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# Organic Agriculture in the Mediterranean Area: State of the art

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## 1. Origin and development of organic farming

In Europe, the process of organic farming has been marked by a number of fundamental steps. Organic farming is supposed to originate in the early 20th century, when a new cultural approach to the use of natural resources got established in Germany.

At the beginning of the 1920s, this cultural excitement gave rise to the anthroposophical movement, founded by Rudolf Steiner.

The renewed approach to nature led to the elaboration of the principles of biodynamic agriculture based on the concept of healthy and balanced foods, the same fundamental principles that gave rise to organic farming.

In 1943 Lady Eve Balfour, in England, founded the Soil Association, a research body to study the interrelationships between the use of land for agricultural purposes and its effects on the animal and plant kingdom.

Again in the 1940s, in Switzerland, Hans Muller and Hans Peter set up the “organic method”.

Distinctive characteristics of this method are the importance attributed to soil humus, the use of composting and reduced-to-minimum soil tillage to prevent altering soil microflora and for an optimal use of renewable resources.

In the 1960-1970s there has been a proliferation of organisations and associations promoting organic farming also in the Mediterranean countries. In 1972, in France, different associations joined to found the International Federation of Organic Agriculture Movements (IFOAM), a body that will set common regulations and guarantees to safeguard organically produced foodstuffs and protect consumers. Today, based on IFOAM standards, many state administrations of different Countries are increasingly recognising organic farming.

In 1973, in the United States, for the first time, the term “organic” became under the protection of the law: the Oregon Administrative

Rule established that the term “organic” means “an agricultural system conducted without using synthetic chemicals”.

Further pioneer experiences were made in Egypt (1978) where an association called Sekem gave rise, in the desert, to a biodynamic farm of about 70 hectares where medicinal plants and aromatic herbs are grown.

In the 1980s, in Israel, the Israeli Bio Organic Agriculture Association (IBOAA) was established.

In the same decade, organic farming developed in most of the European countries. In fact, between 1980-88, the minimum standards required for organic production and the designated inspection authorities were introduced in the French legislation.

Such development was followed by the increasing demand for quality products by consumers.

Similar experiences were developed in Morocco (1986) by French organisations, and in Tunisia.

In the 1990s, the advances and changes in the EU Common Agricultural Policy (CAP) and, more generally, the decision-makers' awareness of the environmental impacts of agricultural activities, contributed to create a favourable framework to the development of organic farming.

On 24 June 1991, the EEC Council approved the Regulation no. 2092 published in the Official Journal of 22 July, 1991, “on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs”.

In the last years, surfaces being converted to organic farming have largely extended. The enforcement of Regulation (EEC) 2092/91, that defined terms and procedures, and of Regulation (EEC) 2078/92, that granted subsidies to holdings converting to organic, favoured huge and rapid development of organic farming in Europe.

A further and important step was the Community approval of the regulation for the recognition of a logo for organic production (Regulation EEC 331/2000) and the approval of the regulation on organic livestock farming (Regulation EEC 1804/99).

In the Mediterranean, in 1997 the IFOAM – AgriBioMediterraneo was established with its secretariat at the CIHEAM-IAMB (Italy). Since 2000 its headquarters are at EKOLIBURNIA, Rijeka (Croatia).

In 1999, the MOAN (Mediterranean Organic Agriculture Network) was set up through the promotion and support of CIHEAM-IAMB.

That same year, Malta's Organic Agriculture Movements (MOAM) was

founded, with the purpose of starting developing organic farming and in view of joining the European Union. The purpose of MOAM is also to start initiatives in the field of training and research, of standards and certification, of rural development and marketing.

So, in the last five years, interest and consent on organic farming have continuously increased, both in demand and supply, and by now it involves all the Mediterranean countries. However, the application of the organic production method is not the result of improvisation or the return to traditional techniques, rather it requires huge investments in knowledge oriented to production and conservation techniques, and compliance with the regulations in force. Also from the point of view of marketing and distribution, a lot has still to be done. In particular, strengthened distribution network and more capillary information are basic prerequisites to allow the potential organic product consumer to effectively meet his/her requirements.

Following on these European and non-European experiences (USA, Japan, Australia), some non-EU Mediterranean countries have started working for the regulatory recognition of organic farming.

## 2. Regulatory framework

### 2.1 EU rules and regulations on organic farming

The worldwide application of unified and/or harmonised production standards for organically produced foodstuffs is extremely important for a greater development of organically grown land and of markets of organic products.

Harmonisation of rules and the mutual recognition of regulations of each single Country are important aspects aimed at facilitating trade of organically produced foodstuffs.

In many countries, organic products are under the protection of the law. This applies in the EU countries (Regulation (EEC) 2092/91 and Regulation (EEC) 1804/99, annex 1), Switzerland, Australia, Hungary, USA, Japan and Canada. In the Mediterranean, only Tunisia, Turkey, Israel and Slovenia have national regulations on organic farming. In many other countries actions are being taken in this sense. The presence of a national regulatory framework on organic farming is important, not only for export, but also to reinforce consumers' culture and trust and, thus, for the development of domestic markets. In June 1999, the Codex Alimentarius Commission of the FAO/WHO, also thanks to the collaboration of IFOAM, launched the Guidelines for the Production, Processing, Marketing and Labelling of Organically produced Foodstuffs. These Guidelines should contribute to have more

stable rules that safeguard and regulate organic farming and labelling of organic products in all the countries. In such a way, harmonisation of regulations would be possible worldwide and, consequently, it would be easier to legislate on organic farming matters and international trade of organic products.

A similar objective is expressed in the accreditation programme of IFOAM. IFOAM standards are translated into 19 languages and are continuously updated.

In all the Mediterranean countries there are private bodies for the control and certification of organically produced foodstuffs, taking as reference the standards established in the law in force in the Country (table 1). The organisations working in the southern countries are predominantly European companies that rarely employ local staff.

In fact, except Tunisia and Morocco, in the other countries, inspection and certification bodies exclusively rely on foreign or mixed staff. In many cases, local headquarters are absent and the organisation operates directly through the European or foreign headquarters.

Such bodies operate following essentially the regulations of the European Union and IFOAM standards.

## 2.2 The influence of the regulatory framework in the Mediterranean Basin

The Mediterranean region is a worldwide important market for agricultural products and foodstuffs, in particular to the European countries. The trade flows between the EU and the southern bank of the Mediterranean are in favour of the EU: over time, the structure of such trade flows has been strongly influenced by the agricultural policy of the EU and strongly affected by periodical "bilateral agreements", that establish conditions and import quotas in trade flows. By the year 2010, the "free trade" area will be established in the Mediterranean region. As for imports of organically produced products from third countries, the following types are indicated:

Imports from Third Countries whose equivalence is established by the decision of the European Commission, can be marketed solely when they originate in the list expressed in Regulation (EEC) no. 94/92 of 14 January 1992 and subsequent modifications (Regulation (EEC) no. 2092/91, art. 11, paragraphs 1-5), establishing the modes of application on the import regime from Third countries.

The Third countries in question, requested to be included in the list on the basis of the application of an internal regulation on the method of organic farming, in compliance with Regulation (EEC) no. 2092/91 and

Table 1. Regulatory framework and certification bodies in the Mediterranean countries (CIHEAM-IAMB, MOAN, 2001; Adler, 2001; Willer and Minou, 2002)

Country	National regulation	Number of certification bodies present in the country	Certification bodies
Italy	YES	9	AIAB IMC ECOCERT QC&I BIOS BIOAGRICOOP CODEX SUOLO E SALUTE CCPB
France	YES	5	ECOCERT SARL QUALITE FRANCE AFAQ-ASCERT INTERNATIONAL QUALITE NORD – PAS DE CALAIS USALE
Greece	YES	3	DIO SOGES FYSIOLOGIKI
Portugal	YES	2	SOCER SATIVA
Spain	YES	1	CRAE
Albania	NO	2	BIOSUISSE CODEX
Algeria	NO	0	-
Egypt	NO	6	IMO (Switzerland) DEMETER NATURLAND (Germany) BIOAGRICERT IMC (Italy) SOIL ASSOCIATION (United Kingdom)
Israel	YES	1	IBOAA
Lebanon	NO	0	-
Malta	NO	0	-
Morocco	NO	4	QUALITE FRANCE (France) ECOCERT (France) GfRS (Germany) BSC (Switzerland)
Cyprus	NO	3	LACON (Germany) DIO SKAL
Slovenia	YES	1	ENOTA ZA NAZDOR EKOLOGSKEGA KMETOVANJA
Tunisia	YES	6	INNO RPI (Tunisia) BIOAGRICOOP (Italy) ECOCERT (France) LACON (Germany) BCS (Germany) AIAB (Italy)
Turkey	YES	8	BCS (Germany) BIOAGRICOOP (Italy) ECOCERT (France) IMO (Switzerland) SKAL (Holland) INAC (Germany) ETKO (Turkey) EKOTAR (Turkey)

its annexes. At present, the list in the Annex of the same Regulation (EEC) no. 94/92, reports the Countries authorised to export into Europe on the basis of the “principle of equivalence!”: Argentina, Australia, the Czech Republic, Hungary, Switzerland and Israel. Moreover, the said Annex also reports the full information required to allow the identification and import of products, Authorities and Bodies of the Third Countries competent for the issue of certification, Inspection Authority of the Third Country and/or the private Bodies authorised to supervise operators, the indications concerning processing units and packaging, exporters and marketable agricultural products.

Should another country wish to be included in the said list, the Commission reserves to examine its application for membership “after having received the application for inclusion, submitted by the representatives of the third Country”, with all the required information.

The inclusion of the third country in the list “can be subject to the condition that the actual application of the rules of production and the inspection modes in the country be periodically checked by independent experts, and that they regularly write a report on it”.

