. Each state must compile a list of previously certified quality wines psr and submit it to the Commission for publication in the Official Journal.

Registered PGI and PDO are protected against any misuse or false misleading indication. Member States may maintain national protection of the names communicated until a decision on registration has been made.

Regarding the certification of other quality labels, the specifications of products to which a *Label Rouge* or *Certification de Conformité* has been awarded are made available for public inspection and for examination by qualified staff from research institutes or professional technical institutes. In France, the *Commission Nationale des Labels et de Certification des Produits Agricoles et Alimentaires* (CNLC) issues a report on the specification. If a favourable report is obtained, then the specifications are approved through a decree or inter-ministerial order after a test period.

Like the *Label Rouge*, certificates of conformity are issued by certifying bodies accredited by COFRAC (in accordance with EN 45001) and approved by public powers following the report of the *Agréement des Organismes Certificateurs* section of CNLC.

The administrative authorisation to use the designation *montagne* is granted to natural or legal persons, or to associations. The authorisation is awarded by the civil governor of the region following the favourable report of the Regional Commission on Quality Foodstuffs (CORPAQ) or, if appropriate, the coordinator of the local governors of the mountain range concerned[128].

Labelling

In order to add value to designations of origin and geographical indications protected by the Community, and to inform consumers, professionals require a Community symbol that was established by Regulation (EC) No. 1726/98. The logo can be included in the label or packaging of registered products, or even be used in advertising. A Member State may stipulate that the name of the inspection authority or body must appear on the label of the agricultural product or foodstuff concerned.

In **SPAIN**, for example, every label must include the following term: "Denominación Específica" (Specific designation or PGI) or "Denominación de Origen" (Designation of Origin or PDO). Any of these consumer products must

127 The Commission shall be assisted by a committee composed of the representatives of the Member States and chaired by the representative of the Commission. Also, if appropriate, it will seek the advice of the Scientific Committee for Designations of Origin, Geographical Indications and Certificates of Specific Character, which represents professionals and specialists in the matter.

128 This procedure is followed since the issuance of Decree 2000-1231, of December 15, on the usage of the term montagne.

have an assurance label or a numbered counter-label; both are issued by *consejos reguladores* (regulatory councils) and attached at the packaging, transforming or processing plant after the control that assures the Specific Designation or Designation of Origin. Labels must be attached in such a way as to prevent reuse.

Graph 9: Community PDO, PGI and TSG logos.

The award of a Community label to a product does not preclude its certification as organic produce under Regulation 2092/91 or under a different quality protection figures. In France, for example, only those products previously certified as *AOC* are eligible for the award of a Community PDO and only those receiving a *label* or *certification de conformité* are eligible for that of a PGI; such products must therefore bear both the Community logo and the applicable French logo.

ANNEX 25 examines the labels of some national quality certificates.

ISO standards certify a process, so some products bear a distinctive label from the certifying body on their packaging.

Control

There is an inspection body in each Member State for the control of PDO, PGI and TSG that may comprise one or more designated inspection authorities and/or private bodies approved for that purpose by the Member State the function of which shall ensure that agricultural products and foodstuffs bearing a protected name meet the requirements laid down in the specifications. **ANNEX 26** lists some such authorities.

An inspection body offering adequate guarantees of objectiveness and impartiality checks whether the product meets the criteria laid down in the specifications. Also, it can withdraw the right of the producer or processor of a product to use a PGI or PDO if the product fails to meet such criteria. Any Member State may dictate that a product no longer meets the criteria laid down in the specifications. In such a case, the Commission decides whether or not to suspend or withdraw the PGI or PDO.

Inspections bodies must have permanently at their disposal the qualified staff and resources needed to conduct inspections of agricultural products and foodstuffs bearing a protected name. If an inspection structure uses the services of another body for some inspection, that body must offer the same guarantees. In that event, the designated inspection authorities and/or approved private bodies shall, however, continue to be responsible vis-à-vis the Member State for all inspections. Private bodies must fulfil the requirements laid down in standard EN 45011.

Other quality figures are usually controlled by third-party, independent bodies also accredited in accordance with EN 45011 and, in the case of dealing with official or public certificates, approved by the public authorities.

- In order to be awarded a Community certificate for an agricultural product or foodstuff, an application must be sent to the competent national authority. The authority shall examine the application and submit it to the Commission. After a control procedure, and in the absence of objections, the product is registered.
- Member States are competent to certify and register wine products.
- Community logos were created with a view to adding value to PDO, PGI and TSG, and to informing consumers (Regulation No. 1726/98).
- There is an inspection structure in each Member State for the control of PDO, PGI and TSG that may comprise one or more designated inspection authorities and/or private bodies.

2.3.5.8. Specific details of the transition process

Unlike organic farming, there has been no regulated transition process for the agricultural system dealt with in this chapter. Rather, adhering to any of its variants only requires that those interested follow the established guidelines for the quality figure of choice.

The procedures to be followed by producers and/or transformers associations in order to be awarded a PDO or PGI certificate for a specified product are described in the preceding sections.

A producer wishing to market a product to which a PDO or PGI certificate has previously been awarded must belong to the producers and/or transformers association that is to apply for the quality figure concerned, and also produce it within the geographical area described in the specifications for the quality figure previously awarded. In addition, the producer must go through the controls established by the designated control service and/or private bodies authorised by the Member State concerned, which are responsible for ensuring that products bearing a protected designation meet the requirements laid down in their specifications.

- Unlike organic farming, there has been no regulated transition process for agricul-ture under guaranteed quality. Interested parties must follow the guidelines established for the quality figure concerned in each case.

2.3.5.9. Implications of multifunctionality

Policies aimed at the promotion of quality in agri-food products as an alternative to rural development have received much attention in various Community documents.

Thus, products adhered to a PDO can additionally "become an important asset to the rural world, notably in less favoured or distanced zones, by assuring on the one hand the increase of farmers' gains and the other the keeping of the rural population in these zones" (Charvet and Plet, 1996)[129]. These authors emphasise the existence of an "important structure of small businesses (food industry) which play an important role in food production as well as in the irrigation of the rural structure... Apart from those which are stemmed from technological innovations, these small and middle-sized businesses are most often situated on the gap of regional or quality products". One other undeniable benefit for the rural world provided by the protection of product quality and origin is the preservation of traditions and of local cultural and social values.

Regarding environmental implications, the Protected Designation of Origin labelling system does not guarantee the environmental credentials of the products bearing the label. However, there is scope for PDO registration to involve

129 Charvet and Plet, (1996). "Espaces ruraux et strategies des firmes agro-industrieles", in L'Europe et ses Campagnes, Jollivet, M. and Eizner, N. (Eds), Presses de la Fondation Nationale des Sciences Politiques, Paris.

the specification of environmental production criteria. Such is the case with some types of regional or speciality products (*e.g.* some varieties of French and Italian cheeses specify that the milk must come from cows grazed extensively on permanent pastures). Stronger links between environmental considerations such as lower water pollution levels and product certification systems are being considered in some regions (*e.g.* in Italy). The institution of measures under the Rural Development Regulation and, particularly, the promotion and marketing of high quality products under Article 33, have broadened the scope to link these measures to the identification and safeguarding of special environmentally sensitive farming methods associated with regional products.

Also, some quality figures (*e.g.* PDO) possess an important potential for the economic development of natural resources as they impose the exclusive use of raw materials coming from a designated geographic area in the obtainment of some products. The establishment of such quality figures therefore helps preserve some plant varieties and traditional and indigenous animal breeds.

If a product with a specific identity certified under some quality figure meets the expectations of certain consumers, these may accept to pay more for it than for its substitute product; this results in economic advantages in the production and marketing of guaranteed products.

- One of the benefits of protecting product quality and origin is that it helps preserve local traditions and cultural and social values.
- There is scope for PDO registration to involve the specification of environmental production criteria.
- The establishment of quality figures occasionally helps preserve some plant varieties and traditional and native animal breeds.
- Consumers may accept to pay more for guaranteed products, which will result in economic advantages in their production and marketing.

2.3.5.10. Product marketing

Because markets are currently highly standardised and saturated, any characteristics strengthening differences among products and facilitating their distinction or increasing the number of related associations constitute a highly valuable asset. Thus, the ability to distinguish products by their quality endows quality with a market power that facilitates rising prices and deriving benefits for holdings and transformation industries. In addition, quality differences provide protection and independence from other market agents. If the distinctive label is provided by a reliable, renown institution —as is the case with the EU quality figures—, then the quality certificate issued will be indisputable.

Quality certificates provide a commercial opportunity that allows producers to increase the added value of their production by offering a product featuring specific characteristics demanded by consumers. According to Alvarez Sánchez-Arjona *et al.* (2001)[130], the guarantees contained in such certificates can meet the following consumer demands:

- Food safety[131], which increases the acceptance of products made using traditional natural

130 Alvarez Sánchez-Arjona et al. (2001). " La calidad como estrategia en un mercado global: denominaciones de calidad en queso español". Proceedings of the IV Coloquio Hispano-Portugués de Estudios Rurales. López Iglesias, E., García Arias, I. and Lorenzo, M.C.: (Eds). IDEGA. http://www.usc.es/idega/soledada.doc.

131 Burrel, 1997. "Tendencias del mercado mundial de productos lácteos". Revista de Economía Agraria, 181, pp 243-272. In: Alvarez Sánchez-Arjona et al. (2001). "La calidad como estrategia en un mercado global: denominaciones de calidad en queso español". Proceedings of the IV Coloquio Hispano-Portugués de Estudios Rurales. López Iglesias, E., García Arias, I. and Lorenzo, M.C.: (Eds). IDEGA.

methods with respect to similar products obtained without regard of these premises.

- Preservation of the environment and animal welfare[132]. In fact, many certified products are obtained by feeding and managing animals in accordance with traditional procedures that are in principle more respectful to the rural environment.

Market-wise, the geographic name protected by a PDO or PGI takes the form of a collective or public brand with restricted access in terms not only of origin, but also of the conditions imposed on the nature and quality of the protected products, which results in some marketing advantages.

As noted earlier, one of the advantages of distinguishing products by quality is the ability to obtain better prices for guaranteed products. In the case of quality figures tied to a geographical origin, defining the geographical area concerned allows any producers within their bounds meeting the established requirements to use the distinctive label. There is thus a restriction on supply that has an obvious impact on prices. One example is the milk used in the production of cheese with AOC (Appellation d'Origine Contrôlée or PDO) *Rocamadour*, for which farmer cooperatives can pay up to 70% more than for "standard" milk. Also, the average price for AOC cheese[133] in 1999 was 9.22 euro/kg (*i.e.* 1.86 euro/kg higher than that for non-AOC cheese). This price gap is widening and stood at 2.1 euro/kg in 2000 —there are, however, strong differences among AOCs.

The success of a specific product is often dependent on management correctly defining the market for it. This definition takes us beyond the "naturalist" concept of the product market as defined by the nature of the actual product and its most common use[134]. The relevant market for Parmigiano Reggiano, for example, is not so much the cheese market as that of meal ingredients.

In addition, precise identification of products allows consumers to be certain about their nature and exact provenance. The European Commission has judged it essential to explain the meaning of the PDO/PGI distinctive labels to the general public in the community languages. Article 5 of Commission Regulation (EEC) No. 2037/93 provided that the Commission would take the necessary steps over a period of five years. The EU has already spent 8.8 million euros on an extensive communication campaign to heighten producer, consumer and distributor awareness of PDO and PGI.

Good proof of the commercial success of this type of produce is that the foodstuff output under PDO has increased dramatically over the last few years. Thus, the number of PDO has grown by a factor of four over the past ten years and a high potential continues to exist not only in demand, but also in supply. However, some experts[135] believe that the excessive proliferation of product origin and quality indications brought about by the creation of "artificial" designations of origin (*viz.* for areas or products that previously had no specific name or market) may be counterproductive and saturate the market with certified products that will make it more difficult for consumers to appreciate the distinct, exclusive character of guaranteed products.

The turnover generated by products with a designation has also grown in parallel in recent

132 Bigne. (1997). "El consumidor verde: bases de un modelo de comportamiento". Esic Market, 91, pp 237-251. In: Alvarez Sánchez-Arjona et al. (2001). "La calidad como estrategia en un mercado global: denominaciones de calidad en queso español". Proceedings of the IV Coloquio Hispano-Portugués de Estudios Rurales. López Iglesias, E., García Arias, I. and Lorenzo, M.C.: (Eds). IDEGA.

133 Lassaut. (2001). "Origin labelled products sector in France". http://www.origin-food.org/pdf/olp/olp-fr.pdf.

134 In France, Label Rouge chicken only took off when it eventually found its relevant market. In the first decade (1965-75), Label Rouge Chicken was sold in the traditional form of cut chicken through specialist channels (poultry and retail butchers). The product only got off the ground when it was decided to sell it at supermarkets and very large shopping centres to urban, middle-class customers. In its oven-ready form, it has extended its market; it not only is positioned in the currently thriving quality poultry segment, but is also a service food, a larger market with even greater growth.

135 Juan de Dios Martínez Pérez, Chief of the Quality and Promotion Service of the Agriculture and Fisheries Ministry of the Andalusian Regional Government (private communication).

years. In Spain, it rose from 90.6 million euros in 1991 to 501.9 million euros in 2001; 84.9% was sold on the domestic market and 15.1% on foreign markets —quality wines produced in specified regions and spirituous beverages with a designation of origin or specific designation are excluded from these figures.

ANNEX 27 provides more detailed information about the marketing of these products in the different Member States.

- At present, quality certificates increase the added value of produce as they distinguish products with specific features demanded by consumers.
- Precise identification of guaranteed products allows consumers to be certain about their nature and exact provenance.
- The EU has so far spent 8.8 million euros on an extensive communication campaign.

2.3.6. Other agricultural systems

2.3.6.1. Precision agriculture

Historical development

The spatial variability in soil and crop conditions inherent in agricultural fields has been apparent for decades or even centuries. Thus, since the beginning of agriculture, farmers have known that production areas exhibit a high spatial variability in factors such as pH, drainage, nutrient contents, weed density, pathogen attacks, topography and crop yield.

Between the mid-1970s and early 1980s, increased awareness of variability in soil and crop conditions within fields was acquired from the use of improved field research methods involving soil survey, soil sampling, aerial imaging and crop scouting operations. In the late 1970s, CENEX, Farmers Union Central Exchange, Inc., and the computer company Control Data Corporation, started a joint venture called "CENTROL – Farm Management Services" (Fairchild, 1988)[136]. The principal aim was to facilitate the use of more information about soil and crop conditions for each field during an entire growing season with a view to improving management and farm profitability. One important outcome of this venture was much better awareness of soil and crop variability within fields, and of the potential benefits of using zone-based rather than whole field-based management practices. This and the inception of microcomputers led to the development of a spreader capable of changing on-the-go the blend and rate of fertiliser. The first commercial Variable Rate Technology (VRT) applicators were used in 1995 by CENEX in the USA.

This signalled the beginning of a new agricultural management concept originally called "Farming by Soil Types" and later renamed "Precision Agriculture". The new concept soon aroused strong interest, mainly because it made good sense, was associated with the use of new technologies and opened up new avenues for agro-industries and agro-businesses. The advent of tools such as the Global Positioning System (GPS) allowed a variety of farming machines including harvesters, seeders, herbicide sprayers and fertiliser applicators to be substantially improved. Geographical Information Systems (GIS), miniaturised computer components and sensors, currently allow farmers and agricultural enterprises to gather more comprehensive data on production variability in both space and time.

- Since the beginning of agriculture, farmers have known that production areas exhibit spatial variability in factors such as pH, drainage, nutrient contents, weed density and crop yields has been

136 Fairchild, D. S. (1988). "Soil Information System for Farming by Soil Type". In: Proceedings of an International Interactive Workshop on Soil Resources: Their Inventory, Analysis, and Interpretation for Use in the 1990's. Minneapolis, MN. March 22-24, 1998. University of Minnesota: St. Paul, Minnesota.

known since the beginning of farming. However, it was not until the mid-1970s to early 1980s that better awareness of soil and crop condition variability within fields was acquired from the use of improved field research methods.

- Variable Rate Technology applicators were made commercially available in 1995, which signalled the beginning of a new agricultural management concept called "Precision Agriculture".

Related bodies

No international associations concerned with precision agriculture have to date been formed owing to the low adoption of this agrosystem by producers. There are, however, a few research and testing units —virtually all of which belong to public institutions— devoted to it in various countries.

In the USA, the Precision Agriculture Center of the University of Minnesota was established in 1995 to foster the use of site-specific management techniques through collaborative research, education and outreach programmes. A similar aim is pursued by the Site-Specific Management Center of Purdue University. A number of departments of various universities and official bodies are also engaged in research and promotion of this agrosystem.

In Australia, where precision agriculture is also widely practiced, the Center for Precision Agriculture of the University of Sydney was founded in 1995 to introduce, develop and promote its adoption as a method of environmentally and economically sustainable management with a view to maintaining Australia's internationally competitive rural industries and sustaining their resource base.

The New Zealand Centre for Precision Agriculture (NZCPA), founded on January 1, 2001, aims to increase efficiency in the management of land and resources through the use of leading-edge technologies and common sense. This body encompasses a mosaic of experts in emerging agricultural, horticultural and natural resource management technologies. The NZCPA is a self-funding unit of Massey University.

In Europe, the Centre of Precision Farming of Cranfield University in Silsoe (United Kingdom) was set up in 1996 with the following aims:

- To provide a forum for farmers, the supply industry and research bodies to focus on a wide range of precision farming activities.
- To provide expertise and training in key subject areas.
- To promote links with the commercial agricultural sector at both the service and farmer levels.
- To enable coherent worldwide development and provide a central understanding of developing precision farming technology and practice.

- The low adoption of precision agriculture by producers has so far deterred the establishment of international associations for its promotion; there are, however, a number of research and testing centres concerned with this agrosystem.

Associated production techniques

Rather than specific production techniques, precision agriculture relies on a number of management practices and activities in its different implementation stages. Such practices involve various technologies that include both field and cabinet work.

The steps to be followed with a view to implementing precision agriculture are essentially the following:

1. Collection of information.
2. Processing, analysis and interpretation of the information.
3. Implementation and feed-back.

The **collection of information** includes the field operations required to gather data for its subsequent mapping with a view to performing analyses of spatial variability of the parameters concerned and their mutual interactions. This step is facilitated by the use of Global Positioning Systems (GPS), direct and remote sensors, and Geographic Information Systems (GIS). The practices most commonly used in connection with this step include grid sampling[137] for physico–chemical analyses; direct or remote sensing of soils; crop scouting[138] for the identification of weeds, pests and diseases; and yield monitoring. Yield maps are among the most useful results of this step as they make powerful tools for quantifying variability in specific production areas.

The **processing, analysis and interpretation** of the previously collected information entails the use of dedicated software that facilitates the mathematical and statistical analysis of the different types of data acquired. Especially important in this step is the economic analysis of the impact of the information obtained on the production system concerned and the feasibility of its implementation. The technology involved in this second step includes GIS software, expert systems and statistical software for data mapping, the analysis of the spatial dependence of data and the production of prescription and assessment maps.

The **implementation and feed-back** step involves the application of the conclusions drawn from the analysis of the collected information to field work, as well as the monitoring and assessment of the treatments used through the collection of field data at different points. Continuously monitoring the treatments or prescriptions applied allows the precision level to be progressively improved. This step can involve changes in field operations or the use of Variable Rate Technology (VRT) —if economically feasible.

The application of VRT involves three steps, namely: identifying variability, characterising the environment, and fixing and applying the optimum input rates in accordance with the specific site. In precision agriculture, VRT can be implemented in two ways. One is map-based and involves the sampling and mapping of the production factors to be managed (*e.g.* soil fertility, weeds) in a differential manner and the subsequent production of prescription maps for the application of inputs (*e.g.* fertilisers, herbicides) at variable rates. The other approach involves direct or remote sensing of soil and/or crops in order to facilitate the immediate application of inputs at variable rates. Diagnosing soil fertility is made difficult by the lack of sensors capable of measuring nutrient contents in real time —research aimed at their development is currently under way, however.

Some commercially available controllers and machines allow input rates to be changed with a high degree of precision —down to the square metre, if needed. The hardware can be programmed to control the flow of liquids or granulate material to be applied in order to regulate and facilitate application —which is usually GPS-guided. In addition, application maps can help assess the efficiency of applications by comparison with the original prescription map. This allows one to determine crop yield, among other parameters. **Table 5** describes the uses and advantages of the major precision agriculture technologies.

- Rather than specific production techniques, precision agriculture relies on a number of management practices and activities in its different implementation stages (viz. during collection of information; processing, analysis and interpretation of the information; and implementation and feed-back).
- Geographical Information Systems (GIS), yield monitors, and Global Positioning Systems for guiding soil sampling and the application of inputs at variable rates are among the technologies most frequently used in precision agriculture.

137 A soil sampling method by which the zone to be sampled is split into squares of a preset size and samples are subsequently collected from each for analysis.

138 Visual assessment of the crop conditions (including growth status or ripeness, plant vigour and the presence of diseases, weeds or pests).

Table 5: Principal technologies used in precision agriculture.

Technology	Uses	Advantages
Geographical Information Systems (GIS)	Management of information in the form of georeferenced databases	• Rapid, efficient information management • Production (inputs and products) control
Yield monitors	Measuring areas and the variation of crop yield within the harvested zone	• Accurate measurement of crop areas • Accurate knowledge of yield variability to design tailored agronomic management strategies
GPS-guided input application systems	Precise application of inputs at the desired places	• More uniform application • Avoidance of application to neighbouring zones • No ground staff needed for aerial applications
GPS-guided soil sampling	Determining spatial variability in soil fertility with a view to defining uniform management zones	• Accurate knowledge of the managed area • Efficient sectoring of the managed area

Source: Ortega (2001)[139]

Geographical distribution and land area of the major crops

Although, as noted earlier, precision agriculture is being intensively investigated and tested at present, it continues to be rather slowly adopted by producers. The main reasons for its poor acceptance are the dismal prices for commodities, the complex technologies involved and a learning curve that is too steep for many. In addition, assessing the expansion of such technologies is made difficult by the scarcity of appropriate parameters —among which the land area devoted to this agrosystem is not included.

In fact, the parameter most commonly used to measure the spread of precision agriculture is the number of yield monitors sold by their marketers. **Table 6** lists the monitor sales recorded in some of the countries most deeply engaged in precision agriculture.

Judging by the number of monitors sold (25,000), USA is no doubt the country where precision agriculture is most widespread, followed by Australia and Argentina, with more than 500 monitors both.

Table 6: Number of yield monitors sold in the year 2000 in the countries where precision agriculture has been adopted to the greatest extent.

Country	No. of monitors
USA	25,000
Australia	800
Argentina	560
Brazil	100
South Africa	15
Uruguay	12
Chile	4

Source: Bragachini (2002)[140]

Table 7: Number of yield monitors sold in some European countries.

Country	No. of monitors
United Kingdom	400
Denmark	400
Germany	150
Sweden	150
France	50
Holland	6
Belgium	5

Source: Stafford (2000)[141]

139 Ortega, R. (2001). "Agricultura de Precisión: Usos y Potencialidades en Chile". Agronomía y Forestal UC, No. 13, October 2001.

140 Bragachini, M. (2002). INTA Manfredi, Argentina in Stafford (2000), in: "Profitability of Specific-Site Management". Lowenberg-DeBoer. Site-Specific Management Center, Purdue University. http://www2.agriculture.purdue.edu/ssmc/jessNCFldDay8602c.pdf.

141 Stafford (2000). In: "Profitability of Site Specific Management". Lowenberg-DeBoer. Site-Specific Management Center. Purdue University. http://www2.agriculture.purdue.edu/ssmc/jessNCFldDay8602c.pdf.

In Europe, the ranking is topped by the United Kingdom and Denmark, followed at some distance by Germany and Sweden (see **table 7**).

The extent of adoption of precision agriculture can also be measured by the proportion of input suppliers that provide application of fertilisers at computer-controlled variable rates. According to Bragachini (2001)[142], 40% of USA dealers provide such a service. Also, producers in the USA are using variable application rates on intensively managed crops of such a high added value as sugar beet. By contrast, the use of variable rates is more restricted in Latin America and Australia owing to the high cost of sampling and soil analyses. In Western Europe, precision agriculture is beginning to be adopted in response to the increasing environmental pollution and to comply with legal rules.

- There is no reliable data about the land area devoted to precision agriculture, the extent of adoption of which is currently estimated from the number of yield monitors sold.
- USA, Australia and Argentina are the countries with the most yield monitors.
- In Europe, United Kingdom and Denmark top the yield monitor ranking.

Regulation and subsidies

There are no legal regulations on precision agriculture or specific aid for the producers who adopt it.

Control, certification and labelling

Precision agriculture produce is not distinguished in any way from mainstream agriculture produce, so no specific control or certification structures for the former have to date been established.

Specific details of the transition process

The low adoption of precision agriculture by producers makes it difficult to identify the way the transition to this agrosystem has taken place. However, a report by the Committee on Assessing Crop Yield[143] states that it is difficult to generalise about the expected adoption process for precision agriculture but, because this is actually a suite of technologies and practices used to improve agricultural decision-making rather than a single technology, and based on studies on similar innovations such as irrigation technologies, the greatest long-term potential of precision agriculture may be in geographical areas or production systems where input costs are high or crops have a high value.

Adoption of precision agriculture innovations is unlikely to be uniform across farm types and sizes. Even though technically possible, the adoption of precision agriculture at farm unit level can be impeded by various factors such as access to capital, management sophistication and the presence of local service providers. Although farm size may make a difference in access to all precision agriculture techniques, all farms will likely have access to some in the long term.

- It is difficult to generalise about the expected adoption process for precision agriculture because this system is a suite of technologies and practices used to improve agricultural decision-making rather than a single technology. In any case, its greatest long-term potential may be in specific geographical areas or production systems where input costs are high or crops have a high value.
- The factors potentially governing the adoption of precision agriculture include access to capital, management sophistication and the presence of local service providers.

142 Bragachini, M. (2001). "La Agricultura de Precisión. Nivel de Adopción Actual y Potencial en el Mundo y en Argentina". http://www.agriculturadeprecision.org/presfut/NivelAdopcionActualyPotencial.htm.

143 Committee on Assessing Crop Yield. (2002). "Precision Agriculture in the 21st Century". Geospatial and Information Technologies in Crop Management". National Research Council. National Academy Press. Washington.

Implications of multifunctionality

Broadly speaking, the potential economic, environmental and social implications of precision agriculture arise from the application of appropriate amounts of inputs at specific places at appropriate times. However, because precision agriculture is at an early stage of adoption, it is not yet feasible to analyse its impact rigorously or draw valid conclusions about it.

Regarding **economic implications**, precision agriculture practices can be profitable when the production factor to be managed (*e.g.* fertility, weeds) has a strong influence on production costs and/or crop quality and yield. Accordingly, one is to expect benefits from the investment returns derived from the use of increased amounts of inputs in potentially more responsive areas. However, existing studies are contradictory in this respect and authors such as Kilian (2000)[144], and Hilt and Brynjolfson (in Stenka, 1997)[145], have concluded that precision agriculture improves productivity and product quality but that no significant impact on farmers' income is to be expected.

Also, regarding Variable Rate Technology (VRT), a review of studies on precision agriculture profitability by Lambert and Lowenberg-DeBoer (2000)[146] revealed potentially positive net benefits from this technology in some and negative outcomes in others —essentially as a result of the high cost of soil sampling and analysis.

Regarding **environmental benefits**, the ability to use agrochemicals only where needed or where the likelihood of leaching is lowest can significantly reduce the risk of environmental pollution —through reduced or more efficient use of agrochemical inputs.

In Europe, the environmental benefits of precision agriculture appear to have a greater weight than the economic benefits of adopting the agrosystem. In addition, the future spread of production standards such as ISO 14000 across the world in response to the growing demand of consumers is bound to foster its adoption in the future.

Precision agriculture also has some **operational implications** that include the ability to control and record field operations remotely. In fact, precision agriculture affords careful planning of management operations and a range of potential scenarios for the adoption of the most suitable choice at the time of application. Also, the use of digital application maps reduces the risk of spurious applications.

One other advantage of precision agriculture is the ability to record the input rates used on each site with a view to checking the efficiency of applications and their consistency with the plans.

Finally, the availability of precise applicator and sprayer guides allows applications to be accurately adjusted to the actual needs and reduces the occurrence of zones to which no product or excessive amounts of input are applied. In addition, GPS-guiding reduces sunlight-dependence and provides more hours of field labour as a result.

- Although precision agriculture is at an early stage of adoption, it is expected to have major economic, environmental and social consequences in the future.
- Regarding economic implications, some authors claim that precision agriculture provides benefits derived from investment returns resulting from site-based management of resources, whereas others believe that this agrosystem improves productivity and product quality but has no significant impact on farmers' income.

144 Kilian, B. (2000). "Economic Aspects of Precision Farming: a German View-point". http://www.preagro.de/Veroeff/USA_Economy.pdf

145 Stenka, S. (1997). "Precision Agriculture in the 21st Century". Geospatial and Information Technologies in Crop Management. National Academy Press, Washington.

146 Lambert, D. and Lowenberg-DeBoer, J. (2000). "Precision Agriculture Profitability Review". http://mollisol.agri.purdue.edu/SSMC/Frames/newsoilsX.pdf.

- In relation to environmental implications, the ability to use inputs only where needed is bound to have clearly favourable effects.
- The ability to control field operations remotely can have "operational" implications including the ability to carefully plan management operations, reduced risks of spurious applications and improved input application efficiency consistent with the plans.

Product marketing

At present, the products of precision agriculture are not distinguished in any way from mainstream agricultural produce on the market. However, the improved assessment and monitoring of soil preparation, growth, harvesting, storage, handling and processing methods that have the potential to be part of precision agriculture in the future will enable products to be traced back from end-user right along the distribution chain to the producer. This is the only sure method of ensuring food safety.

In those countries with low subsidy levels (*e.g.* Argentina) or a large farming land area (*e.g.* USA, Australia) where no agriculture under guaranteed quality is practiced and organic farming is not a practical alternative for large farms, precision agriculture has the potential to become one of the most effective methods of documenting trace-back and reducing the risk of food contamination. As soon as the resulting produce is distinguished from mainstream produce and official bodies are created for its certification and control, dedicated marketing channels are bound to arise.

- At present, the products of precision agriculture are not distinguished in any way from mainstream agriculture produce on the market. However, the improved assessment and monitoring of soil preparation, growth, harvesting, storage, handling and processing methods that have the potential to be part of precision agriculture in the future will enable trace-back from end-user along the distribution chain to the producer. Dedicated marketing channels for precision agriculture products are bound to emerge as soon as they are distinguished from mainstream produce and official bodies for their certification and control are created.

2.3.6.2. Urban agriculture

Historical development

Urban agriculture (UA) is probably as old as cities. In fact, archaeological fieldwork and aerial imagery have unveiled massive, ingenious earth and waterworks within and on the edge of the urban settlements constructed by ancient civilisations.

The prevailing eighteenth century philosophical current in Western Europe opposed nature to civilisation. The exclusion of agriculture as a permanent urban function in western contemporary urbanism was reinforced by recent urban planning associated with the Industrial Revolution. The sanitation argument of West European colonial powers against large-scale food production was also aimed at many African cities (Mougeot, 1994)[147].

Although urban sprawl is consuming many formerly rural spaces, some green areas have persisted within metropolitan districts. The first type of urban planning intended to bring people closer to nature was the garden city of the 19th century, which was conceived for low population densities. Small houses were surrounded by a garden and public green spaces were designed for the whole

147 Mougeot (1994). "Urban Food Production: Evolution, Official Support and Significance" . Published by City Farmer, Canada's Office of Urban Agriculture.

urban community. Several neighbourhoods and towns were built according to this design in France, Germany, the United Kingdom and the United States, usually in close connection with heavy industries and well-known private enterprises. By the end of the century, the Spanish visionary Arturo Soria had expressed his notion of the ideal city through a particular form of garden city that was linear in shape; residences were surrounded by woodland and had horticultural spaces and family gardens. The British planner Ebenezer Howard theorised a concentric model of a garden city similar to the satellite towns and green belts of twentieth-century cities (Madaleno, 2001)[148].

In times of crisis such as war or recession, growing food in cities has always been essential to urban people. *Schrebergaerten* (allotments or garden plots) were started in Germany after World War I, when city people had the choice of either going hungry or grow some of their own food. In World War II, the "Dig for Victory" campaign[149] brought much British urban land into cultivation (Deelstra and Girardet, 2000)[150]. After the war, so-called "communal orchards" emerged in France.

The post-war agricultural policy in Europe turned agriculture into a "food generator" focussing on the production of large amounts of cheap food to avoid hunger and ensure social stability. Urban agriculture did not fit this mould; policy makers considered it small-scale and therefore inadequate and undesirable (Deelstra *et al.*, 2001)[151].

Urban agriculture was seen as an oxymoron until the 1980s. With the development of environmental sciences, urban planners began to emphasise the importance of interrelationships between human beings and nature. Today, as some Western European and North American urban populations increasingly seek out green space, cities are being transformed, spreading through the countryside, and intertwining built-up and farming spaces (Madaleno, 2001)[152]. In Western Europe, the main interest in urban agriculture is possibly that of environmental management; by contrast, in Central and Eastern Europe, urban agriculture is growing rapidly to ensure food security and income generation. This last has also been the driving force for urban areas in various developing countries in the South, where bylaws from the colonial times are being changed and urban food production is now tolerated if not supported.

In both the North and the South, cities may eventually reduce the amounts of food brought in from other areas and extend the useful life of the resources they still require. For many decades now, this utopia has become a reality in major Asian metropolises (Mougeot, 1994)[153].

- Urban agriculture (UA) is probably as old as cities, but has been excluded as a permanent urban function from western contemporary urbanism.
- The first type of planned urbanisation created to bring people closer to nature was the garden city of the 19th century.
- Urban agriculture was seen as an oxymoron until the 1980s, when, with the development of environmental sciences, urban planners began to emphasise the importance of interrelationships between human beings and nature.

148 Madaleno (2001). "Cities of the Future: Urban Agriculture in the Third Millennium". http://www.fao.org/DOCREP/004/Y1931M/y1931m03.htm
149 During World War II, the British government introduced a campaign that called for every man and woman in Britain to keep an allotment.
150 Deelstra and Girardet (2000). "Urban Agriculture and Sustainable Cities". http://www.ruaf.org/reader/growing_cities/Theme2.PDF
151 Deelstra et al. (2001). "Multifunctional Land Use: An Opportunity for Promoting Urban Agriculture in Europe". Urban Agriculture Magazine, No. 4.
152 Madaleno (2001). "Cities of the Future: Urban Agriculture in the Third Millennium". http://www.fao.org/DOCREP/004/Y1931M/y1931m03.htm
153 Mougeot (1994). "Urban Food Production: Evolution, Official Support and Significance" . Published by City Farmer, Canada's Office of Urban Agriculture.

Related bodies

Historically, urban agriculture has had no institutional representation. Agriculture ministries usually lack a political mandate to deal with it and farming projects to implement this agrosystem are rarely included in global urban planning. Also, dedicated NGOs are poorly coordinated with municipal agencies and urban farmers are seldom organised (de Zeeuw *et al.*, 2001)[154]. Various government agencies and NGOs have been active for many years in promoting urban agriculture, primarily in developing countries. While the collective level of effort has been helpful, it has also been inadequate; there remains much to be done (Mougeot, 1994, quoted in Henning, 1997)[155].

Examples of international organisations and programmes that have taken major initiatives on urban agriculture include the International Support Group on Urban Agriculture (SGUA), the European Support Group on Urban Agriculture (ESGUA), the Resource Centre on Urban Agriculture and Forestry (RUAF), FAO's Interdepartmental Working Group "Food for the Cities", the United Nations Development Programme (UNDP), the United Nations Human Settlements Programme (UN-Habitat) and the International Development Research Centre (IDRC). In Europe, there exists the European Federation of City Farms (EFCF), which essentially plays an educational role. Further information about these bodies can be found in **ANNEX 28**.

- Historically, urban agriculture has had no institutional representation. However, various government agencies and NGOs have been active for many years in promoting urban agriculture, primarily in developing countries.
- International organisations concerned with urban agriculture include the International Support Group on Urban Agriculture (SGUA), the European Support Group on Urban Agriculture (ESGUA) and the Resource Centre on Urban Agriculture and Forestry (RUAF).

Associated production techniques

Urban agriculture is different from, but complementary to, rural agriculture in local food systems. According to Mougeot (1999)[156], UA is integrated into the local urban economic and ecological system. In fact, the cultivation methods of urban and peri-urban agriculture have been adapted to the conditions of cities and the types of products required. Thus, urban agriculture requires higher technological and organisational precision than rural agriculture because it must be more tolerant of environmental stress and very carefully monitored to protect public health (Dubbeling, 1997)[157].

Urban producers can obtain practical efficiencies by using inadequately exploited resources such as vacant land, processed wastewater, recycled waste and unemployed manpower for production purposes. Productivity can be up to 15 times higher than in rural agriculture; however, yields are often reduced by the use of low or inadequate inputs, inefficiently adapted varieties, poorly planned water supplies and the lack of agricultural knowledge (FAO, 1999)[158].

Agriculture in cities is practiced on different types of space including plots of land (backyard and courtyard, communal land, all kinds of public, vacant land suitable to grow crops, and large fields at the edge of or outside the city, which is especially frequent in Africa), rooftops, balconies, containers and growing walls (hydroponics).

154 de Zeeuw et al. (2001). "La Integración de la Agricultura en las Políticas Urbanas". Agricultura Urbana. http://www.ipes.org/aguila/publicaciones/Revista%20AU1/AUarticulo4.pdf
155 Mougeot (1994), quoted in Henning (1997). "Cities Feeding people: An Overview". http://www.eap.mcgill.ca/CPUG1.htm
156 Mougeot (1999). "Urban Agriculture: Definition, Presence, Potentials and Risks". http://www.ruaf.org/reader/growing_cities/Theme1.PDF
157 Dubbeling (1997). "Bulletin of Urban Agriculture in Europe". ETC, The Netherlands.
158 FAO (1999). "La Agricultura Urbana y Periurbana". http://www.fao.org/unfao/bodies/COAG/GOAG15/X0076S.htm.

Crops in small plots near houses are managed intensively. Weeds are removed as much as possible and water is applied when available and required. Mostly, people try to fertilise crops close to their homes, using whatever is available (crop and food residues, compost, manure). They hardly ever use artificial fertilisers on their crops around the home, so according to Smit (quoted in Helmore and Ratta, 1995)[159], urban agriculture is usually more organic than rural agriculture. Such intensive farming results in high yields for a wide variety of crops (Pepall, 1993, quoted in Preceup, 1995).[160]

Intercropping is often practiced to optimise available space, sunlight, soil characteristics and water. Reijntjes *et al.* (1992)[161] designed a system that makes optimal use of horizontal and vertical space in a home garden; it consists of a four-tier vertical array of tall trees, medium-height trees, shrubs and high/lowfield crops.

Larger fields, which are not close to the home, are often not intensively managed because of distance, low crop densities and risk of theft.

Because crops grown along roadways are vulnerable to heavy metal pollution, some city farmers have developed ways to reduce the risks. Solutions include the use of crops that are less vulnerable to pollution by heavy metals (*e.g.* fruiting plants are safest, while root crops and green leafy plants absorb increased amounts of lead and cadmium)[162] and planting so-called "barrier crops" (*e.g.* trees, cassava or some other hedge plant).

- The cropping methods of urban and peri-urban agriculture have been adapted to the conditions of cities and types of products required.
- Urban agriculture requires higher technological and organisational precision than rural agriculture because it must be more tolerant of environmental stress and very carefully monitored to protect public health.
- Urban agriculture is normally more organic than rural agricul-ture.

Geographical distribution and land area of the major crops

Urban agriculture is most often a spontaneous activity subject to no official planning. Also, most urban farmers operate informally, so actual facts and figures for the number of hectares under UA and for the number of urban farmers are clearly missing.

In any case, some 800 million people are estimated to be involved in urban farming worldwide[163]. Of these, 200 million are market producers and 150 million are employed full-time in UA (Mougeot, 1999)[164].

Urban agriculture already plays an increasingly crucial role in the survival of many people in southern developing countries, where this agrosystem is a source of income for about 100 million people and of food for five times as many (Helmore and Ratta, 1995)[165]. In some cities, a fifth to a third of families are engaged in agriculture, and some have no other source of sustenance or income.

Highly productive agricultural activities are taking place within most European metropolitan areas. In the environs of Paris (**FRANCE**), with only 10% of the Isle of France agricultural useful

159 Helmore and Ratta (1995). "El Sorprendente Rendimiento de la Agricultura Urbana". Opciones, Revista del Desarrollo Humano, PNUD.
160 Preceup (1995). "Urban Agriculture". http://www.globalnet.org/preceup/pages/fr/chapitre/reflreco/reflex/asptech/a_b.htm.
161 Reijntjes et al. (1992), quoted in Preceup (1995). "Urban Agriculture". http://www.globalnet.org/preceup/pages/fr/chapitre/reflreco/reflex/asptech/a_b.htm.
162 Wade (1986), quoted in Preceup (1995). "Urban Agriculture". http://www.globalnet.org/preceup/pages/fr/chapitre/reflreco/reflex/asptech/a_b.htm.
163 http://www.fao.org/sd/ppdirect/ppre0073.htm - http://www.unhabitat.org/Istanbul+5/72.pdf
164 Mougeot (1999). "Urban Agriculture: Definition, Presence, Potentials and Risks". http://www.ruaf.org/reader/growing_cities/Theme1.PDF
165 Helmore and Ratta (1995). "El Sorprendente Rendimiento de la Agricultura Urbana". Opciones, Revista del Desarrollo Humano, PNUD.

surface, peri-urban agriculture ensures about 35% of the regional crop deliveries in value, mainly in the form of vegetables, flowers and fruit. This system accounts for only 14% of holdings in number, however (Pujol and Beguier, 1998)[166]. As can be seen from **table 1 in ANNEX 29**, peri-urban agriculture (PUA) in Paris provides much higher yields than mainstream agriculture does with a much larger land area.

In London (**UNITED KINGDOM**), about 30,000 active allotment gardeners control a total of 831 ha of public land, 13.4% of which is located inside the urban area and the remainder on the outskirts (see **table 2 in ANNEX 29**). Market gardening prevails in peri-urban areas, covering 13,566 ha of public or private land. However, this is largely in decline as a result of the continuous urban development pressures. There are 65 city farms in the UK, with 8 in London alone, which are up to 2.5 ha in size; they produce some horticultural commodities and most are devoted to animal keeping. There are also in the region of one thousand beekeepers in Greater London who obtain a total of about 27,000 kg of honey each year (Madaleno, 2001)[167].

Berlin (**GERMANY**) has more than 80,000 urban farmers[168].

Horticulture, livestock, forage and milk production, aquaculture and silviculture are major PUA sectors[169]. Virtually all types of crops are grown in cities —provided they can adapt to the prevailing climate. The prejudice that most crops grown in cities are vegetables is groundless. According to Wade (1986[170]), there are fruit and nut trees, trees of which the leaves are eaten, green leafy vegetables, roots and tubers, other staple crops, legumes, fruit, vegetables, pumpkins, onions, spices, medicinal crops, *etc.* Not only seasonal, but also year-round produce, is found, depending on land tenure, water and labour availability, and climate. In any case, urban conditions are better suited to the intensive production of fresh fruit and vegetables and the breeding of small animals than to the extensive production of staple crops[171].

The commercial peri-urban production of livestock is an extremely fast-growing sector that currently accounts for 34% of the total meat production and nearly 70% of the egg production worldwide[172].

- Because urban agriculture is a spontaneous activity, actual facts and figures about the number of hectares and farmers engaged in its practice are missing. In any case, an estimated 800 million people worldwide practice UA.
- Highly productive agricultural activities are taking place within most European metropolitan areas.
- Virtually all types of crops are grown in cities. However, urban conditions are especially suitable for the intensive production of fresh fruit and vegetables, and the breeding of small animals.

Regulation and subsidies

Many governments do not recognise or accept the presence of agriculture in their cities. Central governments often do not support urban agriculture; indeed, many ignore or actively discourage it. This is a result of UA often being a spontaneous activity of which municipal governments are normally

166 Pujol and Beguier (1998). "Paris' near Urban Agriculture". http://www.ruaf.org/conference/info_market/econf_papers/8beguier.doc
167 Madaleno (2001). "Cities of the Future: Urban Agriculture in the Third Millennium". http://www.fao.org/DOCREP/004/Y1931M/y1931m03.htm
168 http://www.unhabitat.org/Istanbul+5/72.pdf
169 FAO (1999). "La Agricultura Urbana y Periurbana". http://www.fao.org/unfao/bodies/COAG/GOAG15/X0076S.htm.
170 Wade, 1986 quoted in http://www.globenet.org/preceup/pages/fr/chapitre/reflreco/reflex/asptech/a_b.htm
171 Horticultural species have potentially high yields as they can meet urgent food requirements. Also, post-harvest losses can be substantially reduced when the products are grown near the point of consumption, which facilitates the implementation of UA.
172 Agriculture 21. http://www.fao.org/WAICENT/FAOINFO/AGRICULT/magazine/9901sp2.htm.

unaware. Other authorities tend to believe that it is a temporary activity and pay no attention to it. There is thus a lack of enabling policies, with few rules for land tenure, no agricultural extension services, no agricultural inputs available within city boundaries, a lack of unpolluted water, and no coordination between the work done by governments, NGOs and private bodies.

Other governments tend to obstruct or even ban agriculture from their cities for reasons of image and public health, among others (*e.g.* the low prices paid for UA products, a growing reliance on food imports or restrictions on the use of water). In addition, urban and peri-urban agriculture (UPA) is under extreme pressure from other, more lucrative, land use demands such as housing and work spaces. This lack of support is usually the source of the persistence of problems associated with UA (*e.g.* the use of polluted water, unhealthy crop protection measures, and inadequate removal of wastes); also, its illegal, clandestine status precludes its defence before politicians and civil servants.

The situation changes when governments do recognise the importance of urban agriculture and encourage it through enabling policies such as favourable land rules, the creation of farming zones and the prevention of dumping of cheap imported food.

The international justification for the integration of agriculture into urban planning was laid down in the 1992 UN Rio Conference[173] and the Local Agenda 21[174].

There have been striking successes of UPA in response to national policy changes and economic crises since 1980 in Tanzania, Zimbabwe, South Africa, Cuba, Romania, Russia and Malaysia, among other countries. Many cities including Newark (New Jersey), Toronto, Sao Paulo and Moscow have had success with pro-UPA policies (Drescher, 2000)[175]. Also, the programme "Urban Agriculture and Nutrition in Latin American and Caribbean Cities" has facilitated the development of pro-UA municipal policies in the countries concerned (Cabannes and Dubbeling, 2001).[176]

Some industrialised countries such as The Netherlands and Canada, and many cities in the world, are designing "green plans" that provide support for urban farmers (Helmore and Ratta, 1995)[177].

In **SWEDEN**, UA has received considerable attention from local authorities and the national parliament through the provision of land and the recognition of the sector as a useful component of the urban landscape. Urban agriculture receives even greater recognition through the Local Agenda 21 programmes and its incorporation as a legitimate green structure in urban areas.

A pilot action for the conservation, improvement and economic promotion of the suburban agricultural area in Barcelona (**SPAIN**) was held at Llobregat Agricultural Park with financial support from the LIFE programme[178]. As a result, society at large has recovered a green belt that was in danger of disappearing. Also, the city council has launched a campaign to use courtyards, rooftops and balconies in Barcelona as "urban orchards" [179].

