Prospective Analysis of Agricultural Systems

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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.

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
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

DRIVER	SIGNIFICANCE	LIKELY EVOLUTION
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

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 “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.