Only after accomplishing the above-said procedure, the EU recognises the regulatory and the certification and inspection systems in force in the third country as equivalent to that in force in the EU. The recognition of equivalence allows free movement within the Community, excepted the enforced provisions of law and referred to the agricultural sector in general.

The second possibility is related to the application of Regulation (EEC) no. 2491/92 of 19 December 2001, that modifies Annex III of Regulation (EEC) no. 2092/91 in those countries where no national legislation does exist and/or equivalence to the national legislation is not recognised, and that allows the inclusion of the list laid down in article 11 of Regulation (EEC) no. 2092/91 (and reported in the Annex to Regulation (EEC) no. 94/92). In this case, it is the Member State that issues a specific authorisation to import in accordance with Regulation (EEC) no. 2092/91, art. 11, paragraph 6.

To be included in the said list, it is necessary to ensure to the final consumer “the traceability of organic agricultural products at the various steps of the commercial chain and their conformity to the provision of Reg. (EEC) no. 2092/91”.

Generally, these provisions are performed by involving an Inspection Body, approved at the European level, that guarantees to the EU the compliance with the minimum requirements for organically produced agro-food products included in Regulation (EEC) no. 2491/2001. This regulation establishes the “minimum inspection requirements and the

precautionary measures under the inspection scheme, referred to in articles eight and nine of Regulation (EEC) no. 2092/91", concerning the modes of execution of the inspection visits, the required documentation, the modes of packaging and transport of products to other units or production/packaging factories or units and the modes of storage and access to equipment.

Some specific provisions are defined that apply to all units involved in the production or import of plant products and foodstuffs from Third countries.

At present (validity until 2005), the Third Mediterranean countries from which it is possible to import into the EU through the guarantee given by the Inspection Body (approved at the European level) are the following: Bosnia Herzegovina, Croatia, Cyprus, Egypt, Morocco, Serbia and Yugoslavia.

From July 2002, the Regulation (EEC) 1788/2001 of 7 September 2001 will come into force. It fixes the modes of application of the provisions on the inspection certificate for the import of products from Third countries, in compliance with article 11 of the Regulation (EEC) 2092/91. Thus the existing procedures will have to be revised.

## 2.3 Support Policies

On the south-eastern bank of the Mediterranean, co-ordinated interventions that may support the development of organic farming are lacking. Few initiatives are undertaken on different sectors, ranging from training and extension to experimentation.

Moreover, in the Mediterranean countries in particular, there is a lack of national or regional support policies to farms, both in direct and indirect form, aimed at favouring conversion to organic farming.

Therefore, differently from what has occurred in Europe, the development of organic farming in the Mediterranean is taking place solely for market reasons, stimulated by the high demand for products from the EU, the USA and Japan.

In fact, the major organic holdings are owned or "controlled" by large firms or foreign multinationals that, of course, produce to export without triggering local development.

As regards the European experience on the application of Regulation (EEC) 2078/92, the results obtained have definitely gone beyond expectations.

Through the Agro-Environmental Programmes Regulation 2078/92 (EC, 1998), farmers are requested to adopt environmentally friendly practices, and measures are taken to compensate for losses in income and

additional costs. Such programme has involved 900 000 farms (except Germany) and 27 million hectares, equal to 20% of the European agricultural surface. The expenditure for the 12 countries of the EU raised from 0.1 billion ECU in 1993 to estimated 1.2 billion ECU in 1998, equal to about 4% of the European Agricultural Guidance and Guarantee Fund (EAGGF) expenditure, guarantee section.

The actions relative to both integrated pest management and integrated production are the most widespread. Forty per cent of the surface covered by the Regulation is involved in the application of these two actions that represent 56% of submitted applications.

Organic farming, with 15.9% of total surface, ranks second and goes beyond any forecast. The planned objective of the EU was to reach 12% of total Agricultural Area in the early four years.

This important result is due to the strong commitment of public administrations in the diffusion of low environmental impact production methods.

Considering all of the above, one may wonder: Is the EU approach to favour organic development the correct one?

### 3. Sector Overview

#### 3.1 Data and problems of organic farming development at the world level

Information reported in this paragraph are based on the data supplied by the German Foundation Stiftung Ökologie & Landau (SÖL). About 17.2 million hectares in the world are organically grown in 120 countries, and the surface is increasingly growing (Willer and Minou, 2001).

The country with the largest area is currently Australia with 7.7 million hectares, followed by Argentina with 2.8 million hectares, and Italy with over one million hectares (figure 1).

In Europe there are 3.8 million hectares organically grown by over 130 thousand farms that account for 2.8% of the average European Agricultural Area (AA) and 1.8% of farms, respectively.

In some EU countries (Austria, Italy, Finland and Denmark) the incidence of organic AA exceeds 6% of the national AA, thus confirming the great interest of the agricultural world towards organic products (figure 2).

In the European Community the highest growth is observed in Scandinavia and in the Mediterranean region, but Eastern Europe too organic products; in particular, Canada and the USA show huge growth rates of organically-grown surface areas. Actually, the surface area in

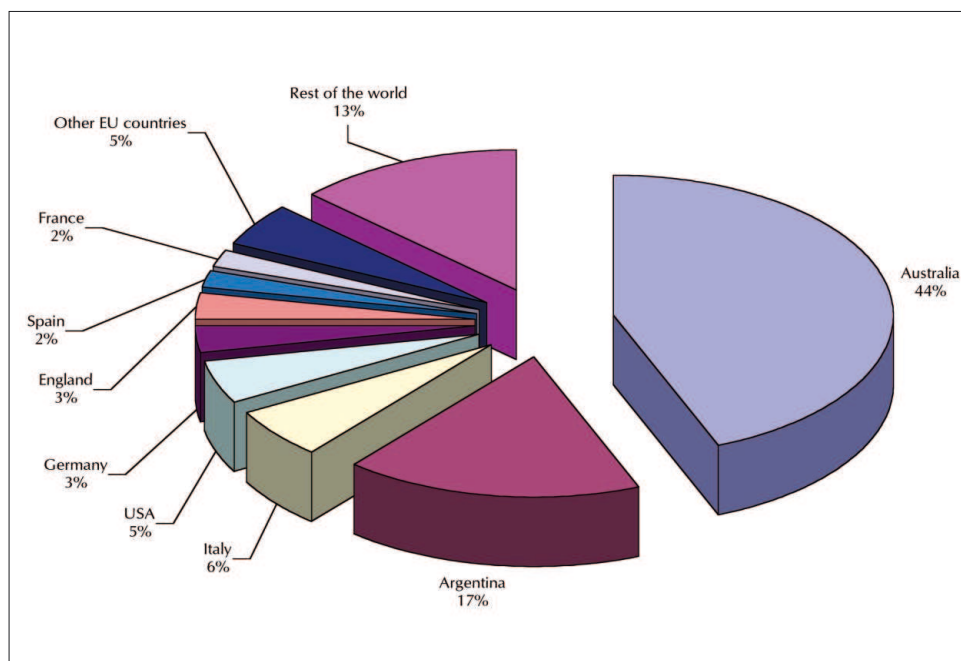


Fig. 1. Share of main producing countries of total world organic area in percent (Willer and Minou, 2001).

the USA doubled from 1995 to 2000, due to a growing domestic demand and an increasingly higher export share towards Japan and Europe.

In nearly all the Latin American countries the organic method is applied. The highest percent values are found in Argentina, Brazil, Costa Rica, El Salvador and Suriname, but sometimes the organically-grown surface does not exceed 0.5% of the AA. The growth rate is, however, high. In Argentina the organic area has grown, in less than 10 years, from 5500 hectares in 1992 to 2.8 million hectares during 2001 (Willer and Minou, 2001).

In Africa the traditional farming methods are ecological, but certification is adopted in few countries; consequently, products are sold through conventional markets and there are few data on organic productions. In the Trade World Conference organised by IFOAM in October 1999 in Florence, it has come out clearly that something is moving also in this continent. Indeed, the gradual soil exploitation and land erosion are leading Africa towards the awareness of the beneficial effect that organic farming could have to reduce the on-going degradation and to safeguard natural resources. Another major reason for growth in Africa is the possibility to market organic products in the industrialised countries.

In Asia there are few countries that have clear guidelines for organic farming. However China, India, Philippines, Thailand and Malaysia are

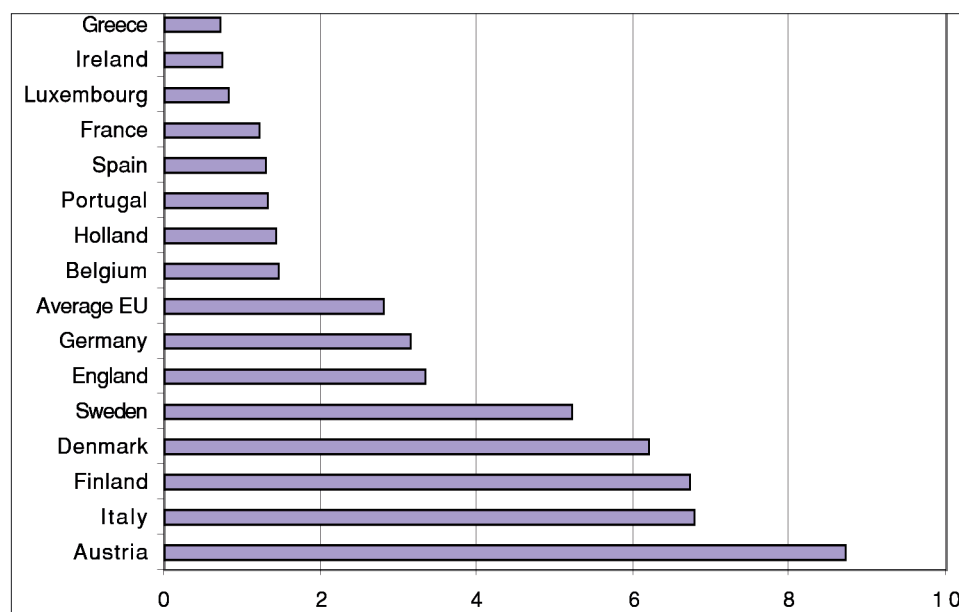


Fig. 2. Incidence of organic agricultural area on the total area of each European country (%) (Willer and Minou, 2001).

now setting out national standards and some countries have already their own inspection bodies.