By contrast, local planning authorities in the **UNITED KINGDOM** have to date paid little

173 This has resulted in various programmes for sustainable urban development such as HABITAT and the Urban Management Programme (UMP).
174 Drescher (2001). "The integration of Urban Agriculture into urban planning. An analysis of a current status and constraints". http://www.ruaf.org/bibliography/annotated/014.pdf
175 Drescher (2000). "Urban and Periurban Agriculture and Urban Planning". Discussion paper for the FAO-ETC/RUAF electronic conference on "Urban and Periurban Agriculture on the Policy Agenda".
176 Cabannes and Dubbeling (2001). http://www.cityfarmer.org/marielleUN.html#marielle .
177 Helmore and Ratta (1995). "El Sorprendente Rendimiento de la Agricultura Urbana". Opciones, Revista del Desarrollo Humano, PNUD.
178 This project was run by Diputación de Barcelona (the provincial council) and PROELSA (a risk capital company responsible for local development). More than one third of the budget (923,861.49 euros) was provided by the LIFE programme.
179 This campaign was held by the foundation Tierra in cooperation with the city council of Barcelona.

attention to urban agriculture (Howe and White, 2001)[180]. In fact, no central or local government policies deal specifically with UA in the UK. However, allotments have been protected by law since 1908 and somewhat greater support is now being provided[181].

- Many governments do not recognise or accept the presence of agriculture in their cities. Central governments often do not support urban agriculture. This lack of support is usually the source of the persistence of the problems associated with UA.
- The international justification for the integration of agriculture into urban planning was laid down in the 1992 UN Rio Conference and the Local Agenda 21.
- Some industrialised countries such as The Netherlands and Canada, and many cities in the world, are designing "green plans" that provide support for urban farmers.

Control, certification and labelling

The scarcity or absence of regulations on urban agriculture noted in the previous section has resulted in the virtual absence of control, certification and labelling schemes for UA produce. In fact, most UA activities go unnoticed by surveillance and control bodies.

Also, there are virtually no logos or brands certifying the urban or peri-urban provenance of products as a result, among others, of the fact that urban holdings are usually small and urban farmers are largely not associated. One exception is the above-mentioned project of the Llobregat Agricultural Park in Barcelona; grants have been awarded to create and promote the "*Producto Fresco del Parque Agrario del Baix Llobregat*" brand and to contribute to the costs of producing crates bearing the logos of the LIFE programme and the agricultural park.

- Because of the scarcity or absence of regulations on urban agriculture, most UA activities escape surveillance and control.
- There are virtually no logos or brands certifying the urban or peri-urban provenance of products.

Specific details of the transition process

Unlike rural agriculture, urban agriculture has followed no well-defined transition process as it has emerged from no specific previous practices. Instead, one must examine the way farming was started in vacant land that could have been devoted to other uses —some of which, including housing construction, business establishment and recreational facilities, are often more profitable than UA.

What can thus have led to the adoption of this agrosystem? The reasons for starting urban agriculture are usually rather different in developing and developed countries. In the former, adoption is promoted by sustenance and food security reasons, as well as by social and economic motivations (e.g. finding an occupation and contributing a small income to the family economy). In the latter, UA is practiced for recreational, educational, food safety or even economic reasons (to obtain an additional income or produce in a more organised manner in order to reach the market).

In some cases, the city grows as far as neighbouring agricultural areas. Whether or not some agricultural activity existed beforehand, farmers must adapt to urban conditions. Urban farmers are often immigrants from a rural zone where they practiced agriculture. Frequently, the techniques they were used to employing must be adapted to constraints such as the shortage of

180 Howe and White (2001). "Planning for Urban Agriculture in the UK". http://www.ruaf.org/no4/11-12.html
181 GTZ, Deutsche Gesellschaft für Technische Zusammenarbeitz. "Growing Cities-Growing Food. London, England".

space and soil and water pollution; also, fertiliser inputs must be reduced in order to avoid harmful effects on the population.

In general, the greatest hurdles to the establishment of urban agriculture in cities are the difficulty of accessing land and legal restrictions. Land availability may be insecure and dependent on regulations frequently dictated by economic and real estate interests. Arrangements are often informal and occasionally based on customary law. In addition, UA management involves deciding which types of products and what scales of operation are to be allowed in different parts of a city. Thus, a city may want to avoid major concentrations of stall-fed dairy cattle or piggeries in central districts, where it may encourage systems integrating stacked small livestock with space-intensive high-valued crops (Mougeot, 1999).[182]

- The emergence of UA has been propitiated by sustenance and food security reasons in developing countries, and by recreational, educational and —occasionally— economic reasons in developed countries.
- Farmers must adapt their previous farming techniques to city conditions (e.g. shortage of space, risk of pollution, the need to coexist with the population).

Implications of multifunctionality

The main feature of UA that distinguishes it from rural agriculture is its integration into the urban economic and ecological system. According to Mougeot (1999)[183], UA is embedded by, and interacting with, the urban "ecosystem". Therefore, UA can bring social and economic benefits to the city, but also raise some problems that are often worsened by the lack of regulation and control of its practices.

The social and economic benefits derived from UA depend on the motivations that lead to its adoption, which usually differ between developed and developing countries. The principal advantage of UA in the former —and in the latter in times of crisis— is that it guarantees provisions of food. In this situation, UA is primarily aimed at ensuring survival. However, urban agriculture can also be motivated and contribute additional family income when practiced on a larger organisational scale and aimed at the urban market.

The social implications of UA are also manifold. As a rule, it is just another source of employment —a major source in some cases as an estimated 150 million people are employed full-time in UA. Women play a prominent role in UA in developing countries; the shortage of work outside their homes having led them to cultivate plots in their neighbourhood. In developed countries, UA has educational or even recreational implications that result in increased community welfare.

However, farming and cattle breeding activities are not always accepted by city dwellers, particularly when they take place near homes. Noise, unpleasant odours, poor hygiene or simply the appearance of urban holdings can lead to rejection and for social pressure to be exerted on the authorities for the land use to be changed (frequently to real estate).

The urban environment can be favourably or adversely affected by urban agriculture, depending on the specific farming practices used and the way they are regulated and controlled by the competent authorities. If practiced in an orderly way, using appropriate quantities of inputs, urban holdings, like other "green spaces", can help abate pollution and improve air quality. On the other hand, excessive, uncontrolled use of fertilisers can have the opposite effect and be harmful for the population. Also, urban produce —unlike rural produce— does not need be transported so far

182 Mougeot (1999). "Urban Agriculture: Definition, Presence, Potentials and Risks". http://www.ruaf.org/reader/growing_cities/Theme1.PDF

183 Mougeot (1999). "Urban Agriculture: Definition, Presence, Potentials and Risks". http://www.ruaf.org/reader/growing_cities/Theme1.PDF

to the point of consumption, which helps reduce atmospheric emissions.

In addition to helping purify the air, UA has the environmental advantage that it facilitates the recycling or processing of organic waste, which is often used as organic fertiliser (compost); this facilitates the disposal of part of the vast amount of waste produced by a city.

Urban agriculture can have favourable or adverse food safety implications depending on how efficiently it is regulated and controlled. As a rule, UA in developed countries is safer as a result of holdings being closer to the point of consumption or the farmer and consumer being the same person —which ensures optimum product quality. To alleviate this serious concern that has arisen lately in rich countries, the nearness of UA to consumers ensures that its produce will not be hazardous.

However, this is not always the case, particularly in the absence of control by local authorities; this can propitiate the use of polluted soil or water to grow products that will obviously be unfit for consumption. Also, the nearness of animals to the population can be a source of poor hygiene and spread of disease.

- Urban agriculture has various social, economic, environmental and food safety implications that differ between developed and developing countries.
  - Social and economic implications. Advantages: Food security, additional income, source of employment, educational and recreational functions. Disadvantages: Social rejection.
  - Environmental implications. Advantages: Reduced pollution, recycling. Disadvantages: Potential poisoning.
  - Food safety implications. Advantages: Increased food safety. Disadvantages: Potential spread of disease.

Product marketing

It is estimated that 15% of all the food consumed in urban areas is grown by urban farmers and that this figure will double over the next 20 years.

Many of the products of urban agriculture are either self-consumed or produced near their consumers. This endows UA produce with some advantages such as increased freshness, the increased sensitivity of urban farmers in detecting market preferences and easier market access.

Urban and periurban agriculture (UPA) supplement rural supplies with additional, cheaper produce. During emergency periods or when transportation and distribution channels are interrupted UPA becomes more than a supplement and can be the main source of food for urban consumers —who must thus bear the resulting price rise.

The frequently direct access to consumers results in substantial savings for urban farmers in relation to rural farmers, who must bear the costs of transportation, packaging —when needed— and, almost always, intermediation —which inevitably rises the final price of the product by a substantial amount.

Urban agriculture products are typically marketed on a small scale, with little organisation or infrastructure.

Some urban and peri-urban farmers are turning to the intensive production of commodities with a high added value in preference over staple foodstuffs.

- It is estimated that 15% of all the food consumed in urban areas is grown by urban farmers and that this figure will double within 20 years.
- Urban agriculture produce is typically marketed on a small scale. It is obtained near the consumer (usually self-consumed), which reduces costs and dispenses with the need for much organisation or infrastructure.

2.3.6.3. Agriculture Paysanne

Historical development

As noted in the introductory chapter, *agriculture paysanne* is one of the most recent coinages in the vocabulary of alternative agrosystems. Thus, *agriculture paysanne* was acknowledged with the constitution of the European Farmer Co-ordination in 1986, which was followed the next year by the professional agricultural organisation *Confédération Paysanne* in France.

Another milestone for *agriculture paysanne* was the meeting held in April 1992 in Managua (Nicaragua) by several leaders from Central and North American, and European, countries within the framework of the National Union of Farmers and Breeders Meeting. Shortly afterwards, in May 1993, the first meeting of *Vía Campesina* was held in Mons (Belgium); the meeting established *Vía Campesina* as a global organisation, its structure and operational guidelines.

By the early 1990s, *agriculture paysanne* was a global phenomenon, an ideological movement inspired by such disparate sources as the peasant studies of the early 20th century and late-century anti-globalisation movements.

The second international meeting of *Vía Campesina* was held in Tlaxcala (Mexico) in April 1996. It was attended by individuals from 37 countries and 60 organisations, who discussed various topics of concern to small- and medium-scale producers, namely: food sovereignty, agrarian reform, loans and the external debt, technology, women's participation and rural development, among others. The attendees expressed their position on these and other topics in the so-called "Tlaxcala Declaration".

In Europe, the movement continues to be especially active, as reflected in the opposition of the *Confédération Paysanne* to the use of Genetically Modified Organisms (GMO) in agriculture. Occasionally, such opposition has materialised in boycott actions that have been widely covered by the media.

- Paysanne agriculture was officially acknowledged with the constitution of the European Farmer Co-ordination in 1986, which was followed by that of the professional organisation "Confédération Paysanne" in France the next year.
- In May 1993, "Vía Campesina" was born as a global organisation. Agriculture paysanne continues to be especially active in Europe.

Related bodies

The principal body concerned with *agriculture paysanne* at world level is *Vía Campesina*, which was created in 1993. Based on data from its web site[184], it currently encompasses 72 agricultural and rural organisations in more than thirty countries, and is organised in the following eight regions: East Europe, West Europe, Northeast and Southeast Asia, South Asia, North America, the Caribbean, Central America and South America. Also, *Vía Campesina* is organised around the following bodies:

- The Conference, which is the highest policy decision-making body and holds meetings every three years, rotating location among the regions.
- The regional offices, which act as liaisons and articulation bodies within each region. It is there that the principal work of the organisation is done.
- The International Coordination Committee, which is the body coordinating the regions.

Vía Campesina has defined its own operational strategies, which include the following:

- Articulating and strengthening its member organisations.
- Influencing power and decision-making centres within governments and

184 http://ns.rds.org.hn/via/miembros.htm.

multilateral organisations in order to redirect the economic and agricultural policies that affect small- and middle-scale producers.

- Strengthening women's participation in social, economic, political and cultural matters.
- Formulating proposals in relation to important issues such as agrarian reform, food sovereignty, gender, and trade and investment.

The European Farmer Co-ordination (*Coordination Paysanne Européenne*, CPE), which was created in 1986, encompasses 18 peasant and rural organisations in 11 European countries, and represents farming professionals before EU institutions. Its Council comprises representatives of all member organisations and appoints an Executive Board consisting of four individuals. Its activities include awareness-rising and action campaigns, the exchange of information among peasant organisations in the same or different countries and the publication of many general or sector-based documents about CAP, CMO, nutrition, *etc.*

The *Confédération Paysanne* is the standard-bearer of the CPE. Created in 1987, this French professional body was the second most voted in the 2001 Agrarian Chamber Elections in France. It has fostered an approach to production that breaks away from existing structures. Its aims are similar to those of its global and European counterparts. Especially prominent among its activities are the production of a monthly publication and its protest actions against GMO.

- "Vía Campesina" currently encompasses 72 agricultural and rural organisations in more than thirty countries and is organised around the following organs: the Conference, the regional offices and the International Coordination Committee.
- The European Farmer Co-ordination encompasses 18 peasant and rural organisations in 11 European countries and represents farming professionals before EU institutions.
- The "Confédération Paysanne" was the second most voted body in the 2001 Agrarian Chamber Elections in France. It has fostered an approach to production that breaks away from existing structures.

Associated production techniques

Agriculture paysanne has no specific techniques of its own (partly because it is not a self-contained agricultural system, but rather a body of ideological approaches). There are, however, some guidelines intended to facilitate its implementation (see under "Regulation and subsidies").

Geographical distribution and land area of the major crops

The actual land area under *agriculture paysanne* at present is unknown. No official statistics are available, nor have any estimates been published by the bodies engaged in its promotion.

Regulation and subsidies

Agriculture paysanne lacks any kind of subsidies or legal framework for its development in Europe; the reasons range from the absence of a clear-cut definition of the system to its difficulty of implementation or to the critical position of some farmers against established rules. The *Charte Paysanne* (Peasant Chart), produced by the *Confédération Paysanne* (and thus private in nature), is the closest thing to a regulation on this matter.

The *Charte* contains the guidelines and principles to be followed in implementing this agrosystem. Started early in 1993, it has been the result of a participative process involving both farmer groups from different French regions and

departments, and experts in related matters. The *Charte* examines current production systems and emphasises those policy decision elements with an impact on agriculture. Its contents are summarised in the six programmatic points to be adhered to in establishing agriculture "paysanne" farms, namely:

- Farmers should be economically and technically independent in making their decisions.
- Land should be transferred in accordance with the average income obtained by each worker and the living conditions on the farm and its local environment,
- Production shares and rights should be allocated in an equitable manner and ensure a minimum income.
- Holdings should play a prominent role in local development and the sustenance of life in the country.
- Quality should be the driving force for food production.
- Farm work should help invigorate the social fabric and preserve nature in the territory concerned.

- The "Charte Paysanne", produced by the "Confédération Paysanne", is the closest thing to a regulation on peasant agriculture. It contains the guidelines and principles to be followed in implementing this agrosystem.
- According to the "Charte", agricultural systems can be fully characterised in terms of autonomy, transmissibility, land distribution, local development, product quality and cooperation with nature.

Control, certification and labelling

Agriculture paysanne has no European legal framework enabling the implementation of control and certification —and hence labelling— schemes.

Specific details of the transition process

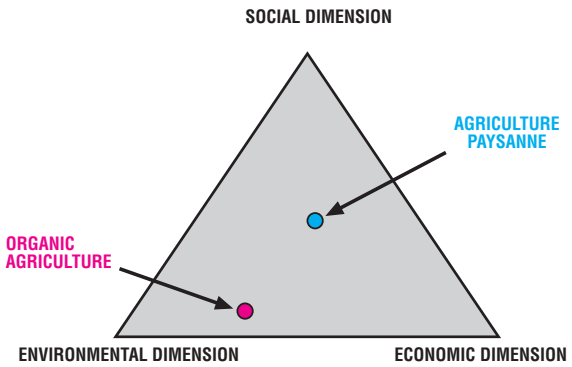
This agrosystem has undergone no specific adoption process as farmers merely pursue the aims and follow the social, economic, environmental, quality and consumer guidelines established in the *Charte Paysanne*.

Implications of multifunctionality

All agrosystems possess three essential dimensions: social, economic (efficiency-related) and environmental. These dimensions can be best represented at the vertices of an equilateral triangle; the closer to a given vertex a given system, policy or activity is, the more markedly it will be influenced by the dimension lying at such a vertex. The aims of each agrosystem are inevitably closer to one dimension than to the other two. Not only individual aims, but also the body of aims of agrosystems such as organic farming, for example, possess a stronger dimension —the environmental one in this case (see **graph 10**)—; with organic farming, however, the economic dimension is also important as consumers pay a premium on its produce. *Agriculture paysanne* aims at equilibrium between the social, economic and environmental dimensions —with special emphasis on the first.

The multifunctionality of *agriculture paysanne* encompasses both for-profit and non-profit-making functions. The following are some aims of this agrosystem in relation to the three dimensions:

Graph 10: Dimensions of agricultural systems.



Source: The authors.

- *Social dimension*. *Agriculture paysanne* aims to facilitate the development of rural communities in their broadest sense, maintain the rural population to avoid desertification, and preserve native knowledge and ancestral know-how —which are being gradually lost with the increasing growth of industrial farming.
- *Economic dimension*. The principal aims here are to ensure a minimum income for farmers to lead a decent life and to derive beneficial side-effects for the development of rural communities.
- *Environmental dimension*. Agriculture must be fostered and remunerated as a space and landscape management activity —provided it is practiced in a sustainable manner[185].

- Agriculture paysanne aims at achieving a balance between the social, economic and environmental dimensions. It places special emphasis on the social function of agriculture.
- The specific aims of agriculture paysanne include the development of rural communities; the maintenance of the rural population to avoid desertification; ensuring a minimum income for farmers to lead a decent life; and fostering and remunerating agriculture as a space and landscape management activity.

Product marketing

As expected, the absence of a legal framework and a certification and control system for *agriculture paysanne* has resulted in European farmers lacking a distinct market acknowledging the provenance of their produce.

A global initiative with similar aims to *agriculture paysanne*, Fair Trade, seeks to improve the living standards of producers by having consumers pay a fair price for their products, providing opportunities for development (particularly for women and natives), fostering transformation at the source, protecting human rights through social justice and economic safety, and encouraging healthy environmental practices. It should be noted, however, that this practice is restricted to exports from developing countries and that it applies not only to agricultural products but also to crafts.

- There exists a global initiative with aims similar to those of agriculture paysanne: "Fair Trade". This practice, however, is restricted to exports from developing countries and not exclusive of agricultural products.

2.3.6.4. Permaculture

In the mid-1970s, the Australian ecologists Bill Mollison and David Holmgren started to develop ideas that they hoped could be used to create sustainable agricultural systems. A design approach called "permaculture" (a contraction of "permanent agriculture" or "permanent culture") arose as a result and was first made public with the release of *Permaculture One* in 1978.

Following the publication of this work, Mollison and Holmgren further refined and developed their ideas; between the two, they designed hundreds of "permaculture plots" and wrote several more books on the subject. By the early 1980s, the concept had moved on from being predominantly about the design of agricultural systems towards a more fully holistic design process for creating sustainable human habitats. However, although the more recently developed concepts of sustainable development and sustainable agriculture are clearly related to the central notion of permanence at the heart

185 Although agriculture paysanne revolves around the definition of sustainable development formulated by the Brundtland Commission in 1987, its advocates criticize the way the concept is being implemented by some global and European institutions.

of permaculture" (Holmgren ,1991)[186], it cannot be affirmed that sustainable agriculture and permaculture are equivalent.

Permaculture is not restricted to the field of agronomy. In fact, it is an attempt at integrating several disciplines including biology, ecology, geography, agriculture, architecture and gardening.

At present, permaculture can be viewed as a mere philosophy with principles and recommendations that focus on the design of environments with the stability, diversity and resistance of natural ecosystems while regenerating degraded grounds or helping preserve almost intact areas.

- The term "permaculture", a contraction of "permanent agriculture" or "permanent culture", defines a design approach conceived in the mid-1970s by two Australian ecologists who developed ideas they hoped could be used to create stable agricultural systems.
- By the early 1980s, the concept had moved on from being predominantly about the design of agricultural systems towards being a more fully holistic design process.
- At present, permaculture is only a philosophical approach encompassing specific principles and recommendations.

Related bodies

There are several international organisations engaged in the promotion of permaculture and the dissemination of its principles. Especially prominent among them are those in Australia, where, as noted earlier, the movement originated. Bellow, there is a brief description of selected permaculture-related bodies.

The **Permaculture Research Institute** (PRI) is a non-profit organisation engaged in global networking and practical training of environmental activists. Based in New South Wales (Australia), it provides advice to solve local and global ecological problems, and has an innovative farm design in progress. It also does design and consultancy work, and supports several aid projects around the world.

The **Southern Cross Permaculture Institute**, based in Australia, was established under the name "Permaculture Education and Design Systems" in 1993 and aims to provide permaculture education to a wide range of people.

The **Permaculture Association of South Australia Incorporated** is a non-profit voluntary organisation with the following aims: promoting, practicing and representing permaculture in South Australia, and supporting the development of the permaculture community in its territory. The association is committed to sharing permaculture information and experience between both members of the permaculture movement and the wider community. The day-to-day management of the association is entrusted to a Co-ordinating Collective that is elected at each annual general meeting.

Permaculture International Limited (PIL) provides services to members in support of their work in permaculture design and permaculture-related activities. As a non-profit organisation, it depends on membership to survive. The association offers positive solutions to local and global problems. This is achieved through a customer service and information, a global networking, an informative web site, a sponsorship of permaculture and related projects, a promotion of permacultural and educational resources, and a consolidated staffing and update technology base at the PIL office.

The principal permaculture body in Europe is the *Permaculture Association*. Based in the

186 Holmgren (1992). "Uncommon Sense", Permaculture International Journal, No. 44.

United Kingdom, it supports people and projects through training, networking and research, using the ethics and principles of permaculture. Through their growing networks, members share their skills and design sustainable solutions for their communities.

- The principal bodies engaged in the international dissemination of the principles of permaculture are in Australia and include the Permaculture Research Institute (PRI), the Southern Cross Permaculture Institute, the Permaculture Association of South Australia Incorporated and Permaculture International Limited (PIL).
- The principal permaculture body in Europe is the Permaculture Association, which is based in United Kingdom.

Associated production techniques

As noted earlier, permaculture is not limited to crop and livestock production, but also includes community planning and development, the use of appropriate technologies, and the adoption of concepts and philosophies that are both earth-based and people-centred.

Because permaculture is not a self-contained production system, but rather a land use and community planning philosophy, it is not limited to a specific method of production. Also, because its principles can be adapted to farms or villages worldwide, it is site-specific and therefore amenable to locally adapted techniques of production.

For example, permacultural systems emphasise the use of standard organic farming and cultivation techniques utilising cover crops, green manure, crop rotation and mulches. However, there are other options and technologies available to farmers working within a permaculture framework (*e.g.* chisel ploughs, no-till implements, spading implements, compost turners, rotational grazing). The decision as to which "system" is employed is site-specific and management-dependent.

Many of the technologies advocated by permaculturists are well-known and include solar and wind power, greenhouses and energy-efficient housing.

Because of the inherent sustainability of perennial cropping systems, permaculture places heavy emphasis on tree crops. Systems that integrate annual and perennial crops take advantage of the "edge effect", increase biodiversity and exhibit other characteristics missing in monoculture systems. Thus, multicropping systems that blend woody perennials and annuals hold promise as viable techniques for large-scale farming. Ecological methods of production for any specific crop or farming system (*e.g.* soil building practices, biological pest control, composting) are central to permaculture.

- Permaculture is not limited to a specific method of production as it includes community planning and development, the use of appropriate technologies, and the adoption of concepts and philosophies that are both earth-based and people-centred.
- The options and technologies available to farmers working within a permaculture framework include cover crops, green manure, crop rotation and no-till implements.

Geographical distribution and land area of the major crops

Because permaculture is essentially a planning philosophy, there is currently no data quantifying the extent of its implementation.

Regulation and subsidies

There is no legal framework for agricultural production under permacultural principles.

Control, certification and labelling

Nothing can be said about control, certification and labelling of permacultural produce as it is not distinguished in any way from other types of produce.

Specific details of the transition process

A system intended to comply with the ethics of permaculture should rely on close observation of nature, traditional sustainable agricultural systems, earth sciences and common sense.

According to the creators of permaculture, there exists a series of principles inherent in every permacultural design under any climate and at any scale. Whereas permaculture ethics are more akin to broad moral values or codes of behaviour, these principles provide a set of universally applicable guidelines that can be used in designing sustainable habitats. Distilled from many disciplines including ecology, energy conservation, landscape design and environmental science, such principles are as follows:

- Relative location (components placed in a system are viewed relatively, not in isolation).
- Each element performs multiple functions.
- Each function is supported by many elements.
- Energy-efficient planning.
- Using biological resources.
- Cycling of energy, nutrients and resources.
- Small-scale intensive systems.
- Natural plant succession and stacking.
- Polyculture and diversity of species.
- Increasing "edge" within a system.
- Observing and replicating natural patterns.
- Paying attention to scale.
- Attitude.

- A system intended to comply with the ethics of permaculture should rely on close observation of nature, traditional sustainable agricultural systems, earth sciences and common sense. Also, it should comply with a series of principles which provide a set of universally applicable guidelines that can be used in designing sustainable habitats.

Implications of multifunctionality

The ethics of permaculture provide a guidepost to right livelihood in concert with the global community and the environment rather than individualism and indifference. The three basic ethics are as follows:

Care of the Earth, which includes all, living and non-living things (plants, animals, land, water and air).

Care of people by promoting self-reliance and community responsibility, and access to the resources necessary for existence.

Setting limits to population and consumption, and giving away surpluses.

Permaculture is therefore deeply engaged in current social demands such as the protection and conservation of the environment, food security and animal welfare.

- The ethics of permaculture provide a guidepost to right livelihood in concert with the global community and the environment. In fact, permaculture is deeply engaged in demands such as the protection of the environment, food safety and animal welfare.

Product marketing

Because permacultural produce is not distinguished from other types of produce, it lacks specific marketing channels.

2.4. Cases Studies

2.4.1. Introduction and layout

This chapter makes an in-depth analysis of the different emerging agricultural systems in three EU selected regions: Lower Normandy (France), Bavaria (Germany) and Andalusia (Spain).

Each case study aims to offer a complete and reliable image of the main emerging agricultural systems' situation in each region, positioning each system in the agricultural context of the zone. In order to achieve this, a common structure has been conceived for the three case studies, irrespective of whether each one has its own special features worth mentioning.

First of all, in order to show the main differentiating characteristics of the regions, a general description of each one with diverse facts is given. After that, there is a more accurate characterisation of each region's agriculture and subsequently, a description of the most developed emerging agricultural systems of each zone. Besides, each case study has a section containing the main factors determining farmer's decisions to choose a specific agricultural system.

2.4.2. Methodology

The methodology used to draw up the case studies has combined quantitative and qualitative techniques. The former have involved a revision and an analysis of statistics and documents regarding the changing process that European agriculture is suffering nowadays as well as a description regarding how this process is reflected in each region's reality. Thus, basic EU documentation, official sources of the corresponding regional ministries of agriculture as well as existing bibliography of specialised centres have been consulted in order to analyse the influence of each production system and the profile of farmers that have adhere to them. In that sense, the basic structural features of agriculture have been analysed in each region, in order to clarify the interests' representation systems and the contents of the agricultural policy. Likewise, the reconstruction of the genesis and development process of the new agricultural systems in each region has been attempted in order to study the factors that have influenced to a great extent the implementation of these systems as an alternative to mainstream agricultural practices.

The latter (qualitative techniques), have been carried out during successive visits of the research team to each region from March to July 2003. In these stays, a variety of information has been compiled through different individual and group interview programmes to different persons, namely experts from research centres, opinion leaders bound to new agricultural systems, leaders of professional and traditional cooperative movements, intermediate level civil servants from the agricultural administrations and standing out members of the diverse organisations linked to organic and integrated farming as well as to conservation and quality guaranteed agriculture. Finally, some representative holdings of the different production systems in the regions have been visited, in order to grasp the principal aspects of those systems and to find out about farmers' expectations and concerns *in situ*. **ANNEX 30** includes a list of the interviews carried out and the organisations visited in these regions.

As it will be shown below, the information collected through the mentioned research techniques has been used in one of the methodological phases of the chapter regarding factors influencing farmers' decisions on the agricultural system to be implemented, in order to empirically contrast the factors included in the provisional analytical framework.

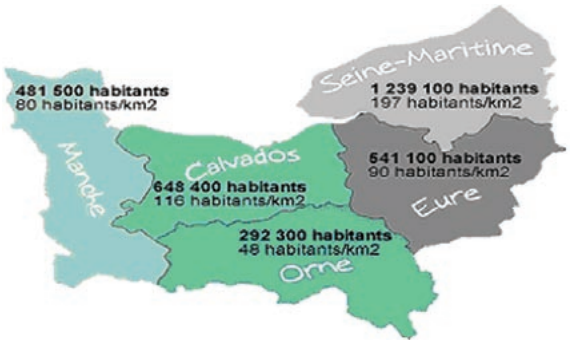
2.4.3. Agricultural Systems in Lower Normandy (France)

2.4.3.1. General description of the region

Situated in the northwest of France, Normandy is a natural region which occupies 5% of the national territory and is inhabited by 5% of the country's population. From an administrative viewpoint, it is divided into two regions: Upper

Normandy and Lower Normandy (**graph 11**). Lower Normandy, which is the subject of our study, is made up of departments of Manche, Calvados and Orne.

Graph 11: Departments of Normandy.

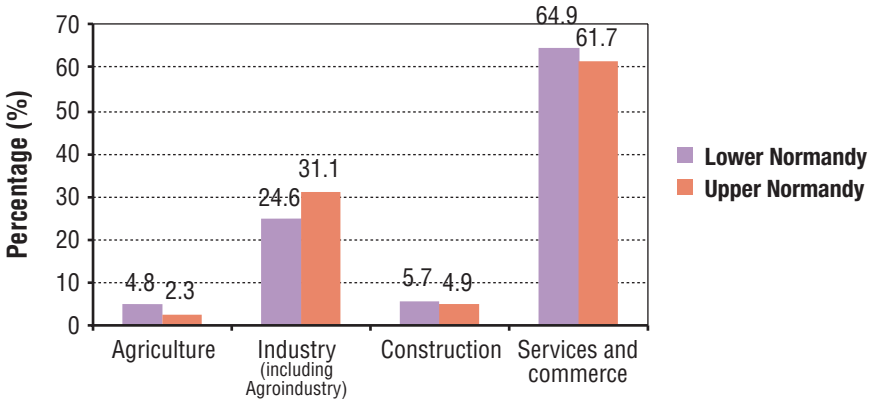


Source: Agriscopie 2002. Chambre d'Agriculture de Normandie (Agricultural Chamber of Normandy).

In the year 2001, the GDP in Lower Normandy was 20,316 euros per inhabitant. As it can be verified in **graph 12**, the service sector is the most important one in the regional economy contributing with 64.9% to the regional added value, as usual in the rest of EU countries. Agriculture contributes 4.8% of added value, placing it in last position, although this percentage is more than double of what farming sector represents in Upper Normandy (2.3%).

The importance of the agricultural sector is also apparent in terms of employment. According to the official statistics (**table 8**), agriculture employs 7.5% of the active population (compared to the national average of 4.1%), which is even above the building industry. Service and commerce sectors are placed again at the top, employing two out of three inhabitants of Lower Normandy.

Graph 12: Distribution of the value added per sector, in 2001.



Source: Institut National de la Statistique et des Etudes Economiques (INSEE), National Institute of Statistics and Economic Studies.

Table 8: Employment in Normandy (2001).

(In thousands)	Lower Normandy		Upper Normandy		France
Agriculture, Forestry, Fisheries	42.8	7.5%	19.2	2.8%	**4.1%**
Industry	113.6	20.0%	156.8	22.6%	**16.6%**
Agri-food industry	20.2	3.6%	15.3	2.2%	**2.6%**
Construction	36.7	6.5%	43.8	6.3%	**6.1%**
Services and Commerce	374.7	66%	472.6	68.3%	**73.2%**
Total Employment	**567.8**	**100%**	**692.4**	**100%**	**100%**

Source: Institut National de la Statistique et des Etudes Economiques (INSEE). National Institute of Statistics and Economic Studies.

In general, the strong points of Lower Normandy are the following: an employment rate which is higher than the national average; the fact that the agri-food industry is the major industrial activity; the existence of a coastal zone that attracts tourists from Paris, England and Belgium; and finally, a network of small towns which are close to one another, allowing local markets to be maintained where farmers and artisans can sell their products directly to the consumer.

In terms of development, the lack of professional skills, the exodus of highly qualified young people, the lack of innovation in the business sector and poor railway infrastructures are some of the problems faced by the region. Under the Regional Development Plan for the 2000-2006 period, Lower Normandy has set four principal objectives: to create employment, to strengthen the social cohesion between rural and urban areas, to foment social and economic activity in rural areas and to undertake actions in order to improve the environment.

- Situated in the northwest of France, Normandy is a natural region which occupies 5% of the national territory and is inhabited by 5% of the country's population.
- In Lower Normandy agriculture contributes with 4.8% to added value; this percentage is more than double of what farming sector represents in Upper Normandy. According to the official statistics, agriculture employs 7.5% of the active population.

- In general, the strong points of Lower Normandy are an employment rate which is higher than the national average; the fact that the agri-food industry is the major industrial activity; and a network of small towns, allowing local markets to be maintained.

2.4.3.2. Importance of agriculture in the region

The Utilised Agricultural Area (UAA) of Lower Normandy (**table 9**) occupies 1,381,540 hectares, amounting to 78% of the region's total area and devoting to agriculture more land than any other region in France (in Upper Normandy the UAA amounts to 67% of the region's total area).

However, throughout the nineties, the amount of land used for agricultural purposes decreased (the UAA dropped to 60,000 hectares during that decade), reflecting the tendency of farmers to abandon unprofitable farmland. The cattle sector also declined and as livestock was lost, meadows and pastures also diminished, in spite of having benefited from the European subsidies programme. At the same time, from 1988 to 2000, the average size of farms in the region increased from 25 to 35 hectares in Lower Normandy and from 35 to 45 hectares in Upper Normandy.

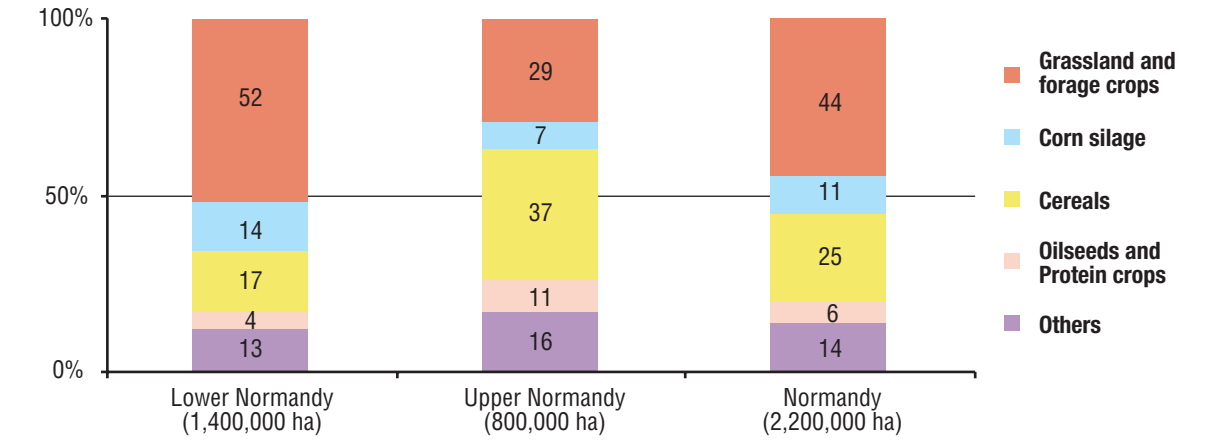
In relation to how UAA of Lower Normandy is occupied (see **graph 13** and **table 10**), 52% is for grassland and forage crops (representing 11.4% and 7.2%, respectively, of the whole French area), 17% for cereals and 14% for corn silage. This gives us some indications of the importance that livestock farming systems have within regional farming. In that respect, it differs from Upper

Table 9: Land use in 2001 (in ha).

Regions	UAA	Wood	Uncultivated land	Land not used for farming	Regional area
Lower Normandy	1,381,540	175,850	30,660	180,520	1,772,970
Upper Normandy	823,580	224,500	18,000	164,600	1,233,375
Normandy	2,205,120	400,350	48,660	345,120	3,006,345

Source: Service Central des Enquêtes et Études Statistiques (SCEES). Central Service of Surveys and Statistical Studies.

Graph 13: Distribution of UAA per crop in Normandy (2001;estimated).



Source: Service Central des Enquêtes et Études Statistiques (SCEES). Central Service of Surveys and Statistical Studies.

Table 10: Utilised agricultural area (UAA) in hectares in Lower Normandy and France.

	Lower Normandy		Region/France (%)
	2000	**2001**	**2001**
Cereals	252,620	239,320	2.7
Oilseed crops	27,450	22,300	1.2
Industrial crops [187]	n. d.	n. d.	n. d.
Fresh produce and potatoes	8,640	9,760	2.4
Dry and protein crop legumes	27,750	29,300	6.1
Annual forage crops	174,900	194,900	11.4
Artificial temporary meadows	100,600	100,100	3.8
Fallow land	33,175	37,515	2.8
Surface with permanent meadows	729,900	720,620	7.2
Total UAA (ha)	**1,383,223**	**1,381,543**	**4.7**

Source : Ministère de l'Agriculture, de l'Alimentation, de la Pêche et des Affaires Rurales. Ministry of Agriculture, Food, Fisheries, and Rural Affairs.

Normandy, where cereals are more important (37%) than grassland and forage crops (29%).

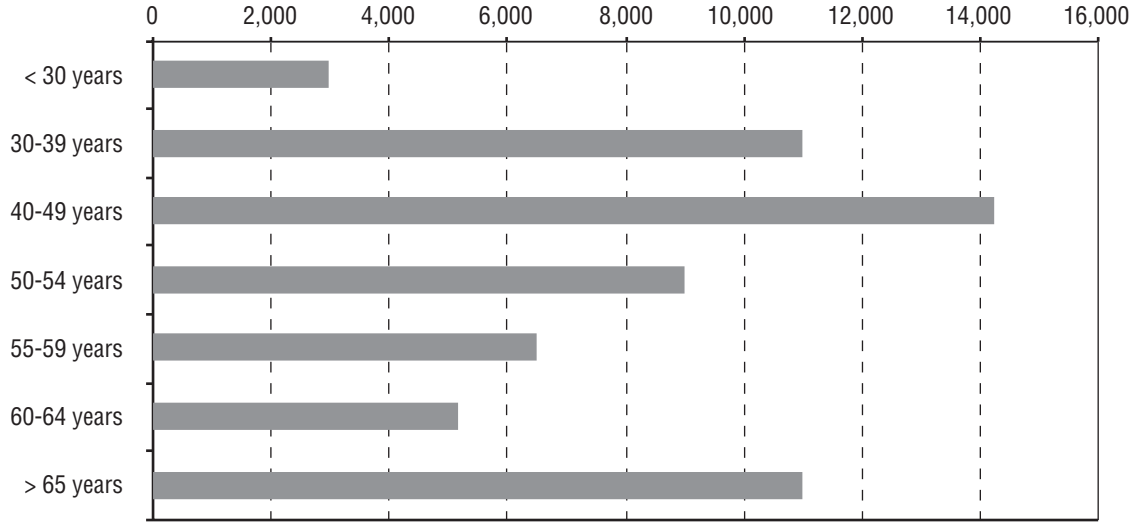
Agricultural population

On average, farms which produce arable crops utilise one Annual Working Unit (AWU) per 78 hectares, dairy farms (cows) one AWU per 37 hectares, mixed farms (crops + livestock) one AWU per 54 hectares and pig farms, which are the most intensive, one AWU per 27 hectares.

In the year 2000, 58,530 farmers were registered in Lower Normandy. Of these, 28,590 (49%) were the principal owners and worked full time on their farms. Almost half (47%) of the farmers were under 50 years old and one out of every four farmers were over 60 (**graph 14**). The work of farmers amounted to 62% of the AWUs for an average family farm, while the work of spouses amounted to 17%. It is also interesting to note that 30% of the 58,530 farmers in the region are women (26% in Upper Normandy).

187 No data are available.

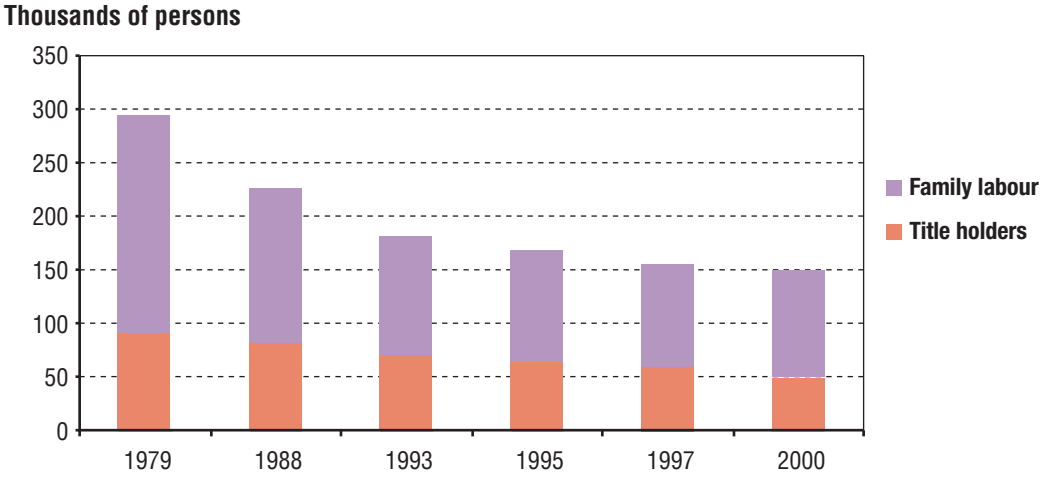
Graph 14: Distribution of farmers by age in Lower Normandy (2000).



Source: Service Central des Enquêtes et Études Statistiques (SCEES0). Central Service of Surveys and Statistical Studies.

In the year 2000, a total of 102,300 family members worked regularly on family farms in Lower Normandy, amounting to 7.2% of the region's total population. However, in Upper Normandy only 2.7% of the region's population (48,000 persons) were engaged in this activity. **Graph 15:** Family farm population in Lower Normandy.

As shown in the **graph** above, the number of family members engaged in work on farms has fallen significantly over the last 20 years, like in the rest of the EU. In Lower Normandy, the loss of workers in agriculture is related to a drop in the number of farms and the fact that a large percentage of the farming population has retired; a loss which has not been compensated for by the numbers of young farmers joining the agricultural sector. This decrease in the active farming population has gone hand in hand with the concentration of farms (increasing the average UAA per farm) in accordance with the EU model of agricultural modernisation. The drop in the number of family members engaged in work on farms is one of the factors which reflects the process of an increased production and the change in the social model of production occurring in the EU over the last twenty years; a change that is also reflected in the



Source: Service Central des Enquêtes et Études Statistiques (SCEES). Central Service of Surveys and Statistical Studies.

increasing use of paid labour (paid labour currently represents 13% of the AWUs).

Agricultural markets

Within the agri-food sector, the dairy industry is the most important one, ranking Lower Normandy third in France behind Brittany and Midi-Pyrénées in terms of exports. Due to the proximity of ports and territories of Belgium and the United Kingdom, large food industry groups, such as Bongrain, Lactalis, Nestlé or Danone, have settled in the region.

Lower Normandy is also characterised by a social fabric which is organised around small towns, allowing local markets -where direct sale of agricultural products is high- to be maintained. Furthermore, this organisational structure encourages traditional craftsmanship, demonstrated by the fact that some 80,000 people are engaged in this activity in the service sector. Nevertheless, the inhabitants of Lower Normandy fear that the unique nature of these local markets will be negatively affected by the establishment of large food retailers.

- The Utilised Agricultural Area of Lower Normandy occupies 78% of the region's total area. More than a half is for grassland and forage crops.
- Almost half of the farmers were under 50 years old in 2000. It is also interesting to note that 30% of the 58,530 farm owners in the region are women.
- The drop in the number of family members engaged in work on farms is one of the factors which reflects the change in the social model of production.
- Within the agri-food sector, the dairy industry is the most important one. Lower Normandy is also characterised by a social fabric which is organised around small towns.

2.4.3.3. Emerging agricultural systems in Lower Normandy

Organic farming

Specific characteristics of organic farming in Lower Normandy

Historical development

In France, the beginnings of organic farming date back to the 1950s after World War II when doctors and consumers placed the blame for cancer and other diseases (including mental illnesses) on the use of chemical agricultural inputs. It was within this context that the *GRAB-Ouest* association (*Groupement d'Agriculteurs Biologiques de l'Ouest, Group or Organic Farmers from the West*) was founded in 1959.

The rapid expansion of the Green Revolution was not well received by all farmers and agronomists. In fact, the technology and practices linked to Green Revolution encountered a fair amount of reticence, either due to the fear of change or the fear brought on by the massive use of chemical products. In Lower Normandy, the first proponents of organic farming were farmers that did not look fondly upon the modern models of agriculture which were founded on the principles of the Green Revolution, nor the systems of vertical integration to which these models inevitably led. These groups of farmers had a highly ideological, militant stance, and until the eighties were largely excluded from the official system of representation (dominated by the tandem formed by the farmers' unions FNSEA— *Fédération Nationale des Syndicats d'Exploitants Agricoles*— and CNJA— *Centre National des Jeunes Agriculteurs*). These groups of *bio*-farmers sought refuge in minority trade unions like the CNSTP (*Confédération National des Syndicats des Travailleurs Paysans*, National Confederation of Peasant Trade Unions), but were faced with enormous difficulties in accessing the lucrative benefits to be obtained under French agricultural policy in the glorious decades of modernisation (the 60s and 70s).

In 1981, when the socialist party came into office during the V Republic with Mitterrand as

president and Edith Cresson as the new Minister of Agriculture, the pluralistic character of French agriculture gained recognition, allowing different forms of agriculture to flourish and granting all farmers a voice in the forums of representation. It was a change that responded to the profound crisis occurring in the "productivist" model of modernisation, where marked social and economic contradictions (given the enormous indebtedness of farmers who had opted for the modern model based on the principals of the Green Revolution) and serious environmental problems (especially in the livestock regions of the west) were beginning to emerge. The so-called *Etats Generaux du Development* (General States of Development) in 1984, that took place in Paris under supporting of the Ministry of Agriculture, allowed bio-farmers to come to the fore and demonstrate the potential of unconventional methods of producing foods. Since then, organic farming has grown spectacularly, especially in regions such as Lower Normandy whose particular demographic and agroecological characteristics encouraged farmers to adhere to this new form of agriculture.

In 1991, organic farming (called *agriculture biologique* in France) received a major boost when the first EU regulations regarding this new system of agriculture were passed, thus giving it legal coverage and public recognition and allowing it to be present in previously inaccessible spheres such as the scientific sector and the mass media. A regional branch of the above-mentioned *GRAB-Ouest* association (the *GRAB-Basse Normandie* association) was founded in this context and grew quickly in the nineties thanks to the favourable atmosphere of the plural left-wing governments headed by the socialist L. Jospin in which the Green Party would play a key role. The health crisis in the livestock sector (mad cow disease, dioxins) would also prove to be a positive impetus to the development of *agriculture biologique* as it was particularly hard felt in western France and especially in Lower Normandy.

- In 1959, the GRAB-Ouest association (Groupement d'Agriculteurs Biologiques de l'Ouest, Group or Organic Farmers from the West) was founded.
- In the 1980s, the pluralistic character of French agriculture gained recognition.
- In 1990s, organic farming received a major boost when the first EU regulations were passed. The GRAB-Basse Normandie association, a regional branch of the GRAB-Ouest association, was founded in this context.