In Japan the Ministry of Agriculture approved a law on organic farming in June 2000 and in the meantime, 26 Certification Bodies have been registered. In Asian countries organic farming finds its major reasons in self-consumption and land reclamation.

On the other hand, some studies conducted in India and Indonesia show that organic farming yields can be higher than conventional ones (Willer, 2001).

A key problem of the whole sector is related to export. The major world producers are Israel, Turkey, China and India, but there are nearly everywhere great distribution difficulties.

In Oceania organic farming is largely affected by the huge demand coming from Europe, Asia and North America: exports are supported through State aid and subsidies. In Australia and New Zealand there are certification bodies recognised by IFOAM.

An exception that cannot be neglected is Japan: it is a great importer, it had a volume of business of 2.5 billion dollars in 2000; it is one of the largest world markets of organic products (ITC, 2001).

The data illustrated above are helpful to understand the recent developments and potentials of the sector in different world regions. However, there is still much to do to strengthen the conversion of farms and facilitate the conversion process also for the farms involved in the processing and marketing of organic products.

## 3.2 The Mediterranean region

### 3.2.1 The agri-food system

Agriculture in the Mediterranean shows a great diversity between the EU- and the non-EU Mediterranean countries, although they have, in productive terms, similar properties for the “Mediterranean climate”. Differences are related to various aspects: (i) a different economic relevance of the agricultural and agri-food sectors on the overall economy of the country; (ii) a diversified weight of the agricultural workers on the total working population; a different capacity to access financial resources for new investments; (iii) a different availability of water resources; (iv) a different ability to access the knowledge resources and (v) a different role of agriculture (CIHEAM, 2000).

As shown in figure 3, the contribution of the agricultural sector to the overall economy varies a lot from country to country: in 1999 the weight of the agricultural sector on the national economy was 63% in Albania, 16% in Morocco and 14% in Tunisia, whereas it equalled about 2% in France, Italy and Portugal.

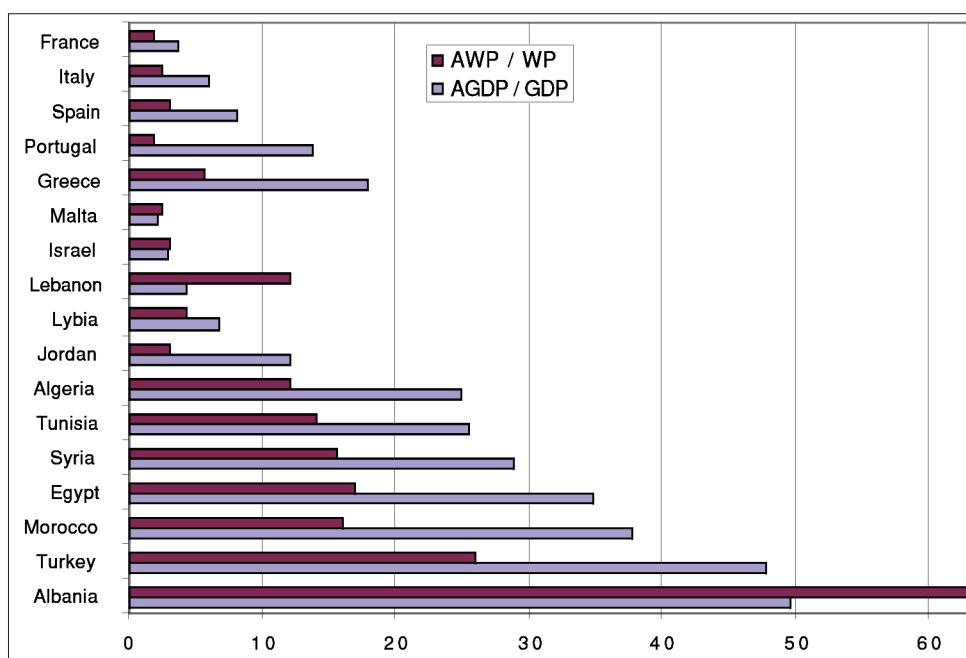


Fig. 3. Agricultural Working population (AWP) and Agricultural Gross Domestic Product (AGDP) in 1998 (CIHEAM-IAMM, 2001).

The agricultural working population also shows wide differences in different Mediterranean countries: with respect to the total working population, in 1999 it was about 50% in Albania and Morocco, 40% in Turkey, 34% in Egypt and only 4% in France and 6% in Italy.

The agricultural sector of the Mediterranean countries is, however,

very relevant for the economy of the region, both for non European countries, where it accounts for over 10% of the Gross Domestic Product, and for the most advanced economies, where it is the basis of an important agri-food and processing industry.

Moreover, the agri-food sector plays different roles in the rural societies of the Mediterranean, ranging from the production for self-consumption to rural development, including the environmental services and the symbolic and cultural functions.

The Mediterranean region is a world-wide market for food and agricultural products. It includes the major cereal-producing countries, such as France and Turkey, as well as the major wheat importers, like Egypt.

Many Mediterranean countries, especially the Southern ones, have been characterised, over the last few years, by a fast population growth, an increase in the *per capita* income and a change in the food habits, that have seen a decline of cereals and an increased consumption of animal-based products. In these countries, the growth in the total population and the growth in food demand clash with a reduced agricultural population, a lower availability of resources for agriculture (such as water resources) and an increase in food and agricultural imports.

The trade flows between the EU and the Southern Mediterranean countries are in favour of the former. The main farm products sold by the EU to the Mediterranean Third Countries are those which are in surplus and which benefit from export refunds (cereals, dairy products, sugar and meat), whereas imports are mostly fruits and vegetables, textiles and olive oil.

In the third countries the population growth rates are higher than in the EU Mediterranean countries. This trend, framed in a basically static economy, where agriculture plays a greater role than in Europe, leads to a growing supply of labour that favours the migration flows towards the towns or towards the Northern shore of the Mediterranean, and causes a strong human pressure on land.

### 3.2.2 The organic agri-food system

The history, the experiences and the dynamics of evolution on the application of organic farming method between the Northern and Southern-Eastern countries shores are different from each other. The identification of sustainable forms of land use is therefore a primary goal to be pursued for the purpose of reducing the degradation of primary resources, the ruin of rural environment and of biodiversity. The soil management through the organic farming method can be a model

responding to the sustainable development need. However, the application of this production method necessitates additional knowledge on the technical, agronomic, legislative and market issues, to be able to produce and sell on the market, in compliance with the rules imposed by the certification and inspection system. Lastly, the lack or sometimes the inadequacy of policies has further slowed down the application of this production method in the Southern Mediterranean countries.

During the first International Seminar on Organic Farming, held in Acireale, Catania (Italy) in May 1997, it came out that it is necessary to envisage organic farming as a tool for the sustainable development of agriculture in the Southern Mediterranean region (De Castro, 1999). On the occasion of the International Symposium on organic farming in the Mediterranean, held in Agadir (Morocco) in October 2001, it has been stressed that the development of the sector needs to be supported by various actions including (i) the introduction of specific rules for the control and certification in the Southern Mediterranean countries; (ii) the training of technicians; (iii) the extension service and the spread of information; (iv) the strengthening of research and (v) the development of markets, in particular the local one. The Symposium has also given the opportunity to know the state of the art on the production, the problems and developments of the sector, so as to view organic farming as a method able to contribute to the safeguard of natural resources and, at the same time, as a production technique able to meet the current production requirements without jeopardising the possibility for future generations to equally meet their needs (Hanafi and Kenny 2001).

Based on the data collected in the Mediterranean region by MOAN, there are about two million hectares under organic farming (CIHEAM-IAMB. MOAN, 2001). The farms that have adopted this new production method amount to more than 100 000 (table 2).

Over half of organic farms and surface areas is in Italy, which is the country that has given the most positive response to the introduction of this new production method.

The Southern Mediterranean countries, that have recently started up the organic production, have been stimulated by two factors: (i) the progressive interest of the European marketing farms that have moved more and more to the South to meet the growing demand for products of the North-European consumers and (ii) the interest for new commercial opportunities identified by local producers.

Actually, over the last few years organic farming in the South has been very vital, as shown by the strong growing trend of surface areas, origi-

nated undoubtedly by market phenomena but also by the evolution of the local agricultural policies, increasingly sensitive to environmental sustainability and production upgrading. In particular, the country with the highest organically grown area is Turkey, followed by Tunisia and Morocco (table 2).

Table 2. Organic farming in the Mediterranean region. (CIHEAM-IAMB. MOAN, 2001; Adler, 2001; Willer and Minou, 2002)

Countries	Farms (no.)	Organic Area (ha)	Organic farms/ Total farms (%)	Organic Area/ Total Area (%)
Italy	51 552	1 069 339	1.91	7.21
Spain	13 724	388 031	1.20	1.60
France	10 400	420 000	1.60	1.50
Portugal	763	57 771	0.18	1.31
Greece	5270	24 800	0.64	0.71
<b>Total EU Mediterranean countries</b>	<b>81 709</b>	<b>1 959 941</b>		
Turkey	18 375	57 001	0.10	0.15
Tunisia	245	16 818	0.03	0.33
Morocco	555	11 956	0.01	0.14
Israel	n.d.	7000	n.d.	n.d.
Slovenia	620	5200	n.d.	0.66
Egypt	300	41 67	0.01	0.14
Lebanon	17	250	0.01	0.03
Cyprus	15	52	0.01	0.03
Albania	8	4	n.d.	n.d.
<b>Total non-EU Mediterranean countries</b>	<b>20 135</b>	<b>102 448</b>		
<b>Total Mediterranean Region</b>	<b>101 844</b>	<b>2 062 389</b>		

The relative weight of the Southern Mediterranean countries with respect to the whole Mediterranean region is still low (figure 4), but the growth rates experienced, over the last few years, by some of these countries suggest a fast and considerable development of the sector.

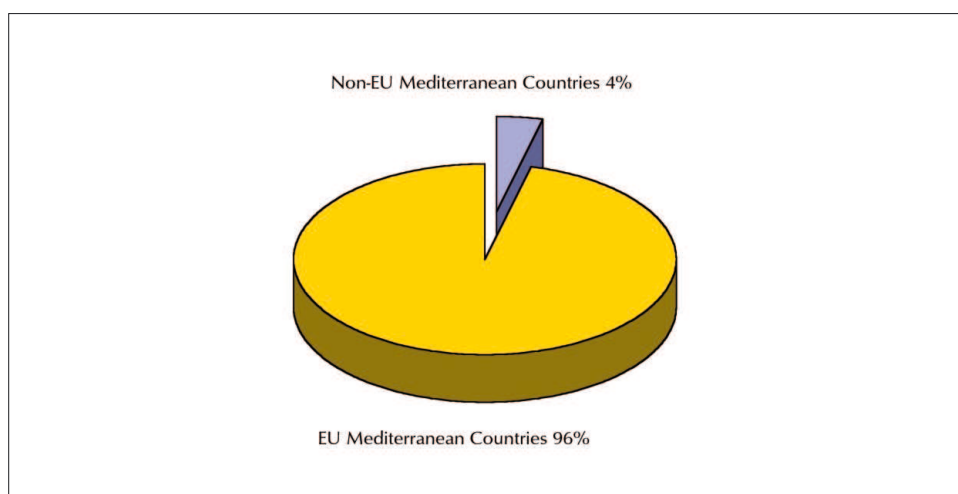


Fig. 4. Organically grown area in the Mediterranean region (CIHEAM-IAMB. MOAN, 2001).

#### 4. Mediterranean organic agriculture: some major agronomic features

The model of agricultural development, still applied at present day, refers to intensive, specialised and highly-yielding agriculture largely based on the use of new technologies.

For a long time the effects on the environment and natural resources stemming from the application of this production model have been underrated or disregarded since attention was paid to other objectives (food self-sufficiency and economic income).

In the second half of last century, research and agricultural policy that had backed up this development model changed radically the agroecosystems oversimplifying the food chains in order to get the highest yield. This approach paved the way to an increasingly frequent application of external inputs (plant protection products, fertilisers and energy inputs) thereby endangering natural resources.

Over the last years the European and worldwide scenarios have profoundly changed: food self-sufficiency is a problem of resource allocation and not one of production intensification since several countries are confronted with surplus management. Furthermore, the demand for healthy and high-quality products is rising jointly with the increasing awareness on the limits of natural resources.

New productive models outcrop; they are based on the sustainable development of the rural area within which agriculture plays a new strategic role.

The concept of sustainability in the exploitation of natural resources is strongly ambiguous despite its excessive use in the political domain and scientific research.

To date, the most accredited benchmark is the definition provided by the Bruntland Commission (World Commission on Environment and Development, 1987) which features the clear-cut concern for the progressive and sometimes irreversible degradation of natural resources in the poorest countries. The Commission analysis focuses on two key issues: the first concerning the responsibility of today's generation towards future generations while the second brings up the replaceability of natural resources with other forms of capital (physical and social investments).

These concepts encompass ethical elements and highlight problems related to the long-term impact of current actions.

The fragility of the system is more and more recognized. Like all the ecological, anthropogenic systems depending on energy inputs, it shows reduced self-regulation ability.

The ecological fragility of agrarian landscape is substantiated by the susceptibility of Southern European countries and of the poorest areas to degradation processes referred to as desertification.

One of the clearest aspects of environmental degradation is the increasing desertification of soils leading to social migration and cultural impoverishment.

The soil is more than a mere interface between sub-aerial and underground environment and is strongly impacted by the changes in man-nature relationship.

The soil may be degraded by salification, laterization and erosion; it may be enriched or depleted by agricultural and animal husbandry practices thereby leading to wealth or poverty.

According to the FAO (2000), thirteen billion hectares are available in the world for cultivation of which only 1.4 are devoted to agriculture. In Europe, the best area in climatic terms, 145 million hectares can be cultivated equalling 29.4% of the world total. In Africa only 214 out of 3031 million hectares are cultivable (including prairies and the use of pastures by nomads), equal to 7.1% of the total value. And this situation gets worse and worse. In Germany annual losses of arable land total up to 10-12 tons per hectare, five to 10 times higher than the new soil that forms which corresponds to one to two tons/ha/year. Erosion alone points up that the present-day use of soil is untenable.

Among the strategies proposed in the field of sustainable development for the conservation and protection of the environment, just a few show operational instruments which can deeply impact on the whole system and enhance its greatest wealth: complexity.

This represents the ideal condition to overcome both the approach of natural resources conservation and that of productive exasperation in favour of the integration between the short to medium term economic needs of farmers and the medium to long term ecological requirements of society. The sustainable development of the territory requires the joint implementation of both actions: the application of low-impact production methods and the maintenance and functional rehabilitation of natural resources.

This implies the application of agricultural models based on the enhancement of natural resources in order to minimise dependence on external inputs: sustainable development model.

Following the definitions provided by the Organization for Economic Cooperation and Development (OECD, 1992), agriculture is sustainable if it guarantees the sustainability of resources, of human health and economic aspects.

In particular, it shall ensure:

- the conservation of environmental equilibrium so as to guarantee an endless productive activity; it shall not cause any reduction or loss of energy or renewable materials (resource sustainability);
- safety for farmers and consumers' health through a production which is sustainable for human health;
- economically convenient production and a satisfactory yield for farmers (economic sustainability).

In the early 90s, the EU recognised the organic production method by issuing norms and designating it as an element of a broader strategy for the productive and environmental re-equilibrium of agriculture and consumer's protection (Regulation EEC 2092/91 and amendments). The United Nations, in a recent report of the UNCTAD Secretary (United Nations Conference on Trade and Development - 1996) maintain that organic agriculture can contribute to development and ensure the improvement of the environment, people's income and food safety.

The same source underlines the importance of the organic production method since it represents a credible and reliable system of regulations and certification unlike other methods of sustainable agriculture (integrated management, low input), whose standards are too diverse; difficulty in certification originates confusion and lack of transparency towards consumers.

For these reasons the organic production method can become an important frame of reference.

#### 4.1 Major agronomic problems of Mediterranean organic farming

The Mediterranean organic farming experiences all the problems affecting the whole agricultural sector in general, besides some peculiar difficulties related to different factors and causes (traditional, cultural, economic and vocational).

In particular, other weaknesses of the traditional agricultural sector are related to:

- the introduction of new varieties more sensitive to the influence of biotic and abiotic factors;
- the simplification of rotations due to merely commercial reasons and to the distinction of "agriculture" from "livestock farming";
- greenhouse growing which favours and increases the plant sensitivity period;
- the excess of mineral fertilisers, notably nitrogen, that makes plants

- more sensitive to fungal diseases and pests;
- the increase in plant density which reduces light interception and extends the period of moisture persistence on the leaves;
- the increase in the growing area with a subsequent reduction of the space devoted to the shelters for the beneficial fauna;
- the development of pathogens' resistance to insecticides, herbicides and fungicides;
- the modifications induced by some pesticides on plant physiology, which induce a greater plant sensitivity to pest attacks and diseases;
- poor or no use of organic fertilisers;
- the globalisation: the increase in the number of plant and animal exchanges has contributed to favour global contamination, thus, becoming a major source of infection.

An issue that cannot be overlooked is water resource management: water is a renewable resource but it is very rare in the Mediterranean area. Agriculture is actually competing for water with non-agricultural sectors that are more profitable; moreover, intensive rainy periods are followed by long drought periods. A large fraction of rainwater is subject to surface runoff and therefore it is not usable by plants; actually, water infiltration in the soil is made difficult by ordinary agricultural practices, deforestation and the abandonment of livestock farming!

There is an additional aspect to consider: the Mediterranean area has historically shown a gap in the technical-scientific knowledge on the behaviour of the agro-ecosystem and its self-regulating capacity, which is crucial to develop a production method mostly designed to create an environmentally sound and human-friendly agro-ecological system, based on the use of local or farm renewable resources, on the management of ecological and biological processes with no or minimum dependence from off-farm inputs.

As to this objective there is a problem of adjustment of the present international and European regulations, considering the peculiarities of the Mediterranean areas.

Indeed, all the rules on the organic production method (Rush-Muller, bio-dynamic, Lemaire, IFOAM standards and EEC Regulations) have been historically set out in Northern Europe and do not take into account the specific features of the Mediterranean environment. This sometimes, originates application or interpretation problems.

Based on the above, it seems necessary to define the major technical principles for the Mediterranean region that may be summarised as follows:

- a) soil fertility improvement. This necessitates an organic fertilisation,

making use of farm and local resources. The use of technical inputs is allowed only if it is strictly necessary;

- b) phytosanitary control based on the prevention and improvement of the agroecosystem self-regulating capacity. Treatments may be applied only in extreme cases using the authorised products;
- c) weed control through cultural practices and mechanical actions;
- d) holistic view of the farm and of the land system: it can lead to the farmer ability to observe the agroecosystem dynamics with a view to minimise any interference and interact making it as self-sustainable as possible. This means that it is necessary to guarantee the highest structural and genetic complexity that is known as biodiversity.

#### 4.1.1 Soil fertility management

For the enhancement of soil fertility in Mediterranean climate, first of all it is necessary:

- to develop a greater awareness of soil potentials and envisage the possible solutions to improve its fertility (in physical, chemical and microbiological terms);
- to recycle all organic materials: their decay causes the progressive release of the fertilisers they contain; this results in a natural fractionation of applications. (In table 3 are reported some examples of compostable crop residues in Apulia Region);
- to never burn the organic matter (crop residues and others), that is often done by the farmers in the Mediterranean area.