Importance of organic farming in Lower Normandy

In the three departments that make up the region of Lower Normandy, some 25,939 hectares (1.7% of the region's UAA) are devoted to organic farming (**table 11**). This area is much bigger than 2.952 hectares devoted to organic farming in Upper Normandy (3.6% of the region's UAA). Lower Normandy is one of the leading regions in France for this type of agriculture; ranking sixth on the national level out of 22 regions in terms of the

Table 11: Figures for organic farming (2001).

	Lower Normandy		Upper Normandy	
	2001	Evolution (2000-2001)	2001	Evolution (2000-2001)
Farms	496	(+ 8%)	86	(+ 0%)
Cultivated area of organic farming	25,939 ha	(+ 6%)	2,952 ha	(+ 6%)
Hectares converted to organic farming in 2001	6,661 ha	(- 41%)	1,135 ha	(+ 5%)
Mean UAA per farm	52 ha		34 ha	

Source: Observatoire National de l'Agriculture Biologique. National Observatoy of Organic Farming

ratio between organic UAA and regional UAA. Of the total number of organic farms in France, 5% are located in Lower Normandy.

The 496 organic farms in Lower Normandy are distributed fairly throughout the three departments, with 38% in the department of Manche, 35% in Orne and 27% in Calvados. According to data provided by the *Observatoire National de l'Agriculture Biologique* (National Observatoy of Organic Farming), the number of organic farms in Lower Normandy has risen by 153% from 1997 to 2001 (**table 12**).

Furthermore, production on organic farms is oriented towards traditional crops and products such as cattle, cereals, some fruits and vegetables and apple cider. In **graph 16** it can be seen that milk is the principal organic product (53% of the total number of organic farms in Lower Normandy and 25% in Upper Normandy), followed by meat (beef and lamb) (26% and 18%). It should also be pointed out that Orne was the first department to introduce organic pig production.

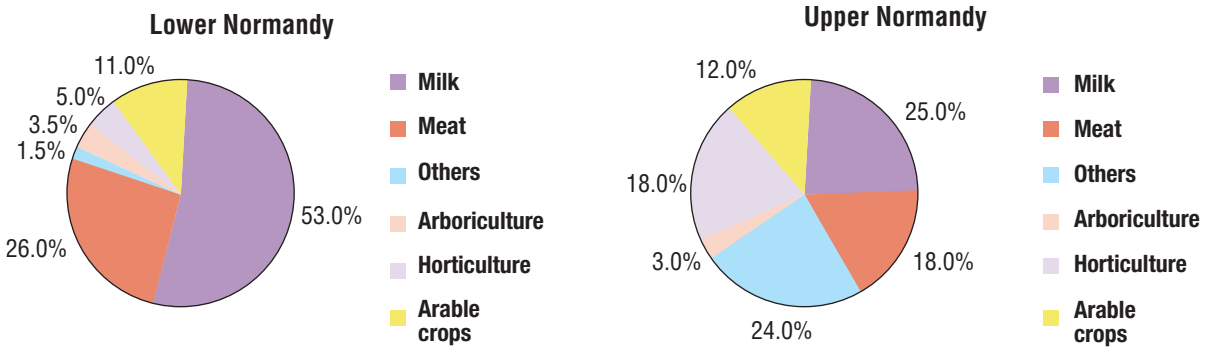
As can be seen in **graph 17**, 86% of the area which has been declared as organic produces forage for the production of milk and dairy products. This is followed by organically produced cereals (9%), including wheat for bread.

Table 12: Development the number of organic farms in Lower Normandy.

	1997	2001
Calvados	53	134
Manche	76	188
Orne	67	174
Lower Normandy	**196**	**496**

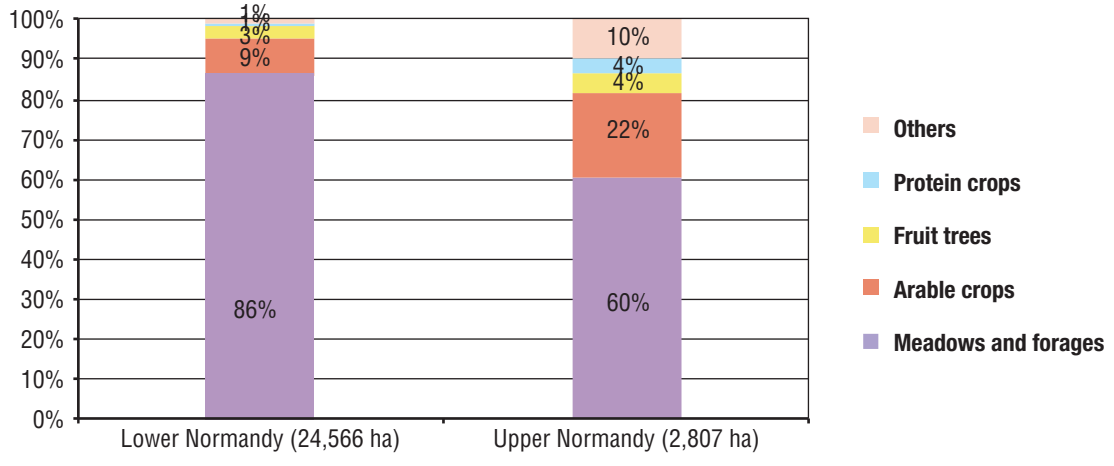
Source: GRAB Lower and Upper Normandy

Graph 16: Distribution of organic produce, in 2001.



Source: GRAB Lower and Upper Normandy.

Graph 17: Distribution of organic farming area in 2001.



Source: Observatoire National de l'Agriculture Biologique. National Observatoy of Organic Farming

- In Lower Normandy, 25,939 hectares (1.7% of the region's UAA) are devoted to organic farming, ranking sixth on the national level out of 22 regions in terms of the ratio between organic UAA and regional UAA.
- Production is oriented towards traditional crops and products such as cattle, cereals, some fruits and vegetables, and cider.
- Milk is the principal organic product (86% of the area which has been declared as organic produces forage), followed by meat.

Specific details on the transition process

In recent years, more than two-thirds of the area converted to organic farming includes new farms run by young, technically well-trained farmers who come from mainstream systems. It should be said, however, that the majority are semi-extensive farms where conversion to organic farming is easier.

Product marketing

Based on the information collected from interviews, one of the main obstacles to be overcome in organic farming in Lower Normandy is the lack of a solid marketing strategy that would allow this type of agriculture to expand beyond the sphere of local markets. Although organic farming is closely linked to local markets, to such an extent that this has become one of its distinguishing features, it is also true that these markets provide a low added market value and are highly vulnerable to competition from large retailers. Thus, increasingly more members of organic farming are voicing the need to reach out to larger markets and open up to a wider consumer base. Another important challenge facing organic agriculture is the need to develop an information strategy that highlights the quality and wholesomeness of organic products and their strict compliance with regulations.

The organic farmers of Lower Normandy are facing a time of deep uncertainty before the changes that are looming on the horizon. In recent years, organic farmers have had a great opportunity for development as a consequence of the food crisis and the advancement of agroenvironmental measures, but they are aware that other forms of agriculture (i.e. conversion to integrated agriculture which is less costly for farmers) also constitute an important event. Excess production in certain sectors of organic agriculture (e.g. milk) due to increased production which is not paralleled by increased consumption is another factor to be taken into account. While it can be said that organic farming has been successful in its strategy to expand out to all producers, this has not been the case when capturing new consumer markets. Thus, one of the shortcomings of organic agriculture in Lower Normandy lies here, in the consumer sphere.

With the aim of resolving the problems faced by organic farming in Lower Normandy, the GRAB association proposes the following actions: to create a consumer watchdog organisation; to perform studies to identify the market share of organic products in accordance with the strategies of retail chains in the region; to create a web page on internet for the general public and professionals which will facilitate the exchange of ideas and information and establish a network of demonstration farms.

These actions would facilitate the commercialisation of Norman organic products. The following products in the region have been certified as *agriculture biologique:* Cattle meat, pork meat and derived, lamb meat, birds, eggs, milk and dairy products, cider and fruits and vegetables.

- Organic farming is closely linked to local markets that provide lower added market values than other markets and are highly vulnerable to the competition from large retailers.
- Another of the shortcomings of this system lies in the excess production in certain sectors (i.e. milk), a factor to be taken into account.

Factors influencing decisions of organic farmers

The main determining factors that make farmers adopt the organic farming system in Lower Normandy are the following:

Farmers Ideology (social and political concern)

Farmers in the Lower Normandy region who adhere to organic farming maintain a strong militant stance and regard this form of agriculture as the only alternative to mainstream agriculture. Organic farmers of Normandy continue to consider themselves as "alternative producers" and proudly offer another way of producing and practicing agriculture and livestock production. Organic farming in France has a solid ideological base and brings together two groups linked to the scientific world, one which is opposed to the use of conventional methods for the artificial and mineral fertilisation of plants and another group of farmers linked to the *paysans travailleurs* movements who reject the modern productivist model.

Improvement of Farm Profitability through higher Prices

Nevertheless and nowadays, the ideological component of those farmers who choose this type of agriculture is losing importance and other factors are becoming more relevant in their decision, such as the market and the improved profitability of farming due to better prices for producers.

Searching for social recognition and meeting new social demands

A change in the ideological values that marked the adherence of farmers to this system in last decade can be observed. The political militancy impregnating the origins of the first organic farmers is being increasingly displaced by a search for social recognition and a new legitimacy for farming (environmental friendly practices, food safety, animal welfare, etc).

Farm Size and Structure

Initially, organic farmers in Lower Normandy ran small family farms. The model was difficult for others to adopt given the fact that they were excluded from receiving aid during the first years of the CAP in the sixties and seventies.

Age of Farmers and Attitudes to Risk and Innovation

Likewise, a major facility of the youngest farmers to adopt the methods of organic farming is observed. It is also related to the minor distaste for risk and a major innovative capacity of the youngest generations of farmers.

Productive Orientation of Farms

The fact that in this region livestock farming linked to grasslands predominates favours the spread of organic farming among producers in the sector.

Product Differentiation and Price Increases

It is important to stress that although organic farmers share the common characteristic of running small family farms, they have greatly evolved and today the group is quite heterogeneous. Currently this group brings together farmers of a diverse range of origins and characteristics: new farmers of an urban origin (the so-called neo-rural farmers), farmers with a high degree of technical training (for example, agronomists) and even agricultural entrepreneurs who own large farms. Each of these groups has different reasons for adopting organic farming, a reflection of the fact that this type of agriculture is no longer linked to a determined ideology (anti-productivist, anti-consumption, ecological), but instead reaches out to include all farmers and is accepted by them as an interesting complement to mainstream agriculture and even as a new way of capturing quality markets with substantial buying power. Nevertheless, in contrast to other emerging systems (i.e. integrated

or conservation agriculture), organic farming in Lower Normandy is viewed as a system which produces quality products and not as a means of obtaining large yields. In this way, organic farming continues to break away from conventional models of agriculture, although this rupture has no ideological roots and is instead based on a range of strategies following a clear economic rationale.

Trade Structures and Facilities to Access to Market.

In order to understand the spectacular growth of organic farming in Lower Normandy, several factors must be taken into account. Some of these factors have to do with the comparative advantages of the region as mentioned above (i.e. the importance of livestock, the existence of local markets and its proximity to coastal areas which serve as a tourist attraction).

Public Support and Aid

Other influential factors are political, namely those related to the regionalisation process that began in France in the eighties[188] and which was clearly committed to promoting the development of local territories. Within the framework of this process, which coincided with the first symptoms of the crisis of the productivist models of agriculture, organic agriculture was presented as a new food production system that made it possible to integrate agriculture and territory and soon became a driving force behind the development of rural areas. For this reason, in areas such as Lower Normandy, the high level of regional awareness manifests itself in support for all activities related to territorial development, thus explaining the Regional Council's strong endorsement of organic farming with EU funds. Furthermore, the presence of the Green Party in regional politics has been a key factor in promoting this alternative form of agriculture.

Training for farmers, Technical Advice and Promotion among farmers

Another aspect to bear in mind when explaining the enormous growth of organic farming in Lower Normandy is the role played by agents for development (a sort of advisor from the department of agriculture), whose main aim is to raise organic farmers' awareness of the need to improve their situation of exclusion and broaden their horizons in order to make their farming and livestock practices known in the Chambers of Agriculture and in agricultural schools. The work of the agents for development has been rewarded by the rapid recognition that organic farming has gained in official professional agricultural organisations of France, not as an alternative form of agriculture but as a complement to mainstream systems. This has given rise to a sort of peaceful coexistence between different groups of farmers that today constitute the rich and pluralistic nature of agriculture in Lower Normandy. Today it can be said that there is a good rapport between organic farmers of the GRAB association and the Chambers of Agriculture of the three departments (traditionally dominated by modern farmers belonging to the FNSEA and the CNJA). In order to maintain this good rapport, the organic agriculture technicians and agents for development do not compete with the agents for development of the Chambers of Agriculture, but instead carry out their activity in different areas, respecting each other's sphere of action.

Environmental Concern, Food Safety and Animal Welfare

Although on an individual level the reasons for farmers to adhere to organic farming are varied, and the economic motivations are very important, the organic associations of Lower Normandy continue to equate organic farming with an ethical attitude regarding environment as well as health and animal welfare. Thus, and as a consequence

188 This endorsement of the territory is also a novel feature as the agricultural sector has traditionally held power in the departments (provinces) and not in the region.

of the health crises that have occurred in recent years, organic farming associations have placed this type of agriculture on a par with wholesomeness and quality.

Tradition and Cultural features of the local environment

For this reason, a large majority of organic farmers are interested in maintaining the small local markets where their activity is considered an integral feature of the rural territory. This explains why many organic farmers sell their products to the same clients, creating a sort of relationship of proximity between producers and consumers. In this context of new relations which have emerged within the framework of organic farming, the figure of the *paysan* (peasant) has been redefined, shedding its archaic connotations and stressing its artisan rather than business dimension. It should not be surprising, then, that many organic farmers (especially those with family farms) are sympathetic to organisations such as the *Confederation Nationale Paysanne*.

Other important factors that help Norman farmers to decide joining this model of agriculture are the following ones:

- Existence of associations favourable to this agricultural system which help to put social actors in organic farming together (GRAB).
- Existence of a scientific and transference technology system adapted to this emerging agricultural system.
- Enterprising culture of the local and regional society.
- Specific quality policies in favour of organic farming.
- Programmes promoting organic products consumption.

- The political militancy impregnating the origins of the first organic farmers is being increasingly displaced by searching for social recognition and a new legitimacy for farming.
- Although on an individual level the reasons for farmers to adhere to organic farming are varied, and the economic motivations are very important, the organic associations of Lower Normandy continue to equate organic farming with an ethical attitude.
- Another aspect to bear in mind when explaining the enormous growth of organic farming in Lower Normandy is the role played by agents for development.

Integrated Farming

Specific characteristics of integrated farming in Lower Normandy

Historical development

The Lower Normandy region has been pioneer in introducing integrated farming (called *agriculture raisonnée* in France) due precisely to the fact that the health crisis of the nineties hit this region particularly hard, and farmers were severely criticised by the public. In response to this criticism, certain groups of farmers set out to modify their own agricultural practices and reflect upon the negative effects of the productivist models to which they had adhered for decades. Without going to the extreme of opting for organic farming, present in Lower Normandy since the 60's, these farmers who were critical of the modernisation process, but at the same time benefited from it, took advantage of their ties to the scientific world to incorporate into their farming and livestock production practices the advances in environmental sciences and their knowledge of the effects of intensive agriculture on the natural environment of farms, without renouncing economic profitability. For example, in livestock production systems, some farmers opted for cultivating their own grains and protein crops to feed livestock directly, thus lowering costs and, in particular, avoiding the risk of buying feed of unknown origin.

Importance of integrated farming in Lower Normandy

Integrated farming is being favourably received in Lower Normandy, and unlike the exclusive character of organic farming, it acts as a sort of umbrella which encompasses many types of farmers and farms, thus greatly widening its scope of action and its potential support base. What is more, the fact that it is headed by young farmers from the CNJA (one of the largest farmers' unions in the region), lends *integrated farming* an air of respectability in a wide range of public opinion sectors. Given the recently-released French regulation in this matter, it has not been possible yet to accede to any official record of farms under integrated farming qualification. However, based on regional experts' opinion, it is estimated that in more than 60% of Norman farming area the main principles of integrated production are already respected (though farmers are not aware of it).

Related bodies

The installation of FARRE in two of the three departments in Lower Normandy has been fairly easy, since many farmers were already aware of health risks and were strongly committed to food traceability. In each department where the FARRE network is present[189], the association functions as a local antenna to encourage farmers to adhere to this new system of production and to explain to consumers that, in spite of the possible errors of the past, today's farmers are the first to be interested in guaranteeing food quality and safety by improving agricultural and livestock production practices (for example, pesticide and waste management, animal hygiene or tree conservation).

Specific regulations and aid

The Integrated Farming Code has been well received by Norman farmers and those who endorse it view it as a useful document in defining the practices to be employed on their farms. In Lower Normandy, integrated farming is not presented as an alternative system to mainstream agriculture but rather as an additional route for sustainable development in agriculture, admitting any farm or territory on the condition that it complies with the rules established in the Code. Leaders of the FARRE network do not wish to minimise the importance of organic farming and acknowledge that organic farmers were concerned about issues regarding quality and the environment long before they were. Today, farmers in Lower Normandy can opt for two systems as an alternative to mainstream agriculture:

- Organic farming (*agriculture biologique*), which is subject to specific regulations and the certification of its products. By endorsing the *cahier de charges* (product specifications), farmers pledge to respect specific farming and livestock production practices. Organic agriculture can even be considered a model of development.
- Integrated farming (*agriculture raisonnée*), which continues to be a determined attitude shared by groups of farmers, but has not still gained official recognition. Adherence to this form of agriculture is an individual choice, with the sole commitment of respecting the *cahier de charges* (stipulations) that includes the 110 recommendations outlined in the Code. In contrast to organic agriculture, which can affect one or several products, *agriculture raisonnée* concerns the farm as a whole and not just a single product. It is not, therefore, a model of development, although it could be a first step towards organic farming.

- The Lower Normandy region has been pioneer in introducing integrated farming due precisely to the fact that the health crisis of the nineties was especially hard felt in this region.
- Given the recently-released French regulation in this matter, it has not

189 According to FARRE, in Manche and Orne (Lower Normandy) there are 15 farms (www.farre.org).

been possible yet to access any official record of farms under integrated farming qualification. Nevertheless the Integrated Farming Code has been well received by Norman farmers.

- In contrast to organic agriculture, which can affect one or several products, integrated farming concerns the farm as a whole and not just a single product.

Factors influencing farmers' decisions

The main determining factors that influence farmers' decisions regarding the integrated farming system in Lower Normandy are the following:

Social Recognition and Food Safety

Integrated farming was introduced within a setting characterised by the need for farmers to recover their good image and legitimacy within society. Furthermore, there is a clear need for farmers to be trained in how to correctly produce foods destined to the consumer market, for specifications (*cahier de charges*) regarding the traceability of their farms and to demonstrate to society what they do and how they do it. Farmers adhere to integrated farming in search of social recognition and consumer confidence, hoping to win back their "good farmer" image. As one farmer explained, "*Farmers have been singled out for criticism to such an extent, especially with the BSE crisis, that today they are determined to do things well and to convince and inform the public about how they do it.*"

Facilities for Conversion to the Emerging Agricultural System

One of the main attractions for the farmer to adopt the principles of integrated farming in this region is the existing similarity between this system and the practices that normally have been carried out in mainstream agriculture. This facilitates enormously the transition process to integrated farming and leaves open the possibility of taking up again to the previous practices (mainstream agriculture) in case the results of integrated farming do not satisfy the due expectations (reversibility). In fact, as it has been previously pointed out, and according to the information facilitated by experts of the region, many Norman farms might fulfil the principles of integrated farming, without, in many cases, the awareness of farmers.

Reduction of production costs

Another reason that can attract farmers and, especially, Norman stockbreeders to this system is the reduction of inputs of out of the farm. The production of nourishment for livestock in the same farm can involve a reduction of costs. At the same time, and related to food safety, the risks involved by the employment of inputs of unknown origin are minimised.

Information campaigns for consumers and training programmes for farmers

Regarding the training programmes and information campaigns, it is necessary to stress the main role played by the association FARRE, which acts as a very important bridge between integrated production farms and consumers. Besides, FARRE plays an important role among its members making farmers aware of the new sustainability paradigm in agriculture.

Other factors explaining farmers' decisions who adopt this farming system are the following:

- The size of the farm (in medium-sized and big farms it is easier to change the mainstream agriculture production practices to integrated ones than in smaller farms, because of the higher level of agronomic training among their farmers and their greater capacity to make innovations in farms).
- Interest of farmers on the environmental negative effects of mainstream agricultural practices, and worries about the efficient use of natural resources.

- Growing limits and restrictions on the use of certain inputs (fertilisers and phytosanitaries) in agriculture.
- Integrated farming was introduced within a setting characterised by the need for farmers to recover their good image and legitimacy before society.
- One of the main attractions for the farmer is the existing similarity between this system and the practices that normally have been carried out in mainstream agriculture.
- The production of nourishment for livestock in the same farm can involve a reduction of costs. At the same time, the risks involved by the employment of inputs of unknown origin are minimised.
- It is necessary to stress the main role played by the association FARRE, which acts as a very important bridge between integrated production farms and consumers.

The future of integrated farming in Lower Normandy

For FARRE, integrated farming constitutes the future model of agriculture in Europe as it will permit the certification of all farmers and exclude none. The cross compliance measures included in the current CAP reform imply that farmers who do not prove that they have made enough effort regarding environmental conservation are unlikely to prosper. With their proposed Code, FARRE and EISA (European Initiative for Sustainable Development in Agriculture) are working to clarify the principles of cross compliance already defined in the Agenda 2000[190].

Integrated farming is a complementary form of agriculture which does not compete with organic farming. Small diversified farms that have opted for the CTEs (territorial contracts) already form part of integrated farming, as the approach to this type of agriculture was taken as a reference for these contracts and continues to be a source of inspiration for the CADs (sustainable agriculture contracts).

One of the priorities of integrated farming refers to water use practices, which is the way to achieve a form of production that will preserve the quality of water and economise its use in agriculture: a challenge which was a key point at the World Food Day Conference held on October 16, 2002. With regards to the CTEs and the CADs, M. Hervé Gaymard, current Minister of Agriculture in France, has stressed that the CADs are an instrument of public aid for the contributions made by some farmers towards environmental conservation[191].

- For FARRE, integrated farming constitutes the future model of agriculture in Europe. Farmers who do not prove that they have made enough effort regarding environmental conservation are unlikely to prosper.
- One of the priorities of integrated farming refers to the way to achieve a form of production that will preserve the quality of water and economise its use in agriculture.

Agriculture Paysanne

Specific characteristics of Agriculture Paysanne in Lower Normandy

The *agriculture paysanne* in Lower Normandy is linked to small and medium-sized family farms, especially in the department of Calvados. This can be explained by the fact that the *Confédération*

190 In addition to presenting their proposal of Code before the European Commission in Brussels, EISA members will announce the establishment of a European certification that will allow compliance with the "Code of References for Integrated Farming" to be verified on individual farms.

191 Le Monde, 13.03.03, "Agriculture Raisonnée : premières certifications à l'automne".

Paysanne plays an important role among farmers of this department (the organisation's spokesman, François Dufour, lives there and works as an organic dairy farmer). Furthermore, in 1993, the above-mentioned *Charte Paysanne* and the debates on the role of agriculture in society started precisely in the village of *Saint Lô* in the department of Calvados. Today, many farmers continue to work in this department of Lower Normandy alongside the FADEAR (*Fédération des Associations pour le Développement de l'Emploi Agricole et Rural,* Federation of Associations for the Development of Rural and Agricultural Employment), to update and expand upon the content of the *Charte Paysanne (*Peasant Charter), which in the not so distant future should serve as an instrument of analysis (for qualitative and quantitative diagnoses) to foment the development of a more social and equitable form of agriculture.

Factors influencing farmers' decisions

The main factors influencing farmers' decisions regarding *agriculture paysanne* are the following:

- To position themselves as professional farmers working full-time.
- Size of farm (family farm).
- Productive capacity of the resources available.
- Ideology of farmers (anti-globalisation, neo-peasant discourse based on a new social legitimacy of farming, and strategies of confrontation face to multinational companies).
- Implementation and mobilisation of the farmers' union *Confederation Paysanne* in the zone.
- Interest and worry on food safety and animal welfare.

- The agriculture paysanne in Lower Normandy is linked to small and medium-sized family farms.

- The Confédération Paysanne plays an important role among farmers of the department of Calvados.

Conservation Agriculture

Conservation agriculture is not widespread in Lower Normandy owing to the fact that the production systems are predominantly geared towards forage crops for dairy production and for which there already exist permanent meadows and pastures.

Agriculture under guaranteed quality

Specific characteristics of agriculture under guaranteed quality

Historical development

Lower Normandy has an important tradition in the production of high quality foods, being known popularly among other products by their cheeses, meats and apple drinks. In this region, there is one of the oldest designations of origin of France, the "*AOC Calvados du Pays d'Auge*", which dates from 1942. Later on, in the seventies and eighties other designations were created, in the cheese sector, standing out "*Pont l'Évêque*" and "*Livarot*" designations, both regulated in 1970. From the late eighties until today, numerous collective quality brands have appeared in the Norman region (see below). This shows not only the high level of quality of products in Lower Normandy but also the capacity of Norman producers to join forces with one another to promote the quality of their foods on the market.

Importance of agriculture under guaranteed quality in Lower Normandy

Lower Normandy is one of the leading regions among those where farmers are committed to follow certain guidelines (*cahiers de charge)* in order to offer consumers a wide range of quality products. Many products can be found under the official labels that inform consumers about the

quality and origin of what they consume. The most popular and representative ones in this region are the dairy products, beef and cider.

As it was analysed above, there are three main official symbols of quality on the national level: *Appelation d'Origine Contrôlée (*AOC or PDO*), Label Rouge* and *Certification de Conformité Produit (*CCP).

In the year 2001, around 15% of the farms labelled their products under one of these three official quality trademarks.

There are ten *AOCs* or PDO in Lower Normandy, five of them are food products (cheeses, butter and cream) and the other five are beverages. The following products from Normandy have been certified as AOC in this region:

- Cheeses: Camembert de Normandie, Livarot and Pont–l'Evêque.
- Butter and cream: *D'Isigny*.
- Apple drinks: Calvados, Calvados du Pays d'Auge, Calvados du Domfrontais, Cidre du Pays d'Auge, Pómeau de Normandie and Poiré Domfront.

The following products are certified as *Label Rouge*:

- Mimolette vieille and extra-vieille cheese.
- Butter of *Baratte*.
- Cider of Normandy (+ Protected Geographical Indication-PGI).
- Saint-Jacques shells or scallops of Normandy (+PGI).
- Carrots of *Créances* and Carrots of sables (sands).
- Leeks of *Créances* (+PGI).
- Carrot purée.
- Farm Veal bred with full-cream milk.
- Farm pork of Normandy (+PGI).
- Farm poultry of Normandy (+PGI).
- Eggs of free range chickens.
- "*Race à viande*" (meat from cattle of a specific breed): Beef *Charolais*, blond beef *d'Aquitaine*, farm beef of Maine, beef limousin *Blason Prestige*.

The most important products of Normandy with the *C.C.P.* trademark include:

- Beef *Filière qualité race normande* (Norman breed quality).
- Veal: Veal "des rivières", Veal "Maître veal", Veal "des 4 saisons", Veal "de la laitière", Veal "de Perette", Veal "Plaisir de France", Veal "Le Valfleuri".
- Pork: "*Porc charcutier élevé à la farine d'orge*" (pork from barley flour fattened pigs), Fresh pork meat.
- Poultry "*Poulet de chair*" (chicken), "*Dinde de chair*" (turkey), "*Pintade de chair*" (guinea-fowl).
- Rabbit "Le Père Guillaume".
- Cider of Normandy (+PGI).
- Carrots and leeks.
- Fresh cheese made from milk produced by cattle of the Norman breed.

Lower Normandy is one of the regions of France where there are more quality designations in foods. In fact, of the 63 designations existing in France, five are produced in this region, which represents 8% of the total number of French quality designations. **Table 13** shows the evolution of the production of Norman quality food designations and **table 14** includes the evolution of the number of food producers with the above mentioned certification comparing it with the national facts.

As shown in **table 15**, products under *Label Rouge* or CCP designations are less important than those under AOC designation in Lower Normandy. In fact, *Label Rouge* or CCP designations supposes only 1% of the entire national production of these designations, since there are other regions (Aquitaine, Midi-Pyrenees or Pays de la Loire) with many major volume of production like that certified in France.

The brand *"Parc Naturel Régional"* is another quality label existing at the national level, which

Table 13: Time course of the production of foodstuffs' designations in Lower Normandy (t).

DESIGNATION	1998	1999	2000	2001	2002
Camembert de Normandie	13,280	12,696	13,198	12,813	
Livarot	1,101	1,116	1,066	1,267	
Pont L'Eveque	3,612	3,512	3,537	3,446	
Isigny Cream	4,030	4,019	3,921	3,805	3,841
Isigny Butter	4,537	4,781	4,833	4,913	4,851

Source: INAO, L'Institut National des Appellations d'Origine. National Institute of Designations of Origin.

Table 14: Time course of the number of producers involved in designations of origin of foodstuffs in Low Normandy.

	1998	1999	2000	2001
TOTAL Lower Normandy	6,900	6,845	6,903	6,993
TOTAL France	43,106	42,375	41,536	38,796

Source: INAO, L'Institut National des Appellations d'Origine. National Institute of Designations of Origin

Table 15: Lower Normandy Labels Rouge and CCP in 2001.

	Operators	Volume	Turnover
Label Rouge poultry	107 poultry farmers 1 organisation of producers 3 food manufacturers 1 hatchery operators 2 abattoirs	1,637,677 heads	
Label Rouge eggs	14 poultry farmers	2,506,180 eggs	
Label Rouge cooked pork meats	1 processing industry	8 t	
Meats	548 stock breeders 3 organisation of producers 11 food manufacturers 12 abattoirs 57 retail outlets	687 t	
Label Rouge beef	495 stock breeders	555 t	
Label Rouge pork	3 stock breeders	120 t	
Label Rouge veal	50 stock breeders	11 t	
Label Rouge dairy products *butter, mimolette cheese*	2 processing industries	317 t	
Label Rouge fruits and vegetables *Carrots*	17 producers 1 organisation of producers 1 packaging industry	40 t	
Label Rouge ready meals *carrots purée*	1 processing industry	116 t	
Label Rouge cereal products and pastry *Flour for bread-making*	1 processing industry	4,265 t	
CCP+IGP beverages *Cider*	2 manufacturers	12,742 hl	
Total Lower Normandy			**16,955,348 €**
Part in the national production			**1.0%**
Total Lower Normandy CCP+PGI			**1,850,000 € (0.5%)**
Total Lower Normandy Label Rouge			**15,105,348 € (1.3%)**

Source: CERQUA, Centre de Développement des Certifications des Qualités Agricoles et Alimentaires. Center for the Development and for Quality Food Certifications.

differentiates the foodstuffs elaborated in some areas of unspoiled nature under protection. In Lower Normandy, the regional nature reserve of Perche has granted the above mentioned brand for apple juice, produced by three companies (two in Orne and one in Eure-et-Loir), which produce about 3,000 to 4,000 bottles a year.

Although France is one of the main EU producers of quality wines, Lower Normandy does not produce Quality Wines produced in specified regions or Table Wines with geographical indication. No *Label Régionales* exist in this region either.

- Lower Normandy has an important tradition in the production of high quality foods, being known popularly among other products by their cheeses, meats and apple drinks (the "AOC Calvados du Pays d'Auge " dates from 1942).
- In the year 2001, around 15% of the farms labelled their products under one of the three official quality trademarks: Appelation d'Origine Contrôlée, Label Rouge and Certification de Conformité Produit.

Related bodies

The importance held in Lower Normandy to the distinct quality of the region's products is reflected in the creation in 1999 of the Regional Institute for Agri-food Quality in Normandy (*IRQUA-Normandie*), located in the city of Caen, a forerunner in the development of new forms of agriculture. In 1997, the *Charte de bonnes pratiques des élevages bovins* (The Good Practice Charter for Cattle Breeding) was drawn up here, a charter that would later in 1998, at the height of the BSE crisis, be accepted by the two most powerful federations of cattle and dairy producers: the FNB (*Fédération National Bovine*) and the FNPL (*Fédération Nationale des Produits Laitiers,* National Federation for Dairy Products); both of which form part of the FNSEA (*Fédération Nationale des Syndicats d'Exploitants Agricoles,* National Federation of farmers' trade unions) as sectorial trade unions.

Control, certification and labelling

As it was mentioned above, the AOC/PDO designations are controlled by the INAO (*Institut National des Appellations d'Origine*, National Institute for Designations of Origin) in all French regions, including Normandy. There are three official bodies for the certification of *Label Rouge* and CCP designations in Normandy: Avicert, Qualinorm and QualitéFrance.

The different collective brands existing in Lower Normandy are controlled by specific control bodies according to the features of each brand. For example, the brand "*Le porc bien élevé* " is controlled by Certisud.

Regarding the creation of collective quality brands, the most prominent example is the brand created by the Regional Institute for Quality (*IRQUA-Normandie*) named "*Gourmandie*". This brand is granted for quality products made with raw materials coming from Normandy and having characteristics evaluated through tests made by consumers. Every kind of product must draw up a technical dossier that establishes the quality conditions of the product. This brand can be granted to products under AOC/PDO, AB (organic products), *Label Rouge* or CCP designations. Other collective brands can be found for meats, fishes, fruits and vegetables:

- Beef: "Boeuf du pays normand", "Artisan Boucher de Normandie", "Qualité Normandie, "la Normande à la table des chefs", "Boeuf Normand Herbager/Boeuf Normand de Tradition Herbagère".
- Pork: "Le porc bien élevé".
- Lamb: "Agneau du pays normand", "Le couronné normand".
- Fois gras: "Fermiers des Becs".
- Cider: "Cidres des pays de Haute Normandie".

- Fisheries: "Fraîcheur du Littoral de Haute-Normandie», «Normandie Fraîcheur Mer», "L'huître de Normandie"(oysters), "Moules de Bouchot" (mussels).
- Fruits and vegetables: "Jardins Fraîcheur", "Petits fruits rouges de Normandie", "Croquine Normandie".
- Bakery: "Le pain normand".
- Other brands not linked to a specific sector (for example, "*Les démarches terroirs*", "*Produits de la ferme*").

The brand "*Produits de la ferme*" or "*Bienvenue à la ferme*", linked to the concept of short-chain agriculture, is conceived for products that are directly sold in farm. Those products are integrated in farm networks, which also offer rural tourism services

Each one of these collective brands defines different conditions to certify products, but, in general, such conditions are related to the Norman origin of products and to quality standards, such as size, calibre, fresh raw materials, traditional methods, etc.

Finally, and regarding labelling, some collective Norman brands' logos can be seen below.

Factors influencing farmers' decisions

The main factors influencing farmers' decisions who adopt quality production system in Lower Normandy are the following:

Expectations of higher prices for products under quality designations.

Productive orientations of farms coincident with prestigious products under quality designations of the region (cider, milk, wine, etc...).

Natural resources available for quality productions.

Distribution network and easy access to market for these products.

Favourable attitudes of farmers regarding risks and innovation.

Awareness of food safety and public health.

Specific policies aimed to promote quality.

- The importance held in Lower Normandy to the distinct quality of the region's products is reflected in the creation in 1999 of the Regional Institute for Agri-food Quality in Normandy (IRQUA-Normandie).

Artisan Boucher

Qualité Normandie

Boeuf Normand Herbager

Agneau du Pays Normand

Normandie Fraicheur Mer

Les Demarches Terroirs

Le Pain Normand

Produits de la Ferme

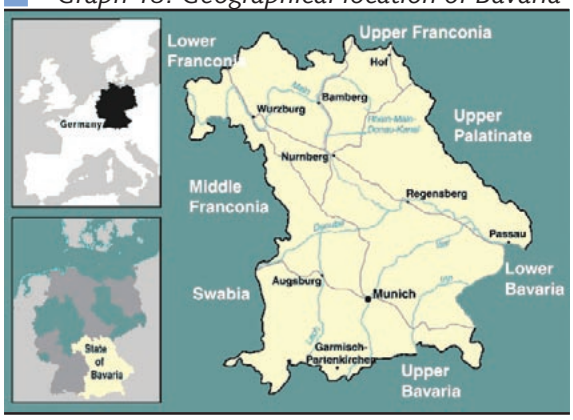
- There are many quality labels: EU-level, national, regional, public and private, collective brands, sectorial and non sectorial, etc.

2.4.4. Agricultural Systems in Bavaria (Germany)

2.4.4.1. General description of the region

The region of Bavaria is the oldest, largest and most southerly Germany's *Länder*, imbuing it with an especially strong sense of identity and autonomy with respect to other regions of the country. From a political and administrative viewpoint, Bavaria is divided into seven units or provinces (**graph 18)**: Upper Bavaria (*Oberbayem*) whose capital is Munich; Lower Bavaria (*Niederbayem*) with its capital in Landshut; Upper Palatinate (*Oberpfalz*) whose capital is Regensberg; Upper Franconia (*Oberfranken*) whose capital is Bayreuth; Middle Franconia (*Mittelfranken*) with its capital in Anshbach; Lower Franconia (*Unterfranken*) with its capital in Würzburg; and Swabia (*Schwaben*) whose capital is Augsburg.

Graph 18: Geographical location of Bavaria



Source: http://www.internationalreports.net

Despite the enormous industrial growth of the last forty years following World War II, Bavaria is the top farming region in Germany. Agriculture is the distinguishing feature of Bavaria and has left an indelible mark on the region's cultural landscape as well as its traditions and customs. Unlike other regions, industrial development in Bavaria has not occurred at the expense of agriculture, but has coexisted alongside an agricultural structure comprising small and medium-sized family farms. This sound agricultural foundation has constituted the cornerstone of Christian democracy, embodied in the CSU (Christian Social Union); a party that has governed the region uninterruptedly over the past forty years, in contrast to the hegemony of social democracy in other regions.

As shown in **table 16**, the State of Bavaria occupies 7.1 million hectares, amounting to almost 20% of the area of Germany. 86% of the total surface area of the state is occupied by rural territory, of which almost 60% is classified as mountainous area. For this reason, the State of Bavaria approved a programme in favour of its mountainous areas in 1972. It was the first region in Europe to promote this type of agricultural and rural policy, which had a significant influence on the EU socio-structural directives approved in the early seventies under Sicco Mansholt. Regarding the importance of farming land, the UAA occupies 3.3 million of hectares, amounting to almost 47% of the area of Bavaria and 19% of the UAA of Germany. However, the Bavarian farming sector is much modernised, with a very high level of productivity, which is reflected in the fact that only 214,000 inhabitants (1.75% of the total population) in this Länder are working in agriculture.

Forestry is a very important sector in the rural areas of Bavaria given that this Länder has the greatest amount of forestland in all Germany; some 2.5 million hectares (35% of the total area of the Länder is covered by forestland and similar vegetation) 23.4% of the total forestland in Germany. More than half of the forestland is privately owned (54%), with one-third (31%) belonging to the Länder of Bavaria, 13% to collectives and 2% to the German government. Protected by a Forestry Law dating back to 1852, the forest is a natural resource that, by tradition, has been cared for and conserved in Bavaria. Besides, the Bavarian Constitution of 1984 provides protection for its forestland (under Article 141, Paragraph 1), and considers the forest to be a natural resource providing a healthy environment for the country's inhabitants, while at the same time

Table 16: Comparison of area and population of Bavaria and Germany.

	BAVARIA	GERMANY (Bavaria represented in %)
Territory	70,955 km², equivalent to 7.1 million has	356,910 km² equivalent to 35.7 million has (19.9%)
Utilised Agricultural Area (UAA)	3.3 million has (47% of territory)	(19.1%)
Forestland	2.5 million has (35% of territory)	(3.4%)
Population	12,187,000 inhabitants	82,188,000 inhabitants (14.8%)
Population Density (hab/km²)	173	230
Working agricultural population	214,000 (1.75% of population)	(22%)

offering a tranquil setting and ensuring economic activity and employment.

Bavaria's rate of development is higher than both the German and European average when measured in terms of its GDP per inhabitant (**table 17**). Although the strength of its economy lies in a strong industry employing more than one-third of the working population, the number of people dedicated to agriculture is proportionally higher than in Germany as a whole, albeit farm employment is lower than the European average. Another important aspect to be highlighted is the low rate of unemployment in the Länder; far removed from the present context of growing unemployment in other parts of Germany and Europe.

- The region of Bavaria is the oldest, largest (almost 20% of the area of Germany) and most southerly Länder of Germany. The population is almost 15% of the total in Germany.
- Although the strength of its economy lies in a strong industry employing more than one-third of the working population, the number of people dedicated to agriculture is proportionally higher than in Germany as a whole.

Table 17: GDP and employment in Bavaria compared to Germany and Europe.

	BAVARIA	GERMANY	EUROPEAN UNION
GDP per inhabitant in PPS[192] in 2000 (UE-15=100)	**124.0**	106.4	100
Employment by sector 2000 (% of total)			
Farming	**3.6**	2.6	4.1
Industry	**36.2**	32.8	28.5
Services	**60.3**	64.6	66.7
Unemployment rate in 2001 (%)	**4.3**	7.8	7.6

Source: Second Progress Report on Economic and Social Cohesion, 2003. http://europa.eu.int/comm/regional_policy/sources/docoffic/official/reports/interim2_en.htm

192 Purchase Power Standard

2.4.4.2. Importance of agriculture in the region

Production and use of farmland

From 1977 to 1999, the total Utilised Agricultural Area (UAA) of Bavaria decreased from 53.2% to 46.2% (some 3.2 million hectares). During this time, the UAA of permanent grassland/pastureland also declined from 41.8% to 35.4%. Currently, the arable area occupies almost two-thirds of the UAA (64%) and is distributed in the following manner: 45% cereals (wheat, barley and maize), 8% oilseeds, 4% sugar beet, 5.5% fodder, 2.5% potato and 0.8% hops (a crop traditionally used in beer production). Bavaria produces 29% of the meat in Germany, principally in the cattle and sheep sectors, which are the largest. In the year 2001, 77% of the farms in Bavaria were engaged in livestock production while half of these combined both agricultural and livestock production. Since the seventies, Bavaria has stood out for its highly productive agriculture, producing 27% of the milk, 20% of the cereals, 30% of the beef, 17% of the lamb and 14% of the pork meat in Germany. In the last two years, the added value of the Bavarian farm sector has increased by 10% for a worth of 4,100 million euro, totalling 18% of the added value in Germany.

Equestrian sports are yet another important feature that characterises Bavaria, leading to a significant increase in horse breeding (there are an estimated 120,000 horses in Bavaria, two-thirds of which are bred on livestock farms). This aspect is considered the key to the development of the rural economy and has encouraged the spread of equestrian clubs in recent years. By the year 2001 there were already 941 equestrian clubs in Bavaria with a total of 102,200 members.

Structure of farms

As shown in **table 18**, there are 140,425 farms in Bavaria (more than 30% of the total number of existing farms in the whole Germany). The mean area per farm is 23.3 hectares (almost 56% of the German average where the mean area per farm after unification is 41.4 hectares) and practically all farms –three out of every four– have less than 30 hectares. In spite of the clear predominance of family farms, the farm structure in Bavaria has undergone a process of concentration since 1970. Thus, while the mean area per farm (excluding farms with less than 2 hectares) was 16.9 hectares in 1990, ten years later the mean had risen to 23.3 hectares. The effect of this change on the agricultural structure of Bavaria has varied by farm, with concentration occurring mainly on farms with more than 40 hectares.

In 2001, 42.2% of the total number of farms in Bavaria were full-time farms occupying 69% of the UAA. From 1999 to 2001, the average area of these farms increased by 2.4 hectares to an average surface area of 35 hectares per farm. During this same period, 57.8% of all the farms in Bavaria were part-time and occupied 31% of the UAA in the region, with a mean area of 11.5 hectares per

Table 18: Farm structure in Germany and Bavaria (2001).

	BAVARIA		GERMANY
Total number of farms	**140,425**		**411,800**
Farm size (by number of ha)	**Number of Farms**	**Percentage of farms by size (%)**	
2-10	48,318	34.4	34.7
10-20	36,647	26.1	20.5
20-30	19,698	14.0	10.8
30-50	21,396	15.3	14.2
50-100	12,081	8.6	13.4
> 100	2,285	1.6	6.4
Average size of farm		**23.3 ha**	**41.4 ha**

farm. Since 1987, part-time agriculture has been on the rise and currently plays a key role in the conservation of land, the environment and nature reserves in the rural setting. The importance of part-time agriculture is, however, not unique from Bavaria, but a common feature found throughout Germany. Today, income generated from non-agricultural activity is a guarantee for the viability of many small farms whose owners view multifunctionality as the only means to achieving social and economic reproduction.

Agricultural population

The process by which the number of farms has been reduced more than a half and farms with more than 40 hectares have been concentrated has occurred hand in hand with increased agricultural production. Thus, while in 1980 a Bavarian farm produced enough foodstuffs for 50 people, in 2001 productivity was doubled, providing foodstuffs for 110 people. This increasing of productivity arrived with an important reduction of working agricultural population (55% less than in 1975).

In 2001, 214,000 people worked in the Bavarian farming sector (15,000 less than 1999). In spite of the fact that only 3.6% of the total working population are engaged in the primary sector, one out of every eight workers in Bavaria depends directly or indirectly upon this sector. This means that approximately 12% of the working population is employed in sectors related to agriculture, either agricultural or livestock production, forestry or agri-food industry. Family labour continues to be key on Bavarian farms, as demonstrated by the fact that only 16% of Bavarian farm labour is paid.

Agricultural markets and economy

Since 1979, the agri-food industry has grown by 700% amounting to a total worth of 26,000 million euro and employing 192,000 people in the year 2001. Agricultural products are the principal exports of Bavaria. In 2000, agri-food exports were estimated to be worth a total of 4,701 million euro and accounted for 18.3% of all federal agri-food exports, more than any other state in Germany. 82% of these exports are destined to the EU, chiefly Italy (32.8%), France (12.8%) and Austria (10.4%). Over the last decade, exports to Central and Eastern European countries (the CEEC) have increased as well. In the year 2000, Bavaria exported foodstuffs to these countries for a value of 345 million euro. According to the Bavarian Ministry of Agriculture, during that year, the principal exports included cheese (19.2%), fresh dairy products (12.8%), beef and beef products (12.9%). These three sectors alone represent 45% of the total agri-food exports of the State of Bavaria[193]. However, Bavaria does import pork and chicken, eggs, wine, fruit and vegetables from other countries, namely Italy (22%), Holland (13.7%) and France (12.6%). Quality and local specialties are one aspect that is strongly backed by the Bavarian administration, which has attempted to organise the farm sector according to both market imperatives and ecological concerns. With this aim, the Bavarian government encourages the use of organic labels and provides support to market-oriented, medium-sized farmers whose commercial strategies are based on product quality.

- Arable area occupies almost two-thirds of the UAA (45% cereals). Bavaria produces 29% of the meat in Germany, principally in the cattle and sheep sectors.
- Three out of every four farms have less than 30 hectares (the German mean area per farm after unification is 41.4 hectares).
- In 2001, 214,000 people worked in the Bavarian farming sector (15.000 less than 1999).
- Cheese, fresh dairy products, beef and beef products represent 45% of the total agri-food exports of the State of Bavaria.

193 Bayerisches Staatsministerium für Landwirtschaf und Forsten (STMLF), 2000. Agriculture and Forestry in Bavaria, Facts and figures. 23 p.