Among the natural resources, one of the most valuable is the soil. This is a non-renewable resource in the short medium run which is unfortunately depleting, in particular in some areas where the trend towards desertification is more and more evident.

Table 3. Potentially compostable crop residues in Apulia (CIHEAM-IAMB. Biopuglia, 1998a)

Crop	Surface (000 ha)	Pruning debris (000 t)	Green residues (000 t)	Potential biomass (000 t)
Olive	358.3	352.4	643.2	995.6
Grapevine	157.2	560.1		560.1
Almond	34.6	41.1	33.4	74.5
Artichoke (leaves)	17.9		501.3	501.3
Tomato	36.2		502.9	502.9
Wheat (straw)	385		1119.5	1119.5
Barley and Oats (straw)	60.4		121	121
<b>TOTAL</b>	<b>1049.6</b>	<b>953.6</b>	<b>2921.3</b>	<b>3874.9</b>

Forms of intensive farming have so far caused a great impoverishment of the land resource, notably in terms of organic fertility, one of the most important aspects often overlooked, for superficiality or due to specified interests (chemical and pharmaceutical industry). Organic farming, that makes no use of synthetic chemicals both for crop protection and for soil fertility management, is a productive model that is intended to recover and upgrade farm and local resources.

For instance, in Europe through the Regulation EEC no. 1488/97, besides the use of composted manure and animal dejection, that are deficient in the Mediterranean environment, the possibility to use the compost derived from domestic waste has also been introduced: this closes in some way, the “organic matter and nutrient cycle”, so as to re-use on the land at least a part of the organic matter the land actually has supplied to the towns. Nevertheless, despite all the beneficial aspects, it could be used only till 2002 and only after the Certification Body has recognised its necessity. Since it is a soil conditioner, nearly all soils can benefit from it, especially in the Mediterranean countries. This is certainly an innovation that encounters, however, many limitations in different countries.

The first is that the domestic waste for composting should be separated at the source (that is at consumers’ houses); the second limitation is the heavy metal concentrations, which should be very low and which cannot be easily obtained through the currently composting procedures.

Still nowadays, at the farm level it is possible to use compost and provide composting obtained from “in-farm” matrices. Within the farm, there are many usable biomasses, which have been discarded and removed in different ways. These include: the pruning residues of tree crops, the crop residues of herbaceous crops and the residues of animal origin.

In addition, there are the biomasses which are found in the farm site: urban green residues, agro-industrial residues etc.

This enables implementing the concept of “closed-cycle farm”, in which it is possible to produce and re-integrate without necessarily using off-farm energy inputs.

This concept is in conflict with the present reality, which is represented by small-sized and scattered farms. Nevertheless, this old but still valid agronomic concept may be recovered considering that the farm is not a separate system but it is closely related to the whole land system.

This is further confirmed by annex I of Regulation EEC no. 2092/91: “The fertility and the biological activity of the soil should be main-

tained or increased, in appropriate cases, through:

- the cultivation of legumes, green manure or deep-rooting plants in a multiannual rotation programme;
- burying of manure from organic livestock farming;
- the incorporation of other organic material, either composted or not, from holdings producing according to organic methods."

#### 4.1.1.a The cultivation of legumes, green manure or deep-rooting plants in a multiannual rotation programme

The actions carried out on soil fertility vary depending on the legume species (either for forage or grain, table 4), the amount of plant material that is returned to the soil, and the soil and climatic conditions.

Table 4. Supply of dry matter (d.m.) and nitrogen (N) of the main legumes (CIHEAM-IAMB. Biopuglia, 1998b)

Crops	d.m. (q/ha)	N (Kg/ha)
Field Bean	30-90	90-240
Vetch	102	90-111
Pea	60	174-219
Berseem	5-50	56-156
Crimson clover	30-70	64
Alfalfa	100	78-222
Lupin	23,6	94

#### 4.1.1.b Burying of manure from organic livestock farming

By manure, or dung, we mean the fertiliser being produced from the fermentation of solid and liquid faeces of the animals reared in the stable or on the litter, formed by the various plant materials placed on the floor where animals live.

The main fertilising properties of manure are just resulting from the simultaneous fermentation of two different organic materials, the animal faeces and the litter vegetables. The composition and the physical, chemical and biologic properties of manure vary a lot, and depend both on the characteristics of the dung and litter, and on the processes of fermentation that have occurred. In general we can say that the manure of horses and sheep is quite dry and rich in nutrients and it develops much heat during fermentation; that of pigs, which is quite rare, is usually aqueous and is generally the least valuable. The cowshed manure has intermediate characteristics and is the most largely used; it is actually considered as "the manure" par excellence.

Also from a chemical point of view, the manure is made up of many organic substances deeply different from those that are found in the origin materials, or the excrements and the litter plant materials. Many of these substances are quite complex and stable and, once they reach the soil, they enable the formation of structural humus, thus increasing the soil organic matter content. The manure also includes all the nutrients that are essential for plant life.

The ECC regulations on organic farming prescribe that manure should be derived only from extensive livestock farming.

#### 4.1.1.c The incorporation of other organic material, either composted or not, from holdings producing according to organic methods

Green manure, for instance, is a very helpful means to fertilise soils in the best way, also in hot-arid countries, independently of the availability of manure and compost.

The green manure cropping of legumes, in particular:

- transfers - through nitrogen fixation - the nitrogen from the atmosphere to the soil (it normally supplies 50-60 kg/ha);
- favours the activity of the soil beneficial microflora, by supplying nitrogen;
- makes soil fertility available to the subsequent crops, by solubilising and bringing to the surface major nutrients like phosphorus and potassium;
- may be useful to correct alkali or saline soils that have been damaged, for example, by irrigation with brackish water (greater effect than manure).

As to the compost intended for organic farming, instead, it is one of the most frequent items in annex II A to Regulation EEC no. 2092/91 (as subsequently modified), since it includes different products usable for soil conditioning, such as (i) composted animal excreta, including poultry dung and manure; (ii) domestic waste transformed into compost (iii) mixture of plant materials and composted barks and (iv) the excreta of worms (vermicompost) and insects.

4.1.1.d The integration with other organic or mineral authorised fertilisers is allowed only exceptionally. A useful reference could be Annex II to Regulation EEC no. 2092/91.

#### 4.1.2 Phytosanitary control

The human action involving the use of high impact cultural practices causes imbalances in agricultural ecosystems. One of the most evident signs of these alterations is the intensification of pest attacks and fungal diseases.

The organic production method is generally based on the re-establishment of a high environmental diversity that is given by the relation between the number of species and the number of individuals for each species.

This model, which is poorly relevant when applied to one or few species, is one of the concrete possibilities of biocenosis analysis, for the control of organisms that can turn from hosts into harmful and/or dangerous organisms only under certain conditions.

These conditions are basically related to the interactions plant-environment-pest.

The deep knowledge of these interactions can enable adopting the best choices and limiting the use of the technical means, however authorised, in order to face situations that can seriously jeopardise the production and income.

Pest control in organic farming rely principally on pest knowledge, monitoring and prevention. At maximum extent, direct control should be done according to regulations.

##### 4.1.2.a Pest knowledge and monitoring

Each crop in a given environment may be exposed to one or several pests, which compromise its productivity. Efforts should be made in order to know the development of the key pests and of their natural enemies. According to the pest, a specific methodology may be applied with a view to monitoring its development and predicting its damages.

For insects, monitoring is performed through traps, which detect their presence in the field. Sampling to determine the plant pest population and its potential harmfulness by comparing values on the basis of the economic threshold follows monitoring. The economic threshold represents the plant pest population, which may induce economically relevant damages on the crop. In organic farming, the economic threshold value shall consider the low efficacy of technical means and the ability of antagonists to limit the plant pest development.

For pathogens, the concept of economic threshold is not applicable because of their rate of development and limited curative action of the

technical means authorised. Predictive criteria are envisioned considering climatic and phenological conditions. For some fungi (and a few plant pests) predictive models are being developed.

Predictive models of the biotic potential are based on abiotic and biotic data.

#### *Abiotic data*

Climate: relative humidity (R.H.) and temperature (in terms of absolute value, thermal build-up and/or degree/day) are the key elements for predicting the biotic potential of a species.

Soil: soil nature (structure, reaction etc.) provides information on the possible development of soil-borne organisms, which can turn into harmful organisms under given conditions.

#### *Biotic data*

Are based on the preventive control of the plant pest or pathogen so as to ensure timely decisions for their control.

#### 4.1.2.b Prevention

Prevention is undoubtedly the best practice for the correct application of the organic production method. It shall maintain a permanent state of tolerance or resistance of plants to diseases and insects. The limited presence of pests and pathogens in the field is a normal condition; an excessive pest increase results from the alteration of biological equilibrium.

In this strategy the farmer shall adopt preventive techniques in order to achieve the best result.

Prevention techniques are numerous; it is up to the farmer to evaluate what may be applied according to the farm:

- use of healthy material;
- preventing the introduction of the inoculum;
- inoculum reduction;
- inoculum eradication;
- use of resistant varieties;
- shifting the cropping period;
- promoting the crop aeration;
- rational nutrition;
- use of aphid-proof nets;
- promoting beneficial insects;
- other agronomic practices (crop rotations, solarisation and soil tillage).

#### 4.1.2.c Direct control

Direct control under organic farming integrates several methodologies; the application of the technical means admitted is subject to real needs in order to limit damages on production and/or plants.

Control strategies are direct against insects. They are as follows:

##### 4.1.2.c.A – Use of reared beneficial insects

Studies on the pest and fungi antagonists have led to the identification of beneficial insects, nematodes, fungi, viruses, bacteria, rickettsiae, mycoplasmas and protozoans that jeopardise the development of crops pathogens.

For some of them, biofactories apply commercial rearing techniques. At present, the Italian market sells great many beneficial insects such as the bacterium *Bacillus thuringiensis* against lepidoptera (and recently against beetles), as well as mites and nematodes.

The use of reared insects may be designed to increase the populations already present in the field or to anticipate their settlement (inoculative releases). Large amounts of these insects may be released in protected areas like greenhouses (inundative releases) to combat the pest. The release technique and the conditions to achieve the best results are specific for the beneficial insect.

##### 4.1.2.c.B - Mass trapping

Mass trapping in large areas through specific traps can help reducing the plant pest population and suppressing the damages induced. Mass trapping is applied in closed environments such as warehouses and greenhouses. In warehouses males' eradication with pheromone traps is applicable against food moths; the population drops down to harmless levels. In greenhouse, chromotropic traps are applied in large quantities in order to combat white flies. In some open field conditions, mass trapping is applied against the olive fly and forest plant pests.

##### 4.1.2.c.C – Mating disruption

Mating disruption is based on the diffusion of a constant quantity of synthetic pheromone in the orchard so that males are unable to locate females.

##### 4.1.2.c.D – Use of technical means

In organic farming the use of technical means is the last remedy that helps preventing damages on plants or production. Even though a very few products are authorised, generally of natural origin and with use restrictions, their application has an impact on the environment.

Annex I of EEC Regulation 2092/91 envisions the application of technical means only when they are strictly necessary:

"...Pests, diseases and weeds shall be controlled by a combination of the following measures:

- choice of appropriate species and varieties;
- appropriate rotation programme;
- mechanical cultivation procedures;
- protection of natural enemies of pests through provisions favourable to them (e.g. hedges, nesting sites, release of predators);
- flame weeding.

Only in cases of immediate threat to the crop may recourse be had to products referred to in Annex II of the EEC Regulation 2092/91. "

With reference to the EEC Regulation, the authorised products useful for crops under Mediterranean conditions are a few. Furthermore, the use of the very few specific products is rather controversial. Synthetic pyrethroids, which may be used in traps against the olive fly and Mediterranean fruit fly, are a worrying example because for the first time the use of a synthetic substance is authorized.

The major concern bound to restrictions for Mediterranean productions is the time limit of copper that may be used till 2002. Its exclusion or radical reduction can compromise the application of the organic production method to most Mediterranean crops since specific research is not available for the identification of valid alternatives.

Another substantial contradiction outcrops from the annex: the use of ethylene for bananas. Why isn't it allowed also for other crops such as citrus and kiwi?

#### 4.1.3 Weed control through cultural practices and mechanical means

The basic and innovative element for weed management in organic farming is the approach by which weeds represent a resource to be enhanced or controlled according to the pedoclimatic and cropping conditions (crop interference, seasonal pattern, type of weeds etc.) and not an enemy to destroy.

The structure and dynamics of weeds are ruled by the productive system, since the cultivation of a species implies a different equilibrium. The cropping system, the definition of the weed critical period and alternative control methods are the factors which may help rationalise the weed management.

For the optimisation of the organic matter balance in the soil, conservative tillage is advisable in organic farming. This approach may be criticised for the risk of reducing the levels of production and increasing perennial weeds. Studies conducted in the USA and in the Mediterranean conditions have showed that the productive levels of both systems are comparable and that the levels of infestation do not increase with minimum tillage techniques thanks to allelopathic substances.

Identification of the critical weed period is crucial for the definition of control strategies. In the Mediterranean fruit cropping systems, this period corresponds to the months in which crops suffer from water stress whereas competition for nutrients is balanced. The ground cover in the rainy period is strategic for reducing erosion especially in hilly areas. The biomass production during this period is fruitful for the system and allows reducing the loss of nutrients by leaching (N in particular) and mobilising less mobile elements from deep layers (P in particular).

Alternative control methods are the use of green manure, cover crops and, when possible, the adoption of biological control techniques.

There exist some experience on the use of alternative techniques such as flame weeding and the adoption of lenses for sun radiation reflection that inactivate the soil. Flame weeding is not agronomically or economically convenient in the Mediterranean orchards whereas good results are attained for some vegetable crops. Experimental data are still insufficient.

It is therefore mandatory to analyse all the practices applied and to combine the various options as a function of the pedoclimatic and cropping conditions. This requests the knowledge of the weed community structure and of the characteristics of the individual species. The organic farmer shall acquire the knowledge on the biology of the key species. Therefore it is often necessary to resort to mechanical means (mowing and/or tillage) to regulate the seed production of different species.

The competition between weeds and vegetable crops is always strong for nutrients and water which is a limiting factor in southern areas. This explains why weeds can harm crops if their growth is not held back.

Other damages result from the shadowing of the crop by weeds. *Convolvulus arvensis* L. can twine itself round the stems of plants hampering the light penetration and jeopardising the right growth of the plant.

The problem is deeply felt for slow-growing crops which are small in size and widely spaced between the rows. Wide spacing is diffused

with organically-grown horticultural crops in order to respect the natural potential of soil in terms of water and nutritional resources.

Despite the above considerations, weeds are not to be completely destroyed in the field.

The controlled presence of weeds can be useful in several cases since it may directly or indirectly help pursue the main aim of organic farming: the creation of an on-farm agroecosystem which is stable and complex.

Mild weeds exert a certain competition towards harmful weeds; they attract some pests, favour the development of beneficial insects, protect the soil from erosion and from leaching of the most soluble mineral elements.

Control shall apply to the most competitive weeds which may compete with the crops grown and/or with those interspersed in the crop rotation. Each crop has harmful weeds and others whose competition is milder or emerge later when the crop has completed its productive cycle. As for early potato, *Convolvulus arvensis*, a very competitive weed, develops only at the end of the productive cycle of the cultivated plant inducing a lower qualitative and quantitative damage. Weeds are to be controlled in the critical competition period between the beginning and the end of cropping. The duration of the control critical point (CCP) depends on the crop. In lettuce, vegetables, onion and garlic the critical competition period is rather long; as to zucchini, eggplant, tomato and other fast-growing crops with a large canopy, sensitivity to weeds is short.

Attention must be paid to species which may host viruses and bacteria.

Techniques for curbing the development of weeds in vegetable crops are preventive (when they increase the natural crop competitiveness) or direct (when they act directly on the weed development).

A wrap-up is proposed about some agronomic techniques with reference to their impact on the crop/weed relationship and the choice to make.

#### a) Preventive techniques

Practices which allow the crop to grow and cover the soil in the shortest lapse of time and to compete with weeds.

A rational planting technique can help limiting the infestation in the field.

The major factors are:

- sowing or transplanting period;
- mode of sowing or of transplanting;

- choice of cultivar;
- crop rotation;
- soil tillage.

b) Direct techniques

Techniques which impact the weed development such as:

- false sowing;
- mechanical operations;
- thermal weeding;
- mulching;
- solarisation;
- irrigation.

#### 4.1.4 Agroecosystem complexity and its self-regulation:

##### *a holistic approach*

The organic farmer shall optimise his cropping choices by analysing the agronomic and economic aspects peculiar to the crop and the features of the on-farm agroecosystem.

Attention shall be paid to the cropping system and to the entire on-farm and land agroecosystem.

Viewing the farm as agroecosystem offers information on its internal organisation and economic choices and its external relations.

The agroecosystem analysis is designed to optimise the system properties (productivity, stability, sustainability and self-regulation) since the system is not a mere summation of its individual components (holistic approach).

The first step is to implement an agroecosystem which is both productive and protective of the environment, energy saving, healthy, producing quality food free from synthetic chemicals (health quality).

The objective is to have an autonomous on-farm agroecosystem close to the model of natural systems in which a high biodiversity corresponds to a greater stability and productive capacity.

In practice, such a model may be achieved through the implementation of a complex system of interventions aiming at:

- securing a high level of self-maintenance and maintaining the soil fertility. Soil conservation is linked with the control of the water cycle, plot layout, tillage and crop choice which have a repercussion on the cover of the soil;
- guaranteeing a higher structural and genetic complexity; and this through the rehabilitation of biodiversity, processes of plant naturali-

- sation and recovery of the landscape;
- reducing the susceptibility to weeds through the use of varieties fit for the environment in order to enhance the intrinsic ability of the plant (productivity, development and resistance to plant diseases);
- optimising the use of native resources (rainfall water, atmospheric nitrogen, soil organic matter and sun radiation);
- introducing the recycling of the on-farm organic material, recovery and enhancement of the biomasses in order to close the natural biological cycles;
- reducing the use of complementary energy (reducing tillage, the use of pesticides and fertilisers although authorised in organic farming).

A preliminary condition for the right application of the organic method is the knowledge of one's own farm and of the surrounding area. By observing the individual elements and their interaction, it is possible to choose the crops which allow to produce in harmony with the ideal agroecosystem.

The biodiversity conservation on the organic farm requires a great awareness of the farmer since his actions are ecological factors. The compliance with the ecological laws regulating the complex relationships between living beings and their environment is achieved by knowing the limits that must be respected (excessive use of fertilisers and pesticides).

The correct and responsible application of the organic farming method, whose technical-agronomic basics are the self-regulation of agroecosystems, represents per se a valid instrument of biodiversity conservation.

The more complex the system structure i.e. the higher the biological richness in terms of number of species, the better the homeostatic ability of an ecosystem.

The management of biodiversity is influenced by the cropping choices and by the organisation of productive systems (rotations and crop associations) in space and time. Through them some measures may be taken such as:

- Conservation, compositional and structural improvement of plants of natural origin on the farm (hedges, woods, windbreaks, riparian plants and of water stretches, old trees with cavities and desiccated parts) and/or their introduction with native species. These are shelter areas for the natural enemies of crop pests and are useful to favour the presence of pollinators. These plants are elements of biological connection between the farm and the region it belongs to (on-farm integrated ecological nets).