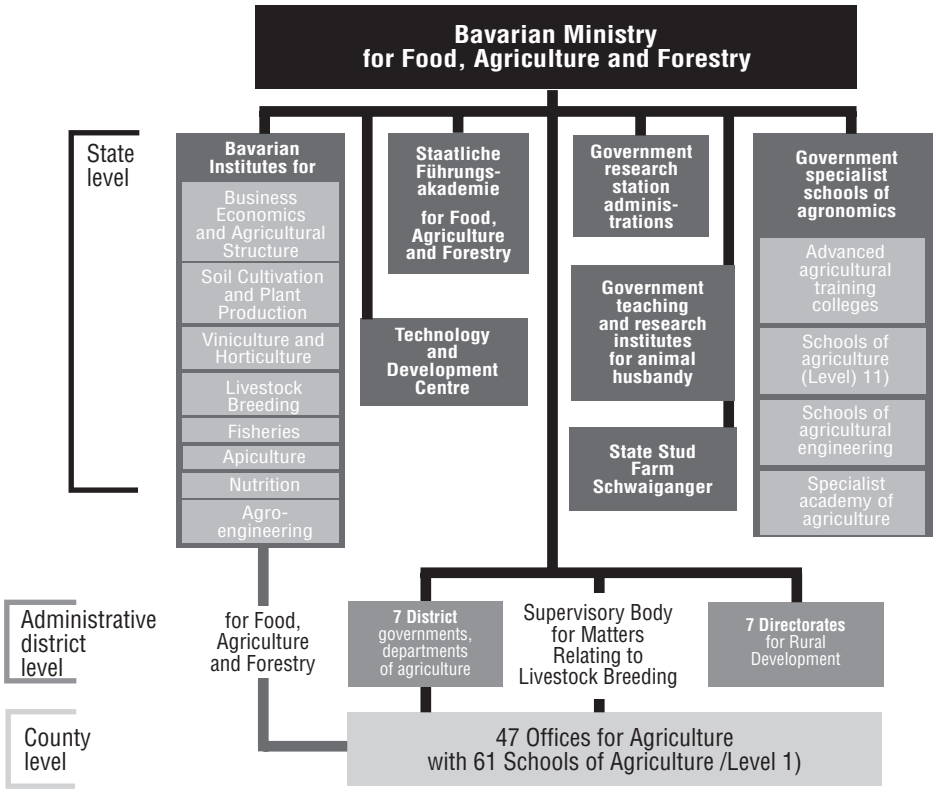
Administrative structure of Bavarian agricultural policy and recent historical developments

The political hegemony of the CSU (Christian-Social Union) in Bavaria can largely be attributed to the Bavarian farm elite that has traditionally formed the leading ranks of the party. In fact, 10% of the CSU's representatives are farmers, thus enabling the farm lobby to play a much more significant role than its economic importance would normally merit. From an administrative point of view, the Bavarian farming policy is implemented by the regional Ministry of Agriculture and Foods, whose organisational structure can be seen in **graph 19.** It is interesting to stress the important administrative structure of the county level, where 47 offices for agriculture and 61 schools of agriculture are at disposal of farmers to develop advising and training functions on new farming practices and emerging production systems.

Throughout the seventies and eighties, Bavarian farmers strictly adhered to the prevailing model of intensive agriculture until a series of health problems, such as BSE, foot and mouth disease or dioxins, made it necessary to seek out new alternatives, among them the development of organic farming and quality products. One example of this effort is the programme to promote brands with the "Quality from Bavaria-Origin of Bavaria" label. Under this programme, the government of Bavaria hopes to encourage consensus and partnership between farmers, industry and commerce in an effort to improve product quality.

In 1982, the government of Bavaria signed facultative contracts with a number of farmers to promote organic farming practices. Under these contracts, which have set a precedent for agri-environmental measures, farmers pledged a commitment to improve the health and welfare of native livestock and to grow the typical crops of the country in a less aggressive manner. These contracts are currently registered in the programme for the conservation of nature and compensation of humid areas under the EU's agri-environmental programme.

Graph 19: Organisational structure of Bavarian Ministry for Food, Agriculture and Foods.



In the last decade, the Bavarian government has opted for multifunctional agriculture, encouraging farmers to undertake functions that benefit society as a whole and open up the possibility for the creation of new activities in the rural setting. In this line, there is the "Contract for Ecology in Bavaria"; a programme that specifically stresses the production of renewable resources and the development of new energies (currently 3.2% of the region's energy is provided by biomass). Another function which is being developed is that of the conservation and revitalisation of the countryside as part of the region's culture landscape so that tourists will come to appreciate and acknowledge Bavaria's regional identity.

Since the year 2000, the government of Bavaria has introduced new ecological aspects in its agricultural policy such as flood prevention and agriculture adapted to environment. The so-called "Pact for the Environment of Bavaria" continues to reflect the Bavarian government's position with regard to environmental protection and the creation of a plural partnership in which not only farmers' associations participate, but other interest groups as well, such as ecologists or consumers. The Pact has been renewed several times since 1995 and is currently used by the administration to encourage companies to make sound progress on environmental issues. As a result of this governmental support, today, Bavaria is the European region with the largest number of environmental management companies that comply with European standards.

The Bavarian approach to environmental protection, which is based on these alliances, has maintained the "Pact for the Environment of Bavaria-Sustainable Exploitation with a View to the 21st Century", signed in October 2000. The government of Bavaria and the industrial sector have set down a series of objectives for the future within eleven thematic areas that specify certain measures to be taken regarding climatic issues and agricultural practices that economise on natural and energetic resources. Furthermore, this agreement is an attempt to go a step beyond current EU regulations by demanding stricter and sounder measures for Bavaria than those established by the European Commission.

- From an administrative point of view, the Bavarian farming policy is implemented by the regional Ministry of Agriculture and Foods.
- In the last decade, the Bavarian government has opted for multifunctional agriculture, encouraging farmers to undertake functions that benefit society. In this line, there is the "Contract for Ecology in Bavaria".

2.4.4.3. Emerging agricultural systems in Bavaria

Organic Farming

Specific Characteristics of organic farming in Bavaria

Historical development

As in the rest of Germany, organic farming has grown slowly, albeit continually, in Bavaria since the 1980s. At the end of the nineties, the market for organic products grew 20-30% in Bavaria as a consequence of the BSE crisis, leading to a slight rise in the number of organic farms. Nevertheless, this streak of good luck lasted only a year and a half and since mid-2002 organic farming has become somewhat stagnant as a result of a drop in trade, especially of milk and beef. This phenomenon is also due, in part, to the current economic crisis taking place in Germany, which has led to lower buying power and forced consumers to buy other, less expensive meats. In some cases, such as in extensive dairy farms, the opposite trend has been observed. Thus, farmers that were engaged in organic farming have reconverted to mainstream agriculture as a result of the burdens and costs involved in organic farming which, as of today, are simply not worth the effort.

Importance of organic farming in Bavaria

As **table 19** shows, in the year 2002 the organic farms in Bavaria that belonged to the LVÖ

Table 19: Evolution of LVÖ organic farms and area in the Länder of Bavaria.

Year	Number of farms	Area (ha)	Percentage from Bavarian's total	
			Farms	Area
1985	350	8,100	0.14	0.24
1988	792	14,700	0.34	0.43
1989	1,196	21,730	0.53	0.64
1990	1,497	28,068	0.68	0.83
1991	1,677	34,529	0.80	1.03
1992	1,735	39,489	0.85	1.18
1993	1,809	40,443	0.90	1.21
1994	1,985	49,640	1.02	1.47
1995	2,212	57,558	1.20	1.71
1996	2,383	63,021	1.33	1.88
1997	2,546	68,141	1.46	2.04
1998	2,815	73,041	1.63	2.18
1999	2,950	80,236	1.99	2.44
2000	3,050	85,617	2.11	2.61
2001	3,386	95,008	2.41	2.90
2002	3,598	101,659	2.63	3.13

Source: Bayerisches Staatsministerium für Landwirtschaft und Forsten (STMLF) and LVÖ in Bavaria.

(which is the largest German federation of organic farmers and represents 85% of the organic farms in Bavaria) accounted for 3.13% of the total UAA and represented 2.63% of all Bavarian farms, figures that are below the federal average. The majority of these organic farms (40%) are located in Upper Bavaria, as shown in **table 20.**

- As in the rest of Germany, organic farming has grown slowly since the 1980s. In mid-2002 organic farming has become somewhat stagnant.
- There are more than 100,000 ha in organic farming in Bavaria.
- The majority of these organic farms are located in Upper Bavaria.

Related bodies

Organic farmers in Bavaria belong, on the whole, to local and provincial associations that are

Table 20: Distribution of LVÖ organic farms per sub-region.

Region	Number of farms	Organic UAA (ha)
Upper Bavaria	1,442	40,227
Lower Bavaria	427	10,137
Upper Palatinate	303	10,282
Lower Franconia	225	6,332
Middle Franconia	211	6,032
Upper Franconia	217	7,106
Swabia	773	21,545
Total	**3,598**	**101,659**

Source: LVÖ, 2003.

also represented at the regional level in the form of federations. The largest federation is the LVÖ *(Landesvereinigung für den ökologischen Landbau in Bayern)*, which represents 85% of the organic farms in Bavaria and includes farmers from the Bioland, Naturland, Demeter and Bio-Kreis associations. The role played by the LVÖ is primarily a political one as it acts as a mediator between farmers and the Bavarian Ministry of Agriculture. The Gäa association is much less representative (it does not belong to the LVÖ) and brings together only 1% of the organic farmers in Bavaria. The remaining organic producers (14%) do not belong to any association or federation. The LVÖ originated from the AGÖL (*Arbeits Gemeinschaft Ökologischer Landbau*), a committee of organic farmers created in 1988 under the environmental association BNN (Association for the Defence of Nature). The BNN founded the LVÖ in 1992 to channel its actions in the field of agriculture and gain recognition in the departments of agriculture and the EU's CAP institutions. Thus, the LVÖ functions as a sort of "umbrella" federation for organic farming in Bavaria.

In addition to the LVÖ and Gäa federations, other organic farming platforms and committees exist in Bavaria such as BÖLW (*Bund ökologischer Lebensmittelwirchaft*) which acts as a lobby whose members include not only organic farmers belonging to the two federations mentioned above, but also other related industries and enterprises. The SÖL foundation *(Stiftung ökologie und Landbau)* is another organisation dedicated to the research and promotion of organic products.

The features that characterise organic farmers from Bavaria vary according to their associative trajectory. In other words, farmers belonging to Demeter are different from the Bioland, Naturland or Bio-Kreis ones. These differences will be analysed below (see **table 21**).

Members of Demeter

Demeter is the oldest organic farming association in Germany. Founded in 1940 through the initiative of a group of 12 farmers, it later grew to include 50 members and today its membership is estimated to include 440 Bavarian organic farmers with some 12,702 hectares. In Bavaria, the members of Demeter also belong to the regional association LVÖ. The association's members hold an anthropophysical and conservationist view regarding organic farming. Their production is diverse and their farms are concentrated in south-eastern Bavaria, namely cattle farms dedicated to milk and meat production.

According to their philosophy, special emphasis is placed on animal welfare, to such a degree that, for example, cow's horns are left untouched and unshaven. The productive system on farms is based on self-sufficiency, meaning that animals are fed with products produced directly on the farm such as cereals and fodder. Nevertheless, there is a certain amount of discrepancy among its members regarding the origin of seeds: while some members hold that seeds should be produced directly on the farm itself, others allow seeds to be purchased externally. However, all members unanimously oppose the purchase of seeds from multinational companies. One issue that is currently under debate in the association is whether to use hybrid maize and wheat seeds or if farmers should go back to using the original, autochthonous seeds.

Members of Bioland

Bioland was founded in 1971 by 12 farmers with the aim of protecting organic farming according to the rules and practices described by Dr. Müller and Dr. Rush, the founding fathers of these alternative practices. Producers of Bioland differ from those of Demeter in that their standards are less strict. This is the second oldest and currently the largest association in Bavaria and all of Germany in terms of the numbers of farmers and operators that it represents. Currently 1,568 farmers (whose farms total 42,045 hectares) are members of Bioland. The farmers that belong to the association hold a position which is similar to that of the environmental association BNN and many of them sell their products directly on the market. The spectacular growth of this association can be attributed to the fact that after 1989, the

Table 21: Distribution of organic farms in Bavaria by association.

Association	Number of farms	Organic UAA (ha)
Bioland	1,568	42,045
Naturland	1,239	38,943
Demeter	440	12,702
BioKreis	351	7,969
LVÖ	**3,598**	**101,659**
Gäa	30	No Data
% of organic farmers who belong to an association compared to overall figures for Bavaria	2.6% of Bavarian farms	3.2% of the UAA in Bavaria

Source: LVÖ.

organic farmers of Bioland began to receive financial aid from the federal government; aid that has continued to increase over the last 15 years.

Bioland views organic farming as the true alternative to mainstream agriculture for several reasons: 1) because it uses natural resources efficiently, 2) in opposition to the agrochemical model that has introduced an enormous amount of pesticides in agriculture and 3) to ensure wholesome products for consumers. In Bavaria, half of the farmers that belong to Bioland are located in the south where they produce milk. Others, however, produce vegetables, wine or wheat for cattle feed, while some have goat and sheep farms (for milk and cheese production) or poultry farms that produce eggs. More than 95% of the farms belonging to Bioland's members are family farms with a surface area of approximately 25 hectares. Farmers who choose to join Bioland do so because of the advantages that this association offers in terms of its recognised trademark and good reputation (especially for milk, cheeses and wheat for bread production); a reputation which is greatly valued by the Germans and which they are willing to pay high prices for. Another important aspect of Bioland is the excellent services it offers, especially its vocational programmes and consulting services with highly specialised teams of technicians.

Bioland

Members of Naturland

Naturland is another large association of organic farmers that was founded in 1982 as *Verband für naturgemäben Landbau e.V. (Association for Organic Farming)* by a group of scientists, farmers and consumers. Initially the association had only 10 members but in the last twenty years has come to be the second largest organic farming association in Germany and Bavaria. Naturland is also accredited to certify organic products at the international level. The aim of the founders of this association was to promote a non-dogmatic style of organic farming through modern farming practices that "respect the environment and offer consumers wholesome products". Since 1989, Naturland has been involved in projects abroad such as those sponsored by the GEPA association (Society for the Promotion of Solidarity with the Third World) with the support of religious organisations in developing countries. Naturland is accredited by the IOAS (International Organic Accreditation Services) and was the first association accredited under the EN 45011 standard. In November 2002, Naturland was accredited by the United States Department of Agriculture (USDA), thus ensuring the entry of certified products into the American market. In countries of Europe, Latin America, Africa and Asia, Naturland certifies and provides consulting services for agricultural projects and cooperatives.

One of the key issues of concern to Naturland is that of Fair Trade to improve the overall quality of life of the world's citizens. Naturland has a large membership in Bavaria where it represents 1,239 member farms and 38,943 hectares. Most of Naturland's members own 70-80 hectare extensive cattle farms, although there are also farms located in northern Bavaria that produce vegetables and wild mushrooms. The farms represented by Naturland are somewhat larger than those represented by Bioland and its farmers have a business-oriented mentality. Sometimes they have been reproached for their industrial production practices which are aimed at large distributors. Naturland carries out inspections on its member farms at least once a year to ensure product traceability and quality. The farmers who belong to Naturland do so, above all, for economic reasons and have adopted organic farming as a means of obtaining higher prices for their production. Nevertheless, after a time, these farmers come to realise that they, too, make an important contribution to improving the environment through sounder and more respectful farming practices, thus combining, at least in the mid term, economic, ethical and environmental motivations.

Bio-Kreis and Gäa Members

Some 351 farmers with a total of 7,969 hectares belong to the Bio-Kreis association and are chiefly located in eastern Bavaria (formerly called Bio-Kreis Osbayern, the association's head office was located in Passan). The association was originally founded by farmers and consumers although in recent years consumers have withdrawn their membership. At present 95% of the members of Bio-Kreis are farmers, while the remaining 5% are businessmen and women who are not directly engaged in agriculture. The Gäa association was recently created in Bavaria, although its roots can be found in East Germany. It is a market-oriented association and is much less strict than the other organisations regarding the norms and standards required to its member farms. Its membership in Bavaria is not very large and represents only 30 farms.

When ranking associations of organic producers according to the strictness of their standards and guidelines, Demeter comes first on the list with the most demanding standards followed by Bioland, Bio-Kreis, Naturland and Gäa.

- Organic farmers in Bavaria belong, on the whole, to local and provincial associations that are also represented at the regional level in the form of federations. LVÖ functions as a sort of "umbrella" federation.
- When ranking associations of organic producers according to the strictness of their standards and guidelines, Demeter comes first on the list with the most demanding standards followed by Bioland, Bio-Kreis, Naturland and Gäa.
- Demeter is the oldest organic farming association in Germany. Bioland is currently the largest association in Bavaria. At present 5% of the members of Bio-Kreis are businessmen and women who are not directly engaged in agriculture. Naturland is accredited to certify organic products at the international level. And Gäa represents only 30 farms.

Specific regulations and labelling

Although a proper label with a common regulation exists at the EU level, the associations in Bavaria (Bioland, Naturland or Demeter) have specific standards linked to their own labels. For example, Bioland's standards are less strict than Demeter's in that the latter is especially concerned with the manner in which compost is made, while Bioland places more importance on good soil fertility and animal welfare.

However, the European and private labels are not the only ones that can be found on the Bavarian market. Since the creation of the Naturland association in the year 2001, its member farmers have adopted the organic label of the German Federal Ministry of Agriculture (see attached logo) for consumer production. To this, we must add the fact that the State of Bavaria has a specific label for its own recently created organic products, a public logotype that is comparable and compatible with those used by private associations for their organic production. This certificate responds to the slogan "more clarity, greater product guarantee".

The Bavarian government is presently awaiting authorisation[194] by the European Commission so that its label can be used throughout the EU (see attached logo). Nevertheless, many farmers are dissatisfied and, above all, sceptical as they consider the requirements for public certification at the European, German and Bavarian level to be too lax compared to the standards set down by private associations. For example, the Bavarian system of certification allows part of farm production to be organic, while Naturland requires that all farm production comply with organic standards. When this is not the case, farmers cannot become members of the association and are not allowed to use their label.

Organic farming logo of the Federal Ministry of Agriculture

Organic farming logo of the Bavarian Government

Implications of multifunctionality

Organic farming in Bavaria is a system of production that has the approval of both the general public and farm interest groups. The favourable reception of organic farming as an alternative to conventional models is due to the fact that organic practices function as a preventive system, are self-sufficient in economic terms, save on inputs and create employment. Clearly, this enthusiasm is more strongly felt among the farmers who practice it and their organisations as they regard this production system as an investment for the future and a means of sustaining the basis of food production in sound alliance with nature. For these groups, organic farming is the only way to exploit natural resources for productive purposes without harming the environment or deteriorating soil or the quality of underground water, while at the same time enhancing soil fertility through the application of organic substances. For this reason the organic producers of Bavaria consider soil not only as a place where plants grow, but also a factor of production whose capacity to produce foodstuffs is limited, making it essential to maintain soil fertility for agricultural systems sustainability.

- The associations in Bavaria (Bioland, Naturland or Demeter) have specific standards linked to their own labels. Besides, the German Federal Ministry of Agriculture and the State of Bavaria have specific labels.
- Organic farming in Bavaria is a system of production that has the approval of both the general public and farm interest groups.

Factors influencing farmers' decisions

The main determining factors that make farmers adopt the organic farming system in Bavaria are the following:

Environmental impact of farming practices

In Bavaria, organic farming is considered to be an environmentally sound, preventive system which saves inputs. For the farmers who practice this type of farming and their organisations, organic farming is the only means of exploiting natural resources for purposes of production without harming the environment or deteriorating soils and underground water quality.

194 The label was not approved at the commission's last meeting because it had just approved the label presented by the region of Baden-Württemberg (Brussels, 5 May 2003), meaning that, in all likelihood, Bavaria will have to wait for one more year before being granted authorisation.

Price difference in favour of organic products

Organic farming can be considered self-sufficient in economic terms. Many consumers believe that the price difference discourages buyers of organic products although they would be willing to buy more in the future if prices were to come down. The overall stagnation of the German economy, including Bavaria, has led to a loss of purchasing power and taken a special toll on organic products, which are more expensive than mainstream agricultural products. The members of Naturland are motivated, above all, for economic reasons and have adopted organic farming in order to obtain better prices for their products.

Existence of a production and marketing structure

Consumers complain that it is difficult to find a wide assortment of organic products on the market shelves. At the same time, there is surplus production of certain organic farming products, especially those native from Bavaria (e.g. milk). Nevertheless, efficient distribution systems do exist for organic farming products, as long as consumers are willing to pay more for them.

Direct subsidies

In the early nineties, EU agri-environmental aid led to a significant increase of the area dedicated to organic farming in Bavaria. The Kulap Programme (grasslands/pastureland environmental program) provides farmers with a premium of 200 euros/ha while the premiums provided for grasslands/pastureland dedicated to organic production are 250 euros/ha. This difference does not compensate the farmer and places the agri-environmental programme in direct competence with the development of organic farming.

Food safety

The BSE crisis boosted the sale of organic products from Bavaria given that the state primarily produces dairy products and beef. This situation, however, lasted little more than one and a half years and has been followed by a period of stagnation since mid-2002. According to Bioland, organic farming guarantees consumers healthy, wholesome products. The number of organic farms may increase given the recent rejection of GMO seeds at the European level. Mainstream agriculture cannot guarantee that another food crisis similar to the past will not be repeated, while consumers are responding favourably to the new, environmentally sound ways of producing foodstuffs.

Production costs

The higher costs of organic production may be an obstacle for farmers to access to the system if their products do not achieve sufficiently high prices on the market. If cattle farmers are to reconvert to organic farming, they must invest in new stabling systems that are often very costly and mean taking on greater debt.

Farmer ideology

In Bavaria, organic farming is, today, a form of agricultural production that is looked favourably upon not only by the general public, but by farming interest groups as well. Thus, the Bavarian organic farmers' associations have a very strong ideological component: the members of Demeter hold an anthropophysical stance and are impregnated with a conservationist vision of organic farming. Besides, and although the initial objective of the members of Naturland is to achieve higher prices for their products, economic, ethical and environmental factors come together in the mid term. However, Gäa is market-oriented and its guidelines are much less strict than other associations.

Labelling

Farmers that belong to the Bioland association do so because it offers them the prestige of a well-known brand. In addition to the distinct organic

labels of the private associations, the Bavarian government has recently created its own official label.

Technical consulting and vocational programmes

An important factor that encourages farmers to become members of Bioland is the quality of the services it provides in terms of its training programmes and consulting services run by qualified teams of specialised technicians.

Legislative framework

The legislation regarding organic farming is very strict making it difficult to comply, under the risk of penalisation. When ranking the associations of organic producers by order of strictness regarding their production standards and guidelines, Demeter tops the list as the strictest followed by Bioland, Bio-Kreis, Naturland and Gäa.

Programme for promoting organic products

The main aim of the Bavarian Ministry of Foods, Agriculture and Forestry is to increase both, the organic farming area and the number of farms, from 3% currently to 10% in 2010. That is why the regional authorities are implementing important partnership programmes for promoting organic products in region.

This research has demonstrated the influence of the other factors in decisions of the Bavarian farmers regarding organic production system:

- To be or not a part time farmer.
- Easy access to local markets.
- Influence of a local culture encouraging innovation and change in economical activities.
- Existence of scientific system suitable for new production systems.
- Easy transition to the new agricultural practices.
- Awareness of health risks at work.
- Restrictions to conventional methods in agriculture.

- The overall stagnation of the German economy has led to a loss of purchasing power and taken a special toll on organic products.
- The BSE crisis boosted the sale of organic products from Bavaria given that the state primarily produces dairy products and beef. Nowadays there is surplus production of certain organic farming products, specially those native from Bavaria (e.g. milk).
- An important factor that encourages farmers to become members of Bioland is the quality of the services it provides in terms of its training programmes and consulting services.
- The regional authorities are implementing important partnership programmes for promoting organic products in region.

The future of organic farming in Bavaria

From the data collected in this study, it can be observed that some organic farmers have decided to back out of their commitment to practicing a new type of agriculture and have returned to using conventional practices. Some of the reasons for this so-called backward step can be explained as follows:

- the legislation is quite strict, making compliance difficult at the risk of penalisations;
- cattle farmers must invest in new stabling systems for their farms, systems that are often highly costly and lead to greater indebtedness;
- under the Kulap Programme (grasslands/pastureland environmental program) farmers receive a premium of 200 euros/ha, while the premiums provided for grasslands/pastureland dedicated to organic production are 250 euros/ha; this difference does not compensate

the farmer and places the agri-environmental programme in direct competence with the development of organic farming;

- the creation of surpluses in the organic farming sector as an adequate commercial outlet does not exist for these products.

Although it is difficult to predict the future of organic farming in Bavaria, until now its evolution has been marked by the production of milk, creating too much dependency on this sector at a time when the price of organic milk is beginning to drop. For many, the current stagnation that seems to characterise organic farming in Bavaria, and in Austria as well, is a direct result of the economic crisis. However, following upon the advice of the European Commissioner Mr. Fischler, the Bavarian government is making an effort to increase organic farming in the coming years from the current 3% to 10% by the year 2010 in terms of both area and number of farms. Although the systems of distribution are efficient enough, this will only be possible in Bavaria if consumers are willing to pay a bit more for the products they buy and structural reforms are undertaken to prevent Bavarian farmers from abandoning organic production.

In order to reduce their dependence on the market, farmers must, among other things, diversify production. In other words, production should not be centred solely on dairy products as it has been up to now. Given that the chief aim of these associations is to promote the development of organic farming, the growing rejection in Europe of GMO seeds may be a positive step in that direction. Both this and the fact that the concept of "transaction costs" has been newly introduced as intermediate costs for the collection of waste products should certainly be beneficial to the development of organic farming. In the opinion of organic associations, the future of organic farming is promising since mainstream agriculture practices provide no guarantee that food crises such as those occurring in recent years (BSE, dioxins, etc) will not be repeated and consumers are responding favourably to the new, environmentally sound ways of producing foodstuffs.

- Until now the agrosystem evolution has been marked by the production of milk, creating too much dependency on this sector at a time when the price of organic milk is beginning to drop.
- The Bavarian government is making an effort to increase organic farming in the coming years from the current 3% to 10% by the year 2010 in terms of both area and number of farms.
- The growing rejection in Europe of GMO seeds may be a positive step in its development.

Integrated Farming

Specific characteristics of integrated farming in the region

Importance of integrated farming in Bavaria

Official figures are not available in Bavaria as to the number of farms that adhere to this type of agriculture, although data does exist regarding field trials using different amounts of inputs. According to official documents of the Bavarian Ministry of Agriculture, farms that are not registered as organic should be considered integrated farms (that is, 96%) given that the EU's agri-environmental programme has been fully implemented in the region. This position, which is questionable according to the concept of integrated farming used here, is also maintained by the Bavarian farmers' union federation DBV in an effort to make all Bavarian farming compatible with the demands of the German public.

However, the attitude of the farmers' union DBV and the Bavarian government is a sort of leap in the dark since, in reality, it does not exist yet a clear consensus as to the boundaries between mainstream and integrated agriculture. The criteria used to define integrated farming continue to be imprecise and inexact regarding soil types, crops, etc., making the future development of this type of agriculture difficult. In Bavaria, the results of

experimental trials have varied greatly depending on the area where they are performed, thus the sector is eagerly awaiting a good practices handbook that meets the approval of all the groups involved in integrated farming. The greatest difficulty lies in setting the limits, that is, knowing how far to take the different chemical treatments (i.e. the quantity of nitrates or the use of pesticides and herbicides).

Like in Lower Normandy as discussed above, integrated farming in Bavaria involves the entire farm, and not just a specific product. However, the problem posed by this global concept lies in defining the good practices of integrated farming as they vary, among other things, according to product, type of soil or ecosystem.

- According to official documents of the Bavarian Ministry of Agriculture, farms that are not registered as organic should be considered integrated farms.
- Like in Lower Normandy, integrated farming in Bavaria involves the entire farm, and not just a specific product.

Related bodies, regulation and subsidies

In Bavaria, integrated farming is being introduced in fodder farms. At present the government of Bavaria is channelling its EU agri-environmental aid towards this sector as it is considered of utmost importance to the viability of integrated farms as well as a way to improve their agronomic potential and to aid them in adapting to the demands of European industry for the production and marketing of fodder. In this line, the Bavarian government holds the view that by orienting the agri-environmental programme towards the development of integrated farming in the fodder sector, soil erosion will be reduced. According to their technicians, permanent grasslands/pasturelands maintain a dense, green vegetative cover and therefore do not require nitrogen fertilisers or intensive treatments with insecticides or herbicides, thereby improving the quality of water and environment. Involvement of the scientific community is key to the development of integrated farming in Bavaria as it not only permits the exchange of knowledge, but it is also a source of scientific authority through research and study, thus gaining the confidence of farmers and the general public alike. This factor is accompanied by the introduction of a new technological system imported from the United States which has reached farmers through producers of agricultural inputs.

Participation of the scientific community in the development of integrated farming in Bavaria is specifically focused on the following fields of action:

- to assess the impact on food health of the contamination produced by local agricultural practices;
- to create a system to produce feed with healthier, safer methods through the use of new biotechnologies;
- to study the epidemiology of the diseases and allergies caused by foodstuffs;
- to analyse traceability throughout the food production chain (bio-safety);
- to elaborate methods of analysis and control of chemical contaminants and pathogenic micro organisms (virus, bacteria, yeast, fungi, etc.);
- to monitor the use of GMOs in feed production

The development of integrated farming in Bavaria, however, is not solely based on taking advantage of the benefits it offers in terms of the environment and food safety; it also has a clear economic component. For the Bavarian government and the FNL association[195], the

195 In Germany, integrated agriculture is represented by the FNL (Fördergemeinschaft Nachhaltige Lundwirtschaft) (Association for the Promotion of Sustainable Agriculture). This association was created in 1986 by farmers, agricultural organisations and large agro-industrial enterprises (including producers of inputs as well as production and marketing industries) with the participation of members in the field of agronomic research.

objective of integrated farming is to achieve yields that are stable, safe and economically viable in such a way that the reduction of chemical inputs does not translate into lower profitability, but the contrary. To this end, advocates of integrated farming promote the innovation of management techniques through the use of technical advances. They stress that excessive farm inputs have been shown to be not only harmful to the environment, but also unprofitable from an economic viewpoint as they lead to higher costs which are not accompanied by higher yields. The FNL and the Bavarian government understand that for integrated farming to succeed, it must be based upon an appropriate combination of mainstream agriculture and agri-environmental measures, which, according to the FNL, should be compulsory and not optional for all farmers as it has been until now.

Product marketing

Unlike Andalusia, integrated farming in Bavaria does not have its own label as the objective of this type of agriculture is not to create a commercial brand but to implement a new form of production that is concerned with the effects of farming and livestock practices on the environment.

- Involvement of the scientific community is key to the development of integrated farming in Bavaria.
- At present the regional government is channelling its EU agri-environmental aid towards fodder farms.
- Integrated farming in Bavaria does not have its own label.

Factors influencing farmers' decisions

The main determining factors that make farmers adopt the integrated farming system in Bavaria are the following:

Direct subsidies

In Bavaria, there is an environmental programme directed at grasslands/pastureland that provides farmers large amounts of direct aid, thus encouraging them to adopt this system.

Social recognition

Involvement of the scientific community is key to developing integrated farming in Bavaria as it provides knowledge while lending the scientific authority of their research and studies to this sector so that this new farming system can gain the recognition of both farmers and the general public. The fact that the government of Bavaria considers all farming practices that are not organic to be integrated farming practices is an attempt to make Bavarian agriculture compatible with public demand.

Implications of multifunctionality and production

The development of integrated farming in Bavaria is not based solely on the benefits it has for the environment and food safety; there is also a clear economic component.

Facility for transition

Farmers are not obliged to undergo major changes on their farms, but simply reduce the intensity of some of their habitual farming practices.

Cross-compliance and restrictions under the general agricultural regulations

According to documents of the Bavarian Ministry of Agriculture, due to the full implementation of the EU agri-environmental programmes in Bavaria, any farm which is not organic should be classified as integrated.

Legislative framework

The criteria regarding soil types and crops are still imprecise and unclear, making the future development of integrated farming difficult. Bavarian farmers view integrated farming as a potentially interesting production system, albeit one that is still in the beginning stages and lacking in controls and sanctions.

Labelling

Integrated farming in Bavaria is not represented by its own label as it is not considered a means of selling more, but rather a new form of production that is concerned with the effects of farming and livestock practices on the environment.

Other factors also influence in decisions of the Bavarian farmers regarding integrated farming:

- Size of farms.
- Influence of a culture encouraging innovation and change in agriculture.
- New demands of consumers.
- Easy access to technology suitable for new production systems.
- Awareness of health safety.
- Presence of interest organised groups.

- There is an environmental programme directed at grasslands/pastureland that provides farmers large amounts of direct aid.
- The development of integrated farming in Bavaria is not based solely on the benefits it has for the environment and food safety; there is also a clear economic component.
- Farmers are not obliged to undergo major changes on their farms, but simply reduce the intensity of some of their habitual farming practices.

- Bavarian farmers view integrated farming as a potentially interesting production system, albeit one that is still in the beginning stages and lacking in controls and sanctions.

The future of integrated farming

The Bavarian regional government has taken a positive stand on the future of integrated farming as it is viewed as a future model of agricultural production in compliance with the CAP and the EU's agri-environmental programme. Following this same line of reasoning, integrated farming in Bavaria is considered the result of a pact or compromise between mainstream agriculture and the environmental demands placed on farmers by public authorities and the general public. Thus, unlike organic farming, integrated farming is perceived as a type of agriculture with a strong scientific and business-oriented foundation, although Bavarian farmers still see it as an imprecise system of production in terms of the criteria to follow regarding good farming practices. While integrated farming is seen as a potentially interesting production system, it is still lacking in controls and sanctions, solely offering technical orientation on the appropriate use of farm machinery and chemical treatments. Environmental associations regard integrated farming with a fair amount of suspicion because they believe that large farmers and plant health companies will be the principal beneficiaries of this type of agriculture. In contrast to the FARRE *agriculture raisonnée* association in France, the Bavarian FNL does not hold traceability to be a fundamental objective of integrated farming, although this federation considers such principle as a useful tool to reduce food-related health risks.

- It is viewed as a future model of agricultural production in compliance with the CAP and the EU's agri-environmental programme.
- Integrated farming is perceived as a type of agriculture with a strong scientific and business-oriented foundation.

Conservation Agriculture

Specific characteristics of Conservation Agriculture in Bavaria

According to the Ministry of Agriculture, conservation farming is not a new system of agricultural production, but simply a series of techniques at the service of integrated farming, although they do stress that not all conservation techniques can be applied to integrated farming.

In Germany, like Spain and France, conservation farming is promoted by the ECAF (European Conservation Agriculture Federation) whose proposals are founded on the directives included in the Agenda 2000 related to sustainable agriculture. Besides, other association called GKB promotes conservation farming in Germany, although its importance is much lower than ECAF.

Like in Spain, conservation agriculture involves a series of agronomic practices that permit the management of soil altering its composition, structure and biodiversity as little as possible and protecting it from erosion and degradation. Some of the techniques which constitute conservation agriculture are direct sowing (non-tillage), reduced tillage (minimum tillage), the total or partial incorporation of crop residues and the establishment of vegetative cover in woody crops or in between successive annual crops (spontaneous vegetation or sowing the appropriate species). Conservation agriculture includes any practice that reduces, modifies or eliminates soil tillage and avoids residues burning to maintain enough surface residues throughout the year. In Bavaria, the ideas proposed by conservation agriculture are not widespread due to the agronomic characteristics of the Bavarian territory, where, as it has been stated earlier, agricultural systems involving pastureland for cattle predominate.

Factors influencing farmers' decisions

The main determining factors that make farmers adopt the conservation agriculture system in Bavaria are the following:

Promotion

In Germany, like in France and Spain, conservation agriculture is promoted by the ECAF (European Conservation Agriculture Federation).

Existence and Availability of Technology

In Bavaria, conservation agriculture is not very widespread given the agronomic features of the Bavarian territory.

- In Germany, like in Spain and France, conservation farming is promoted by the ECAF.
- In Bavaria, conservation agriculture is not very widespread given the agronomic features of the Bavarian territory.

Agriculture under Guaranteed Quality

Specific characteristics of agriculture under Guaranteed Quality in Bavaria

The region of Bavaria has dozens of certified products, either under the EU's PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication) labels or under the labels created by the Bavarian Ministry of Agriculture analysed below ("*Geprüfte Qualität-Bayem*" and "*Aus der Region für die Region*").

Importance of agriculture under guaranteed quality in Bavaria

Bavaria is the region of Germany with the largest number of designations of origin or geographical indications for its foodstuffs and beverages. There are a total of fifteen PDOs and PGIs (5 PDOs and 10 PGIs) distributed among sectors such as bakery products, dairy products, meat, mineral water and fish, although the most numerous and popular quality labels belong to Bavarian beers with as many as seven geographical indications. The Bavarian foodstuffs that are included under this European quality label are shown in **table 22.**

Table 22: PDO and PGI products in Bavaria.

NAME OF THE DESIGNATION	PRODUCT	PDO/ PGI
Allgäuer Bergkäse	Cheese	PDO
Allgäuer Emmentaler	Cheese	PDO
Nürnberger Bratwürste/ Nürnberger Rostbratwürste	Meat products	PGI
Nürnberger Lebkuchen	Bakery products	PGI
Bayerisches Bier	Beer	PGI
Hofer Bier	Beer	PGI
Kulmbacher Bier	Beer	PGI
Mainfranken Bier	Beer	PGI
Münchner Bier	Beer	PGI
Rieser Weizenbier	Beer	PGI
Reuther Bier	Beer	PGI
Bissinger Auerquelle	Water	PDO
Höllen Sprudel	Water	PDO
Siegsdorfer Petrusquelle	Water	PDO
Oberpfälzer Karpfen	Fish (Carp)	PGI

Sources: http://www.origin-food.org/pdf/olp/olp-de.pdf and http://europa.eu.int/comm/agriculture/qual/en/1208_en.htm

As shown in **table 23** regarding the quality wines produced in specified regions (QWPSR), Bavaria ranks third in Germany in terms of the area dedicated to the production of wine with this certification. However, it is far behind the top two regions in Germany, accounting for only 6% of the total area dedicated to producing quality label wines. There are no table wines with geographical indications in this or in any other region of Germany.

Aid

The Bavarian Ministry of Agriculture is making an enormous effort to protect its products and promote the quality of regional foodstuffs in accordance with European Commission guidelines. The European Commission has authorised Bavaria to pay aid worth a total of 3.5 million euros in the year 2002 for the introduction of a new quality label. For the years 2003 and 2004, an annual budget of more than 2 million euros has been approved.

Table 23: Regional distribution of QWPSR and TW+GI in Germany (from 31/08/1999 to 31/08/2000).

LANDER	AREA OF QWPSR	
	ha	%
Baden-Württemberg	26,982.00	26
Bayern	6,018.65	6
Brandenburg	6.00	
Hessen	3,672.00	3
Nordrhein-Westfalen	19.53	
Rheinland-Pfalz	67,670.00	64
Saarland	121.82	
Sachsen	397.75	
Sachsen-Anhalt	607.00	1
Thüringen	35.09	
TOTAL GERMANY	**105,529.84**	

Source: http://europa.eu.int/comm/agriculture/markets/wine/prod/inv.pdf

Franz Fischler, the European Commissioner for Agriculture, Rural Development and Fisheries, has supported this initiative: "this quality label is part of an extensive quality assurance and control programme, which has been introduced in order to recover consumer confidence after a significant drop of beef sales following the BSE-crisis*". Access to the quality label is open for all enterprises in the European Union, if they comply with the programme requirements. The aid is to cover the cost of several individual measures, such as controls and certification of companies participating in the programme, information measures designed to explain the label and its performance to the consumer, sales promotion actions and advertising measures.

- The region of Bavaria has dozens of certified products, either under the EU's PDO and PGI labels (the region of Germany with the largest number of them) or under the labels created by the Bavarian Ministry of Agriculture.

* The Commission has authorized this aid on the basis of new guidelines for state aid for the advertising of agricultural products, which entered into force on 1 January 2002. These guidelines allow, for the first time, joint information about product quality and product origin on a single label. The label for which the Commission has now authorized the granting of state aid allows producers from all over the EU to indicate the respective origin of their products.

- Bavaria ranks third in Germany in terms of the area dedicated to the production of wine with this certification.
- The subsidies cover the cost of several individual measures, such as controls and certification of companies participating in the "Quality from Bavaria-Origin of Bavaria" label; information measures designed to explain the label and its performance to the consumer; sales promotion actions; and advertising measures.

Product marketing

Bavaria has taken the initiative to offer products that are recognised for both their quality and geographical origin. At present the Federal Ministry of Agriculture of Bavaria has several quality labels for the products:

1. The "*Geprüfte Qualität-Bayern*" label for beef guarantees that the product is of Bavarian origin and that the beef products from this region are of high quality. These products have a specific label (see logo attached) that has recently been granted recognition and authorised by the European Commission. These certified products are currently sold in Germany, France and Italy, where the traditional clients of Bavarian beef are situated.

2. *Typical and traditional regional products*. Products are registered under this label depending upon the specific character of the product as well as other criteria. In this case certification is granted to traditional products from the region: the so-called Aus der Region für die Region or regional specialties. The government of Bavaria is currently drawing up a list of 12 protected products which include bakery products, pastry products, beers, fisheries, meats and dried meats, vegetables, fruits, potatoes, dairy products, sweets, soups and stews, wines and spirits (see logo attached).

   This line of products will be enlarged upon in coming years as the Bavarian administration aims to create a list of 40 protected products of regional and traditional origin. Bavaria, therefore insists on "defending geographical or regional specificity". Some of these products are also authorised and registered under the European PGI label.* This is the case, for example, of four types of beer: *Weisbier, Helles Lagerbier, Dunkle Bier and Pils*. Other products are still awaiting European authorisation.

3. Additionally, and as mentioned above, there is a private label in Germany that certifies agro-food product quality called *RAL*. In Bavaria there are at present eight products which have been granted the RAL origin

* Certification is linked to the geographical area in at least one of the stages of production or processing.

guarantee status: *Kulmbacher Bier, Bayerische Steinpilze, Münchner Bier, Bayerische Pfifferlinge, Bayerischer Enzian, Bayerischer Heidelbeerwein, Nürnberger* Lebkuchen and Coburger Kernschinken.

- The "Geprüfte Qualität-Bayern" label for beef guarantees that the product is of Bavarian origin and that the beef products from this region are of high quality.
- In the case of typical and traditional regional products, certification is granted to traditional products from the region: the so-called Aus der Region für die Region or regional specialties.
- Additionally there is a private label in Germany that certifies agro-food product quality called RAL.

Factors influencing farmers' decisions

The main determining factors that make farmers adopt this system in Bavaria are the following:

Legislative framework

Bavaria is the German region with more number of quality designations in foods.

Campaigns to promote quality foods

The Bavarian Ministry of Foods, Agriculture and Forestry is making a big effort to support foods coming from the region and to promote quality in foods.

Labelling and differentiated products in markets

The European Commission has authorised Bavaria to pay subsidies worth a total of €3.5 million in the year 2002 for the introduction of a new quality label: the *"Geprüfte Qualität-Bayern"*, which guarantees the Bavarian origin of products.

Safety in foods

The label *"Geprüfte Qualität-Bayern"* has been introduced in order to recover consumer confidence after a significant drop of beef sales following the BSE-crisis.

Other factors also influencing decisions of Bavarian farmers regarding quality production are the following:

- Expectations of higher prices.
- To be full-time or part-time farmers.
- New consumer demands.
- Natural resources.
- Awareness of consumption quality foods.
- Presence of interest organised groups.
- Existetnce of a suitable scientific and technology system.
- Existence of an administrative advice network.

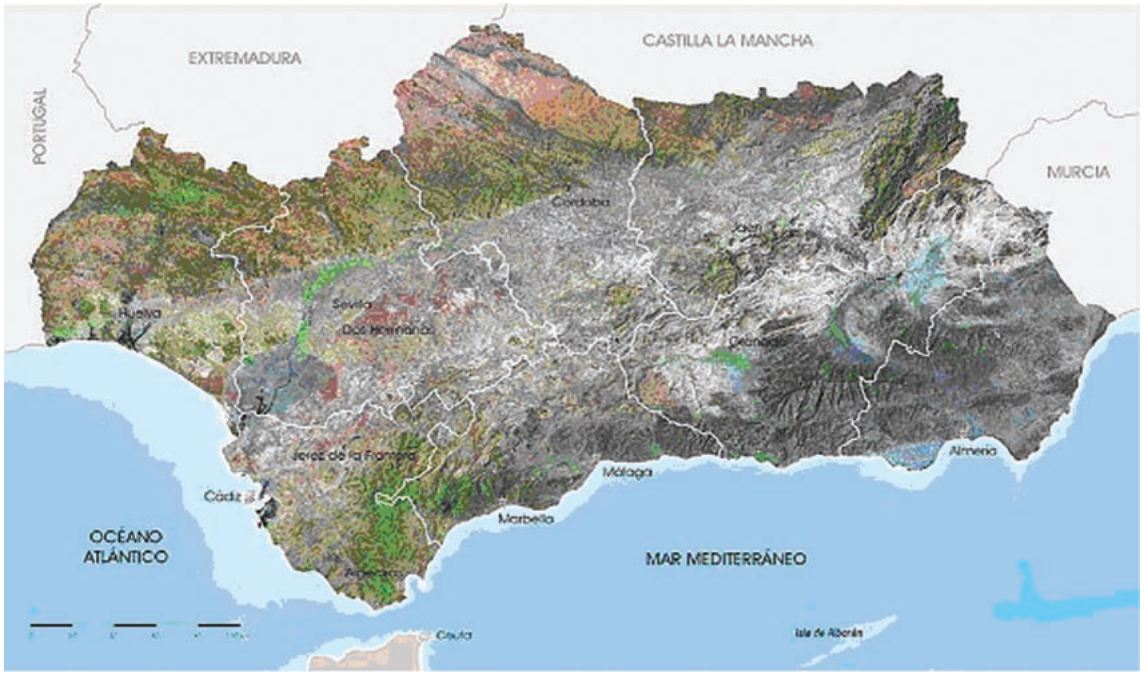
- The Bavarian Ministry of Foods, Agriculture and Forestry is making a big effort to support foods coming from the region and to promote quality in foods.
- The label "Geprüfte Qualität-Bayern" has been introduced in order to recover consumer confidence after a significant drop of beef sales following the BSE-crisis.

2.4.5. Agricultural Systems in Andalusia (Spain)

2.4.5.1. General description of the region

Andalusia is located in southern Spain, among the peripheral regions of the EU, distant from the economic and political power hubs of central and northern Europe. Its geopolitical significance hinges upon its position on the Southern border of Europe, only few kilometres far from North Africa, making it a natural communication pathway with the Maghreb.

Graph 20: Map of Andalusia.



One of the 211 NUTS-2 regions among which the EU is divided, Andalusia occupies an area of 87,268 km^2, making it the second largest region in Spain and the fourth largest region in Europe (NUTS-2), representing 17% and 2% of national and the EU land areas, respectively. Its size, similar to some of the EU countries, implies a great diversity of natural and geographical features.

It is also Spain's most populous region, with 7.29 million inhabitants (2001)[196], representing almost 2% of the EU population and the 18% of population of Spain. Furthermore, in terms of population, Andalusia is a young region, with a percentage of young people (< 25 years) and a birth rate that are above the European Community average, while the mortality rate and the size of the elderly population are both below the EU averages. The demographic trend indicates a growth rate higher than in the rest of Spain and the EU.