- Reduction of the space continuity among crops of the same type and reduction of the genetic and phenological uniformity with an indirect control of plant pests and weeds.
- Higher presence of different habitats with a consequential increase in the number of species and cultivars and wild varieties (a more complex food chain).
- Creation of ecological social niches which find a limited use in conventional agriculture and consequential limitation of specific and varietal erosion.

The management of biodiversity within the farm and at the agroecosystem level is based on agronomic practices and operations which contribute to reducing energy inputs and external substances. These practices and operations are related to the management of water resource, of soil fertility, of weeds and pest control.

In practical terms, the Mediterranean organic farmer, in order to make cropping choices enabling him to produce, to manage the soil correctly and to rehabilitate the ideal agroecosystem, shall:

#### *On-farm management*

- establish or recover hedges and trees to shelter the entomofauna;
- use plant protection products and fertilisers as referred to in annex A and B of the Regulation EEC 2092/91 (and its amendments) in the right dose and at the right time;
- use biological control;
- use mowing for the weed control;
- reduce the number and depth of soil tillage;
- prevent erosion (limiting the period of fallow, refraining from deep tillage and using windbreaks);
- enter plots only under suitable conditions;
- carry out the ground cover of orchards;

#### *Land management*

- preserve the natural vegetation;
- preserve the riparian vegetation along water stretches;
- preserve and promote trees, hedges and headland;
- use native plant species useful for the farm management as hedges;
- create shelters for vertebrates.

The conservation and rehabilitation of biodiversity imply: a greater stability of the agroecosystem, lower use of external inputs (pesticides and fertilisers) and higher productions in quantity and quality.

## 5. The market

Organic products are being increasingly traded internationally. The market share is modest but trends indicate that there is an enormous potential for expansion. The ever-growing number of health conscious and environmentally concerned consumers is at the root of this development along with the huge efforts supermarkets have put into marketing organic products and energetically promoting their consumption.

In the year 2000 the International Trade Centre UNCTAD/WTO (ITC, 2001, table 5) estimated that the global organic market was worth almost US\$ 17.5 billion, accounting for 1-2% of the total food market and predicted a two digit growth rate of 10-25% on an annual basis in the various countries. In Europe, Germany is the leading organic market, followed by the UK and Italy.

Table 5. The global market of organic products in 2001 (ITC, 2001)

Countries	Consumption (million US\$)	% of total food consumption	Expected growth (medium term)
Germany	2200 – 2400	1.25 – 1.5	10-15
UK	1000 – 1050	1.0	25-30
Italy	1000 – 1050	1.0	15-20
France	800 – 850	1.0	15-20
Switzerland	460 – 470	2.0 – 2.5	15-20
Denmark	350 – 375	2.5 – 3.0	10-15
Austria	250 – 275	2.0	10-15
Netherlands	225 – 250	0.75 – 1.0	10-20
Sweden	175 – 200	1.0	20-25
Other EU countries	300 – 500	-	-
USA	8000	1.5 – 2.0	20-25
Japan	2500	-	-
<b>Total consumption</b>	<b>17500</b>	<b>-</b>	<b>-</b>

Also the FAO (1999) has predicted a sustained growth of organic produce. The annual growth rate ranges between 10% and 25% depending on the markets. The sale of organics is predicted to climb from 1% to 10% in the years ahead. The organic trade gap across the world is due to the mismatch between soaring demand and scarce supply.

In a number of less developed countries a domestic market for organic produce is in the making, though at a decidedly staggering pace. The ITC survey has indicated that there are opportunities for less developed countries to market organic produce in Europe and in North America, mainly those products which cannot be grown locally, such as coffee, tea, cocoa, spices, tropical fruits, vegetables and citrus.

As far as distribution is concerned, the role of the various marketing channels for organic produce varies widely from a country to another. A recent European survey of marketing channels (Michelsen, 2000) has highlighted that retail outlets have become dominant in a number of countries (Portugal, Sweden, Denmark, Finland, Austria and Switzerland). Specialist organic retail outlets are prevailing in the Netherlands, Greece, Italy and Belgium, whereas direct marketing stands at 30% in Greece and Luxembourg (table 6).

Table 6. Importance of individual marketing channels for the marketing of organic products (1997/98; %) (Michelsen *et al.*, 2000)

Country	Retail Trade	Specialised shops	Direct Marketing	Other
Portugal	91	1	3	5
Sweden	91	0	7	2
Denmark	90	2	8	0
Finland	89	5	5	1
U.K.	74	15	6	5
Austria	75	10	10	5
Switzerland	69	19	7	5
Norway	56	19	21	4
Luxembourg	40	28	28	4
France	38	46	16	0
Spain	29	49	22	0
Germany	33	38	17	12
Belgium	23	55	17	5
Italy	23	60	17	0
Czech Republic	15	0	3	82
Griechenland	5	65	30	0
Netherlands	2	96	1	1

However, the survey does not take into account the increasingly pivotal role of the major organised retailing and distribution chain. In Italy, the organized outlets which sell organic fruit and vegetables and the like have climbed from 130 in 1996 to 1340 in the year 2000.

The soaring global demand for organic products and the stepped up international efforts made to harmonise the guidelines and regulations governing organic farming will undoubtedly contribute to expanding the acreage of organically cultivated land and boosting the market for

organic products in the years ahead, as confirmed by the mounting interest shown by governments and the unequivocal support provided by the UN and FAO.

Countries like New Zealand, Israel and Argentina are already exporting to those countries where demand outstrips supply. The current trend of organic agriculture across the world indicates a more sustained growth rate and an increase in the organic acreage in the countries with the vastest markets, except for Japan. The countries with the broadest markets are the leading producers, but there is an enormous potential for export in a plethora of minor countries, mainly developing countries. In the face of mounting market globalisation a whole host of problems crop up. Organic farming is not to be regarded as an alternative to long transportation of goods around the globe. The guidelines do not focus on local marketing, nor on seasonal supply of produce. Granted that in the near future organic products will be sold in supermarkets in many countries, organic farming is also expected to meet the local and regional demand for healthy food. Hence, there is scope for lively international trade as industrial countries cannot grow any coffee, nor bananas. Balanced and fair trade remains the key to ensure food security and safety and boost environmentally-friendly growing and eating habits.

### 5.1 The market along the southern and eastern shore

In the South-eastern Mediterranean countries the consumption of organic food is in its infancy with the exception of Egypt where organic products are sold in more than 7000 pharmacies and 3000 shops (Geier, 2001). In some capital cities shops and supermarkets have started to sell organics, but the local community is neither informed nor aware of the existence of these products (CIHEAM-IAMB. MOAN, 2001). Domestic markets and export potential differ markedly from country to country.

In Albania (Ferruni, 2001), agriculture has undergone radical changes over the past decade. The State farms averaging some thousand hectares each have been fragmented into small farms of 1-2 ha in size. The current economic recession does not allow for fresh investments nor for the purchasing of machinery or chemicals which are imported at sky-high prices. Except for a few farms which make use of synthetic chemicals, the vast majority of farms adopt a method of production which can be generally regarded as "organic". Hence, Albania is a breeding ground for organic farming as the country can capitalise on the experience gained in the use of chemical-free production methods. In June 1997 the Organic Agriculture Association was founded by some Albanian producers and researchers. In 1999 the first specialist organic

retain outlet was opened in Tirana and over the past two years a number of projects have been initiated and partnerships have been forged between Albanian and European scientific institutions to give renewed impetus to the organic sector.

In Egypt (El-Araby, 2001), organic produce certification schemes were first introduced twenty years ago to meet the requirements of foreign importers of medicinal plants. Over the years the production has expanded to embrace fruit and vegetables and cotton intended for the European market. The lack of a national regulation has not hampered marketing as certificates are issued by six certifying bodies most of which in the importing countries. In the future, following the completion of the free trade zone and the expansion of the local market, this regulatory gap may become a stumbling block. Egypt markets organic produce in the UK, Germany and Italy (Abou Hadid, 2001). In Israel (Adler, 2001), despite the limited arable land, organic production is well developed and fostered by research activities carried out by some local Universities. More than 7000 ha are currently organically cultivated, accounting for 1.25% of the arable land and the annual growth rate stands at approximately 25%. Organic products comprise: greenhouse-grown vegetables (100 ha), citrus (410 ha), fruit trees (830 ha), field crops, such as carrots, potatoes, tomatoes for industrial processing and cereals (5100 ha), minor and nursery-grown crops (560 ha) and livestock production. The total organic sector is worth US \$ 180 million, 30% of which are marketed locally whereas the remainder are exported. Twenty years ago the Israeli Bio Organic Agriculture Association (IBOAA) was established to train new producers and ensure inspection and certification.

In Lebanon (Estephan, 2001), environmental concerns and health awareness have contributed to strengthening the organic sector. The acreage devoted to organic production amounts to 160 ha (17 producers) and some more 90 ha are under conversion. However, the local market potential is not sufficient to fuel the expansion of the sector which remains hampered by the lack of production standards required to implement a national regulatory framework. Recently, organic products have started to be sold in some supermarkets and in healthy food shops in Beirut as well as in some nearby towns, but it is hard to tell whether there is a revived interest amongst local consumers.

In Malta (Calleja, 2001), with a view to boosting organic farming and given the pending joining of the European Union, the Malta's Organic Agriculture Movement (MOAM) was founded in 1999. The mission of MOAM is to promote training and research, advocate standards and certification schemes, foster rural development, boost marketing and

help local farmers to become familiar with the organic production method. MOAM also promotes organic produce within hotels, restaurants and catering services and actively campaigns to raise awareness among tourists and natives and encourage consumption.

In Morocco (Kenny and Hanafi, 2001), the early attempts at adopting the organic production method date back to 1986 when a citrus grower from the Marrakech region was spurred by some French producers to go organic. From 1992 onward the organic production method has spread across the country despite the lamentable lack of a national regulatory framework.