Andalusia has an average population density of 83.2 inhabitants/km^2, which is 70% bellow the Community average (117.2 inhabitants/km^2). Therefore, Andalusia is among the European NUTS regions classified as scarcely inhabited. However, there are important demographic differences within the region as a whole. Currently, a quarter of the Andalusian territory concentrates the 80% of the population, whereas only 20% of the population lives in the remaining 75%. The majority of the Andalusian population is situated in cities, to be precise in towns with more than 100,000 inhabitants (**tables 24** and **25**).

Table 24: Distribution (%) of the Andalusian population per zones (2001).

	Average (%)
Agricultural interior	22.0
Littoral	12.3
Mountains	9.6
Urban	56.1

Source: Ministry of Environment.

196 Source: Instituto Nacional de Estadística (INE)

Table 25: Distribution (%) of the Andalusian population depending on the size of towns (2001).

	Number of towns	% Population
Less than 5,000 inhabitants	530	13.13
From 5,000 to 20,000 inhabitants	180	24.52
From 20,000 a 50,000 inhabitants	37	15.11
From 50,000 a 100,000 inhabitants	11	9.19
More than 100,000 inhabitants	12	38.04

Source: Ministry of Environment.

Like in the rest of the EU, there is a gradual ageing of population (although the ageing at the Community level is faster) which is still more serious in the rural zones.

The Andalusian Gross Domestic Product (GDP) per head in 1999 was approximately a 60% of the Community average[197], which places this region in the 198th position of the NUTS-2 European ranking (from highest to lowest GDP per head) and makes Andalusia an Objective 1 region according to the Regional Policy classification.

The geographical situation of Andalusia determines its Mediterranean climate, which is very similar to that of other Southern regions of Europe (high temperatures in summer, low rainfall and alternating dry and rainy periods resulting in significant soil erosion).

Andalusia is divided in four main geomorphologic areas: *Valle del Guadalquivir*, *Litoral*, *Sistema Bético* and *Sierra Morena*. There are many physical differences between these areas that explain other structural differences (demographic and economical differences) existing among them.

The important mountainous area is a characteristic of Andalusia. In fact, 46% of the regional surface is recognised as mountainous area by the EU, which is a considerably higher percentage than that for other Spanish and European regions.

The climate and composition of soils explain its limited capacity for regeneration. In fact, erosion is one of the most important factors explaining the deterioration of soils in Andalusia (10.7% of the soil surface shows maximum risk of erosion and 25.2% shows high risk).

Other characteristic of Andalusian landscape is the existence of an important network of natural spaces under public protection. In fact, 17% of the regional surface is within this network [198].

From an administrative point of view, Andalusia and it is composed of 8 provinces: Almería, Cádiz, Córdoba, Granada, Huelva, Jaén, Málaga and Seville. Being one of the 17 Spanish autonomous communities, Andalusia has a significant degree of political autonomy which is articulated through a regional government (*Junta de Andalucía*). Agriculture and fishery issues are implemented by the Regional Ministry of Agriculture and Fisheries (*Consejería de Agricultura y Pesca*).

- Andalusia is the Spanish region with the highest population, representing almost 2% of the EU population and the 18% of the Spanish population.
- The Andalusian Gross Domestic Product (GDP) per head in 1999 was approximately a 60% of the Community average.
- Agriculture and fishery issues are implemented by the Regional Ministry of Agriculture and Fisheries.

197 Source: Eurostat
198 Source: Dirección General de Conservación de la Naturaleza. Ministerio de Medio Ambiente.

2.4.5.2. Importance of agriculture in the region

The economic structure of Andalusia is characterised by the importance of the primary sector, specifically agriculture, in its Gross Domestic Product. The large contribution of the primary sector in the GDP (7.4%[199]) comes at the expense of a weak industrial sector.

In the primary sector, the balance shows a growth of 7.9% of the added gross value (AGV) generated by the sector, in comparison with a moderate increase in the euro zone (0.4%). The high percentage of employment accounted for by the agricultural sector in Andalusia (about 11.7%) represents more than twice the percentage of agricultural employment in the EU. Another feature of Andalusian agriculture is its diversity, which favours the coexistence of many different production systems. **Table 26** and **graph 21** show the main agricultural products of Andalusia, highlighting the prominent role of olive oil and vegetables.

The Andalusian agricultural tradition has generated and consolidated very rigid systems, which are based on monocultures that shape the economic future of entire areas. These systems have negative effects, among them the financial difficulties of incorporating structural changes in farms, resistance to the adoption of innovations, and other problems deriving from the seasonality of the crops.

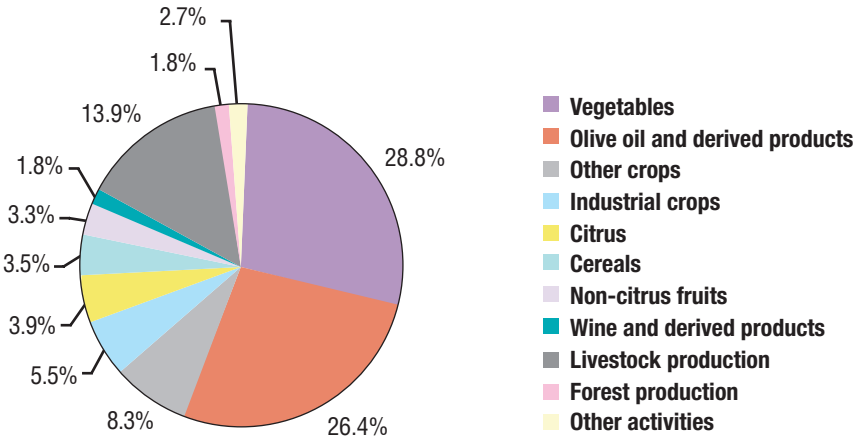
The growth of the added gross value (AGV) of this sector in 2002 was the result of a positive contribution from all branches of production except fisheries (which, as in previous years, showed negative results), namely, arable farming, stock rearing and dairy farming, and forestry.

Table 26: Agricultural sector in Andalusia (2002).

	Millions euros	% total
Crop production	7,347	81.6
Vegetables	2,597	28.8
Olive oil and derived products	2,379	26.4
Wine and derived products	158	1.8
Industrial crops	495	5.5
Citrus	355	3.9
Cereals	311	3.5
Non citrus fruits	300	3.3
Other crops	752	8,3
Livestock production	1,250	13.9
Forest production	164	1.8
Others	245	2.7
Agricultural production	**9,045**	**100.0**

Source: Andalusian Ministry of Agriculture and Fisheries (Junta de Andalucía).

Graph 21: Crop production in Andalusia in terms of value (2002).



Source: Andalusian Ministry of Agriculture and Fisheries (Junta de Andalucía).

199 Source: Instituto de Estadística de Andalucía (IEA). Year 2000.

Related to soil use, it can be stated that agricultural use is predominant in Andalusia, with an agricultural area above 4.1 million hectares, representing almost 47% of regional territory. This percentage is perceptibly higher than that of EU, where only 27% of the whole surface is agricultural area.

- The economic structure of Andalusia is characterised by the importance of the primary sector, specifically agriculture. The contribution of the primary sector to the region's GDP was 7.4% in 2000.
- The percentage of employment associated with the agricultural sector represents more than twice the percentage of the agricultural employment in the EU.
- The main agricultural products are olive oil and vegetables.

2.4.5.3. Emerging agricultural systems in Andalusia

Organic Farming

Specific characteristics of organic farming in Andalusia

Historical development

The pioneers of this new agricultural system in Spain appeared in the seventies and were generally agronomists or farmers that adhered to a philosophy similar to that of the environmental movement and who had heard of the new ways of producing foodstuffs in Germany and France. These pioneers viewed organic farming to be wholesome, natural and biodynamic. The first initiatives taken in favour of organic farming included the publication of the magazine *Vida Sana* (published in Catalonia mostly using texts translated from French) and the *Coordinadora de Agricultura Ecológica* (CAE). In Andalusia, this pioneer role was headed by the UMBELLA association which brought together organic farmers with a tremendous organisational capacity who pressured the Spanish administration for official recognition. These early years, however, were characterised by the lack of a clear consensus on the definition of organic farming. In practice, this new agricultural system owed its initial development to the role played by foreign companies from Germany, Italy and France that had set up business in Spain and spread the news about this new form of agriculture.

The process of regulation and institutional recognition for organic farming in Spain came about in two stages. The first occurred at the end of the eighties when, following the footsteps of other EU countries, the Spanish government approved the first national regulations in October 1989 regarding the designation of "organic farming" based on the existing Spanish legislation for the Designation of Origin. Within the framework of this legislation, the criteria used to certify products as organic were regulated by the INDO (National Institute for the Designation of Origin) which created the *Consejo Regulador de Agricultura Ecológica* (CRAE) (Regulating Council for Organic Farming) as a state-run body to inspect and label organic products. The second stage followed upon the approval of the Council Regulation (EEC) 2092/1991, which was implemented in Spain through the Royal Decree 1852/1993.

As in the rest of Spain organic farming in Andalusia, did not take hold until the seventies when, encouraged by experiences elsewhere in Europe, the first initiatives were taken to promote this alternative agricultural system. EU Council Regulation 2092/1991 was fundamental to the development and institutionalisation of organic farming in Andalusia, the first Autonomous Community to provide for this new food production system in its legislation (the Andalusian Regional Committee of Organic Farming, CTAAE, was created in July 1991, even before the first national legislation was passed). After jurisdictional authority on agriculture was transferred from the Spanish government to the Andalusian regional government (*Junta de Andalucía*), the Andalusian Ministry of Agriculture and Fishery recognised CTAAE as the control authority in organic farming. In August 1994 CTAAE changed its name to

become what is today the Andalusian Committee of Organic Farming (CAAE)[200].

The development of organic farming in Andalusia took place in two phases. The first phase was a pioneering stage marked by a very militant and ideological approach, in which academia played a key role, in particular the ISEC (Institute for Sociology and Peasant Studies) at the University of Cordoba. Since the mid-eighties, this university institute opened up the doors in Andalusia to an "agro-ecological" approach through its postgraduate training courses for technicians currently working in organic farming and as a source of expertise for the CAAE. The "agro-ecological" approach of the ISEC is aimed not only at examining the negative impact of mainstream agricultural practices on the environment, but also stresses the social impact of intensive models of agricultural production on small farmers and agricultural labourers This explains why the development of organic farming in Andalusia took, at least in its initial stages, a strong militant and ideological stance (alternative discourse) and was presented as a solution to the problems facing not only small farmers but also agricultural labourers through a paysanne-based discourse marked by the reality of developing countries, especially from Latin-America. In this first phase, the dominant discourse on organic farming in Andalusia was presented as an ideal peasant-centred approach to production, thus leading to a fair amount of reticence among other groups of farmers in Andalusia and limiting it to militant groups belonging to rural and environmental movements.

Nevertheless, following the incorporation of organic agriculture in political agendas, and in particular, the institutional recognition gained through the European regulations and Spanish royal decrees mentioned above, a second stage was initiated. In this stage, which is currently in force, organic farming has become widespread among Andalusian farmers who view it as a new opportunity to increase their income and explore new markets for their foodstuffs. Thus, organic farming has shed its peasant identity to become a form of production within the reach of all farmers who want to take on the new challenges posed by agriculture today.

From the viewpoint of institutionalisation, organic farming is defined by the Andalusian Ministry of Agriculture and Fisheries as an agricultural system whose principal aim is to obtain maximum quality foodstuffs which are environmentally sound and conserve or improve soil fertility through the optimal use of natural resources without synthetic chemical products. This process of institutionalisation has culminated in the creation of a logo for the Andalusian region.

- Organic farming in Andalusia did not take hold until the seventies when, encouraged by other experiences in Europe, the first initiatives were taken.
- The Andalusian Regional Committee of Organic Farming, CTAAE, was created in July 1991, even before the first national legislation was approved.
- The development of organic farming took, at least in its initial stages, a strongly militant and ideological stance. Nowadays this system has shed its "peasant" identity and Andalusian

200 Recently, the CAAE has been recognised by the Andalusian Ministry of Agriculture and Fisheries as a private organisation to control the organic farming production in this region. The CAAE has become a non-profit making organisation called Andalusian Association Committee of Organic Farming.

farmers view it as a new opportunity to increase their income and explore new markets for their foodstuffs.

Importance of organic farming in Andalusia

Since 1992, organic farming has been received very favourably in Andalusia and is currently under expansion (see **table 27**). In 2002, the registered surface area for ecological agriculture was 225,598 hectares (33.4% or one-third of the total area used for organic farming in Spain) and practically one out of every four organic farmers in Spain is registered in Andalusia (4,024 producers out of a total of 16,521 in Spain). Until 2002, Andalusia was ranked second in Spain after Extremadura in terms of area, number of producers and economic importance of its ecological products. Today, however, the region ranks first in the country in area.

Within Andalusia, Cordoba is the province with the largest number of registered organic producers and processing industries, especially in the Pedroches Valley area (see **table 28**).

Organic farming is considered in Andalusia an agricultural sector which offers quality products and whose production processes are subject to official control. The majority of the area used for organic farming is dedicated to olive grove production, followed by pastureland (for organic livestock production) and almond production (**graph 22**).

In terms of economic importance, virgin olive oil ranks first (according to the CAAE, the olive-oil sector earned over 9 million euros in 2001), followed by subtropical fruit (especially avocado), citrus and horticulture.

The fruit and vegetable industry, wineries and olive-oil mills are the most active in terms of food processing. Finally, in terms of marketing, 85% of Andalusian organic production is exported to other European countries (Germany, France, Italy and more recently the United Kingdom) and 5% to Japan.

Table 27: Evolution of the area and number of organic farmers in Andalusia.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Area (ha)	2,212	2,277	3,987	6,456	20,722	32,497	47,470	62,318	69,042	107,379	225,598
Number of farmers	193	194	237	277	837	1,126	1,769	2,489	2,749	3,983	4,024

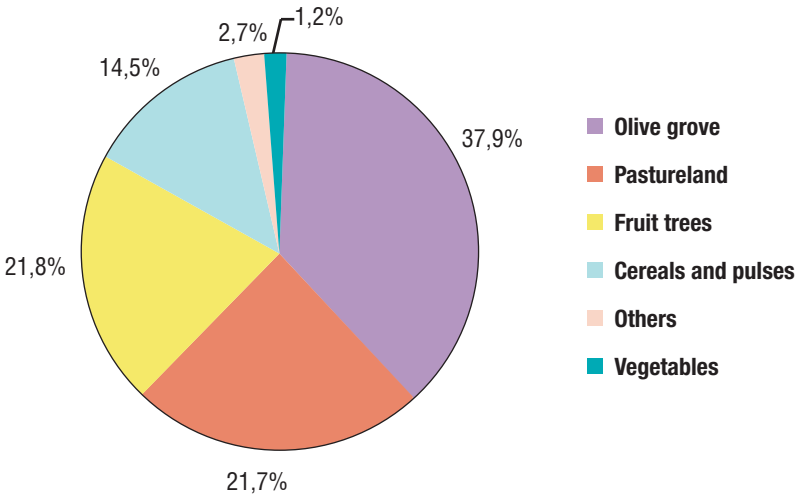
Source: Ministry of Agriculture, Food and Fisheries.

Table 28: Distribution of area, number of organic farms and industries per province in Andalusia in 2002.

Province	Area (ha)	% of organic area in Andalusia	Number of producers	Number of Industries
Almeria	16,217.61	7.2	735	25
Cadiz	13,819.88	6.1	210	10
Cordoba	51,120.08	22.7	1,151	53
Granada	24,214.34	10.7	557	30
Huelva	49,551.32	22.0	289	16
Jaen	26,900.10	11.9	317	15
Malaga	17,525.84	7.8	473	33
Seville	26,249.53	11.6	292	32
Andalusia	**225,598.74**	**100.0**	**4,024**	**214**

Source: Author (from Ministry of Agriculture, Food and Fisheries statistics, 2002).

Graph 22: Distribution of organic farming in Andalusia according to land area (2001)[201].



Source: Ministry of Agriculture and Fisheries and Foods.

A singular characteristic of Andalusian production is that each province produces a particular type of crop. For example, almond and dry-farming fruit trees are found in Almería, Granada and Huelva; olives from Cordoba, Jaén and Seville, organic pastureland is found in Huelva and Seville and dry farming crops in Cadiz.

Organic farming in Andalusia seems to be an overall reflection of Spanish agriculture in terms of its variety, size and extent of production and economic turnover. From a sociological perspective, it is interesting to note that 30% of organic farm owners are women (there is no data available as to whether the women actually run the farms or if their names simply appear on the title deeds).

Table 29 shows the structure of organic farms in Andalusia for 2002. As can be seen, more than a half of the area dedicated to organic farming is concentrated in farms with more than 25 hectares (almost 80%). Likewise, a greater number of small farmers use organic farming practices (2,701 farms with less than 25 hectares), while a large percentage has medium-sized or large farms (almost a quarter, 947, have farms with more than 25 hectares). This would seem to indicate that, contrary to the initial peasant-based approach, organic farming has extended out to include all

Table 29: Mean area of organic farms in Andalusia, 2002.

	Number of Hectares	%	Number of Producers	%	Mean area/ producer
> 5 ha	20,380	2.10	971	26.62	2.45
5-10 ha	5,335	4.70	728	19.96	7.33
10-25 ha	16,384	14.45	1,002	27.47	16.35
25-50 ha	19,091	16.83	545	14.94	35.03
50-100 ha	19,310	17.03	283	7.76	68.23
100-300 ha	16,462	14.51	100	2.74	164.62
300-600 ha	3,532	3.11	9	0.25	392.44
+ than 600 ha	30,926	27.27	10	0.27	3,092.55

Source: Andalusian Organic Farm Committee (CAAE), 2002.

201 The forest area is not included.

sectors of the agricultural structure, especially large farms.

- In 2002, the registered surface area for organic farming was 225,798.7 hectares (one-third of the total in Spain), having increased by 110% since 2001.
- Contrary to the initial peasant-based approach, this system has extended out to include all sectors of the agricultural structure, especially large farms.
- The majority of the area used for organic farming is dedicated to olive grove production, followed by pastureland and almond production. In terms of economic turnover, virgin olive oil ranks first, followed by subtropical fruit, citrus and horticulture.
- In terms of marketing, 90% of Andalusian organic production is exported to other countries.

Specific regulations and aid

Apart from the above mentioned Spanish legislation (particularly the Royal Decree 1852/93 that allows the implementation of the EU Regulation 2092/91 in Spain), the control authorities (like CAAE) establish rules to regulate specific aspects of organic farming in Andalusia. Recently, the Andalusian Ministry for Agriculture and Fisheries has published the *Plan Andaluz de la Agricultura Ecológica* (the Andalusian Plan for Organic Farming) which includes ten measures and an investment of 93.8 million euros for the period 2002-2006. As shown in **table 30**, the Plan lays down the foundations to promote this type of agriculture in accordance with the CAP.

The funding for these measures is considered agro-environmental aid and as such, 75% come from the EU EAGGF-Guarantee[202], 12.5% from the MAPA and 12.5% from the Regional Government of Andalusia. Expenditures are scheduled to increase from 6 million euros in the year 2002 to 11 million in 2006.

Following the objectives of the mentioned *Plan*, a new regional decree has just been published which gathers all former legislation existing in Andalusia on organic farming and adapts them to EU regulations. This regional decree creates the Andalusian Council of Organic Farming to give technical advice to farmers and define rules organising this production sector in Andalusia. Besides, the mentioned regional decree changes the former mixed private-public control system of organic farming, so that today it is the Andalusian Ministry of Agriculture and Fisheries the only control authority.

- Apart from the Spanish legislation, the control authorities establish rules to regulate specific aspects of organic farming in Andalusia.
- Recently, it has been published the Andalusian Plan for Organic Farming, which includes an investment of 93.8 million euros for the 2002-2006 period.

Control, certification and labelling

Until 2003, there was a mixed private-public system to control the implementation of organic farming rules in Andalusia. According to this system, farmers could choose to be controlled by the CAAE or by private bodies. However, as it has been mentioned above, the CAAE is now recognised by the Andalusian Ministry of Agriculture as a private association to develop control and certification activities. To sum up, the control and certification functions are today implemented in Andalusia by private bodies which are approved by the regional government and obliged to accomplish the EN 45011 standard.

202 The European Agricultural Guidance and Guarantee Fund.

Table 30: Strategic Plan for Organic Farming in Andalusia. Objectives and measures for the 2002/2006 period.

Objectives	Measures
1. Encourage organic production.	- Increase agro-environmental aid for Organic Farming (OF) - Create a consulting service for farmers and stockbreeders that use OF. - Encourage OF in Natural Parks - Use Internet to inform about and promote OF
2. Make the means of production available	- Nursery plants - Promote the use of organic seeds - Promote pest control
3. Identify producers and their market	- Characterise organic farms - Elaborate statistical data on production and do market follow-up - Encourage publications on organic production systems
4. Promote the elaboration and transformation of organic products	- Foment the creation of industries for organic products - Establish industrial quality systems
5. Organise the organic farming sector in Andalusia	- Encourage the concentration of organic production - Foment associations to market the products - Support the creation of organisations for consumers of organic products.
6. Update systems for the control and regulation of organic products	- Create an inspection and certification register - Promote regulations
7. Promote and Inform	- Provide information to consumers
8. Encourage the consumption of organic products	- Develop a plan to promote products - Study future market possibilities
9. Promote research and development specifically aimed at organic farming	- Support research about organic livestock production - Promote organic research in the Andalusian Research Plan - Establish a network of demonstration farms
10. Encourage training in the sector	- Technical training courses - Formative programmes for farmers interested in restructuring to Organic Farming.

At present, four bodies are recognised as control authorities in Andalusia: the ACCE (*Asociación Comité Andaluz de Agricultura Ecológica*) and the private bodies Sohiscert, ECAL (*Entidad Certificadora de Alimentos de España*) and Agrocolor.

- Control and certification functions are today implemented in Andalusia by private bodies which are approved by the regional government. At present, four bodies are recognised as control authorities.

Factors influencing farmers' decisions

The main determining factors that make farmers adopt the organic farming system in Andalusia are the following:

Farm Size and Facilities for Conversion (to this new agricultural system)

Organic farming began to develop in Andalusia in areas of low productivity (unfavourable zones or in mountainous regions) to offer small farmers the chance to increase their profits. *Dehesas* (an agro-forestry system) and olive farms have been the most important productions changing to organic farming, since in these farms the shift from a mainstream agriculture system toward an organic system is easier than in others. In fact, the conventional methods in *dehesas* and olive farms are very close to organic practices.

Age and Farmers' Ideology (social and political concern)

As already mentioned, the pioneers of the organic farming system were young people

adhered to a particular philosophy that viewed organic farming to be wholesome, natural and biodynamic.

Access to Market Facilities and Prices Increase

As shown in **table 29**, organic farming has extended through the years to include other groups of farmers, and today is more highly concentrated in medium-sized farms and numerous large livestock farms with pastureland. Due to the high cost of converting to organic farming for these farm holders (it involves a radical change for mainstream agriculture and conventional livestock production practices) the general trend is for part-time farmers earning income from other professional activities or medium-sized and large farmers to reconvert to this type of production as they are better prepared to do so. Farmers with family-run horticulture farms are also increasingly converting to organic farming practices as it offers greater opportunities for family members to continue working on the farm.

Environmental Concern and Food Safety

The increased awareness by farmers of environmental and health issues related to the use of the agrochemical fertiliser complex is other relevant factor influencing farmers' decisions to choose the organic farming system.

Social Recognition

Undoubtedly, organic farmers are becoming increasingly aware that their activity has a positive effect in terms of their social recognition as dynamic and innovative professionals which raise their self-esteem.

Public Support and Aid

The opportunity to receive CAP aid is not a factor directly influencing farmers' decisions, although the research shows that it is an important complement to other factors. It should be stressed that the organic farming system depends as much on European funding as mainstream agriculture. In the light of the information gathered through interviews with experts and farmers, the full consolidation of organic farming will depend on solid support from the Regional Government of Andalusia to put the Strategic Plan into effect and on the creation of a R&D system aimed at aiding farmers with possible technical problems.

Training for Farmers, Technical Advice and Promotion among Farmers

Apart from the relevant factors mentioned above, the research has also demonstrated that the future of organic farming system in Andalusia depends on the creation of a training programme to inform farmers before conversion about the complex reality of organic agriculture, the promotion of adequate marketing networks aimed at an untapped internal market, and the establishment of an easily accessible service network to purchase the required inputs.

However, other factors can have a positive or negative influence on the development of organic faming:

- attitudes of farmers regarding risk
- the local and regional culture regarding innovation
- the existence of local markets
- the new demands from consumers with respect to organic foods
- the leadership of associations supporting organic production systems, and the official recognition of this system by public authorities.

- The transition from mainstream agriculture to an organic system is easier in areas of low productivity than in others.
- Organic farming has spread over the years to include other groups of farmers, and today is more highly concentrated in

medium-sized farms and numerous large livestock farms with pastureland.

- The opportunity to receive CAP aid is not a factor influencing directly farmers' decisions.
- Organic farming system in Andalusia depends on the creation of a training programme to inform farmers before conversion.

Integrated Farming

Specific characteristics of integrated farming in Andalusia

Historical development

The origins of this agricultural system in Andalusia date back to the mid-seventies (concretely, 1976), when the first initiatives for the integrated pest management of cotton crops were taken. From 1979 onwards, these initiatives were headed by groups of producers known as ATRIAs (*Agrupaciones para el Tratamiento Integrado en el cultivo del Algodón*) (Groups for Integrated Treatment in Cotton). Backed by the national legislation, integrated farming was extended in order to include other crops. Today, the ATRIAs are not linked exclusively to cotton, but agriculture in general (they are called *Agrupaciones para el Tratamiento Integrado en Agricultura,* Groups for Integrated Treatment in Agriculture). They constitute a valuable network of integrated farming associations within the framework of vegetable health and a useful source of information and documentation on these agricultural practices in Andalusia.

According to this general approach, the Andalusian Ministry of Agriculture defines integrated farming as an agricultural system that is "capable of maintaining the productivity, profitability, and competitiveness of farms for their use by current and future generations in order to produce high quality foods. These aims are achieved through the conservation and use of natural resources and control mechanisms as well as through the application of the means and techniques which are in the best interest of society, substituting contaminating inputs and thereby ensuring sustainable production."

Contrary to other European countries, like France, Germany or the United Kingdom, where integrated farming is a system affecting a farm as a whole, in Spain, and obviously Andalusia, it concerns one specific crop. So, in Andalusia one farm can be recognised as integrated for one crop but not for others, coexisting both, integrated farming and mainstream agriculture.

Like for the organic farming sector, integrated farming in Andalusia created its own logo in 1998 to certify integrated products and provide consumers with a brand of guarantee.

- The origins of integrated farming in Andalusia date back to the mid-seventies, when the first initiatives for the integrated pest management of cotton crops were taken.
- A given farm can be recognised as integrated for one crop but not for others, such that both integrated farming and mainstream agriculture can coexist on the same holding.
- In 1998 a regional logo was created to certify integrated products with a brand of guarantee.

Importance of integrated farming in Andalusia

In March 2003, there were 81,517 hectares certified as integrated farming in Andalusia.

Farmers who want to be recognised as integrated producers for some crops have to join compulsory an integrated farming group (*Agrupación de Producción Integrada*, API) and accomplish the specific rules and control system linked to it. For this reason there are 227 APIs in Andalusia.

Olive grove sector is first in the Andalusian integrated farming ranking, accounting for 38,210 has in March 2003 and 20 APIs, placed obviously in provinces where olive grove is relevant, followed by rice (33,000 hectares and 55 APIs) which is taking advantage of the EU agro-environmental schemes. A third group is formed by strawberry (4,260 hectares and 77 APIs), citrus (3,220 has and 27 APIs) and stone fruit trees (2,685 hectares and 36 APIs). Integrated farming in horticultural crops grown under plastic is very little relevant (only 161 has and 12 APIs).

Table 31: Distribution of integrated farming area in Andalusia according to crops and number of APIs (2003).

Sector	Number of APIs	Area (ha)
Olive grove	20	38,210
Rice	55	33,000
Strawberry	77	4,260
Citrus	27	3,220
Stone fruit trees	36	2,666
Horticultural crops	12	161
Total	**227**	**81,517**

Source: Ministry of Agriculture and Fisheries and Foods

Due to the importance of integrated farming in Andalusia, the Regional Ministry of Agriculture and Fisheries has implemented computer programmes for integrated farming (*Programas Informáticos para la Producción Integrada,* called TRIANA) to advice farmers about integrated treatment of pests in farms. This programme offers very interesting information about biological cycles, strategies for pest control and other aspects of integrated pest management.

- In March 2003, there were 81,517 hectares certified as integrated farming in Andalusia. Olive grove sector is first in the ranking.

- Farmers who want to be recognised as integrated producers for some crops have to join compulsory an integrated farming group.

Specific regulations and aid

The Andalusian government is one of the first Spanish regional governments to have passed regulations on integrated farming. In fact, this new agricultural system was regulated in Andalusia six years before the national legislation (Royal Decree 1201/2002), by the Decree 215/1995, implemented by the Andalusian Agricultural Ministry Order of 19 June 1996.

However, regional authorities have been working hard together with representatives of integrated farming associations in Andalusia in order to prepare a new decree that updates the current legislation in line with the changes that have taken place at European level. This recently passed Decree on integrated production (Decree 245/2003), which replaces the one in force since 1995, incorporates for the first time rules governing the processing methods and livestock produce. Besides, it establishes control mechanisms for both, production and producers, through independent certification bodies authorised by the Andalusian Government. In order to develop its activities, these bodies must have a control programme and fulfil the EN 45004 and EN 45011 standards, among other requirements.

Together with this general legislation, in accordance with the crop-oriented approach dominant in Spain, several specific regulations have been passed regarding fifteen specific productions. The crops regulated by specific legislations are: olives, rice, horticultural crops grown in plastic greenhouses (tomatoes, courgettes, melons, watermelons, cucumbers, peppers, aubergines and green beans), citrus fruits, strawberries, stone fruit trees, potatoes and cotton.

These regulations set down the general guidelines for the integrated production of each of these crops and the rules to be followed. The

specific regulations aim to orient farmers so that they can optimise (not maximise) the factors of production.

Regarding public subsidies for farmers who switch over from mainstream agriculture methods to integrated farming system, Regulation (CE) nº 1257/99 on Rural Development establishes (chapter VI) an agro-environmental aid scheme. This has been implemented in Spain through Royal Decree 4/2001. Some regional governments are taking advantage of this decree to promote integrated systems for some crops. So, in the framework of this decree, the Andalusian Ministry of Agriculture and Fisheries has implemented a specific aid scheme aimed at the integrated production in rice. Besides, other regional aid schemes are being implemented in Andalusia through the 222 ATRIAs[203] to promote activities aimed to improve the vegetable health. Furthermore, a lot of agreements between regional public authorities and the agricultural associations to develop programmes of integrated production.

- The recently approved Andalusian Decree on integrated production incorporates for the first time rules governing the processing methods and livestock produce. Besides, it establishes control mechanisms for both, production and producers, through independent certification bodies.
- There are fifteen crops regulated by specific legislations.
- It has been implemented a specific aid scheme aimed at the integrated production in rice. Besides, other regional aid schemes promote activities aimed to improve the vegetable health.

Control and certification system

Farmers who opt for integrated farming must comply with state regulations and keep a Farming Register of their agricultural practices in order to facilitate inspections by certifying bodies. As already mentioned, the Andalusian Ministry of Agriculture and Fisheries is the only body authorised to certify and supervise integrated production farms. However, it delegates some inspection tasks to private companies which verify compliance with the EN 45004 and EN 45011 standards. In Andalusia these inspections are carried out by nine private bodies, namely: *Agrocolor S.L., Entidad Certificadora de Alimentos de España (ECAL) S. A., Sococer S.A., Citrensis S.L., Agrivera S.A., Procert Iberia S.L., Asistencia Técnica Industrial SAE, Promo-Vert S.A. and Citagro S.A.*

- The Andalusian Ministry of Agriculture and Fisheries delegates some inspection functions to private entities, which are carried out by nine private bodies.

Factors influencing farmers' decisions

The main determining factors that make farmers adopt the integrated farming system in Andalusia are the following:

Large and Medium-Sized Farms and High Level of Technical Training of Farmers

Contrary to organic farming, Andalusian farmers who opt for integrated farming own usually big and medium-size farms, have a very high level of agricultural training and are very well related to scientific circles and regional administration.

Access to Market Facilities

Generally, integrated farming is for these farmers a way of finding new markets based on quality and *traceability*.

203 In Andalussia there were 203 ATRIAs in 2003, existing 106 of olive grove.

Maximal Profitability in Farms

Analysis about preferences of farmers who opt for integrated farming in Andalusia show that ethical and ideological motivations do not play a significant role in their strategies. According to this research, Andalusian farmers do not take into account environmental concerns either when they decide to convert into integrated farming. The main concern for farmers is to get the maximum profitability from their farms, and to cut their costs. However, due to their high level of technical training Andalusian farmers have realised that shifting from mainstream agricultural practices toward a more rational use of chemical inputs is a good business decision. In this sense, it can be said that integrated production is a way to reform agricultural methods in line with new agronomic knowledge and the rising awareness about negative effects on environment of intensive agriculture.

Facilities to change mainstream agricultural practices

In comparison with organic farming, integrated farming is more flexible and attractive for farmers, since they can change their mainstream agricultural practices without excessive risks.

Other factors that influence farmers' decisions are:

- the desire for social recognition and a new legitimacy for agricultural activity;
- availability and easy access to technology suited to the new production systems;
- perception of environmental impacts of mainstream agricultural practices, and
- existence of restrictions to mainstream agriculture production methods.

- Andalusian farmers who opt for integrated farming usually own large and medium-sized farms.
- Ethical and ideological motivations are not relevant to explain their strategies.
- Integrated farming is more flexible and attractive for farmers, since they can change their mainstream agricultural practices without excessive risks.

Conservation Agriculture

Specific characteristics of conservation agriculture in Andalusia

Historical development

The origin of conservation agriculture in Andalusia can be situated in 1995 when the Spanish Association for Conservation Agriculture – Living Soils (*Asociación Española de Agricultura de Conservación-Suelos Vivos* , AEAC-SV) was created in Cordoba. This association has leaded the promotion of conservation agriculture in Spain.

The idea to create this kind of association came about as a private initiative between scientific researchers from the Centre for Agricultural Research and Training (CIFA) under the Andalusian Ministry of Agriculture and the Institute for Sustainable Development (IAS) of the CSIC (High Council for Scientific Research) under the Spanish Ministry of Science and Technology, both situated in Cordoba (Andalusia). The initiative emerged from the interaction among members of the scientific community and the agrochemical sector to promote and encourage practices to prevent severe soil erosion.

The AEAC-SV is making a concerted effort to promote conservation agriculture in Andalusia by presenting it as an alternative agricultural model and acting as a liaison with the Andalusian Ministry of Agriculture. AEAC-SV's main objective is to promote the use of no tillage and to encourage R&D of these techniques.

Encouraged by the AEAC-SV, other regional and provincial associations have been constituted in Andalusia, Aragon, Extremadura, Castilla-Leon and Catalonia. These territorial associations have gained prominence following the EU LIFE project whose funding has served to encourage technical advising in conservation agriculture.

One characteristic of conservation agriculture in Andalusia is that it makes use of "integrated farming" techniques, especially with regard to the use of cover crop to protect soil (as in the case of olive grove). It should be stressed, however, that the AEAC makes a clear distinction between organic farming and conservation agriculture due to the restrictions placed by the former on the use of herbicides.

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- Encouraged by the AEAC-SV, other regional and provincial associations have been constituted in Andalusia, Aragon, Extremadura, Castilla-Leon and Catalonia.

Importance of conservation agriculture in Andalusia

Conservation agriculture currently represents approximately 3% of Andalusian UAA (2% correspond to the use of cover crops and only 1% to direct sowing methods) and is growing rapidly in Cadiz, Seville and Cordoba, three provinces with large, extensive farms.

There are around 50 farmers that currently use this method in an estimated area of 30,000 hectares in Andalusia. Represented by the *Asociación Andaluza de Agricultores de Conservación* (Andalusian Association of Conservation Farmers), the majority are large farmers, many with farms of more than 2,000 hectares.

This method is chiefly used with arable crops (cereals, oilseeds, cotton) and wood crops (in particular in olive groves due to the fact that soil erosion is greater). According to recent assessments by the IAS-CSIC, land dedicated to olive grove production has soil losses of over 80 tons per hectare annually, losses that exceed by far the regeneration capacity of soil. This loss of soil or erosion is due to planting on slopes; alternating periods of drought and intense rainfall in short periods of time which is characteristic of the Mediterranean climate; clayey soils with slow infiltration that have a marked hydrophobic character coinciding with the first rains; and scarce soil cover due to tilling methods. In order to reverse this situation, the IAS-CSIC proposes the use of alternative tilling techniques and defends, on the one hand, no till as an alternative to soil erosion and on the other hand, the reduction of conventional tilling techniques with disc ploughs or mouldboards to maintain crop residues on the soil surface.

- Conservation agriculture currently represents approximately 3% of Andalusian UAA (2% correspond to the use of cover crops and only 1% to direct sowing methods). This method is chiefly used in cereals, oilseeds, cotton and olive groves.
- In order to reverse losses of soil, it is proposed the use of alternative tilling techniques (no till or the reduction of conventional tilling techniques to maintain crop residues on the soil surface).

Specific regulation and subsidies

EU agro-environmental measures, and in particular the Spanish Royal Decree 4/2001 to implement the EU regulations, encourage the use of these techniques in Spain by providing subsidies for efforts to control erosion in fragile environments (132 euros per hectare in wood crops when cover crop is used and 54 euros per hectare in arable crops when minimal tilling and direct sowing are performed). Furthermore, Article 3 of the recent Royal Decree 1322/2002, following agro-environmental measures established by the CAP, includes this kind of measures regarding soil conditions, and makes a distinction between "good practices" (regarding conservation agriculture) and "undesirable practices".

- EU agro-environmental measures encourage the use of these techniques in Spain providing aid to control erosion in fragile environments.

Factors influencing farmers' decisions

The main determining factors that make farmers adopt the conservation agriculture system in Andalusia are the following:

Age of Farmers and Attitudes regarding Innovation

The majority of conservation agriculture farmers are young and innovative with a solid technical and agricultural background (they are often agronomists). They often have large or medium-sized economically viable farms. Generally, the farms integrating this type of agriculture have dry-land crops, chiefly winter cereal crops (wheat or barley) and sunflower, although many are trying their hand at irrigated farming as well.

Reduction in production costs

Initially, farmers were motivated to learn about and integrate conservation agriculture techniques in their agricultural practices because of the lower costs that these methods entailed. Another aspect that encouraged farmers was the reduction of time and labour, thereby reducing overall production costs. Priority was placed on cost savings, even before environmental concerns.

Facilities to change mainstream agriculture practices

Many local associations have been constituted by farmers who want to reduce costs but who are faced with the difficulty of running economically viable farms. Thus, in order to overcome these difficulties and continue to work their farms, farmers have opted for conservation agriculture rather than changing their production system (as is the case of organic farming) as it provides greater opportunities while involving substantially less risk.

Technical Advising Programmes

Lots of activities carried out by AEAC-SV are aimed at organising meetings to demonstrate the beneficial effects of conservation agriculture. The association has a technical staff that defines the sessions of these meetings and advises farmers about topics related to the new production system.

Environmental Concern

Another reason to choose this agricultural system has an agronomic nature Namely, the knowledge that, in the long term, if these alternative methods are used, the organic content and structure of the soil will improve, thus benefiting the environment.

Public Subsidies

The possibility of receiving agro-environmental aid was another incentive, although now this does not seem to be so important because the aid has little impact on the costs and benefits of large farmers.

This research has also demonstrated the influence of the following:

- farm size, and
- availability and ease of access to technology suited to new production systems.

- The majority of conservation agriculture farmers are young and innovative with a solid technical and agricultural background. They usual run large or medium-sized farms.
- Priority is placed on saving or reducing costs, even before environmental concerns. Another aspect that encouraged farmers is the reduction of time and labour.

- In the long term, the organic content and structure of the soil will improve, thus benefiting the environment.

The future of conservation agriculture

One of the chief drawbacks of conservation agriculture is the high cost of machinery needed for direct sowing (five times that of conventional machinery). In the near future, service industries should exist so that several farmers can, for example, rent a seeder. A second obstacle is conservation farmers' dependence on distributors[204]. A third obstacle is that these techniques involve a significant change from the conventional methods used by most farmers (burning of plant residues, sowing, ploughing with mouldboards, etc.). This means that, in order to develop and expand conservation agriculture, farmers must be aware of the risks involved and will need a period of adaptation to attain economic viability. As discussed above, conservation agriculture involves the renovation of traditional methods and requires considerable investments in human capital.

- In the near future, service industries should exist so that several farmers can, for example, rent a seeder.
- In order to develop and expand conservation agriculture, farmers must be aware of the risks involved in certain conventional methods.

Agriculture under Guaranteed Quality

Specific characteristics of agriculture under Guaranteed Quality in Andalusia

Quality food is protected in Andalusia through the national system of designations which has been analysed above (designations of origin, geographical indications or specific designations, etc.). However, some specific quality designations exist in this Spanish region, such as *Calidad Certificada* and *Marca Parque Natural de Andalucía* (which have been promoted by the Andalusian Ministry of Agriculture and Fisheries and the Andalusian Ministry of Environment, respectively) *Landaluz* and *Doñana 21* (which have been promoted by private entities).

Historical development

The first Spanish designation of origin created following the 1932 Wine Statute was the *Málaga* wine designation, whose Regulatory Council dates from 1933 and whose Regulation was passed four years later, in 1937. There are other quality designations in the Andalusian wine sector, such as *Jerez* (whose Regulatory Council was created in 1935) and *Montilla-Moriles* (whose Regulatory Council was constituted in 1944).

In 1989, the Andalusian Ministry of Agriculture and Fisheries started to promote Andalusian quality foods through the designation *Alimentos de Andalucía* aimed at all Andalusian products meeting certain quality rules. This designation was abolished in 2000 according to the implementation in Andalusia of the 1992 EU legislation which allowed the use of geographic designations only through the notions of PDO (*Protected Designations of Origin*) and PGI (*Protected Geographical Indications*). That is why the regional government created in 2001 a new brand for quality foods called *Calidad Certificada*, existing today. At the same time, the former *Alimentos de Andalucía* association was renamed as *Landaluz* (Business Association for Food Quality), and, after the abolition of its brand, it created the homonymous brand and started to use the services of *Bureau Veritas Español* as an external and independent body to control the quality of foods produced in the member companies.

204 The principal distributor is SEMEATO.

Besides, the Andalusian Ministry of Environment promoted in 2000 the programme called *Parque Natural de Andalucía* (Andalusian Natural Parks) with European funds of the EU Initiative ADAPT, whose main aim is to adapt companies placed in natural spaces to the paradigm of sustainable development. 16 private companies adhered to this programme, so that they are members of this quality designation.

- The first Spanish designation of origin created following the 1932 Wine Statute was the Málaga wine designation.
- In 1989, the Andalusian Ministry of Agriculture and Fisheries started to promote the Andalusian quality foods.

Importance of Quality Designations in Andalusia

There are twenty PDO in Andalusia, which are distributed in wines (6), vinegars (2), olive oils (8), *hams and shoulders* (2), *raisins* (1), custard apples (1) and honey (1). Regarding PGIs, there are five indications of products such as brandy, asparagus, ham, mackerel and frigate mackerel. Finally, there are ten kinds of wine with the quality designation *Vinos de la Tierra (Regional Wines)*. **ANNEX 31** shows, together with their corresponding logo, each one of these existing Andalusian designations.

Table 32 shows the area and production of PDO in the olive oil sector. The designations *Baena, Sierra Magina* and *Sierra de Segura* are the most important ones from the production point of view. **Tables 33 and 34** are referred to the Andalusian wine sector, where the first designations are *Jerez y Manzanilla SB* and *Montilla-Moriles*.

In **ANNEX 32**, figures on other Andalusian PDO and PGI's area, production and number of companies are shown. Figures on some designations have not been included due to its recent constitution.

Regarding the *Calidad Certificada* brand, it is already used by 206 Andalusian food products, corresponding to 84 authorised companies. In the olive oil sector there are 23 authorised companies, followed by the wine sector with 17. In the ham and derived products sector there are 15 companies approved, and in the horticultural sector there are 13. The rest (22) are distributed in other sectors[207].

Table 32: Andalusian olive oil PDO in 2002.

Designation	Area	Industries		Production (tm)
		Mill	Bottling industries	
Baena	45,000	18	12	7,000
Poniente de Granada [205]	-	-	-	-
Montes de Granada	54,001	15	15	5,020
Priego de Córdoba	29,628	17	10	5,246
Sierra de Cádiz [206]	15,196	8	8	78
Sierra de Cazorla	31,500	17	9	750
Sierra de Segura	42,000	20	16	6,550
Sierra Mágina	67,000	31	21	14,218
TOTAL in Andalusia	284,325	126	91	38,862
TOTAL in Spain	391,445	281	181	47,647

Source: Compiled by the authors using data from the Ministry of Agriculture, Fisheries and Foods.

205 There are no figures, since this denomination was created in 2002.
206 This denomination was created in 2001.
207 http://www.consumaseguridad.com/web/es/sociedad_y_consumo/2003/06/05/6754.php

Table 33: Area, wine cellars and production of Andalusian wine designations of origin in 2001/2002 vintage.

Designation	Area registered (ha)	Registered wine cellars	Production (hl)
Condado de Huelva	5,730	39	71,341
Jerez y Manzanilla S. B.	10,359	104	760,000
Málaga y Sierra de Málaga	1,112	16	23,010
Montilla-Moriles	9,853	111	307,820
TOTAL in Andalusia	27,054	270	1,162,171
TOTAL in Spain	626,692	4,567	11,656,391

Source: Compiled by the authors using data from Ministry of Agriculture, Fisheries and Foods.

Table 34: Inventory of .wine-growing potential in Andalusia and Spain (Council Regulation nº 1493/99). 31/07/2001

LAND	AREA (ha)		
	QWPSR	TW+GI	TOTAL
Andalusia	27,222	14,224	41,446
Total SPAIN	900,445	241,541	1,141,986

Source: DG-Agri (European Commission).

Besides, the Andalusian Ministry of Environment has conferred the designation *Parque Natural de Andalucía* on 76 products and services elaborated by 21 companies that are placed in protected natural spaces. Among these companies, 9 elaborate 41 craft products, 3 sell 11 natural products, and 9 are oriented to give services of natural tourism. According to provinces, 5 companies develop their activities in Almeria, followed by Jaén (4), Málaga (3), Córdoba (3), Cádiz (2), Granada (2), Seville (1) and Huelva (1). In the next months, the Andalusian Ministry of Environment will grant this quality designation to new products and services elaborated by 10 companies[208].

Furthermore, the *Landaluz* association currently groups together 99 companies with a collective total turnover of €3,100 million. Wines, vinegars, derived Iberian pork products, olive oils, table olives, tinned foods, nuts, eggs and dairy products are the sectors gathered in this association[209].

The *Doñana 21* brand currently groups together 32 tourism and agri-food companies, along with private and public entities, such as the Council of Almonte and the Foundation Doñana 21.

- In Andalusia there are twenty PDO, five PGIs, and nine kinds of wine with the quality designation Regional Wines.
- Other regional brands: Calidad Certificada is already used by 206 products; Parque Natural de Andalucía by 76 products and services; Landaluz association gathers 99 companies; and Doñana 21 brand includes 32 tourism and agri-food companies.

Related bodies

The Andalusian Government (*Junta de Andalucía)* has created two consultative institutions. The first one is the Andalusian Council for Agri-food Quality *(Consejo Andaluz de la Calidad Agroalimentaria*), constituted in 1999 and attached to the Andalusian Ministry of Agriculture and Fisheries. This Council is in charge of the promotion of the Andalusian quality foods. It encourages the collaboration among the different regulation councils of Andalusian quality designations, and it controls the accomplishment of quality rules. The second of these two consultative institutions is the Advising Committee for the

208 Source: http://www.andaluciajunta.es/
209 http://www.eurocarne.com/noticias/ultimas/20030730-2.html

Designation *Parque Natural de Andalucía (Comité de Asesoramiento de la Marca Parque Natural de Andalucía*[210]) that has been created in 2003 by the Andalusian Ministry of Environment.

Besides, in 2002 the *Conferencia Andaluza de Denominaciones de Calidad* was constituted in Jerez as a forum to interchange experiences on quality in foods, such as to debate any issue related to the management and control functions developed by the PDO and PGI regulation councils and the organic farming council (CAAE).

The association *Landaluz* gathers companies that have been audited by the *Bureau Veritas Español, S.A.* according to both the quality programme elaborated by *Landaluz* and the Technical and Health Regulation (RTS). This association has created the quality label called *Landaluz Alimentos de Calidad*, whose goal has been to encourage its member companies to control their production processes, so that they are capable of guaranteeing safe and quality products to consumers.

The Foundation *Doñana 21*[211] was created to carry out the "Sustainable Development of Doñana and its Environment" and was promoted by the regional government *Junta de Andalucía* and the savings banks El Monte, San Fernando and Unicaja[212]. The aims of *Doñana 21* are, among others, to establish Doñana as a reference of its environment-friendly agricultural products of special quality elaborated with sustainable agricultural practices and to attach importance to wine, fruits and vegetables, oil and table olives through co-operative or diverse associative and business channels.

- The Andalusian Council for Agri-food Quality, a consultative institution, promotes quality Andalusian foods.
- The Conferencia Andaluza de Denominaciones de Calidad was constituted in Jerez as a forum to interchange experiences on quality in foods, such as to debate any issue related to the management and control functions.

Specific regulation and subsidies

Only the quality brands that are exclusively from Andalusia are studied in this section. *Calidad Certificada* and *Parque Natural de Andalucía* were created under the framework of the 1988 national legislation regulating brands through the following rules:

- The Royal Decree 242/2001, governing the brand *Calidad Certificada*.
- The Order published the 1st of august of 2001, regarding the brand *Parque Natural de Andalucía*.

Both rules establish quality-oriented aims and define the products protected as well as the requirements needed to get each brand. Furthermore, they establish the procedure to use the brand and create a logo to identify these products. Next section studies the certification, control and labelling process described in these rules.

The Andalusian Ministry of Agriculture and Fisheries is in charge of the promotion of Andalusian food products supporting promotional activities through specific aid. The main public subsidies in this respect aim, on the one hand to finance the participation of food companies in agri-food fairs and, on the other hand, to promote quality foods. Regulation councils are among the possible beneficiaries of both kinds of aid,, so they can indirectly affect food quality.

210 Decree 27/2003, of the 11th of February.
211 Fundación para el Desarrollo Sostenible de Doñana y su Entorno, Doñana 21 (Foundation for the Sustainable Development of Doñana and its environment).
212 It has been incorporated in the managing structure all the administrations, from the local to the European, county councils, businessman representatives as well as trade unions and conservationist associations like WWF or ADENA.

The promotion of quality foods is usually done through the mass media, presentations of products and informational pamphlets as well as through the institutional participation in agri-food fairs, where companies and public institutions collaborate through stands exhibiting Andalusian products. Olive oil, wine, Iberian pork products, fruits and vegetables are the most relevant productions in these promotional activities.

Furthermore, the Regulation Councils and other certification bodies receive specific aid through the Order of the 5th of November 2002 and the Decree 280/2001. The financial aid given to Regulation Councils in Andalusia is 2 million euros, that is, 50% of the 16 Regulation Councils'[213] budget.

- The Andalusian Ministry of Agriculture and Fisheries is in charge of the promotion of Andalusian food products supporting promotional activities through special aid.
- The main public subsidies finance food companies' participation in agri-food fairs and the promotion of quality foods.

Control, certification and labelling

This section analyses the different quality designations existing in Andalusia:

BRAND "CALIDAD CERTIFICADA"

The brand *Calidad Certificada* is a voluntary and complementary designation that identifies Andalusian foods whose quality standard is officially recognised by the regional government through the Andalusian Ministry of Agriculture and Fisheries. This brand is given for five years (renewable) to a specific product (but not to a group of products) that is protected by any of the existing quality designations (organic and integrated farming products, PDO, PGI, and TSG) or by certifications issued by certification bodies fulfilling the EN-45011 standards.

BRAND "PRODUCTO PARQUE NATURAL DE ANDALUCÍA"

This brand belongs to the Andalusian Ministry of Environment. Its main goal is to support entrepreneurial activities carried out in Natural Parks of Andalusia. These activities must be oriented towards sustainable development and have to offer standing out quality products and services to consumers. Such products and services must be linked to environmental values and promote a traditional and natural image. The brand *Producto Parque Natural de Andalucía* can be used for three years (renewable) and can be given to three kinds of products: natural products[214], craft products[215] and tourism-oriented products.

The producers whose products are under this brand have to accomplish the following general compromises:

- Quality: Producers have to establish the procedure to guarantee the quality standard of products or services, and that they comply with requirements for health conditions.
- Environment: They have to guarantee compliance with environmental legislation,
- Local image: Products and services have to be elaborated in the Andalusian Natural Parks

213 Source: http://www.andaluciajunta.es/economYempresas/AgriculturaPesca/0,,28106,00.html
214 Herbs, pulses, nuts, mushrooms, honey, salt, tinned fruits and vegetables, tinned meats and fishes, among other products.
215 Bread and bakery products, cooked pork products, cheeses and other dairy products, wines and liquors, among other products.

or local areas with a population lower than 100.000 habitants included partly within such Parks.

- Craft orientation: The methods used to manufacture products and provide services have to be traditional crafts

Besides, they have to accomplish certain specific compromises according to the kind of product and service:

- For natural products, at least 75% of their raw materials must be produced within the natural park area, coming from towns with fewer than 100,000 inhabitants.
- For agri-food products, raw materials must come from farms practising integrated or organic farming.
- For handicrafts, they must be total or partially hand-made and their characteristics must be at least partially determined by the artisans' skills.

The certification of products under this brand is issued by ANDANATURA, authorised by ENAC and composed by the Andalusian Ministry of Environment, the public company EGMASA, and some private companies. Once the certificate is obtained, the companies concerned must apply for the brand licence to the Andalusian Ministry of Environment that must decide within the following three months.

BRAND "LANDALUZ, ALIMENTOS DE CALIDAD"

This is a quality brand created by the association *Landaluz* in order to support the quality products elaborated by its member companies. These products have to accomplish certain standards related to the reception of raw materials, the processing method, the packing process and labelling. Bureau Veritas Español, S.A. is in charge of the control of those products.

QUALITY LABEL "DOÑANA 21"

The quality label *Doñana 21* was created by the homonymous Foundation for the promotion of products coming from the area of Doñana. Companies belonging to this brand have to be placed in one of the local communities included within the Programme for Sustainable Development of Doñana, and they have to comply with the ISO 9001 and ISO 14001 standards. Besides, these companies have to demonstrate that they manage good and continuing results to improve the environment and quality. This label is issued for three years (renewable). Control activities are carried out by the Spanish standardisation and certification association, AENOR (*Asociación Española de Normalización y Certificación*). After obtaining this brand, companies are audited annually.

- The brand Calidad Certificada is a voluntary and complementary designation that identifies Andalusian foods whose quality standard is officially recognised by the regional government.
- The main goal of the brand Producto Parque Natural de Andalucía is to support entrepreneurial activities carried out in Natural Parks of Andalusia.
- Landaluz and Doñana 21 are private collective brands.

Product marketing

Tables 35 and **36** offer information about the commercialisation of quality designations in the Andalusian wine and olive oil sectors. **ANNEX 33** shows this information referred to other

Table 35: Andalusian quality wines produced in specified regions in 2001/2002 vintage (hl).

Designation	Domestic trade		Foreign trade		Total (hl)
	hl	% of the total	hl	% of the total	
Condado de Huelva	88,008	90	10,005	10	98,013
Jerez y Manzanilla S. B.	136,629	19	567,029	81	703,658
Málaga y Sierra de Málaga	18,322	65	9,866	35	28,188
Montilla-Moriles	168,416	75	55,965	25	224,381
TOTAL in Andalusia	411,375	39	642,865	61	1,054,240
TOTAL in Spain	6,495,199	62	3,965,363	38	10,460,562

Source: Compiled by the authors using data from Ministry of Agriculture, Fisheries and Foods.

Table 36: Trade of Andalusian olive oil designations of origin in 2001.

Designation	Domestic trade (t)	Foreign trade (t)		Total	
		EU	NON EU	tm	Millions €
Baena	1,800	500	200	2,500	8.26
Montes de Granada [216]	-	-	-	-	-
Priego de Córdoba	550	969.2	58.3	1,577.5	3.88
Sierra de Cádiz	-	-	-	-	-
Sierra de Cazorla	-	-	-	-	-
Sierra de Segura	1,000	150	50	1,200	3.60
Sierra Mágina	1,915	60	25	2,000	4.85
TOTAL in Andalusia	5,265	1,679.2	333.3	7,277.5	20.59
TOTAL in Spain	10,639.9	2,278.8	487.8	13,406.5	42.68

Source: Compiled by the authors using data from Ministry of Agriculture, Fisheries and Foods.

sectors' designations. In the wine sector, the most important designations are *Jerez* and *Manzanilla S.B.*, which commercialise 81% of their output on the international market. It is necessary to stress the importance of the olive oil sector in Andalusia, as it commercialises 50% of the national production. *Baena* PDO is the most important designation (18% of the marketed volume in 2001), followed by *Sierra Mágina* PDO (15%) and *Priego de Córdoba* (12%).

- In the wine sector, the most important designations are Jerez and Manzanilla S.B., which commercialise 81% of their output on the international market.
- It is necessary to stress the importance of the olive oil sector in Andalusia, as it commercialises 50% of national production.

Factors influencing farmers' decisions

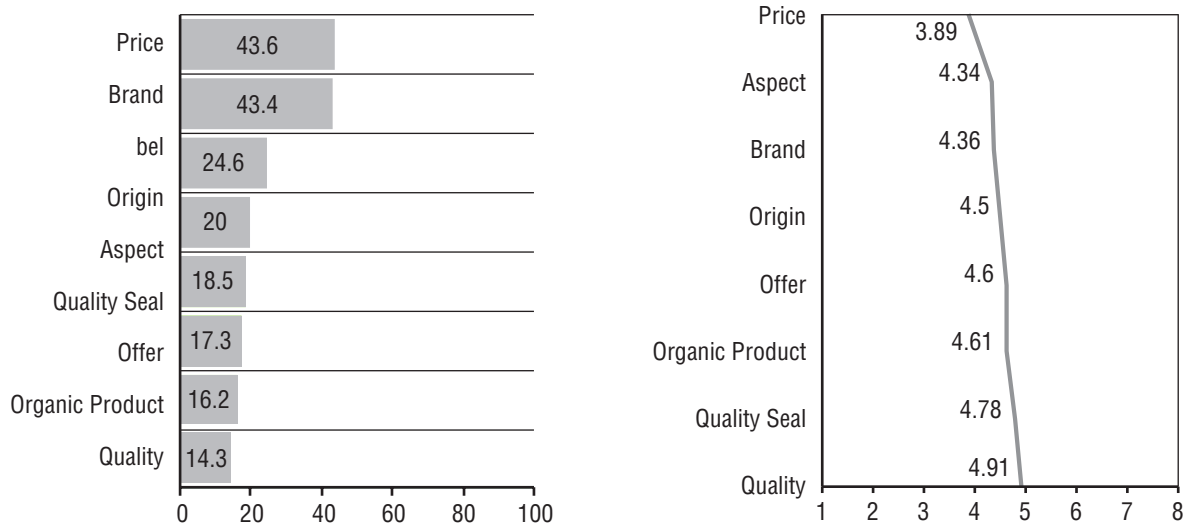
The main determining factors that make farmers adopt this agricultural system in Andalusia are the following:

Product Differentiation and Higher Prices

The most important factor influencing farmers' decisions to adopt a quality production system is to differentiate their farm products and so consequently obtain higher incomes. Research into the "Social Perception of *Calidad Certificada* in the Andalusian Society", carried out by the IESA-CSIC in 2003, showed favourable attitudes among both the Andalusian population and business sector towards foods guaranteed under *Calidad Certificada*. In fact, although only 14.3% of the Andalusian population takes into account whether the product is covered by a quality designation,

216 There are no figures because this designation was created in 2002.

Graph 23: Factors influencing consumers' food purchasing decisions.



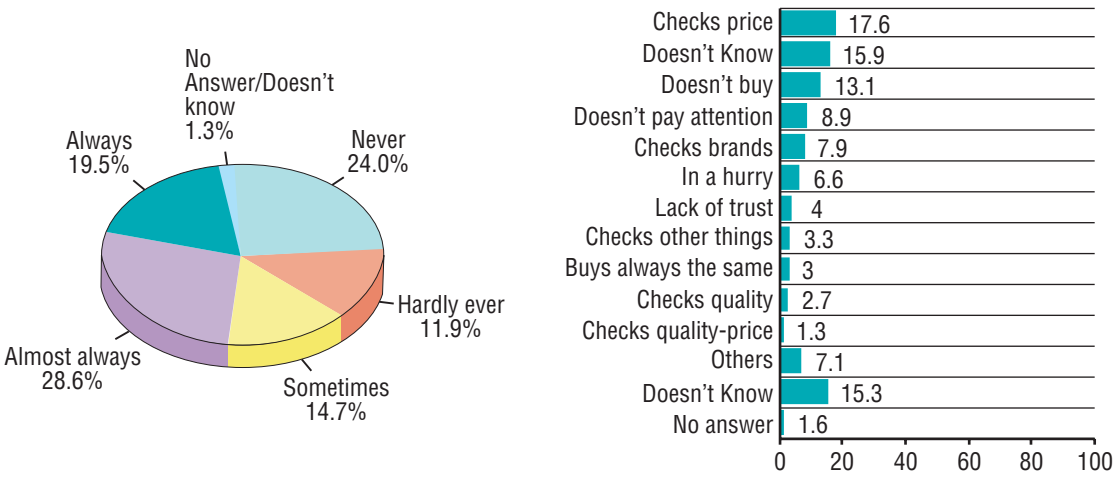
Source: IESA (2003)

the survey shows that they do take other quality-related factors into account, such as (**graph 23**) the brand (43.6%), the origin (24.6%) or the external features (20%).

Graph 24 shows how frequently Andalusian consumers take into account the quality designation of foods (always, often, sometimes, hardly ever and never), and the motivations of those who never take into account this criteria when they buy foods.

Almost two thirds of Andalusian consumers say they take into account quality labels and designations when they buy foods. In fact, 20% says they always take into quality criteria of this kind into account, while 30% says that they often take them into account and 15% some times. The motivations of those consumers who never take quality criteria into account are prices, ignorance or a lack of time.

Graph 24: Frequency of criteria related to quality designations used by Andalusian consumers and motivations of those who take never quality criteria into account when they buy foods.



Source: IESA (2003).

Tradition and Cultural Features of the Local Environment

The most important aim of quality designations linked to countryside or craft methods (PDO, PGI and TSG) is to protect local techniques and craftsmanship involved in food production. That is why farmers' decisions who adopt these practices have important positive effects on the maintenance of local traditions and culture. These implications are incentives for farmers, who are aware that they are contributing to reasserting their cultural identity.

New demands of market distribution channels

In the last two decades, the exportation-oriented distribution channel has demanded higher and higher quality standard in foods. These demands impel farmers to direct their productions towards quality designations.

Other factors influencing farmers' decisions regarding quality productions are the following:

- productive orientation of farms,
- awareness of health problems in food consumption,
- the existence of institutional recognition and implementation of legislation,
- the development of programmes aimed at encouraging consumption of quality foods and
- the implementation of policies aimed at promoting quality production in the agri-food sector.

- The most important factor influencing farmers' decisions to adopt a quality production system is to differentiate their farm products so as to obtain a higher income.
- Farmers' decisions who adopt these practices have important positive effects on the maintenance of local traditions and culture.

3. Analysis of the factors influencing the farmers' decisions

3.1. Introduction and objectives

This chapter examines the factors that influence farmers' decisions in choosing a new production system. These decision factors can be defined as the elements that exert a direct influence on a farmer's decision to adopt or maintain a given agrosystem. The farmer perceives such factors and makes a conscious decision whether exploit their advantages.

Research into farmers' attitudes towards production systems other than mainstream agriculture has so far been largely exploratory and hence relatively unambitious in terms of its scientific objectives, even though the qualitative and quantitative information collected to conduct it has been obtained using the usual methods for this type of investigation.

Because of the exploratory nature of studies in this field, the ultimate objective of this chapter was to develop an analytical framework that would shed some light on the factors that affect farmers' strategies and decisions in meeting the switch from traditional production methods to the new agrosystems. The most salient contribution of this type of research is that its conclusions can be used as outputs for empirical testing in new studies.

3.2. Methodology

Available knowledge on each alternative agrosystem and its status in the EU was used to produce a tentative list of factors, which was employed as a rough guideline , by way of an analytical framework, in each empirical case study. The exploratory study of each regional case was used to check the decision factors in the field, within the pre-established analytical framework. In this way, some of the original factors were removed and new ones added to compile the final list of explanatory factors for farmers' strategies in each region. Based on the final results of each regional case study, the significance of the individual factors on the list was rated as high, medium or low depending on how strongly they were found to influence farmers' decisions. Finally, a comparative analysis of the ratings for the factors in the three regions was used to discuss the significance of each factor in the adoption of the different emerging agrosystems. This analysis allowed us to return to the initial analytical framework, which, following careful revision, is presented in this chapter as the hypothesis to be tested in future empirical studies.

The construction of the analytical framework for this study thus involved the following steps:

- Developing a tentative framework on the basis of the knowledge derived from the literature scan performed.
- Applying such a framework to the three regional case studies (Andalusia, Lower Normandy and Bavaria).
- Constructing the final analytical framework from a comparative analysis of the conclusions on the three case studies.

3.3. Explanatory systems for farmers' strategies

As stated above, a final list of explanatory factors for farmers' strategies in each region examined was obtained by refining the tentative list. The final list consisted of 30 factors classified into six different categories or dimensions, namely: economic, structural, socio–cultural, environmental, techno–scientific and politico–institutional. Obviously, this classification was of purely analytical value as, in practice, the factors have a direct impact on more than one dimension. Nevertheless, we included each factor in the dimension most clearly reflecting its impact on farmers' decisions.

The *economic dimension* comprises three factors related to the efficiency of holdings (a result of reduced production costs and inputs, mainly) and the monetary gains (in the form of income from the marketing of their produce, subsidies or miscellaneous aid granted within the framework of public policies) of the farmers who use specific production systems. These factors can be changed in the short to medium term, under the influence of farmers (through their individual strategies), the public administration (through its policies) and commercial operators (through the prices of their products), so they may be seen as opportunities or threats to the introduction of new agrosystems.

The *structural dimension* comprises permanent —not temporary— factors that can only be changed in the long term, so they constitute strengths or weaknesses for emerging production systems. These factors are related to the characteristics of the holdings (size, division into plots, available natural resources, production types) and their owners (age, dedication to farming), as well as to the infrastructures of their closest external economic environment (marketing networks, local markets).

The *socio–cultural dimension* encompasses factors related to farmers' attitudes towards the processes of change being experienced by European agriculture and to the characteristics of the social environment in which they operate. This dimension includes factors related to the presence of a widespread associative movement in the region supporting the incorporation of new agricultural production systems; consumers' demands and purchasing power; the presence of a local culture favouring innovation; and farmers' awareness of the need to regain the legitimacy and social recognition of their profession.

The *techno–scientific dimension* encompasses factors that allow farmers to access the technology they need to implement the new production systems and experiment with their associated methods and techniques. This dimension manifests itself through an appropriate scientific research system, technology transfer and vocational training. Obviously, the dimension is closely related to the scientific and technical characteristics of each production system, so the difficulty and risks involved in adopting one vary between systems.

The *environmental and health dimension* comprises factors related to the effects of farming on the environment, the landscape, natural resources, animal welfare, human health and food safety, among other factors. Thus, some production systems are more ecologically sustainable than others and certain systems have more apparent effects (whether favourable or unfavourable) on the environment.

The *politico–institutional dimension* includes factors with an impact on the previous five and facilitates or hinders the transition to the new agrosystems. The factors in this dimension are related to global European policies and to their materialisation in national and regional policies (*e.g.* through the establishment of farmer training programmes, administrative and technical infrastructures for logistic support, differential recognition of the produce of the new systems, restrictions on the development of mainstream agriculture); in practice, however, they can materialise in various types of public–private partnerships (agreements).

3.4. Influential factors in each case study

This section rates the 30 previously established decision factors according to their influence on farmers' decisions in each region in the form of three separate tables for Andalusia, Lower Normandy and Bavaria (**tables 38, 39** and **40**).

The first column in each table shows the dimensions into which the factors were grouped, the second describes the factors and the third rates their influence on farmers' decisions as high, medium or low.

Table 37: Dimensions and decision factors.

Dimension	Factor
Economic	• Reduced production costs • Availability of public aid for farmers adopting the new systems • Premiums on the produce
Structural	• Farmer's age • Full- or part-time dedication to farming • Holding size • Production type • Natural resources • Availability of a readily accessible marketing network for the produce • Presence of local markets
Socio–cultural	• Farmer's attitude towards risk and innovation • Farmer's ideology and values in relation to the social role of agriculture • Presence of a local and/or regional entrepreneur culture • Consumers' new demands on the produce of the new systems • Social recognition and a new legitimacy for farmers • Presence of a social fabric organised around associations supporting the new systems
Techno–scientific	• Availability of a scientific and transfer technology system adapted to the new systems • Availability of readily accessible technology suited to the requirements of the new production systems • Technical feasibility of the transition to the new systems
Environmental and health	• Awareness of the environmental impact of the farming practices associated with some production systems • Concern with animal welfare • Awareness of food safety problems • Concern with the occupational hazards of mainstream agriculture methods
Politico–institutional	• Presence of legal recognition and a regulatory framework • Restrictions on the development of mainstream agriculture • Programmes aimed at fostering and promoting the consumption of the produce • Differential quality policies favouring specific production types • Vocational training programmes for farmers • Availability of a network providing technical consultancy for farmers

Table 38: Dimensions, decision factors and their ratings for Lower Normandy.

Dimension	Factor	Factor rating in each production system			
		Organic farming	Integrated Farming (*Agriculture raisonnée*)	*Agriculture Paysanne*	Agriculture under Guaranteed Quality
Economic	• Reduced production costs	Medium	High	Low	Low
	• Availability of public aid for farmers adopting the new systems	High	Medium	Low	Low
	• Premiums on the produce	High	Medium	Low	High
Structural	• Farmer's age	High	Medium	Low	Low
	• Full- or part-time dedication to farming	Medium	Medium	High	High
	• Holding size	Medium	High	High	Low
	• Production type	High	Medium	Low	High
	• Natural resources	Medium	Medium	High	High
	• Availability of a readily accessible marketing network for the produce	High	Medium	Low	High
	• Presence of local markets	High	Medium	Low	High
Socio–cultural	• Farmer's attitude towards risk and innovation	High	Medium	Medium	High
	• Farmer's ideology and values in relation to the social role of agriculture	High	Medium	High	Low
	• Presence of a local and/or regional entrepreneurial culture	High	Medium	Low	High
	• Consumers' new demands on the produce of the new systems	High	Medium	Low	High
	• Social recognition and a new legitimacy for farmers	High	High	High	Medium
	• Presence of a social fabric organised around associations supporting the new systems	High	High	High	Medium
Techno–scientific	• Availability of a scientific and transfer technology system adapted to the new systems	High	Medium	Low	Medium
	• Availability of readily accessible technology suited to the requirements of the new production systems	Medium	Medium	Low	Medium
	• Technical feasibility of the transition to the new systems	High	High	Low	Medium
Environmental and health	• Awareness of the environmental impact of the farming practices associated with some production systems	Medium	High	High	Low
	• Concern with animal welfare	Medium	Medium	High	Low
	• Awareness of food safety problems	High	High	High	High
	• Concern with the occupational hazards of mainstream agriculture methods	High	Medium	Medium	Low
Politico–institutional	• Presence of legal recognition and a regulatory framework	High	Medium	Low	High
	• Restrictions on the development of mainstream agriculture	Medium	High	Medium	Low
	• Programmes aimed at fostering and promoting the consumption of the produce	High	Medium	Low	High
	• Differential quality policies favouring specific production types	High	Medium	Low	High
	• Vocational training programmes for farmers	High	Medium	Low	Medium
	• Availability of a network providing technical consultancy for farmers	High	Medium	Low	Medium

Table 39: Dimensions, decision factors and their ratings for Bavaria.

Dimension	Factor	Factor rating in each production system		
		Organic Farming	Integrated Farming	Agriculture under Guaranteed Quality
Economic	• Reduced production costs	Low	High	Low
	• Availability of public aid for farmers adopting the new systems	High	Medium	Low
	• Premiums on the produce	High	Low	High
Structural	• Farmer's age	High	Low	Low
	• Full- or part-time dedication to farming	High	Medium	High
	• Holding size	Medium	High	Low
	• Production type	Medium	Medium	High
	• Natural resources	Medium	Medium	High
	• Availability of a readily accessible marketing network for the produce	High	Medium	High
	• Presence of local markets	High	Medium	Medium
Socio–cultural	• Farmer's attitude towards risk and innovation	High	Medium	Medium
	• Farmer's ideology and values in relation to the social role of agriculture	High	High	Low
	• Presence of a local and/or regional entrepreneur culture	High	Medium	Medium
	• Consumers' new demands on the produce of the new systems	High	High	High
	• Social recognition and a new legitimacy for farmers	High	Medium	Medium
	• Presence of a social fabric organised around associations supporting the new systems	High	Medium	High
Techno–scientific	• Availability of a scientific and transfer technology system adapted to the new systems	High	High	High
	• Availability of readily accessible technology suited to the requirements of the new production systems	Medium	High	High
	• Technical feasibility of the transition to the new systems	High	High	Low
Environmental and health	• Awareness of the environmental impact of the farming practices associated with some production systems	High	High	Low
	• Concern with animal welfare	Medium	Medium	Low
	• Awareness of food safety problems	High	High	High
	• Concern with the occupational hazards of mainstream agriculture methods	High	Medium	Low
Politico–institutional	• Presence of legal recognition and a regulatory framework	High	Medium	High
	• Restrictions on the development of mainstream agriculture	High	High	Medium
	• Programmes aimed at fostering and promoting the consumption of the produce	High	High	High
	• Differential quality policies favouring specific production types	High	Medium	High
	• Vocational training programmes for farmers	High	Medium	Medium
	• Availability of a network providing technical consultancy for farmers	High	Medium	High

Table 40: Dimensions, decision factors and their ratings for Andalusia.

Dimension	Factor	Factor rating in each production system			
		Organic Farming	Integrated Farming	Conservation Agriculture	Agriculture under Guaranteed Quality
Economic	• Reduced production costs	Medium	High	High	Low
	• Availability of public aid for farmers adopting the new systems	High	Low	Medium	Low
	• Premiums on the produce	High	Low	Low	High
Structural	• Farmer's age	High	Medium	High	Low
	• Full- or part-time dedication to farming	Medium	Medium	Medium	High
	• Holding size	Medium	High	High	Low
	• Production type	High	Medium	High	High
	• Natural resources	High	Medium	Medium	High
	• Availability of a readily accessible marketing network for the produce	High	High	Low	High
	• Presence of local markets	High	Medium	Low	Medium
Socio–cultural	• Farmer's attitude towards risk and innovation	High	High	High	Medium
	• Farmer's ideology and values in relation to the social role of agriculture	Medium	Medium	Low	Low
	• Presence of a local and/or regional entrepreneur culture	High	Medium	Low	High
	• Consumers' new demands on the produce of the new systems	High	Medium	Low	High
	• Social recognition and a new legitimacy for farmers	High	High	Low	Medium
	• Presence of a social fabric organised around associations supporting the new systems	High	Medium	Medium	Low
Techno–scientific	• Availability of a scientific and transfer technology system adapted to the new systems	High	Medium	High	Low
	• Availability of readily accessible technology suited to the requirements of the new production systems	Medium	High	High	Medium
	• Technical feasibility of the transition to the new systems	High	High	High	Low
Environmental and health	• Awareness of the environmental impact of the farming practices associated with some production systems	Medium	High	High	Low
	• Concern with animal welfare	Low	Low	Low	Low
	• Awareness of food safety problems	High	Medium	Low	High
	• Concern with the occupational hazards of mainstream agriculture methods	High	Medium	Low	Low
Politico–institutional	• Presence of legal recognition and a regulatory framework	High	Medium	Medium	High
	• Restrictions on the development of mainstream agriculture	Medium	High	Medium	Low
	• Programmes aimed at fostering and promoting the consumption of the produce	High	Low	Low	High
	• Differential quality policies favouring specific production types	High	Low	Low	High
	• Vocational training programmes for farmers	High	Low	Low	Medium
	• Availability of a network providing technical consultancy for farmers	Medium	Low	Low	Medium

3.5. Comparative analysis of the decision factors

This section compares each influential factor included in the analytical framework in the three regions and discusses the ratings given in each case.

3.5.1. Economic dimension

3.5.1.1. Reduced production costs

This factor has a strong influence on farmers' decisions in adopting integrated farming or conservation agriculture in the three regions. It has a lesser influence on the adoption of organic farming —this agrosystem does not necessarily result in reduced costs— and virtually no influence on the choice of agriculture under guaranteed quality —which often results in increased rather than reduced costs.

3.5.1.2. Availability of public aid for farmers adopting the new systems

This factor is especially influential on organic farming; in fact, a dedicated European programme exists in support of farmers adopting this new agrosystem. It influences mainly the newer generations of organic farmers, who lack the ideological motivations of the pioneers and are thus aware of the difficulties involved in the change appreciating the economic incentives (in the form of subsidies or low-interest loans) available for this agrosystems. To a lesser extent and in a more indirectly manner, other agrosystems are also affected by this factor. Thus, EU agro-environmental measures foster the implementation of conservation agriculture —though restricted to some specific farming practices— and integrated farming —though in some regions aid is limited to certain crops (i.e. in Andalusia integrated farming aid is only given for rice crops). Subsidies related to agriculture under guaranteed quality are mainly allocated to organisations or promotional activities, placing this factor as lesser influential.

3.5.1.3. Premiums on the produce

This factor influences the choice of both organic farming and agriculture under guaranteed quality as farmers adopting them seek to penetrate market niches where the produce of these agrosystems is sold at increased prices relative to other products. On the other hand, premiums have little influence on the adoption of integrated farming —except in relation to French *agriculture raisonnée*, with a strong social component— as its produce has not yet aroused consumers' demands. This is also the case with French conservation agriculture, especially because achieving consumers' distinction of their produce is not one of its objectives.

3.5.2. Structural dimension

3.5.2.1. Farmer's age

This factor has a powerful influence on organic farming in Andalusia and Lower Normandy, as well as on conservation agriculture in Andalusia as adherence to the values inherent in these agrosystems, and the desire to innovate, are more common among the younger generations. In Bavaria, this factor also influences the choice of organic farming, albeit to a lesser extent than in the other two regions, by effect of the Bavarian regional government's strong political backing to this type of agriculture —backing that affects all Bavarian farmers. On the other hand, the age of the farmers concerned has little influence on the adoption of integrated farming or agriculture under guaranteed quality, which is dictated by other factors such as agronomic training, expected benefits, or environmental impact.

3.5.2.2. Full- or part-time dedication to farming

Based on the available data, farmers' dedication appears to influence the decision to adopt a new agricultural production system. Thus, full-time dedication seemingly facilitates the switch to organic farming, particularly in regions such

as Bavaria, where farmers have professionalized to such an extent that they must devote most of their time to managing their holdings. Dedication appears to be less influential on conservation agriculture and integrated farming, where many farmers share agriculture with other occupations and outsource much of the work required by their holdings. Obviously, quality designations call for an increased dedication owing to the high professionalisation prevailing in the associated production systems.

3.5.2.3. Holding size

Holding size was markedly influential on the early development of organic farming in the three regions; in fact, the movements in support of this agrosystem were initially led by small-scale farmers. Subsequently, the body of organic farmers in the three regions has become more heterogeneous, so holding size no longer appears to be so influential. Although the choice of conservation agriculture or integrated farming is influenced by holding size, it is medium- and large-scale holdings that tend to be converted into these two systems. Finally, the decision to adopt agriculture under guaranteed quality does not seem to be influenced by holding size as it is practiced by a wide variety of farmers in the three regions.

3.5.2.4. Production type

This factor obviously influences the choice of organic farming as the ease of migration to this agrosystem depends on the particular type of production. For example, olive producers in Andalusia are more inclined to adopt organic farming than are vegetable and fruit farmers, and livestock breeders (who tend to use intensive methods); by contrast, the switch to this production system in Lower Normandy and Bavaria is more common among extensive (meadow) livestock breeders. The choice of conservation agriculture is also strongly influenced by this factor as it is extensive holdings that are usually converted in order to mitigate soil erosion problems. Somewhat less marked is the influence on integrated farming; however, some production types (*e.g.* olive trees and strawberries in Andalusia) have a stronger tendency to convert to this new agrosystem based on the use of reduced inputs. Finally, some products of quality agriculture (*e.g.* wine, oil, various vegetables and fruits in Andalusia) enjoy better market distinction than others.

3.5.2.5. Natural resources

The natural resources (climate, soil, water) available in a region obviously influence farmers' decisions. In organic farming, the marginality of holdings was a crucial factor for the pioneers, who saw it as a means to ensure their sustenance as farmers. The former identification of organic farming with marginality no longer holds as the current practitioners of this agrosystem are highly professionalized farmers managing modern holdings and seeking a new market niche for their produce. The availability of natural resources influences the decision of farmers to adopt integrated farming or conservation agriculture as they easily realise to what extent the intensive practices of mainstream agriculture can deplete them. Agriculture under guaranteed quality is also affected by natural resource availability in that marginal holdings with scant resources can hardly yield market distinguished products unless their produce is closely bound to a given territory.

3.5.2.6. Availability of a readily accessible marketing network for the produce

The choice of organic farming or agriculture under guaranteed quality is clearly affected by the presence of a readily accessible marketing network for farmers as the primary goal of these agrosystems is market distinction. Integrated farming is less markedly influenced as it has not yet stimulated demand from consumers. Finally, conservation agriculture is virtually unaffected by this factor as it is aimed at proper exploitation of natural resources rather than at marketing.

3.5.2.7. Presence of local markets

The foregoing also holds for this factor, particularly as regards organic farming, the distribution framework for which is more closely connected to local markets than are quality designations —which are marketed at large distribution centres. Until it achieves more widespread acceptance among consumers, integrated farming is mostly present on local markets (see, for example, the situation of *agriculture raisonnée* in Lower Normandy), so the migration to this agrosystem is obviously strongly influenced by this factor. For the same reasons as the previous factor, farmers' decisions to adopt conservation agriculture have little or nothing to do with the market or marketing conditions.

3.5.3. Socio-cultural dimension

3.5.3.1. Farmers' attitudes towards risk and innovation

A number of studies have shown that farmers inclined to take risks and innovate find it easier to change their habits. Unsurprisingly, this factor has proved highly influential on the choice of organic farming in the three regions; in fact, this agrosystem involves greater risks than others such as integrated farming or conservation agriculture in some production sub-sectors. The influence of this factor increases with decreasing public support (in the form of funding or technical advice) available to farmers. For this reason, Andalusia exhibits a strong relationship between the adoption of organic farming or any other agrosystem involving uncertainty and farmers' risk-taking and innovation capacity.

3.5.3.2. Farmer's ideology and values in relation to the social role of agriculture

The farmer's ideology (*viz.* the body of values and beliefs a farmer holds in relation to the social role of agriculture), initially exerted a powerful influence on the adoption of organic farming in the three regions; organic farming was in fact perceived as a better choice than mainstream agriculture in not only economic, but also social and cultural terms. As its professionalisation has increased, the ideological factor has lost influence at the expense of other dimensions such as the economic one. Ideology also has relatively little influence over the choice of conservation agriculture, integrated farming and agriculture under guaranteed quality. This is not the case, however, with French paysanne agriculture, which is more closely related to a new social model of agriculture —where land-bound, small-scale holdings are the norm— than to any particular production system.

3.5.3.3. Presence of a local and/or regional entrepreneur culture

Farmers' attitudes are the result not only of their values and beliefs, but also of the dominant culture in their local and regional environments. Thus, the presence of a local or regional entrepreneurial culture can promote a favourable attitude among the population —farmers in our case— towards change and innovation. In fact, the three case studies expose an influence of the prevailing local culture on farmers' decisions to adopt organic farming or agriculture under guaranteed quality, which are the most widespread alternative agrosystems. The choice of conservation agriculture or integrated farming is less markedly influenced by this factor as these production systems are still fairly uncommon in the three regions, where they are practiced by farmers who are relatively independent of their local environment.

3.5.3.4. Consumers' new demands on the produce of the new systems

This factor obviously has a significant influence on the development of organic farming and agriculture under guaranteed quality as it raises gain expectations among farmers that encourage them to adopt these systems. Integrated farming is much less markedly influenced by this factor. However, the increasing demand for traceability by consumers will add momentum to the adoption of this agrosystem. On the other hand, consumers'

food-related demands seemingly have —and are expected to have— no influence on the choice of conservation agriculture; rather, the choice is dictated by the population's increasing concern about the proper exploitation of natural resources and preventing environmental deterioration.

3.5.3.5. Social recognition and a new legitimacy for farmers

The successive food crises caused by specific animal health problems, widespread concern about agricultural surpluses, and the questioning of public funding for agriculture, have led farmers' associations to seek a new legitimacy for their members. This has clearly materialised in those systems where the ideological dimension is quite strong, as was formerly the case with organic farming and is now with French *agriculture raisonnée* and paysanne agriculture. However, the search for social recognition is also becoming commonplace in the more professionalized systems such as integrated farming and agriculture under guaranteed quality —where safety and traceability principles are gradually gaining ground—, and conservation agriculture —the legitimacy of which lies in the adherence to good agricultural practices to ensure more efficient exploitation of natural resources.

3.5.3.6. Presence of a social fabric organised around associations supporting the new systems

It is well-known that a social fabric properly organised around associations is an important factor in the development of agriculture. However, it can also be a hurdle if such associations are obsolete and bound to traditional models that lack dynamism and are unable to evolve. In those regions where a well-established associative movement exists (*e.g.* in Lower Normandy and Bavaria for organic farming), the production systems concerned spread more easily among farmers by effect of farmers' organisations serving as a source of reference information and providing logistical support networks. Because agriculture under guaranteed quality is guided by a trade and marketing logic, its adoption is more markedly influenced by the presence of economic organisations (co-operatives, producers' associations, interprofessions) than by that of vindicative organisations (unions, professional associations).

3.5.4. Techno-scientific dimension

3.5.4.1. Availability of a scientific and transfer technology system adapted to the new production systems

The adoption of a new agricultural production system involves some changes in the way holdings are managed; this makes the presence of a science and technology transfer system capable of meeting the new requirements of farmers especially important. This factor is therefore strongly influential on the choice of production systems involving substantial changes, as is the case with organic farming —which recovers traditional practices— and conservation agriculture —which experiments with new practices. The influence of this factor on the adoption of agriculture under guaranteed quality is dictated by marketing and distribution criteria; in fact, this agrosystem facilitates a better knowledge of consumers' demands and hence their meeting.

3.5.4.2. Availability of readily accessible technology suited to the requirements of the new production systems

Farmers' willingness to make the transition from mainstream agricultural practices is not enough if they do not have access to the technology required. Hence, this factor is highly influential on the choice of those agrosystems whose practice calls for the use of new technologies (*e.g.* integrated farming and conservation agriculture). The choice of organic farming is less markedly affected by it since, based on available data, this production system involves no substantial technological changes in holdings, but rather in the use of natural resources.

3.5.4.3. Technical feasibility of the transition to the new systems

Obviously, the ease of migration from mainstream agriculture to the new agrosystems depends on the particular production system —and, as mentioned, on the specific production type. Therefore, this factor has a strong influence on farmers' decisions as some production systems may be riskier to adopt than others. For example, it is easier to switch from conventionally to organically managed olive trees (a crop with a strong ecological component in its traditional practices) than to switch to organic vegetable or fruit production given that the production methods for these are more rigid. In those cases where the transition is especially difficult, it is preferable to adopt an intermediate system (*e.g.* integrated farming, which is seen as a preliminary step in the switch to organic farming in some of the opinion centres studied).

3.5.5. Environmental and health dimension

3.5.5.1. Awareness of the environmental impact of the farming practices associated with some production systems

The effects of mainstream agriculture on the environment are difficult to measure as they are rather diffuse and vary between production types. As a result, farmers' awareness of such effects also varies markedly. When a given adverse effect is readily apparent, farmers are more willing to adopt a new system to avoid it. This is particularly true of integrated farming and conservation agriculture: those who adopt it are well aware of the adverse environmental impact of the intensive models traditionally associated with mainstream agriculture. Obviously, this factor has no influence on the decision to adopt agriculture under guaranteed quality as this system is market –rather than environment– oriented. The impact of mainstream agriculture on the environment is a highly significant element in the discourse of the advocates of *paysanne* agriculture in France.

3.5.5.2. Concern with animal welfare

This is a topical subject in countries such as France and Germany, where it has become a major public concern and hence an issue for the authorities and farmers. This factor has very little or no significance in Andalusia. The agrosystems most strongly influenced by it are organic farming and integrated farming, which are gradually incorporating animal welfare into their good practice codes. This factor has no influence on the adoption of other emerging agrosystems such as conservation agriculture and agriculture under guaranteed quality, but it has on the choice of French paysanne agriculture —which is consistent with not only the economic dimensions, but also all other dimensions of this production system.

3.5.5.3. Awareness of food safety problems

Food safety is an influential factor about which there is a growing concern since the recent crises arising as a result of mainstream farming practices (e.g. so-called mad cow disease, dioxin poisoning). This concern has also reached the farming sector and encouraged a departure from mainstream production practices and the institution of control mechanisms in the three regions. This is quite apparent in the case of organic farming and agriculture under guaranteed quality, which have become highly sophisticated through adherence to traceability principles. Also, this factor has become commonplace in the discourse of farmers practicing other systems such as integrated farming.

3.5.5.4. Concern with the occupational hazards of mainstream agriculture methods

The effects of mainstream agriculture practices on the health of farmers and agricultural labourers are a matter of growing concern. This concern is a result not only of occupational accidents, but also of the toxicity of the chemicals (mainly pesticides) used on intensive holdings. Consequently, this factor can strongly influence the choice of organic

farming and integrated farming, but is much less influential in the case of agriculture under guaranteed quality or conservation agriculture. In these latter cases the greatest concern is food safety and the preservation of natural resources, respectively.

3.5.6. Politico–institutional dimension

3.5.6.1. Presence of legal recognition and a regulatory framework

As noted in the previous section, organic farming and quality designations are the only two emerging agrosystems comprehensively regulated at the European, national and regional levels. Integrated farming is in the process of being recognised by the European Union; national associations are debating whether to regulate it in terms of holdings (the prevailing position in France) or of specific crops (as advocated by Spain and Germany). Conservation agriculture has not yet been officially acknowledged as an agrosystem by the EU, even though it has been, to some extent, in countries such as Spain; nevertheless, the EU environmental programme facilitates the recognition of some practices associated with this agrosystem and provides incentives for them where they help protect the environment.

3.5.6.2. Restrictions on the development of mainstream agriculture

Any restrictions on the practice of mainstream agriculture can potentially favour the adoption of new farming systems. This is especially the case with integrated farming and conservation agriculture, which are particularly easy to implement in regions such as Andalusia, where the use of some environmentally hazardous practices is restricted; thus, the adoption of minimal tillage is facilitated by the presence of soil erosion problems, as is the use of reduced fertiliser inputs by that of polluting agricultural nitrates in underground waters. The growing concern with food safety has led the authorities to impose restrictions and controls on production processes —particularly livestock breeding—; this has encouraged many farmers to depart from mainstream farming methods.

3.5.6.3. Programmes aimed at fostering and promoting the consumption of the produce

The new food production systems are unlikely to succeed if they are unable stimulate consumer demand. This can be achieved efficiently through promotional campaigns for their specific produce. The authorities play a crucial role in the dissemination of these products in the three regions examined. Some programmes rely on agreements between consumers' associations and producers' organisations; such is the case with Germany and, more specifically, Bavaria, where such organisations take on the supervision and control of traceability assurance processes.

3.5.6.4. Differential quality policies favouring specific production types

As a rule, these policies rely on the acknowledgement of logos defining the quality of products in terms of specific characteristics of the territory where the holdings, producers and processors involved in their production are based. The logo policy for organic farming, integrated farming and agriculture under guaranteed quality in the three regions has had a strong impact on consumers (except for integrated farming in Bavaria, where no logo has so far been defined)— who see them as guarantees of the products they consume— and farmers —who increase their expectations to obtain additional income in the form of premiums on their produce.

3.5.6.5. Vocational training programmes for farmers

Based on available data for the three regions studied, in the absence of vocational training programmes for farmers, the emerging agrosystems are only adopted by an elite of farmers motivated by heightened environmental concerns or their agronomic training. Training programmes, which

are realised through public–private agreements in co-operation with agrarian organisations, are thus very important. This is particularly apparent in the case of organic farming, and somewhat less so with integrated farming and conservation agriculture, where farmers tend to be self-taught and establish their own association networks. Quality issues are dealt with by co-operatives and interprofessional bodies (particularly in France, where this production system is quite well-established).

3.5.6.6. Availability of a network providing technical advice for farmers

Based on the results of our study, it does not suffice to encourage farmers to adopt the new productions systems with providing funding and training programmes; ensuring that their decision to change their practices will be durable requires one further step. It is thus very important to establish an efficient infrastructure to provide the farmers adopting the new systems with technical advice and support in order to help them solve the problems inevitably encountered in managing their holdings after switching to the new practices. In the absence of such infrastructure, many such farmers are bound to return, frustrated, to their former, mainstream methods, which will have detrimental effects on the sector as a whole. In the regions examined, technical advice and support networks are either public (in Andalusia), private (in Bavaria) or co-managed by the administration and the agricultural sector (in France, via agrarian chambers).

4. The future of alternative agrosystems

4.1. Introduction and objectives

Once the current scenario for agricultural systems in Europe has been described and the factors influencing farmers' decisions to adopt them examined, this chapter presents the authors' structured reflection[217] on the future of so-called "alternative" or "emerging" agrosystems in the EU. The time horizon set for this purpose, 10 years, places us in the prospective scenario for such agrosystems in the year 2013.

This prospective analysis has been restricted to the currently best-defined and most extensively developed alternative systems, namely:

- Organic farming,
- Integrated farming,
- Conservation agriculture and
- Agriculture under guaranteed quality.

In this chapter, the potential evolution of alternative or emerging agrosystems in the EU is predicted by:

- Identifying and defining the factors that will drive, or play a decisive role in, the development of agrosystems in the coming years (i.e. the key drivers).
- Appraising their significance.
- Anticipating the potential evolution of the key drivers within the proposed time scope.
- Identifying potential implications of the foreseeable future of the key drivers on this evolution.
- Describing the potential future outlook for the agrosystems examined.

It should be noted that the assertions made in this chapter represent the opinions of the authors and their collaborators in this work. Therefore, the reflections below constitute a rough approximation to the topic in the absence of more specific studies on the future of these systems. This is only intended to open up a debate on their prospects and hence on the role of EU agriculture in the 21st century.

4.2. Some preliminary concepts: decision factors, drivers and dimensions

In the previous chapter, we defined decision factors as the elements consciously judged by farmers when adopting a given agrosystem. In this chapter, we reflect on the foreseeable evolution of agriculture in general and emerging agrosystems in particular. We have sought to avoid restricting ourselves to farmers' will as the sole driver for the change. These decision factors are too limited in scope for the intended purpose. Therefore, we need to consider more general and integrating factors potentially influencing the actions of all the actors playing a role in agriculture (viz. public bodies, consumers, society, environmental agents, industries, the retail chain and, obviously, farmers).

By drivers we mean events, facts, trends, actions or incentives that drive or dictate in an appreciable manner the development of the systems concerned (viz. alternative agrosystems). The **key drivers** are the most influential drivers, those which will dictate the evolution and future of such systems.

217 With the aid of collaborating experts.

Decision factors are clearly influenced by drivers. In a way, a decision factor is the specific form in which farmers perceive or interpret one or more drivers.

Like decision factors (see Section 3.3.), drivers can be related to the different dimensions that constitute the framework of farming. The problem is that, because drivers are more general in scope than decision factors, a given driver frequently influences more than one dimension —a primary dimension can very often be identified, however.

4.3. Methodology

As noted earlier, the contents of this chapter are based on a collective reflection by the **working group directly engaged in the project,** on the information gathered in previous phases, as well as on their own knowledge and past experience. In order to enrich the group's view with a wider range of opinions, the authors obtained the active contribution of two collaborating groups, namely[218]:

- **Group A (D.a.p.),** which consisted of technicians of the *Empresa Pública Desarrollo Agrario y Pesquero* not directly involved in the project. Its members were specialists in a variety of aspects of the agri-food complex (viz. law, strategic planning, training, research, marketing, cattle breeding, harvesting techniques, farmer advisory system, statistics and information management, organic farming, integrated farming, etc.).
- **Group B (other experts),** which comprised persons of recognised standing and professional experience in agricultural matters (university staff, regional and Community administration staff, members of parliament, bodies concerned with the alternative agrosystems, service providers, suppliers, etc.).

Most of the steps of the analysis presented in this chapter started from proposals of the core of our work group. Such proposals were appraised, completed and refined in work sessions with Group A (D.a.p. technicians) and through questionnaires or individual interviews with members of Group B (other experts). Finally, our work group analysed, compiled and summarised the contributions of both groups in order to complete the preliminary analysis.

The steps followed to produce this document coincided with each of the above-described specific objectives and led to the writing of a synthesis document.

By way of example, the definitive list of key drivers (the first specific objective) was produced from a long list of potential drivers compiled by our work group and completed by generalising the decision factors identified in the case studies, as well as the literature on the drivers that are currently dictating the evolution of farming in general.

Our work group presented this preliminary list to Group A in a dedicated work session; its members completed and refined it by deleting those drivers they deemed irrelevant or redundant, and integrating those related in some way. From this session, each selected key driver was defined. Then, the members of Group B (the external experts group) were presented with a list of key drivers and asked to alter their definitions or add new drivers as they thought fit. The other steps of the process were performed as described for this first step.

The results are discussed below in three different sections. The first presents the key drivers considered and their tentative classification. The second consists of 16 records (one per driver examined). The records share the same layout, which includes the following:

218 The views of the members of both collaborating groups constitute their own individual opinions and do not necessarily represent the official positions of the institutions they represent. Their names are listed in Annex 34

- The designation of each driver;
- its classification with respect to the primary and secondary dimensions;
- its description (definition and scope);
- the appraisal of its significance to the alternative agrosystems on the proposed time horizon;
- its likely evolution; and
- its potential future implications for the agrosystems studied.

By way of synthesis, the third section provides a general description of the prospects for each individual agrosystem examined.

4.4. Selection of key drivers and dimensions

The final key driver list contained the following items:

Key Driver	
1.	Specific aid for alternative agrosystems
2.	General scheme of CAP aid
3.	Price of agricultural products
4.	Farmer profile
5.	Holding structure
6.	Development and transfer of new technologies
7.	Consumers' awareness of environment- and health-related issues
8.	Community harmonisation of alternative agrosystems regulations
9.	Cross-compliance
10.	Farm Technical advice on alternative agrosystems
11.	Agri-food demand in the enlarged EU
12.	Agri-food supply in the enlarged EU
13.	Acceptance of genetically modified crops by the EU
14.	Diversification of rural economy
15.	Macroeconomic situation
16.	Distribution and marketing structures

For consistency with the decision factors examined, these drivers were considered in relation to the following dimensions:

- Politico–institutional
- Economic
- Socio–cultural

- Environment- and health-related
- Structural
- Scientific–technological

The politico–institutional dimension was split into two fairly independent sub-dimensions, namely: market policy and structural policy.

Primary and secondary dimensions are assigned to each driver in its corresponding record.

4.5. Key drivers: records

4.5.1. Specific aid for alternative agrosystems

POLITICO-INSTITUCIONAL

Market policy	Structural policy	ECONOMIC	SOCIO-CULTURAL	ENVIRONMENT AND HEALTH-RELATED	STRUCTURAL	SCIENTIFIC-TECHNOLOGICAL

RELATED DIMENSIONS:

DESCRIPTION:

Within the broad framework of potential agricultural policies, this driver encompasses any type of institutional support farmers may be eligible to receive if they comply with specific agreements concerning one of the agrosystems studied This aid may be aimed at compensating farmers for the cost of transition, loss of income or price gaps with conventional practices, or simply be justified as a means of promoting practices that are deemed socially or environmentally valuable by the public authorities.

Agreements in this context are fulfilled by complying with specific protocols or implementing practices typical of the alternative agrosystems. Therefore, aid of this type can be established without the need for the administrations concerned to acknowledge or thoroughly regulate the alternative system to be supported, but only to define specific practices or standards and control their observance.

SIGNIFICANCE OF THE DRIVER:

LOW	MEDIUM-LOW	MEDIUM	MEDIUM-HIGH	HIGH

LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

Although the future of Community aid may be influenced by a number of factors (including EU enlargement, the WTO, budgetary stability and social legitimacy), the economic resources devoted by the EU to rural development, food safety and environmental protection can be expected to rise. Taking into

account that many such factors are present in the agrosystems studied, one can expect specific aid for these systems —or their practices— to be increased.

Specific aid for agrosystems for which official control and certification have already been established have the additional advantage that they simplify management and facilitate control, which are both very important in the current scenario of Community policies.

Consistent with this perception, the Mid-Term CAP Review of 2003 expanded and/or consolidated measures in favour of some alternative agrosystems. Thus, it increased the Community co-funding of agri-environmental measures (85% in the objective 1 regions and 60% in the others), withdrew set-aside obligations in the case of organic farms and provided for legume cultivation on set-aside land, among others. The Review allows interested Member States to strengthen their support for quality or environmentally interesting products. Also, measures in favour of rural development, which is the second pillar of CAP, can include specific aid for some emerging agrosystems (e.g. aid for the preservation of farming activities in some areas, co-funding of operating programmes of recognised producers associations, etc.).

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

Subsidies are important for environmentally friendly agriculture. Their significance, however, is gradually decreasing in relation to price. It is expected that aid will continue to play a prominent role in facilitating farmers' adoption of this system in the future, by compensating for potential production losses in the first few years and by reducing the risks involved in the changeover.

Specific aid will continue to dictate whether small farms and farms in less favoured areas can achieve income levels at which farming is viable under such conditions. On the other hand, they will lose importance relative to those large and highly productive farms whose main goal is to find safer, more profitable outlets for their produce.

Because obtaining aid within the framework of agri-environmental measures today entails the signing of multi-annual agreements, the situation is not expected to change much in the short run. There might, however, be slight changes in some regions with a special interest in favouring this agrosystem.

Also, the regional implementation of the recent CAP Review, the new measures adopted to support rural development and the imminent EU Action Plan for Organic Farming might provide additional help for this agrosystem to emerge. In any case, support within this new framework is unlikely to materialise in new direct aid.

Integrated farming

Countries where integrated farming is currently being promoted by national or regional authorities may include it among the targets of agri-environmental aid programmes for environmentally friendly agrosystems. However, even in those countries where this appears to be especially likely (*e.g.* Spain), the need for national co-funding of this financial aid is bound to hinder its extension to all crops and regions.

The presence of specific aid for this agrosystem or some of its typical practices might be decisive for their adoption. Because switching to this system involves no substantial change in profitability and its produce still lacks market distinction, the awarding of specific aid can have significant effect in stimulating it.

The presence of producer associations adhering to these practices in some countries may encourage the setting up of financial aid schemes aimed at covering expenses and funding collective projects of

such associations (*e.g.* technical advice, operating programmes). These may be more efficient than direct payments for producers in the long run.

Conservation agriculture

A potential increase in specific aid for this agrosystem might have strong effects. As noted in the analysis of decision factors, one of the key reasons leading to its adoption is the reduced costs it entails, making it fit in with farmers' pursuit of better returns. The presence of specific financial aid can help those initially unwilling to adopt its practices overcome the barriers posed by tillage techniques contradicting those they have used for decades. This will favour dissemination of the system —or at least of some associated practices— in erosion-prone regions.

Agriculture under guaranteed quality

Historically, agriculture under guaranteed quality has enjoyed no specific direct aid (per unit area) similar to those for the systems described above. Rather, public support has focussed on promoting its produce and funding certifying and supervisory bodies (*e.g.* regulatory councils). Farmers and producers have therefore derived no direct benefits from them.

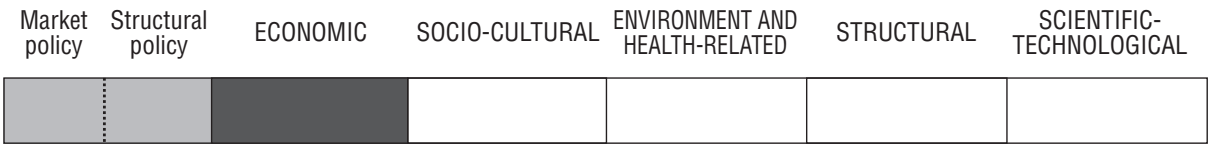
As noted earlier, the regional implementation of the recent CAP review and changes in the rural development policy might provide a new support framework for quality-assured products.

In any case, the award of more or less direct aid for such a clearly market-oriented system —the price gap with mainstream products of which is its principal asset— will represent but an additional incentive to be considered by farmers.

4.5.2. General scheme of CAP subsidies

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL

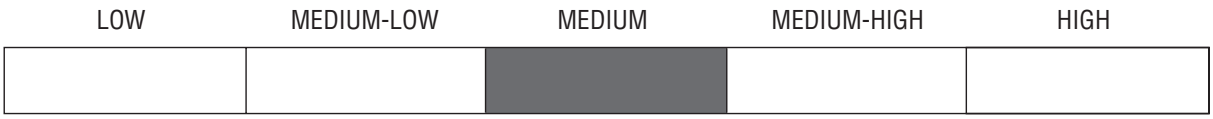


DESCRIPTION:

This driver is concerned with the influence of the European system of farming aid and its potential evolution in the coming years on the development of the different agrosystems, particularly in relation to general aid for farmers not depending on the specific agrosystems they have adopted. The general scheme of the Common Agricultural Policy aid includes both market supporting policies in their different variants (*viz.* area-based subsidies, subsidies for cattle rearing, and subsidies on production, transformation and consumption), agri-environmental aid —some of which are directly related to specific alternative agrosystems or their practices— and structural policy aid (*e.g.* farm modernisation and improvement, easier access of young people to farming).

Worth special note in relation to the new Community guidelines are the effects of the progressive decoupling of subsidies from production, the freezing of farming expenses and a potential trend to a generalised reduction in the level of aid.

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

The evolution of the general aid scheme will unarguably be dictated by the implementation of the Mid-Term Review of 2003 of the Common Agricultural Policy. Through decoupling, the Review has totally or partly disconnected direct aid from production. Accordingly, most European farmers will receive a single annual payment per holding that will be calculated from its productive activity over a historical reference period. In this way, agricultural production is expected to acquire a market focus; in the process, some farmers may switch to one of the emerging agrosystems seeking a better commercial positioning of their produce.

In this context, it may be anticipated that farmers will be freer to adapt their produce to market demands and competitiveness will therefore be fostered.

Also, according to the experts asked, CAP subsidies are likely to be refocused towards improving agricultural structures and promoting rural development through the use of the funds generated via the compulsory module mechanism included in the current support system. The current notion of rural development includes a growing significance of the actions aimed at fostering and increasing the appreciation of agricultural produce, and at preserving the environmental and cultural heritage; these traits are all present in the emerging agrosystems. Therefore, and increased weight of the second pillar on which CAP rests could favour the development of agrosystems such as organic, origin-bound and traditional farming.

One other salient feature of the new aid system is the flexibility principle, which expands the scope of the EU Member States in implementing Community regulations. Thus, the States (or even some regions) will be empowered to devote part of their national (or regional) budgets to additional payments aimed at fostering quality or environmentally valuable farming activities —both of which are included in the alternative agrosystems examined here. The increased regulatory freedom of national and regional institutions may widen regional differences in support given to emerging agrosystems. Therefore, the sensitivity of public administrations in this context will be especially important in the near future.

The gradual reduction of farming aid that may result from the virtual implementation of the financial discipline mechanism (included in the recent CAP review) may strengthen the adoption of new forms of production (e.g. the agrosystems examined here) that will allow the resulting loss of income to be compensated for by the market.

By way of a summary, a distinction can be made between the potential effects of general CAP aid on systems which have a solid presence on the market (viz. organic farming and agriculture under guaranteed quality) from those on the other systems (e.g. integrated farming and conservation agriculture). In the former, aid reduction and decoupling may lead new farmers to adopt these agrosystems. The gradual deregulation of markets may turn such agrosystems into a means of avoiding or at least reducing the resulting loss of

income. On the other hand, the survival of agrosystems with no market distinction for their produce will rely on the transfer of funds to rural development policies and the sensitivity of national and regional authorities to these issues.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

As mentioned, it may be envisaged that the new aid system will benefit organic farming and expand the land area devoted to it. Decoupling provides greater flexibility in planning production, which, in the case of farms in marginal areas (i.e. farms with a low potential), may trigger a rapid switch to organic farming as a way of obtaining subsidies.

Also, the generalised reduction of aid may further increase the need for new market outlets, which may also benefit organic farming —particularly if this agrosystem enjoys some additional regional payments or the effects of rural development measures. National (and regional) administrations will play a decisive role here.

Integrated farming

Based on this driver, the future of this agrosystem appears to be more uncertain than that of organic farming. The national (or regional) implementation of the new CAP will be one of the factors most strongly influencing such a future. In the absence of Community-wide harmonisation for integrated farming, the official endorsement of this system at the national level and its inclusion among objective quality or environmentally valuable production systems will dictate whether it receives any additional funding outside the general aid scheme.

In response to the reduction of aid, farmers may regard integrated farming as an alternative to mainstream agriculture if such aspects as its market distinction and consumers' appreciation —which will reflect on produce prices— are developed.

However, the cross-compliance inherent in the new CAP aid, which is analysed as a separate driver, may be much more relevant to integrated farming as European mainstream agriculture can be subjected to rules similar to those currently imposed on this agrosystem.

Conservation agriculture

As in the previous case, and because this agrosystem is even more unlikely to achieve the market distinction required to obtain additional income from its produce, the new aid system can hardly be expected to have any direct favourable effects on it. However, some of its associated practices may expand across the Community's territory if they are included in the environmental measures rewarded by national (or regional) authorities as complements to their rural development measures. This will obviously be influenced to some extent by the environmental status of each territory —particularly as regards the regional incidence of erosion and desertification.

Agriculture under guaranteed quality

Although, as noted in the relevant chapter, this driver is currently of little significance to farmers adopting this agrosystem, the need to obtain increased profitability for produce in response to the reduction of aid and consumers' increasing acceptance of quality labels may well promote its development.

If this is combined with the possibility of additional support for products complying with objective quality criteria in some regions and of rural development policies focussing on quality as a further element, this agrosystem appears to have a very promising outlook.

4.5.3. Price of agricultural products

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL

DESCRIPTION:

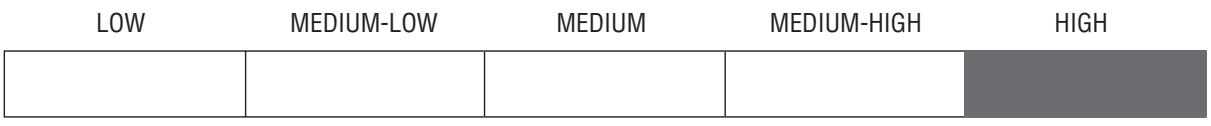
Price changes affecting the output from the different agrosystems has a marked effect on both farmers' adoption of specific systems and consumers' decision to buy these products. However, the significance of this driver is dictated by the potential variation of many other factors including the macroeconomic situation, consumers' environmental awareness and the availability of specific aid for farmers.

This driver can be examined from two different, albeit closely related, standpoints, namely: (1) the price level of agricultural products as a whole and (2) the price gap between the produce of emerging agricultural systems and mainstream agriculture.

A low price level for agricultural products in relation to a society's living standards (i.e. a low weight of food in the shopping basket) invites consumers to buy products other than those needed to meet the essential nutritional requirements in search of quality, environmental friendliness, animal welfare or improved health. On these grounds, consumers may favour current emerging agricultural systems. A small price difference between the products of such systems and those of mainstream agriculture may also favour the development of emerging systems; however, this may also discourage farmers from adopting them in the absence of specific financial support.

The price gap between identical agricultural products obtained with different systems is also closely related to their market distinction through labelling and consumers' appreciation of the differences.

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

How prices will vary over the period up to 2013 is somewhat uncertain as it will depend on a number of factors. In any case, there are strong indications that the increasing openness of borders in the European

Union, decoupling, the reduction of farming aid and the increasing deregulation of world trade, may cause prices on European markets to fall to levels closer to those on the world market.

As regards the price gap between the produce of emerging and mainstream agricultural systems, current premiums on the former cannot be expected to change substantially. If any, the gap might shorten as the alternative agricultural products gain popularity among consumers; their harvesting techniques, and distribution and marketing systems —which are still at an incipient stage of development in some cases— are improved; and costs reduced.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

This driver is highly influential on a system whose products are highly priced relative to those of other, undifferentiated agricultural systems. Premiums here are justified not only by the increased production unit costs of the organic system, its limited output and a geographical distribution that makes economies of scale difficult, but also by the presence of a still incipient distribution and marketing system.

A future scenario where the prices of organic products continue to exceed those of their conventional counterparts in order to compensate practicing farmers for their increased costs and ensure the survival of the system is therefore quite possible. However, some elements (e.g. the potential saturation of markets or the mass distribution of the produce through hypermarkets) might result in a reduction of premiums and lead to an increased market share and hence to further development of this agricultural system.

Integrated farming

The absence of market distinctions for integrated-farming produce and consumers' unawareness of its existence in some cases precludes pricing them higher than the produce of mainstream agriculture. Therefore, price has only a slight influence on this system and is certainly not the decision factor for the adoption of integrated agriculture by farmers.

In the event of this system being regulated at Community level, a distinguishing labelling scheme and an appropriate dissemination policy could help reverse the situation. In such a case, however, integrated farming would compete for a market segment similar to that of organic farming —with little room for change as prices would have to fall within the already declining price ranges anticipated for mainstream agriculture and organic farming.

Should integrated farming expand in response to the increasingly restrictive environmental and food safety regulations, price would not be the most influential factor either. In this situation, prices would have to fall to below those of organic products and slightly above those for products from third countries not certified under the specific regulations for this agrosystem.

Conservation agriculture

The influence of price on this agricultural system differs little from that it has on the other emerging systems. If, as expected, conservation agriculture continues to have little market projection, prices will continue to lack influence here.

Agriculture under guaranteed quality

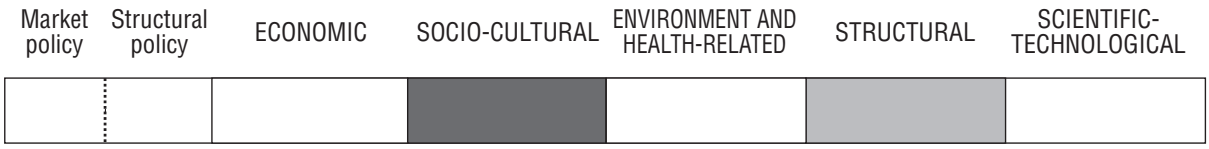
Most of the previous statements in relation to organic farming also apply here. Thus, price is highly influential on a system the produce of which is priced at levels above those of mainstream agriculture.

Also, there are strong indications that this situation will persist; some consumers will appreciate quality-assured produce and be willing to pay a premium on it either because of its origin, the way it is produced or its properties. One development that might alter this trend is an overabundance of quality-assured labelling schemes saturating markets and raising confusion among consumers.

4.5.4. Farmer profile

RELATED DIMENSIONS:

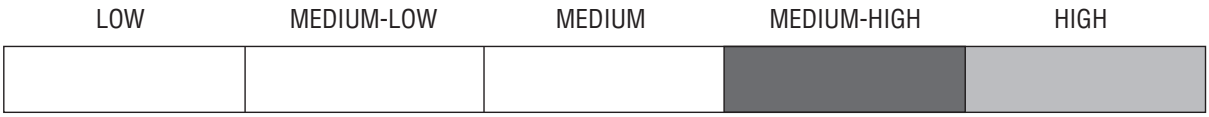
POLITICO-INSTITUCIONAL



DESCRIPTION:

This driver is concerned with the traits of farmers and holding managers (specifically, with those that influence or may affect the way holdings are managed). As such, it encompasses a wide range of elements including farmers' age, ideology, environmental sensitivity, innovativeness and risk-taking capacity, cultural level, specific training, information availability, professionalism and dedication to complementary activities.

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

Changes in the agricultural sector (particularly in the way the farming population thinks and acts), take place more slowly and somewhat later than those in other social areas. Therefore, it seems unlikely for the current profile of European farmers to be dramatically altered by abrupt changes over the next ten years. There are, however, some trends suggestive of its possible evolution in the medium-to-long run.

Based on the opinion of the experts asked, farming entrepreneurs will be increasingly better trained and technically skilled as the chief result of an easier access to the increasingly ubiquitous information technologies. This will be crucial for the evolution of emerging agrosystems, as farmers' receptiveness tends to increase in line with the amount of training they receive.

Also, as the likely result of a stronger market orientation of production activities, full-time farmers may become more professional. Their number will continue to fall and the generation change will face a

number of obstacles (e.g. the presence of more appealing jobs or an increasingly difficult access to land). Simultaneously, farming will acquire a more professional orientation, particularly in the potentially most competitive areas.

It seems farmers' ideology will continue to lose weight on holding management (e.g. on the choice of specific agrosystems or production practices) over the coming years. This will also be the case with farmers' environmental awareness, which is likely to grow in parallel with that of society at large. However, the adoption of environmental measures will be dictated by factors other than those inherent in farm management (e.g. consumers' sensitivity, regulations, and the presence of specific aid).

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

As stated in Chapter 3, farmers' age, innovativeness, skill and information access are crucial —and will continue to be so in the future— with a view to adopting this agrosystem. Adopting it may be riskier than switching to the other emerging systems, so innovative farmers who are willing to take risks are more likely to change their production practices. Thus, the younger generations are typically less reluctant to take risks, and more open to innovation and to absorbing the ideas and values inherent in this agrosystem. Consequently, the generation change will facilitate its adoption.

Finally, the envisaged improved training and knowledge of the future will also have favourable effects on organic farming, which requires an adequate knowledge base.

Integrated farming

Specific features such as farmers' training, their attitude towards technical advice and their interest in rationalising their cultivation techniques are very important for the future development of integrated farming. The above-mentioned prospects of more business-oriented farming, increased professionalisation of farmers and a slow, yet inevitable general improvement in their training and information levels, allow one to envisage a favourable future for this agrosystem.

Conservation agriculture

The switch from mainstream agriculture to conservation agriculture requires farmers to exercise special care in managing their holdings, as well as for substantial investments is equipment fit for implementing the new techniques. It is also important in some cases to discard certain cultural atavisms typical of regions where tillage has traditionally been farming's principal trait.

The farmer profile aspects mentioned in the previous sections are also important here; however, the adoption of this system is less demanding in such aspects than is that of organic farming or integrated farming.

Thus, in erosion-prone areas with similar levels of farmer training, risk-taking capacity, professionalism and innovativeness, this agrosystem may be envisaged developing to a greater extent than will the other emerging systems.

In addition, the environmental benefits of these practices (particularly as regards erosion and the presence of organic matter) are so appealing, outstanding and favourable in terms of soil fertility after only a few years of implementation, that they are bound to facilitate the adoption of this agrosystem provided farmers' environmental awareness rises and the cultural barriers alluded to above fall to the required extent.

Agriculture under guaranteed quality

Agriculture under guaranteed quality associated with specific origins or traditional production methods is probably the emerging agrosystem where farmer profile will be the least influential in the future. In fact, its practice calls for little training or innovativeness on the part of farmers, most of whom rely on specific know-how strongly bound to traditionalism. Nor does environmental awareness appear to be relevant to the development of this system.

This does not seem to be the case with farmers adhering to other quality standards (e.g. ISO 9000, controlled production). The adoption of these systems requires a more entrepreneurial view of farming and hence calls for more professional, well informed and better trained farmers.

4.5.5. Holding structure

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL

Market policy	Structural policy	ECONOMIC	SOCIO-CULTURAL	ENVIRONMENT AND HEALTH-RELATED	STRUCTURAL	SCIENTIFIC-TECHNOLOGICAL

DESCRIPTION:

This driver encompasses those durable characteristics of organic holdings that may influence the adoption of a specific production system. Such characteristics include size, location, division of the land into plots, agronomic potential, production type, and available natural resources, infrastructure and facilities.

SIGNIFICANCE OF THE DRIVER:

LOW	MEDIUM-LOW	MEDIUM	MEDIUM-HIGH	HIGH

LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

A clear distinction between two types of holding could become apparent over this period. Thus, holdings with a high agronomic potential will evolve differently from smallholdings and farms on marginal land. The more dynamic farms, with a higher potential, will increase their technological level and improve their competitiveness under the management of farmers with entrepreneurial insight and a strong commitment to marketing their produce. At the other end of the scale, farms with low productivity or a small turnover may become stranded, unable to move beyond their current structure and eventually cease activity unless they adopt a market distinction approach to production.

All this will take place in a scenario of generally improved production facilities and infrastructures —both publicly and privately promoted—, and of a larger average holding size.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

As noted in Chapter 3 (Decision Factors), some holding structure elements are not very influential at present. Specifically, the agronomic potential and size of farms have lost weight on farmers' decision to adopt the organic agrosystem.

In a scenario maintaining a premium on organic produce, the adoption of this agrosystem may continue to be an effective market distinction and excellence strategy with a view to ensuring the sustainability of small holdings and less favoured areas. However, large, dynamic, competitive farms focussing on market demands may also see in this system a profitable, safe outlet for their produce provided the marketing channels required are established.

Production type will also lose weight in the medium term if the range of products present on organic farming markets continues to expand.

Under these conditions, this driver might favour the future development of organic farming.

Integrated farming

The larger holdings can be expected to have easier access to the technical advice, control and equipment required to manage farms in an integrated way. However, small- and medium-scale producers can associate to overcome some of their individual barriers. Therefore, this driver is unlikely to have a strong influence on the future of integrated farming, which will probably dictated by other factors such as market distinction, price, specific acknowledgement and support, cross-compliance and farmer profile.

Conservation agriculture

At present, conservation agriculture revolves around large farms and specific production types (cereals, wood crops). If farms continue to grow steadily, but slowly, in size, the scenario for this agrosystem is bound to change little in ten years. The proliferation of farming service providers possessing dedicated equipment for conservation agriculture may facilitate the access of the smaller farms to its practices without the need for substantial investments in special machinery. In any case, holding structure will continue to play a central role in both the adoption and maintenance of this system.

Agriculture under guaranteed quality

In broad terms, holding structure seems unlikely to have much influence on the future of this agrosystem. Farms producing under quality assurance standards vary enormously in many respects.

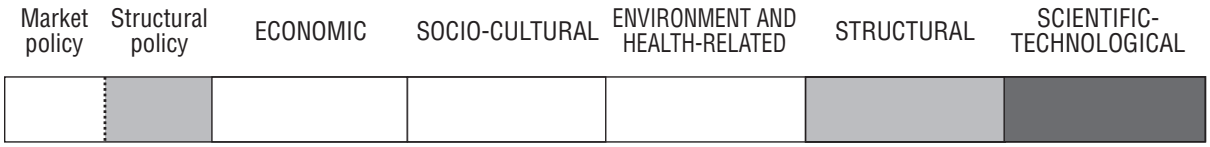
However, for some quality designations associated with a geographic origin or traditional production method, characteristics such as holding location and production type can have a strong influence.

Also, adherence to private quality standards (e.g. ISO 9000 or controlled production protocols) is in principle more typical of dynamic holdings with a large turnover —and thus capable of meeting certification expenses— or of specific production types (e.g. bovine meat, fresh fruit and vegetables). However, an increasing number of products can be expected to have their own quality standards, and the eligibility to private certification to reach the smaller holdings and producer associations, under pressure from the large retail chains. As a result, the above-mentioned holding characteristics will gradually lose weight on the adoption of this agrosystem.

4.5.6. Development and transfer of new technologies

RELATED DIMENSIONS:

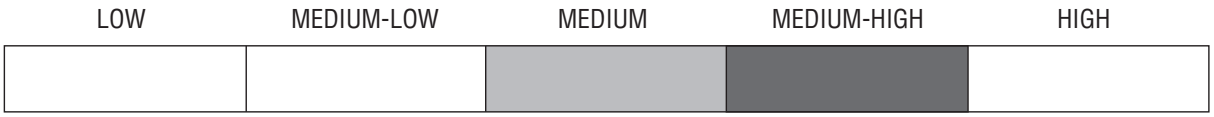
POLITICO-INSTITUCIONAL



DESCRIPTION:

This driver encompasses the development of new technologies, understood as bodies of theories and techniques that enable the practical application of scientific knowledge. Also, it encompasses farmers' access to existing technologies. The efficiency of the technological complex is not limited to the invention and development of technologies, but should also include their transfer and the agents potentially involved: universities, private enterprises, public bodies, foundations, etc.

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

It is anticipated that the transfer of existing technologies will become more prominent than the development of new ones. Thus, information-related technologies, biotechnology or even GMOs —which are currently at an advanced stage of development— are bound to become popular among farmers.

One of the fields with the greatest potential for expansion is food safety in its broadest sense. Improved analytical methods, increased traceability and reduced risks of fraud in the agricultural industry are to be expected.

New breakthroughs or the dissemination of some techniques such as biotechnology may facilitate the emergence of new alternative systems. Precision agriculture is a good example. In a way, it may be logical for alternative agricultural systems to evolve at a faster pace than conventional systems on account of their more dynamic nature.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

Organic production currently possesses a strong technological component. Biological pest and disease control methods or the new organic fertilisers, for example, are under continuous development. This is so not only in the agronomic field, but also in the marketing chain. The current scenario, together with the profile of the organic farmer (a young, trained, innovative person) suggests that the new technologies will

continue to have strong effects on organic farming provided the scientific–technical complex focuses on environmental friendliness —as is the case with current research plans.

Integrated farming

The technological component is also essential here as it facilitates the absorption of continuously evolving techniques. Many of the new technologies are shared by other systems; thus, "biological" pest control is also present in organic farming.

Also, the development and transfer of new technologies can be expected to continue in areas such as biotechnology and traceability in the coming years. Thus, the last is one of the basic cornerstones for the system and also the most likely to persist until the proposed time horizon is reached.

Conservation agriculture

The differential technological component is more limited here as it is restricted to tillage practices and some herbicides in most cases. The use of tilling machinery in conjunction with highly specific herbicides is the core of the technology typically involved in conservation agriculture; by its very nature, it is bound to evolve continuously.

Broadly speaking, the development and transfer of new technologies can be assumed to have a powerful influence on this agrosystem, but a weaker one than that on organic farming or integrated farming as these span a wider range of technologies.

Agriculture under guaranteed quality

As stated in previous sections, agriculture under guaranteed quality is very frequently associated with traditional products obtained using ancestral procedures that have stood the test of time. The technological component is less significant here than in the previous three alternative agrosystems and this can be expected not to change much in the near future.

The situation, however, does not preclude changes in its practices and techniques, and innovations improving the special features of the produce while preserving its identity. One of the fields with the greatest potential for expansion is probably that of fraud control. The use of new technologies will allow the origin and authenticity of quality products to be certified and consumers' trust to be raised as a result.

However, some quality products associated with standardisation or accreditation bodies —ISO 9000 is just one of the certificates awarded in this context— may evolve more similarly to those of systems with a heavier technological component on account of their increased traceability requirements and closer relationship to the agroindustry.

4.5.7. Consumers' awareness of environment- and health-related issues

RELATED DIMENSIONS:

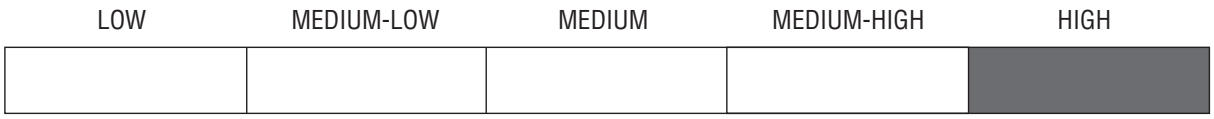
POLITICO-INSTITUCIONAL

Market policy	Structural policy	ECONOMIC	SOCIO-CULTURAL	ENVIRONMENT AND HEALTH-RELATED	STRUCTURAL	SCIENTIFIC-TECHNOLOGICAL

DESCRIPTION:

This driver gauges the influence on consumers' buying decisions of factors related to environmental friendliness, human health and animal welfare. The driver also encompasses the influence on such decisions of events or factors such as food crises or alerts, environmental deterioration, the relationship between residual pesticides and health, etc.

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

The food scandals of recent few years (e.g. dioxins, Bovine Spongiform Encephalopathy (BSE), foot-and-mouse disease) have raised consumers' concern with food safety. Also, society is increasingly aware of environmental decay and animal welfare. This appears to be causing some changes in buying and consumption habits that may decisively influence consumers' willingness to pay a premium on a product they may perceive as safer or more beneficial.

Therefore, consumers' awareness of these issues can be expected to remain or even grow in the near future. The emergence of any new scandals related to food safety or the increasing environmental deterioration would be bound to directly influence whether such sensitivity is maintained or even increased.

Improvements in analytical methods and the rediscovery of the impact of some environmental factors (nutrition included) may also influence the way consumers' preferences for residue-free, environmentally friendly products evolve. This may favour the development of foods with specific healthy properties (functional foods), a sector where the produce of emerging agrosystems occupies an unfavourable place.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

Environmental and animal welfare protection are the main targets of organic farming. In addition, although scientific results do not seem to support this conclusion, consumers usually believe organic products are safer (i.e. less hazardous to health). Consequently, increased consumer awareness of environmental and health-related issues is bound to favour the development of this agrosystem.

Integrated farming

Integrated farming provides unquestionable environmental benefits; the traceability of its produce is an effective means of assuring farmers' control over the origin of their produce and their safety. However, the potential influence of consumers' awareness of environmental and health-related issues on the future development of this agrosystem will only become substantial if consumers are provided relevant information about the principles behind this production system and its environmental benefits.

Conservation agriculture

As repeatedly stated above, conservation agriculture can be defined as a body of farming practices with environmental benefits that focuses on soil conservation but enjoys no market distinction for its produce. Such a distinction is unlikely to materialise in the near future, so consumers' attitudes and buying decisions can be expected to have no appreciable influence on this agrosystem. However, society's increasing environmental awareness, in particular regarding the problems posed by erosion, might indeed favour farmers' adoption of many practices associated with this system, whether voluntarily or compulsorily.

Agriculture under guaranteed quality

There is usually no direct relationship between products differentiated by some quality label and improved specific properties as regards safety or environmental friendliness. However, consumers' usually view them as healthy products because they "come from the earth" or "have always existed". Their distinction on the market, endorsement of certification and control bodies, and association with a geographical origin in some cases, constitute acceptable guarantees for some consumers. However, this driver is unlikely to be too influential on the future development of this agrosystem.

4.5.8. Community harmonisation of alternative agrosystems regulations

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL

Market policy	Structural policy	ECONOMIC	SOCIO-CULTURAL	ENVIRONMENT AND HEALTH-RELATED	STRUCTURAL	SCIENTIFIC-TECHNOLOGICAL
■	■					

DESCRIPTION:

How widely a given agrosystem is recognised can dictate to what extent it will develop. Recognition in this context comprises the existence of specific regulations for the system concerned, the elements of the food chain affected by such regulations, the territory in which the regulations are enforced and applied, the products eligible, the distinction of the products protected by the regulations and the equivalence or similarity to regulations in force in other regions, among others.

This driver is used here to explore the potential implications of applicable regulations and their scope on the future development of emerging agrosystems.

SIGNIFICANCE OF THE DRIVER:

LOW	MEDIUM-LOW	MEDIUM	MEDIUM-HIGH	HIGH
		■		

LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

There are substantial differences in the extent of recognition and regulation among alternative agrosystems in the European Union at present. Thus, a variety of situations currently exist that range from thorough, official, Community-wide regulation for some systems to partial, strictly private regulations for others. Between these two extremes, a host of national or regional regulation schemes exist.

Even where a self-contained regulation framework for the whole EU exists (e.g. in organic farming), both national and regional administrations, and certifying bodies, can expand, restrict or interpret the Community standards and protocols. This has resulted in a differential shaping of some emerging agrosystems depending on the particular region where they are implemented and their certifying bodies, as well as in a widespread deficient knowledge of consumers about the specific properties of the products concerned —which has a decisive influence on supply generation and pricing.

Based on the foregoing, the situation can evolve in many different ways. In a scenario where market distinction is increasingly important for a product to succeed, the proliferation of quality labels and seals may lead to a saturated market in which consumers are overwhelmed by their being made the targets of an excess information they find hard to interpret.

In order to clarify the situation, the relevant authorities at EU-level[219] may attempt to harmonise public (national and regional) and private standards on the systems studied as far as possible. This could be approached in two different ways, each having specific advantages and disadvantages —an in-depth discussion of which is beyond the scope of this document.

- One way is by establishing a framework regulation for specific agrosystems general enough in scope to encompass existing national, regional and private regulations. This would translate into adding a Community label to the products concerned while maintaining their original regional, national or private labels.
- The other way is by developing specific standards regulating as precisely as possible every element of the agrosystem concerned and introducing a unique seal to replace all existing labels for its products.

Should the Community's public authorities choose not to act in either direction, the market itself might, via “natural selection”, decide which certifications would gain consumers' trust. The large distribution and retailing chains might play a crucial role here.

The previous choices are not mutually exclusive; in fact, the final solution might be a combination of specific elements from each or the adoption of different solutions for each individual agrosystem —as has so far been the case.

In any case, the current tendency (viz. the issuance of a host of public and private standards applicable at different territorial levels and the consequent presence of multiple distinguishing seals on the market) is bound to persist in the near future. In the medium term, however, the standards and labels for specific agrosystems can be expected to be harmonised, whether officially (via Community regulations) or by the market.

219 In the authors' opinion, in a future single market comprising 25 (or more) countries, any individual attempt by national administrations would fail.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

This agrosystem is thoroughly regulated by the European Communities in aspects such as production, transformation and produce marketing. For a product to be distinguished with an "organic farming" label on the Community markets, it must comply with specific standards and protocols that establish the minimum requisites to be met. No strong additional regulation endeavours are thus to be expected here.

However, organic farming is regulated differently by some Member States and certifying bodies; thus, while the minimum requirements must be met by any operator, the adherence to others is voluntary. Some harmonisation might thus be required to set and clarify some aspects. There are strong indications that any such harmonisation would have favourable effects on the system.

Integrated farming

This is probably the agrosystem where the greatest changes in relation to the present driver are to be expected. The wide scope and fast growth of integrated farming, in addition to the needs of this sector, may lead the EU to eventually regulate it on a Community-wide basis with provision for its special features.

Based on the effects of Community regulations on organic farming and some quality figures, regulating integrated farming could be an incentive for its adoption. Also, having its own, common labelling scheme for the whole EU could help farmers charge a premium on their produce.

One other possibility is for integrated farming to become the Community's farming standard as a result of mainstream agriculture adopting the typical practices of this agrosystem. In this way, European agriculture would be associated with environmental friendliness and quality produce, and a "produced in the EU" label would come to represent what an "integrated farming" label does today.

Conservation agriculture

Based on current trends, the following possibilities can be envisaged as regards the future regulation of this agrosystem:

- The incorporation of the practices of conservation agriculture into integrated farming (in erosion-prone holdings).
- The incorporation of compulsory good farming practices by all conventional erosion-prone holdings receiving CAP aid (cross-compliance).
- The indirect, partial standardisation of specific conservation practices via the issuance of specific agri-environmental aid not aimed at conservation agriculture as an agrosystem, but to some of its typical individual practices.

Agriculture under guaranteed quality

Some quality figures regulated by EU authorities have been much welcomed by consumers. The market has seen in Protected Designations of Origin, Specific Designations and Guaranteed Traditional Specialities unique properties for which consumers are willing to pay a premium. Therefore, no need for harmonisation or additional regulations appears to exist in a system that is currently working quite well as it is.

The ever-increasing private quality certificates are somewhat heterogeneous. Quality labels can have rather different meanings here (see Section 2.3.5). Natural selection by the market under the protection of

the public authorities may be the most efficient harmonisation mechanism for this sector. In this way, only a few, major quality certificates demanded by the large distribution firms and recognised by consumers would remain in the medium term.

4.5.9. Cross-compliance

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL

Market policy	Structural policy	ECONOMIC	SOCIO-CULTURAL	ENVIRONMENT AND HEALTH-RELATED	STRUCTURAL	SCIENTIFIC-TECHNOLOGICAL

DESCRIPTION:

This driver encompasses a body of conditions and requirements to be met by farmers in order to receive CAP funds. The requirements include maintaining their farms in good agricultural and environmental condition, and contributing to animal welfare and to public, animal and plant health.

SIGNIFICANCE OF THE DRIVER:

LOW	MEDIUM-LOW	MEDIUM	MEDIUM-HIGH	HIGH

LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

For a few years, the awarding of CAP funds has been subject to the fulfilment of a series of production requirements. So-called "cross-compliance" for the granting of subsidies has arisen from the growing demand of the European society for a sustainable, environment-friendly agriculture ensuring animal welfare and food safety. The recent food crises in Europe have but increased such social demands.

In this situation, the requirements to be met in order to receive institutional aid are bound to become stricter or even similar to the use of practices specific to alternative agrosystems such as integrated farming or conservation agriculture. Such measures should be effective if the public funding of agriculture is to be judged legitimate. It is therefore essential that the foreseeable strengthening of cross-compliance requirements be accompanied by improvements in control methods and by the selection and establishment of indicators assuring fulfilment of the conditions concerned.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

The strengthening of cross-compliance requirements to be expected in the coming years is likely to have no effect on the development of a system that relies on compliance with even stricter protocols. It is

unlikely for cross-compliance requirements to ever be as stringent as those currently prevailing in organic farming.

However, the strengthening of cross-compliance as regards environmental protection, and its associated cost, might make it interesting for some farmers to adopt a somewhat more demanding agrosystem but providing incentives such as better marketing prospects (price, commercialisation) or additional specific aid.

Integrated farming

Should the requirements for receiving CAP funds become stricter, the differences between mainstream agriculture and integrated farming can be expected to narrow. If this happens, Europe's mainstream agriculture of the future may be expected to resemble today's integrated farming.

However, there are other possibilities, such as the coexistence of a mainstream agriculture subject to stronger restrictions with a future integrated farming enjoying market recognition and the benefits derived from the granting of labels or logos increasing their value.

One last possibility is the persistence of the current status of integrated farming, regulated to a variable extent depending on the particular country or region, and the strengthening of the restrictions on mainstream agriculture, but with each preserving its identity.

Conservation agriculture

The practices associated with this agrosystem may continue to come under the umbrella of environmental measures, so farmers will be able to freely adopt them and be rewarded in exchange —as is the case at present.

However, such practices may also be included in the body of future cross-compliance measures, so adopting this production system may eventually be compulsory for some holdings or where special conditions apply (e.g. under when there is a risk of erosion from steep slopes or in the case of special climates or crops).

Agriculture under guaranteed quality

Cross-compliance is unlikely to have a significant effect on this agrosystem. In any case, some traditional practices followed in the production of quality-labelled products may clash with the new environmental protection, animal welfare or food safety measures included in cross-compliance schemes. If this were to be the case, production systems would have to be adapted while maintaining their specific features.

4.5.10. Farm technical advice on alternative agrosystems

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL

Market policy	Structural policy	ECONOMIC	SOCIO-CULTURAL	ENVIRONMENT AND HEALTH-RELATED	STRUCTURAL	SCIENTIFIC-TECHNOLOGICAL

DESCRIPTION:

This driver is concerned with the availability of technical advice and support for farmers or other agents about the use of new production techniques, technologies or practices, always within the scope of alternative agrosystems. Briefly, this driver is about the transfer of knowledge to farmers. Advice is usually made necessary by the fact that the technologies concerned involve certain specific features that differ from those of mainstream agriculture.

Farmers can be provided with advice in a number of ways. This driver considers the activities of producer associations, certifying bodies, agricultural public administrations, the private sector, etc.

Farmer training activities with a strong practical slant can be included here. Accordingly, technical advice in this context is related to a variety of dimensions associated with the many agents involved and the wide range of situations that the transfer of knowledge can span.

SIGNIFICANCE OF THE DRIVER:

LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

During the time span leading up to the proposed time horizon, technical advice is likely to be provided by agents from various bodies. Input suppliers will no doubt market specific products for the emerging agrosystems and furnish them with customised information with a commercial focus. This, however, will not be the sole source of advice, which may be expected to continue to be provided by other agents as well. Both dedicated associations concerned with specific alternative agrosystems and service providers will compete for producers' trust in this venture.

Also, public administrations —which have traditionally been sources of independent information for farmers— are bound to strengthen their advisory activities, whether by themselves or in cooperation with the private sector.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

Technical advice is a basic driver in the current state of affairs for organic farming as this agrosystem encompasses practices and standards that are largely specific to it and unconventional. This calls for fluent communication between producers and the agents capable of advising them.

In a future scenario with an increased rate of development and transfer of new technologies, advice will undoubtedly continue to be important.

Integrated farming

Integrated farming is another emerging agrosystem with a strong technological component in continuous evolution. Biological pest control, traceability or even biotechnology are being increasingly implemented

here or undergoing changes for which producers should be prepared. Also, this agrosystem has always been associated with permanent technical advice in various producing regions.

Based on the latest CAP guidelines, a public advisory system can be expected to emerge under the umbrella of European institutions and in accordance with national policies. Also, private advice can be expected to continue, especially from certifying bodies and in relation to distribution systems.

Conservation agriculture

This agrosystem relates to technology differently from the others. In fact, this is an incomplete system that is very similar to mainstream agriculture in terms of technology, but somewhat different in terms of cultivation and soil management practices.

Advice needs in this context revolve around soil management (machinery, tillage). This is probably why input suppliers play a more prominent role here than in the other agrosystems.

Agriculture under guaranteed quality

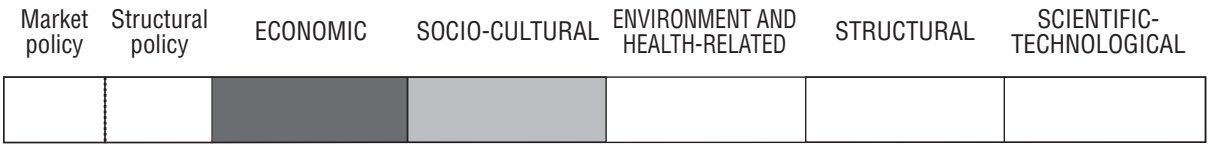
As noted in dealing with the driver "new technologies", agriculture under guaranteed quality is very often associated with traditional products produced in accordance with age-old rules that are intended to be preserved over time. For this reason, the technological component is relatively important inasmuch as this agrosystem involves techniques and practices that are widely known by farmers and therefore require little technological advice.

However, this agrosystem is also strongly market-oriented and its rules of operation are dictated by the needs of consumers and the agroindustry. Because the demands for quality assurance, traceability or an increased added value are also shared by this agrosystem, farmers must be open to the prospect of incorporating new technologies in their practices.

4.5.11. Agri-food demand in the enlarged EU

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL



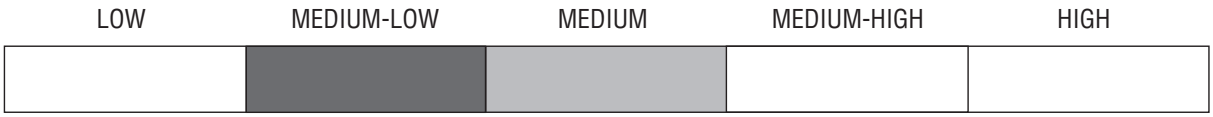
DESCRIPTION:

This driver reflects the influence that demand for agri-food products (and particularly demand for the products of emerging agrosystems) is bound to have on the way farming is understood and practiced in the coming years.

Some aspects of this driver are directly or indirectly dealt with in other records such as "Consumers' Awareness of the Environment- and Health-related Aspects", "Price of Agricultural Products" and

"Macroeconomic Situation". This driver is specifically concerned with the quantitative component of demand (viz. with the potential effects of an increased or decreased demand in the EU after the new Member States have joined it).

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

For the new Member States, the impact of the EU's enlargement can be expected to be markedly favourable in commercial and economic terms by virtue of the potential for increased productivity and an increased foreign trade and investments in these countries. However, the effect of enlargement on current EU members can also be expected to be favourable in the medium to long term; whether it will also be in the short term is more uncertain —consider, for example, the recent experience of German reunification. Enlargement will clearly increase the potential consumer market (particularly in relation to products for which the new Member States are deficient— by effect of the increased EU population; also, the living standards of the population in the candidate members —and their access to products with a higher added value— can be expected to rise upon joining the EU.

However, this favourable scenario for agri-food demand in general may or may not coincide with that for the specific demand for the produce of alternative agrosystems. Thus, the proposed horizon seems too close for the joining of new Member States to have a substantial effect on the demand for their products. This is so not only for economic reasons; in fact, if the new consumers are unaware of the benefits associated with such products, they will hardly be willing to pay a premium for them.

However, in a more optimistic scenario, attitudes might change more readily (e.g. there might be an increased awareness of food safety- and health-related aspects) and the purchasing power of the middle or middle–upper class in the new Member States might grow. This could result in significantly increased demand over the next ten years.

The experts asked tend to support the former possibility (i.e. demand for the produce of alternative agrosystems will be scarcely influenced by the EU expansion in the near future). The latter scenario might apply to countries that are currently exhibiting major developments in the modernisation of their economy and social and cultural structures (e.g. the Czech Republic); this, however, would result in no significant changes in the demand for alternative produce either.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

Although the demand for organic products might grow slightly as a result of enlargement, based on its predicted evolution this driver is bound to have little weight on the development of this agrosystem.

Integrated farming

Even if integrated farming achieves market distinction and consumers' appreciation of its produce on the Community markets, its evolution is unlikely to be substantially affected by the expansion and its associated changes in agri-food demand.

Conservation agriculture

Dealing with a potential influence of the demand here makes no sense as the produce of conservation agriculture lacks market distinction and is highly unlikely to achieve it.

Agriculture under guaranteed quality

As with organic farming, the demand for quality-assured products is likely to grow slightly in a scenario with a larger potential consumer market[220]; however, this is bound to have no appreciable effect on the development of this agrosystem.

4.5.12. Agri-food supply in the enlarged EU

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL

Market policy	Structural policy	ECONOMIC	SOCIO-CULTURAL	ENVIRONMENT AND HEALTH-RELATED	STRUCTURAL	SCIENTIFIC-TECHNOLOGICAL
		■			■	

DESCRIPTION:

This driver describes the influence on the development of emerging agrosystems of the agri-food supply on the world and Community markets, mainly in relation to the joining of new Member States, but also through deregulation of international trade.

In dealing with this driver from the standpoint of this work, one must focus specifically on the supply of distinguished products from the agrosystems studied. However, this need not preclude viewing the topic from the wider perspective of agricultural supply as a whole by virtue of its close relationship to the market for emerging agrosystems.

SIGNIFICANCE OF THE DRIVER:

LOW	MEDIUM-LOW	MEDIUM	MEDIUM-HIGH	HIGH
	■			

LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

The supply for agricultural products in general can be expected to rise in the coming years by effect of the joining of the new Member States and the simultaneous deregulation of international markets.

In principle, the EU enlargement need not be a break point in the short-term evolution of the produce from alternative agrosystems. After the expansion, the free circulation of goods in the future EU will probably allow farmers in the new Member States to market their produce under favourable conditions. This will no doubt be an incentive for especially dynamic farmers in such countries to increase the output of existing alternative agrosystems and expand their adoption. However, based on the special structural, economic and sociological characteristics of the candidate members —with very strong deficient resources in some cases—, the increase in output will not be too significant in relation to the expected evolution of alternative agrosystems in the present Member States, let alone in some production sectors only remotely connected with what is known as "continental agriculture".

The deregulation of world trade can have a stronger impact on the supply of these agri-foods in the EU —particularly those produced by organic farming. However, such factors as the harmonisation of standards, the international endorsement of certificates, and the acceptance by control bodies (and, ultimately, by consumers) of products from non-EU countries, may considerably reduce the impact of market deregulation on such products in the EU.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

Although organic farming in the new Member States already accounts for a substantial land area in relation to the European Union (half a million hectares versus nearly four million in the current EU), the presence of these products on the market is still incipient.

Obviously, in a scenario of high conversion rates for the eastern countries, organic produce from the countries with a solid position in this sector can be expected to expand its presence on the Community market. However, market indicators will probably not be significantly affected over the next 10 years. The significance of the organic farming potential of the new Member States might grow on a more distant horizon —particularly as regards continental produce.

Integrated farming

In the event that the practices associated with integrated farming are adopted as the standard European agrosystem and any such practices are made compulsory for producers through regulations, farmers in the new Member States may refrain from adopting this agrosystem —at least in substantial numbers.

Because of the technological backwardness of agriculture in some of the new member countries, some typical elements of integrated farming (e.g. traceability, crop management practices based on information control and management, the need for technical advice, the use of specific inputs, the minimisation of adverse impacts on the environment) will be difficult to accept in the absence of premiums on such products —as has been the case to date. In fact, even if some practices are made compulsory, new measures aimed at facilitating fulfilment of the new demands would have to be implemented.

Conservation agriculture

Because the produce of this agrosystem enjoys no market distinction from that of mainstream agriculture, it is included in the general agri-food supply.

The rate of adoption of this agrosystem by the new Member States may increase in a substantial manner. The opening of the borders with these countries will facilitate the spread of the alternative practices and facilitate farmers' access to advice and dedicated machinery, so, in the medium term, the reduced costs of conservation practices and the efficient conservation of soil fertility may encourage large-scale eastern European farmers to adopt this agrosystem.

Agriculture under guaranteed quality

Quality-assured products in the new Member States will have to be adapted to Community regulations. Such will be the case with PDO, PGI, TSG and QWPSR, which may provide ample scope for these products. However, these labels are not very popular in the candidate members; in fact, they are typical of the Mediterranean region (France, Italy, and Spain) and of products such as wine and cheese.

Based on the current proliferation of products complying with a rather wide range of quality standards, however, new labels will find it increasingly difficult to obtain a favourable market position. This is one challenge the new Member States will have to meet by irrefutably demonstrating the distinguishing features of their produce and its excellence to a body of consumers who are increasingly overwhelmed by the large number of quality labels and labels present on the market.

Products under internationally accepted generic quality assurance certifications (e.g. ISO 9000), which are especially appreciated and demanded by retail chains, might have a brighter future in the medium run, once these agrosystems have been adapted and updated. This may also be the case with the supply of certified products from third countries, access to the European market of which may be facilitated by the gradual deregulation of international trade.

4.5.13. Acceptance of genetically modified crops by the EU

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL

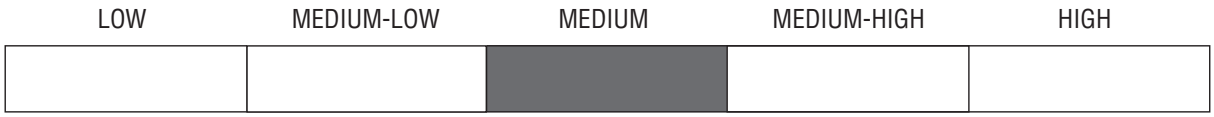
Market policy	Structural policy	ECONOMIC	SOCIO-CULTURAL	ENVIRONMENT AND HEALTH-RELATED	STRUCTURAL	SCIENTIFIC-TECHNOLOGICAL

DESCRIPTION:

This driver reflects the potential influence of the legal, social, political and commercial acceptance of agriculture Genetically Modified Organisms (GMOs) on the development of alternative agrosystems in the EU.

In principle, this driver could be viewed as one additional element of the development and implementation of new technologies; however, the environment- and health-related controversies GMOs are intensifying, and their implications in the social, cultural and political realms, may be more important than their technological component. This warrants separate discussion from other scientific–technical aspects.

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

The experts asked believe that GMOs will be increasingly accepted at all levels in the EU. Therefore, the recent moratorium on new genetically modified crops is bound to evolve to cautionary measures intended to avoid the contamination of certified GMO-free crops and to the establishment of specific policies aimed at ensuring their coexistence. The results of experiments under way suggest that such measures will not be so strict as to suppress the economic profitability of the new genetically modified crops. Also, steps should be taken to facilitate the identification of the produce and its derivatives on the market, and to implement efficient control and consumer protection mechanisms.

The evolution of consumers' attitude to these products is more uncertain. The reliability of public agencies for food safety assurance, consumer's access to information and, especially, the response of the larger enterprises, will dictate the outcome. Also, the development of functional and therapeutic foods by genetic manipulation might spearhead the arousal of a more favourable attitude of the population at large towards these products.

In any case, a greater or lesser number of people will continue to willingly pay a premium to ensure the absence of GMOs from their diets. Therefore, those agrosystems able to provide such assurances may strengthen their market positions by the effect of their current demand expanding to this consumer segment.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

The agents of the organic farming sector (producers, transformers and consumers) are unlikely to switch from their current rejection of GMOs in such a short term as the proposed time horizon (2013). Even if authorised GMOs were irrefutably shown to pose no environmental or health risk, and turned into efficient means of controlling pests and overcoming environmental restrictions without the need to use synthetic products, those engaged in this agrosystem are not likely to accept them.

Avoiding GMOs can be a strategic marketing advantage provided efficient control mechanisms are implemented in order to avoid the adventitious presence of modified genes in organic products —otherwise, consumers' trust could be seriously undermined.

Integrated farming

The potential implications of this driver on integrated farming less well defined. Thus, integrated farming aims to balance economic and environmental benefits without rejecting the use of technical means —but ensuring a rational use of technologies and minimising their potential adverse impacts.

Based on these principles, integrated farming could indeed incorporate genetically modified varieties in order to reduce the use of other, more expensive or environmentally hostile inputs.

Should integrated farming avoid the use of genetically modified varieties, this could be understood as its betting on conquering the consumer segment reluctant to purchasing genetically modified foods, in the wake of organic farming. In such a case, if genetically modified varieties proved effective in avoiding the mass use of phytochemicals, improving the sensory properties of the products and raising crop yields, a GMO-centred agriculture could disarm many of the arguments put forward by the advocates of integrated farming.

Conservation agriculture

Because the sole element distinguishing conservation agriculture from mainstream agriculture is the use of soil conservation techniques, nothing could seemingly prevent the former from accepting the incorporation of genetically modified varieties. Moreover, the use of varieties resistant to chemical herbicides is fully compatible with that of minimum tillage —which it may even help develop further. Because conservation agriculture lacks market distinction, the incorporation of GMOs would in no way compromise its image among consumers.

Agriculture under guaranteed quality

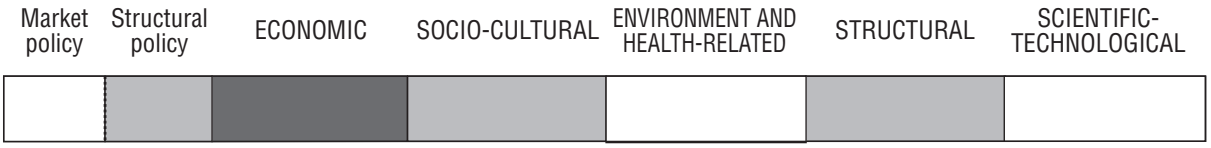
Quality-assured products have so far been bound to geographic origin or traditional production practices. Consumers tend to associate Designations of Origin and Traditional Speciality Guaranteed to typical sensory properties and related features. Therefore, the use of GMOs is seemingly incompatible with the principles of this agrosystem, particularly when its market is a population sector that might reject the inception of genetically manipulated varieties.

The evolution of other quality assurance systems based on private standards is uncertain. In the future, quality labels for GMOs might coexist with certificates relying on the absence of modified genes as their chief marketing message.

4.5.14. Diversification of rural economy

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL



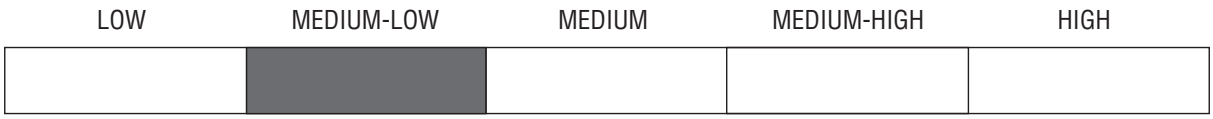
DESCRIPTION:

This driver has been selected in order to consider the influence on agrosystems of the development of new activities complementary to farming that might help revitalise rural areas, diversify the income of their populations and ensure their permanence in the rural environment.

Economic diversification as understood here also encompasses the activities aimed at diversifying farming itself (e.g. emerging agrosystems, part-time farming, leisure farming). Also, in dealing with economic

diversification, we will not restrict ourselves to the essentially productive activities with market reward, but also refer to those which, based on the multi-functional nature of farming, generate externalities that can be appraised and translated into economic terms (e.g. the conservation and valorisation of the landscape, the preservation of biodiversity, the fight against desertification, the preservation of traditions).

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

The rural environment can be assimilated to the space resulting from the appropriation and usage of natural resources, a space where not only farming, but also other production, cultural, social and political processes of variable tendency, take place.

The future of rural areas will largely depend on their intertwining with other territories —urban areas included. Farming is not the sole source of employment in rural areas; although it will continue to be the principal user of rural land and a decisive factor for environmental and landscape quality, one can expect an increasing amount of land to be used by the service sector (particularly for leisure and tourist activities, and in places of natural or cultural interest). Also, one can expect infrastructures in rural areas to be further improved and those in the vicinity of population centres gradually urbanised for use as second homes or leisure-related purposes.

This scenario will be compatible with the traditional agricultural exploitation of rural land, so the new activities will neither end with farming nor replace it. There might even be interesting interactions between the new farming orientations. Part-time farming as a means of supplementing the income from other sectors can be expected to gain significance. Even the alternative agrosystems will be able to integrate leisure and tourist demands (e.g. via ecological tourism, direct sales of traditionally made products, etc.).

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

The diversification of rural economy might be strongly relevant to the development of organic farming as this can be practiced on a part-time basis and is compatible with farming for educational and leisure purposes (e.g. to accommodate visitors and allow them to perform typical farming activities or buy products without the need for intermediaries).

Integrated farming

This driver may be expected to have little influence on the development of integrated farming, even though this form of farming may help recover the legitimacy of European agriculture and revitalise it.

Conservation agriculture

There is no apparent connection between the diversification of the rural economy and the future of conservation agriculture.

Agriculture under guaranteed quality

Such quality labels as PDO, PGI or TSG may not only help increase farming income through an improved commercial image of local or regional produce, but also constitute a means to disseminate the typical values of the rural environment to the urban world, thereby enabling the development of activities other than farming proper (e.g. tourism, leisure, gastronomy, culture, heritage, crafts, agroindustry, nature). The complementariness between such activities and farming might help strengthen origin-bound quality-assured designations.

4.5.15. Macroeconomic situation

RELATED DIMENSIONS:

POLITICO-INSTITUCIONAL

Market policy	Structural policy	ECONOMIC	SOCIO-CULTURAL	ENVIRONMENT AND HEALTH-RELATED	STRUCTURAL	SCIENTIFIC-TECHNOLOGICAL

DESCRIPTION:

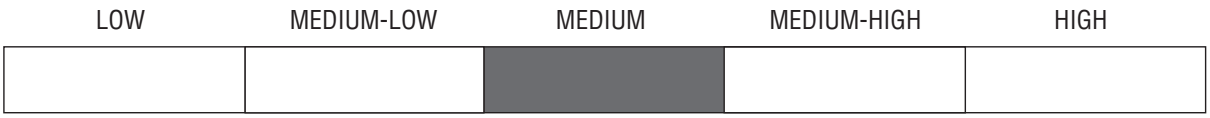
The way the macroeconomic situation changes not doubt affects the agricultural markets examined in terms of both supply and demand. It is therefore included here as a major driver for the evolution of emerging agrosystems. Closely interrelated indicators of the macroeconomic situation such as the evolution of GDPs, per capita incomes or consumers' average purchasing power can have powerful effects on future changes in these agrosystems.

Many of the products of emerging agrosystems carry a premium over their mainstream agriculture counterparts. The general economic situation and, in particular, consumers' purchasing power, dictates the fraction of their income consumers have to devote to meeting their basic needs. Once these needs are met, the greater the consumer's income, the greater is their likelihood of seeking in foods properties other than those of purely nutritional nature, thereby increasing the demand for products —usually more expensive— with some added value as regards in terms of complementary functions.

Also, some elements of the macroeconomic situation (e.g. inflation, unemployment, consumption and trade balance) influence farmers' ability to meet the challenges posed by the adoption of practices and techniques other than those they have traditionally used —particularly when the confronted with reduced yields, increased costs and an incipient, uncertain market.

The evolution of international trade is an additional component of this driver.

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

This is probably one of the drivers with the most uncertain future, even on a mid-term horizon such as 2013. Macroeconomic variables depend on many factors and the predictive models currently used allow no reliable forecasts to be made for the proposed horizon.

Because of its cyclic behaviour, the economy alternates between phases of expansion and recession. There are strong indications that the coming years will see a situation of economic recovery and stability, with a trend to moderate growth. However, based on the events of recent years, there are still many uncertainties that might introduce a break point in this trend.

Substantial advances in the deregulation of international trade in general and that of agri-foods in particular are to be expected over the period studied. This will result in reduced protection of the Community market and in the consequent inflow of products from third countries competing with those of EU agriculture. In this scenario, an effective market-distinction approach favouring European produce over that from other countries might be a logical response of our agriculture to the need to gain consumers' attention and trust. In a way, some emerging agrosystems have come a long way along this path.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

In a scenario of general economic recovery and stability, organic farming, which produces more expensive products than mainstream agriculture in exchange for supplying the socially demanded value of environmental friendliness, is bound to find no economic hindrance to its development and growth. This may result in an increase in the land area and number of farmers engaged in this agrosystem, and, especially, in the expansion of the organic product range currently on the market. Such an expansion must arise from the presence of more heavily processed products obtained by incorporating the agroindustrial process to the system and raising their added value.

The influence of globalisation and the deregulation of international trade is more difficult to predict as its impacts can be variable. Thus, organic farming is well enough placed to withstand an influx of undistinguished products from third countries as it has its own market and a favourable image among most consumers. However, because it is a markedly developing system throughout the world, the market could easily absorb competitive organic products from non-EU countries. In response, European organic farming would have to put forward some distinguishing feature allowing it to compete in a saturating market (see the "Agri-food Supply in the Enlarged EU" record).

Integrated farming

The prospects for economic stability are bound to favour a system that has entered the market with the economic and environmental sustainability values of integrated farming. However, in a global scenario where some form of differentiation is necessary, consumers are unaware of this system and its being mid-way

between organic farming and mainstream agriculture places integrated farming places integrated agriculture at a disadvantage compared with organic farming.

Here, again, the European farming model may adopt the philosophy of integrated farming and make it the de facto European standard in agri-food production. This would allow European agricultural produce to be distinguished from that coming from third countries as a means of competing with them on the home market.

Conservation agriculture

The macroeconomic situation (specifically, its foreseeable evolution in the coming years) is bound to have little influence on this agrosystem, particularly as regards marketing —where it has progressed little and is expected not to grow much in the near future.

However, a favourable economic situation might encourage farmers or service providers to invest in the machinery required to implement this system (e.g. direct seeders, vertical tillage implements, herbicide applicators) in search of the reduced costs some of its practices involve.

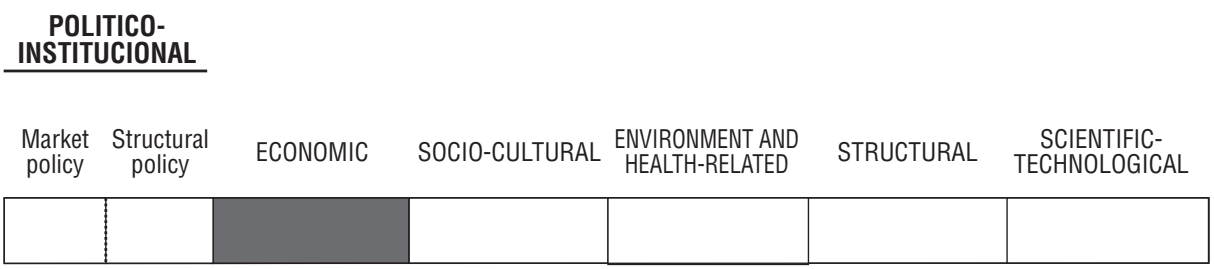
Agriculture under guaranteed quality

Quality-assured products[220] are related to the present driver in much the same way as organic farming: a favourable macroeconomic situation is bound to favour products with a high added value.

Regarding the market opening trend, there is the advantage in the above-discussed market distinction to be expected from binding to a specific origin or traditional production method in some quality designations (PDO, PGI, TSG) [221]. In a scenario of deregulated international trade, quality certificates bound to no geographic origin (e.g. ISO, EN, UNE or EUREP–GAP standards) will also be at an advantage as regards market distinction; however, such certified products might have to compete with others from non-EU countries bearing identical or similar quality labels.

4.5.16- Distribution and marketing structures

RELATED DIMENSIONS:



DESCRIPTION:

This driver encompasses the characteristics that define distribution and marketing in the agri-food system, and the pathway followed by agricultural produce from production to end-market.

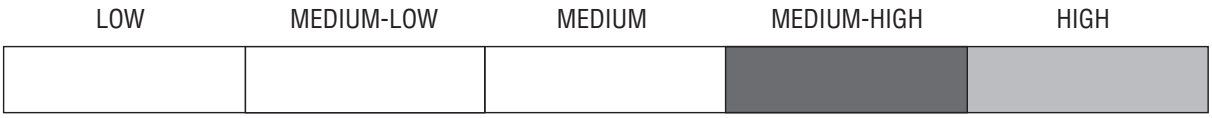
220 This includes both the designations acknowledged by European legislation (PDO, PGI and TSG), private standards of voluntary compliance (e.g. ISO, EUREP-GAP), etc.

221 In fact, these designations originated from the need to provide market protection for the products (specifically, their names) from copies or substitutes made in other regions or countries which used the names of the originating regions to exploit the prestige of the originals.

The presence of an appropriate distribution and marketing structure may be the key to the success of a given product range and hence influence both farmers' ability to find outlets for their produce and consumers' access to it.

The produce of alternative agrosystems follows different marketing pathways that involve selling on site or at hypermarkets, promotion at trade fairs and direct sales, among others. One essential component of this driver is the role of modern distribution methods in promoting specific agrosystems, ensuring compliance with quality protocols, expanding the range of products available to end-consumers, etc.

SIGNIFICANCE OF THE DRIVER:



LIKELY EVOLUTION OVER THE PERIOD UP TO THE PROPOSED TIME HORIZON:

The currently available data suggests that large retail chains are seeking to find a place in as many market segments as possible. In pursuance of this goal, many enterprises are backing products from alternative agrosystems (e.g. organic farming or agriculture under guaranteed quality).

Additionally, large retailers are increasingly compelling farmers, through agreements, to comply with specific production protocols typical of integrated agriculture or to deliver products endorsed with a quality certificate.

In view of the factors alluded to above, these products may come to be marketed mainly through hypermarket and large supermarket chains in the future, thereby considerably reducing the scope of the speciality shops currently selling them.

A new dynamic in the commercial relationships of producers will find its way and supply concentration, as a form of trading on equal terms with the large retail chains will become especially important. In this scenario, prices can be expected to fall (at the expense of farmers' margins); however, products can also be expected to gain in popularity and consumers' demand to grow as a result.

One possible alternative might arise by which farmers could undertake additional roles in the agri-food system (e.g. conditioning, marketing), thereby shortening the distance with consumers and increasing their share of the added value.

FUTURE IMPLICATIONS FOR THE MAJOR EMERGING AGROSYSTEMS:

Organic farming

Distribution and marketing structures play a central role in the development of organic farming — an agrosystem that is closely bound to the market. In Europe, agri-food products are increasingly being distributed by hypermarkets and other modern distribution channels. Speciality shops, which formerly marketed most of the organic produce, are gradually losing weight as a result.

There are strong indications that this trend will persist and hypermarkets continue to increase their market share. One possible consequence of this trend might be a reduction of the price gap between organic and mainstream produce by effect of the cost savings inherent in the economies of scale associated with these distribution channels.

Integrated farming

As already mentioned, some large retail chains are favouring certain production methods —particularly for fresh produce, on which they impose specific traceability, assurance, production and agricultural input criteria (among others). In some cases, this is leading to the adoption of production protocols very similar to those of integrated farming where, for example, synthetic inputs are replaced with biological pest-control methods or traceability is compulsory.

One future possibility is therefore the persistence of this scenario, with an increasing number of farmers adhering to modern distribution guidelines and operating under even stricter standards.

One additional possibility also discussed in relation to other drivers is the widespread compulsory adoption of integrated farming as a requisite for obtaining CAP subsidies. This would effectively lead to integrated farming's becoming the mainstream agriculture for the European Union.

A third possibility is the promotion of integrated farming as such, using a distinctive labelling scheme and regulations adopted by the whole European market. Here, the large retail chains might act as the vehicles for promoting this agrosystem, as they have in the case of organic farming.

Conservation agriculture

As noted earlier, conservation agriculture is not bound to reach market distinction via a labelling scheme of its own. Therefore, this driver can be expected to influence this agrosystem in much the same way, as it would affect mainstream agriculture.

Agriculture under guaranteed quality

Like organic farming, agriculture under guaranteed quality is closely linked to distribution and marketing structures. Emphasis here is placed on the industrial and marketing stages rather than on the farming stage. So far, marketing channels have bet heavily on quality labels, and so are, increasingly, hypermarkets and modern distribution channels.

Therefore, the future of this system in a time where markets are showing some signs of saturation will rely heavily on the stance of marketing channels and the response of consumers. To alleviate the increasing saturation, hypermarkets may take the initiative and group different labels under a common brand or favour specific designations of origin over others.

4.6. Medium term outlook of the alternative agrosystems

4.6.1. Organic Farming

An expanding agrosystem, albeit subject to some limits

The evolution of organic farming from the present to the year 2013 can be expected to conform to some specific patterns. Thus, its territorial scope will continue to expand and the certified organic land area to increase in the next few years (i.e. the growing trend of recent years will consolidate). This will therefore be accompanied by an increase in the European demand for organic products, which will strive to find a place on agri-food markets.

However, this trend might be reversed in the medium term. According to most of the experts asked, the organic land area and market scope will stabilise by the proposed time horizon or even before. The demand will be unable to absorb the current growth rate for this agrosystem and a "ceiling" will thus be reached. This suggests that the market for organic produce has a limit as it is a minority consumer segment that cannot grow indefinitely.

A number of signs support this assertion Central European countries —which are the greatest consumers of organic produce and those that implemented organic farming earliest— have lately shown a drop in the growth rate of certified organic land area. While Mediterranean countries have climbed some positions on the EU ranking for organic area, central European countries are closer to this potential equilibrium. Also, although market saturation here is still highly unlikely, some signs[222] are emerging that suggest it might indeed occur some time in the future.

The potential stabilisation of the system (viz. a scenario where supply would grow asynchronously with consumers' ability to absorb it) would lead to a reduction of the price gap between the products of organic farming and mainstream agriculture.

In any case, organic farming is seemingly unlikely to be adopted by European holdings at large. Based on the prevailing market structure, it will continue to be another market-distinguished option among emerging agrosystems.

Specific supportive measures will facilitate the switch to, and consolidation of, organic farming

The consolidation of the organic agrosystem, which is unquestionable, will be facilitated by the maintenance or strengthening of specific aid. Public administrations (the Community Administration included) will continue to reinforce their support of organic farming. Regional, national and Community-wide programmes will favour the development of organic farming. The CAP focus on the second pillar and environmental respect are consistent with the principles of this agrosystem and can be fostered via agri-environmental measures or related policies.

Environmental respect and health consciousness: two values on the rise

Market-wise, consumers' demand for organic products will continue at its present levels or even grow substantially in the short to medium term. The increasing environmental awareness is a decisive factor here in persuading consumers to pay a premium on organic products. The foreseeable deterioration of the environment and the increased sensitivity of the population to the health problems associated with improper nutrition will help the demand consolidate.

Functional foods (viz. those foods providing some specific health benefit) may constitute a disturbing element here. Based on the new Community foci, functional foods will have to prove their benefits in order to be accepted by consumers —an unnecessary condition for organic products. Therefore, functional foods might become "competitors" for organic products in a health-conscious population segment concerned with healthy nutrition.

A favourable macroeconomic scenario

A stable macroeconomic situation with moderate growth is bound to favour products that carry a premium with respect to those of mainstream agriculture. An unfavourable disruption of this trend might be especially detrimental to organic farming.

The way other similarly important elements evolve is also bound to have marked effects on the future of organic production. Their influence is discussed below.

222 A decreased consumption of organic products in Italy and isolated surpluses of bio cereals in France, for example, have been reported.

Training and advice: the necessary conditions

Technical and legal advice, together with training, will continue to play central roles in an agrosystem that uses innovative technologies and practices. Commercial organic farming cannot be understood without this support, which has traditionally been provided by various agents. The simultaneous provision of advice by various bodies and entities is bound to remain in the future.

The strategy of the large retail chains. Direct sales as an alternative

One of the factors most strongly influencing the future of organic farming will probably be the role of distribution and marketing structures. In recent years, the large retail chains have adopted a diversification and strategic segmentation approach that has shifted some weight from speciality shops and other distribution channels. Over the period up to the proposed time horizon, the main part of organic produce will be marketed via the modern distribution structures —this, however, will depend on their undertaking a more or less active role here. The decisions about what to market and how to do it, and the endorsement of this agrosystem by hypermarkets and large supermarkets, will be essential for its consolidation.

The removal of links from the marketing chain —the ultimate expression of which is direct sales on site— may help develop this agrosystem —particularly at the local and regional levels and in connection with rural development initiatives and small-scale producer and consumer associations. Quantitatively, however, this will be a minor marketing channel.

The CAP review: a more market-oriented European agriculture

Based on the guidelines established in the recent CAP review, the European agricultural policies of the next few years will probably focus on decoupling. Also, a general trend exists towards reducing subsidies —at least as the first pillar of the CAP is concerned. In this situation, where European agriculture would be more openly exposed to market rules, and with the growing deregulation of international trade, one can expect farmers to be increasingly professional and their holdings more modern and competitive. In such a scenario, organic farming might be indirectly favoured by the new CAP: for some farmers, organic farming may become a means of maintaining their income thanks to the market premiums on organic produce and the support of specific development programmes for this agrosystem.

Farmers in the most less favoured areas will be those most likely to switch to organic farming, as they will be faced with reduced subsidies and the lower competitiveness of their produce. They will therefore have to choose between ceasing activity and seeking alternative, better rewarded markets.

Harmonisation of regulations versus proliferation of standards: the inevitable convergence

There are other, less important factors, which, however, can also contribute to shaping organic farming in the future. Regarding the evolution of regulations, clarifying and harmonising existing standards, and specifying their requirements more precisely, would make the system competitive with products from third countries eventually reaching the Community markets. If the EU administrations fail to provide such harmonisation, the market itself will adopt the standards endorsed by consumers' trust and leave to one side many of the existing local, regional and private standards currently operating under the umbrella of organic farming.

Towards healthy, environment-friendly practices of proven effects

An agrosystem that addresses society's health and environmental consciousness will increasingly need to demonstrate its alleged benefits in an increasingly better informed and knowledgeable world. Organic farming is will thus faced with the challenge of demonstrating that its practices are associated with proven favourable effects in this respect. Therefore, as noted earlier, the body of technologies used by this system can be expected to be refined and reflected in specific regulations. Obviously, organic farming should free itself from purely ideological and pseudo-scientific atavisms and their standards incorporate additional, environmentally relevant aspects such as the efficient usage of water and energy, soil management or restrictions on long-distance product transport.

The low impact of the EU expansion

The expansion of the European Union will have no substantial effect on the organic product market. While adoption of this agrosystem is bound to grow and the organically cultivated land area to increase in the new Member States, the current agri-food system in these countries, and their marketing potential, are unlikely to influence market variables. Also, the overall demand is bound to change little. Because of the low-income levels of most of the new Member States, and of the low environmental consciousness of their population, their demand for organic produce will be very limited.

4.6.2. Integrated farming

Growth and changes

The experts asked nearly unanimously feel that integrated farming is bound to grow very rapidly in the near future. More uncertain however, are the direction of such growth and the parameters that will define an agrosystem currently in conceptual, territorial and regulatory development.

There is also the widespread believe that integrated farming is currently in an unstable situation. In the lack of uniform regulations, a number of labels and logos associated with a variety of protocols and standards have emerged that have progressed to a varying extent in different countries and regions. Some labels —a few, actually— have succeeded in winning consumers' trust. One other hindrance to the development of this agrosystem is a lack of awareness of integrated farming and its benefits among the general public. For this reason, many consumers purchase its products because they associate them with a geographic origin or believe that they are healthier, without knowing the exact meaning of "integrated" here. In summary, this agrosystem is expected to grow, but also to undergo major changes including restructuring (possibly promoted by public administrations, retail chains, producer and transformer associations, etc.) in the regulatory, production, transformation and marketing realms.

Integrated farming as the paradigm of European agriculture

One of the most salient trends in this context is the shift of European mainstream agriculture to the principles of integrated farming; many of its current practices and techniques have been incorporated in the general regulations established by the CAP. In the medium to long term, European agriculture can thus be expected to operate in accordance with the principles of today's integrated farming, which will thus lose its specific meaning. Agenda 2000 and cross-compliance (introduced by the recent Mid-Term Review of CAP) have taken the first step in this direction by binding the award of farming aid related to the first pillar to the fulfilment of technical specifications, much in the vein of the principles of today's integrated farming.

Future regulations are expected to strengthen cross-compliance by making it stricter, and more thorough and efficiently controlled. The environmental audit model introduced with the CAP review proposal by the Commission would represent a firm step in this direction.

Harmonisation of standards and adaptation of the marketing message: the necessary conditions for a distinct market

For integrated farming to develop in ways other than by assimilation to mainstream agriculture, it must conquer a specific market segment by achieving consumers' distinction of its produce. For this to be feasible in a single European market, current standards and labels must inevitably be harmonised, whether publicly (via framework regulations) or privately (via natural selection of a certification endorsed by the large retail chains). This would facilitate consumers' appreciation and reward of its products.

However, the current marketing message of this agrosystem seems inappropriate. In a scenario where the price gap between the products of organic farming and mainstream agriculture is shrinking, there can be little room for an agrosystem that is struggling for a place in between the previous two.

Market distinction as a competitive strategy for European agriculture

It should be noted that the previous two options (viz. the adoption of integrated farming as the European farming model and the market distinction of integrated farming) are not mutually exclusive. A future European agriculture absorbing the principles of integrated farming and its practices as a necessary condition for eligibility to aid could also be market-distinguished. Thus, European agri-food products could be supplied at a premium with respect to those from non-EU countries (world prices) in exchange for a commitment with environmental friendliness, the preservation of the European rural environment and traceability as a quality assurance mechanism for consumers.

The active role of public administrations: the influence of aid

Based on the foregoing, the evolution of integrated farming will rest heavily on its regulation and on that of European agriculture as a whole, as well as on the commitment of the Community and national administrations to this task.

While regulation is important here, aid policies can also help this system develop. In this respect, one can expect aid to be extended to all practicing regions and farmers, whether within the general framework of CAP subsidies or through agri-environmental measures or the support of national and regional administrations. Also, because it is a relatively self-contained, fully developed system, and consistent with the above comments in relation to an increased harmonisation of standards, one can expect aid to focus on the implementation of this system as such rather than on any of its individual practices.

The significance of advice and training: public and private provision

Technical advice and training are currently among the cornerstones of this agrosystem, which relies on rational management of the information produced on site via technical knowledge. In the future, advice and training will continue to be especially prominent by virtue of the growing significance of the new technologies to farming. How accessible both are will largely dictate to what extent the system spreads to new sectors and territories. Advice will be provided at both the public and the private level (e.g. farming consultancy and advice, service providers, farming supply and equipment dealers, etc.).

In any case, the dedicated producer associations in each practicing area, with the endorsement and support of some public administrations, can be effective means to facilitate the access of small and medium-scale farmers to such services. In some areas, professional organisations will play a prominent role in the provision of these services and the gathering of farmers in associations.

Also, the incorporation of the new information and communication technologies into the farming world may enormously facilitate farmers' access to training and expert advice.

A closer involvement of the large retail chains

Another factor that will unquestionably affect the future of this agrosystem is the response of the large retailers. Supermarket chains will continue to play an increasingly important role in the monitoring and control of agri-food production and transformation processes. This will lead to the increasing adoption, via the signing of agreements, of compulsory specifications and production protocols by producers and transformers intending to use these marketing channels. The production standards farmers will have to adhere to will be essentially concerned with food safety and environmental respect. All are encompassed by today's concept of integrated farming, whether or not it is referred to as such in the binding agreements.

The EU expansion: difficulties in reaching the new Member States

The expansion of the European Union will have little impact on the supply and demand for integrated produce. The input and advisory levels involved, which demand substantial endeavours from farmers, are bound to result in a low level of adoption by the new Member States if the current regulatory and marketing status of this agrosystem remains unchanged. This will not be the case if cross-compliance is reinforced by demanding the adoption of integrated farming practices or if integrated produce is priced high enough for farmers to adopt the system. In the absence of such changes, agriculture in Eastern Europe will have to undergo structural transformations of a different kind in order to improve their competitiveness before they can adopt such a complex agrosystem as integrated farming.

The response of consumers in the new Member States is also bound to cause no change in the market for integrated produce. As noted earlier, consumers' environmental sensitivity and demands for traceability do not seem to be among their top priorities in these countries. The new consumers will gradually evolve to the Community's current consumer profile and thus exhibit the same concerns in the medium term.

Permeability to the incorporation of new technologies

Finally, we would like to emphasise the advantage of integrated farming that derives from its openness to new technologies provided they are consistent with some quite broad general principles. This will allow it to incorporate the best among the proven effective techniques used in other agrosystems (e.g. precision agriculture, conservation agriculture) without a priori excluding any potentially favourable developments in economic profitability, environmental respect or food safety and traceability.

4.6.3. Conservation agriculture

Popularisation of soil conservation practices in erosion-prone areas

The land area under soil conservation practices will grow substantially, albeit with territorial differences, in the time remaining until the proposed horizon. Adoption of these practices will increase to greatest extent in the most erosion-prone regions (particularly those on the Mediterranean arch).

An incomplete system with little development in the agri-food chain

Conservation agriculture will continue to be an incomplete system, one restricted to the agronomic field. Its produce will neither enjoy market distinction nor carry specific quality labels[223] —at least in Europe. Rather, conservation agriculture will continue to be a body of soil management practices with no impact on the agroindustry or marketing channels.

Strengthening of the presence of conservation agriculture in agri-environmental programmes

Some practices typical of this agrosystem are currently included in the agri-environmental programmes of various countries. In the near future, the presence of conservation agriculture in such programmes may grow with the incorporation of additional fundable conservation practices or their extension to other regions. This is justified by the specific environmental benefits such practices provide for some, especially sensitive regions; thus, they help preserve the agrological capacity of soils and facilitate the fight against erosion, water run-off and dam clogging, among others.

The presence of conservation agriculture in these programmes, and the financial support it might attract, may help this system expand its territorial scope.

The use of conservation practices as a necessary condition for the awarding of CAP subsidies

In addition to, or instead of, the possibilities described in the previous section, some soil conservation practices might be incorporated into the body of cross-compliance conditions to be met in order to receive funds from the first CAP pillar in erosion-prone areas. The compulsoriness of such practices would be justified by factors such as climate, crop, slopes, soil type or the risk of water contamination with phytochemicals. This may definitely help popularise these practices among farmers.

Integration of conservation practices into other emerging agrosystems

Conservation practices can reasonably be expected to reach other alternative agrosystems such as those examined in this report or others potentially emerging in the future. Integrated farming is probably the system most likely to adopt such practices in its specific protocols in holdings facing erosion problems.

The inability to use certain herbicides in organic farming hinders the adoption of conservation practices. However, alternative weed control strategies may make the two compatible, which is desirable on account of the environmental benefits conservation practices provide.

Finally, agriculture under guaranteed quality is unlikely to face any difficulties in incorporating soil conservation techniques.

Holding structure will continue to influence the adoption of this system

Holding structure has to a large extent dictated, and continues to dictate, the adoption of conservation agriculture. The importance of this driver will persist in the future. Thus, the system will be restricted to specific production types —its associated practices would be meaningless for a horticultural greenhouse or an intensive cattle breeding farm, for example. Also, larger holdings will have a stronger tendency to adopt conservation agriculture than smaller ones.

223 Although some countries (e.g. USA, Brazil, Argentina) have started to promote the commercial distinction of the produce of conservation agriculture, this trend is unlikely to reach the markets -and, even if it does, it will have little spread.

Service providers: an entry way to soil conservation technology

However, service providers, in search of the reduced costs involved in conservation practices, are already betting on this system by incorporating the special machinery required to their stocks. Service providers can play a central role in the popularisation of conservation practices by facilitating the access of small- and medium-scale farmers, who are unlikely otherwise to be able to purchase their own dedicated machines.

The technological driver: technical developments and their dissemination

The benefits of conservation agriculture will also be fostered by new technological developments. However, the popularisation of existing technology will be more significant than the emergence and spread on new techniques.

Technological developments will be accompanied by increased technical advice. Soil management machinery and herbicide treatment procedures will develop to a marked extent. As a result, service (machinery) and input (herbicide) providers will be the agents furnishing most of the technical advice —with an obvious commercial slant— to farmers adopting conservation agriculture.

4.6.4. Agriculture under guaranteed quality

A system in clear expansion over a changing horizon

In the opinion of the experts asked, and the authors themselves, agriculture under guaranteed quality will consolidate by the year 2013; in the meantime, it will grow as a result of increasing consumer demands. However, there are strong indications that the current proliferation of quality logos and standards will cease to be sustainable in the medium to long term.

The need for a new meaning in origin-bound certificates

In the near future, incipient signs of market saturation may emerge by effect of the excessive proliferation of labels bound to geographic origin or traditional production methods. The number of such certificates increases almost daily and Community-endorsed quality figures (PDO, PGI, TSG, QWPSR) are being joined by new, national or regional, designations. This is making it increasingly difficult for consumers to identify the actual added value of specific quality sales and raising confusion and uncertainty among them.

Some experts believe that the original meaning of some origin-bound designations may be distorted as a result. In fact, the original aim of providing commercial protection for the name of products enjoying some market prestige is shifting increasingly to obtaining such prestige via the use and registration of territorial designations. This approach may be effective in the short term, but will hardly be so in the long term unless it is accompanied by objective improvements in the quality of products and the implementation of stricter quality control mechanisms capable of earning consumers' trust.

Reduction of the number of standards via natural selection by the market

Quality certificates bound to no specific geographic origin with a rather varying scope and implications (e.g. ISO, UNE, EUREP–GAP) are also on the increase at present. Although this situation can be expected

to persist, recognition and assimilation initiatives are arising under the umbrella of the powerful marketing machinery of the large retail chains. For example, standards other than EUREP–GAP have been promoted for recognition at the same level.

Traceability, environmental respect and food safety: the convergence with other systems

This appears to be the beginning of a restructuring process, which suggests that this movement towards transparency will be reinforced. Traceability and the use of good farming practices during production will have to be incorporated, which will bring these systems closer to the principles and requirements of integrated farming. Quality-assured systems will absorb a gradually increasing number of elements of the different links in the agri-food chain, as well as a variety of food production-related requirements (e.g. environmental respect, animal welfare, work safety, health safety, etc.).

Quality certificates as the key to market access

Carrying a quality label has by now become a necessary condition for any product to enter specific marketing channels. This situation will spread in the future and leave aside from the major distribution channels all those products lacking a certificate or having one not directly endorsed by the large retail chains.

The large retail chains and their winning of new market segments

Large firms are trying to reach many consumer segments —minority segments included— that were formerly outside their commercial scope. Thus, hypermarkets now devote special sections to highly specific segments of the population (e.g. buyers of traditional or local products and consumers concerned with the presence of pesticide residues in foods, aware of the increasing environmental deterioration, demanding dietetic products or seeking high-end products). For products carrying a label certifying their origin or their production in accordance with traditional methods, this will the main market outlet; alternative outlets (delicatessen and speciality shops, direct sales, the Internet) will not disappear, however. In this scenario, the rapid growth of such certificates can promote some selection, so only those best known and appraised by consumers are bound to reach them.

The preservation of premiums on recognised quality-assured products

The price reached by quality-assured products is one other central variable. In a stable macroeconomic scenario of moderate growth, the price gap between such products and those of mainstream agriculture is likely to be maintained. If the sector eventually self-regulates, clarifies and meets the requirements of consumers, customers will continue to be willingly pay a premium on quality-assured products.

The situation may be different for products not bound to a geographic origin. Thus, if quality assurance systems eventually become compulsory for marketing via some large retail chains, then the systems will become the standards for an increased number of market segments and consumers will fail to notice a premium on such products.

The low significance of public aid

Public funding will continue to have little significance to this system. Historically, public aid has focussed on the funding of certifying and control bodies, as well as on the promotion of the produce. The new

guidelines of the Community's agricultural policy favour quality-assured products within the framework of rural development. The issuance of specific farmers' aid is unlikely, as is the persistence of this situation to become a deterrent element provided the market continues to reward quality-assured products with a premium.

The technological revolution: towards objective quality

Technological and analytical breakthroughs, and advances in the knowledge of food–health relationships, might revolutionise the currently complex spectrum of quality certificates. The ability to authenticate foods and check their composition in a rapid, convenient manner, might facilitate the individual appraisal of their quality and make many of the current collective certificates —many of which rely exclusively on a commercial image— redundant.

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