The estimated acreage under organic farming totals 11 956 ha, 35% of which under conversion (Kenny and Hanafi, 2001). More than 1400 ha are grown with vegetables and citrus. Some varieties of vegetables are grown under greenhouses so as to ensure out-of-season harvesting. The major organically cultivated crops are citrus, medicinal plants and argan trees for oil making. The argan tree is a typical Moroccan crop, similar to the olive tree, the fruits of which are harvested by the natives to extract oil. The argan oil, which again is similar to olive oil, is used for cooking and for making cosmetics. Over the past five years, Morocco has been the sole world's producer and exporter of organic argan oil.

Since there is no domestic market, the production is fully exported, mainly to Europe. Vegetables (especially tomatoes and cucumbers) and citrus account for 95% of the goods which are exported to France, the UK and Germany.

Over the past five years, Tunisia (Ben Kheder, 2001) has witnessed a sustained and fast-paced increase in the acreage and number of farms which have gone organic, from 10 farms over 300 ha in 1997 to 137 farms over about 15 thousand ha. Organic products comprise olive oil, dates, vegetables, fruits and honey. This growth is largely dependent on the expanding export opportunities and the huge efforts the state has put to back the organic sector. Tunisia is the southern Mediterranean country which has first transposed the regulation governing the inspection and certification of organic produce and has issued a law on organic farming (Law no. 99-30, dated April 5, 1999). The Tunisian government has also recognised some foreign inspection and certifying bodies and a Tunisian body, INNORPI (Institut National de la Normalisation et de la Propriété Industrielle). A subsidy has also been envisioned and local farmers are reimbursed 70% of the inspection and certification expenses borne. In addition, the "Centre Technique de l'Agriculture Biologique" (CTAB) has been set up and a number of actions have been undertaken to help conversion and promote training. The local market is still in its infancy and a limited range of

Tunisian organic produce is on sale in a few supermarkets in the capital city.

Turkey (Aksoy *et al.*, 2001), with more than 26.7 million ha, is the Mediterranean country which has the vastest arable land available; it is one of the few countries in the world which has exceeded the food self-sufficiency threshold and is a leading exporter of agricultural products. The farming sector remains the major source of employment for 56% of the population and feeds the local industry. The current acreage devoted to organic production exceeds 40 thousand ha which encompass more than 12 thousand farms. Also in Turkey the spur to go organic has come from abroad. It started in the mid 1980s following an upsurge in demand by European importers. The early foodstuffs to be produced organically were dry fruits. Over the years, about one hundred products have been added to the list, including fruit juice and preserves, bakery products etc. In 1992 the Turkish Association of the Organic Agriculture Movement (ETO) was established to cater for the needs of the existing organic farms, set the standards for production, inspection, certification and export of organic produce and speed up the development of the sector. This Association, which groups researchers, farmers, distributors and consumers, provides training and counselling to farmers and serves as a link between dealers and institutions. A national regulation was enforced in 1994 in keeping with the EC regulatory framework. The Ministry of Agriculture has been entrusted to supervise the sector. The bulk of the domestic production is exported to the European Union (80%), especially to Germany (60%) and the USA (15%). The domestic market started to operate in 1999, mostly in the main towns. Marketing is generally confined to healthy food shops and supermarkets.

The country-based analysis has highlighted a flurry of interest for organics among producers who have realised the promising marketing opportunities on the leading markets. A mounting interest in organic products is also sweeping among consumers across the Southern Mediterranean countries where it is safe to expect a local market boom. This is an enticing scenario which bolsters producers' confidence and encourages dealers and public institutions to keep a close eye on this flourishing sector.

## 6. Conclusive Remarks

Organic farming supplies the Mediterranean countries with a production system that focuses on strategic interests, not only for the single farm but also for the whole land system. It is not only a production method but rather an actual development model that integrates environmental, socio-economic and ethical aspects.

These interests are based on: the maintenance of soil fertility, biodiversity, the use of appropriate technologies, the proper use of water resources, the control or reduction of desertification, crop rotations and the diversification of products.

The model of sustainable agriculture development that encompasses organic farming differs from the Western model of intensive agriculture, whose damages to the environment and to the natural resources are still impossible to quantify in relation to the well-known economic benefits assessed following the conventional criteria of economic analysis.

Despite the progressive development of organic farming and the rising interest of the major international markets (USA, Japan and European Union) in this production method, the evolution of the organic production method in the Mediterranean region is constrained by some critical points.

First of all, many Southern Mediterranean countries still lack a regulatory framework on the organic production method. There are no reference national regulations regulating the certification and inspection systems of organic products and, in other Southern Mediterranean countries, the existing legislation necessitates an adjustment to the regulations in force at European and international levels.

There are still no co-ordinated measures to back up the development of Mediterranean organic farming: there are still few and occasional actions in the various sectors ranging from training and extension service to experimentation; there are no national or regional policies fostering, both directly and indirectly, the conversion of farms to organic farming. Therefore, contrary to what has happened in Europe, organic agriculture is growing in the Mediterranean area only for market reasons, with a poor technical support, sometimes financed by the institutions.

Moreover, the Mediterranean region is also suffering for the great gap in the technical and scientific knowledge about the application of organic production method, which includes techniques developed in areas characterised by greatly different soil, climatic and cultural conditions. An additional constraint is the great difficulty to find out the technical means to be used or, where these are available, the poor technical knowledge on their use.

However, there is a common trend in the whole Mediterranean region towards the reconversion of the present agricultural productive systems into a more comprehensive sustainable development project, aiming at the growth and overall recovery of the rural space and tackling the aspects bearing a reference to environmental protection, animal wel-

fare, consumers' behaviour, market development, quality of food products, regulations, certification and labelling.

Within this scenario, some strategic lines shall be set up for organic farming development in the Mediterranean region.

The primary task is develop locally a culture of organic farming relating not only to the production but also to the market, social and land-related issues.

Secondly, the adoption of a national legislation in each State is essential to harmonise the international rules in view of the mutual recognition of the regulations of different countries (principle of equivalence).

The EU has currently defined a system of equivalence with six countries (Argentina, Australia, Switzerland, Czech Republic, Hungary and Israel) included in the Annex to Regulation EEC no. 94/92, identifying for each of them the product categories and the bodies in charge of inspection and certification. In other instances, imports from a Third country are regulated by specific procedures in compliance with EEC Regulation no. 2092/91 (art. 11).

The ultimate goal is to institutionalise the certification and inspection system of organic farming method, that means defining a national regulatory system, where the State is in charge of supervising (via planning and co-ordination activities) the whole certification and inspection system on the production, processing and marketing of organic products.

In more general terms, in the Mediterranean region (EU and non-EU countries), it is necessary to set up a regulatory system which takes into account, in view of certification, the outcome of a farm in terms of environmental-friendliness and public health. At present, the certification is assigned to organic products by simply proving that no synthetic chemicals are applied, following a "minimalist" approach.

Moreover, it is also necessary to set out the rules for the application of basic standards unified at the Mediterranean level for organic products in order to define the basic guarantee requisites for consumers.

It is necessary to define a policy to support the establishment of organic producers' associations aimed at enhancing and concentrating the supply. It is therefore necessary to disseminate the technical knowledge on the organic production method in order to avoid production losses and to guarantee basic quality standards especially during the conversion period.

At the same time, the public institutions should take actions and start up programmes designed to enhance the production and national consumption. This would have great benefits for the public health and for the environment.

## Annex 1. Contents and objectives of Commission Regulations (EEC) 2091/91 and 1804/99

**Council Regulation (EEC) No 2092/91** of 24 June 1991, on organic production of agricultural products referring thereto on agricultural products and foodstuffs  
*Official Journal No L 198 of 22.07.1991*

The Council Regulation (EEC) No 2092/91 tackles highly important topics and integrates, in a restrictive fashion, the general regulations in force in agricultural production.

This regulation fixes the rules for the whole production network of organic farming, defining the rules for production, preparation, presentation, packaging and marketing that operators have to comply with. Moreover, it defines the corresponding inspection system aimed at checking the compliance with the rules and procedures.

Among the main reasons that induced the organs of the Community to adopt a specific regulation on organic farming, there is the need of harmonising the legislation of each single member State, and the opportunity of setting real guarantees to the increasing consumers' demand for organically produced agricultural products and foodstuffs.

Moreover, the organic production system, by involving a less intensive use of land and of production factors, takes a strategic importance in the context of the reorientation of common agricultural policy, since it contributes towards the attainment of a better balance between demand and supply of agricultural products.

An equally important aspect is the environmental value of the production method in that farm management is focused on the knowledge and development of the dynamics of the agro-ecosystem without making use of synthetic chemicals.

The provisions of the Regulation (EEC) No 2092/91 are aimed at defining the production method of unprocessed plants and of products consisting of one or more ingredients of plant origin and ingredients of animal origin. Therefore, the Regulation introduces rules on the process to obtain agricultural products that can be marketed as organically produced only if obtained in compliance with those rules.

The Community regulations in this sector, also provide the rules to those operators who mean to obtain fresh or processed agricultural products to be labelled as organically produced.

Those operators who wish to carry out their activities following the principles of organic farming, have to comply with specific production rules and their basic principles are listed in the Community Regulation (Annex I part a and part b); they may make use of specific fertilisation products or plant protection products for the production of feed materials (Annex II part a, b and c), only when the techniques adopted are adequate for production purposes.

Another absolutely important and original aspect of the agricultural sector introduced by the Community regulation is an inspection system that details the roles, requisites, obligations and measures that the operators working in the context of organic farming have to comply with.

Proper functioning of the inspection system to ensure the compliance with the principles of the organic method, certainly contributes to increase consumers' trust in organic products and the credibility of traders: the management responsibility of the inspection system is transferred from the European Community to national Authorities and to designated Bodies.

Another theme included in the Community regulation concerns the modes of presentation of products with the wording to be reported on the labels of products and the information for advertising.

Following the regulations, only the products obtained in compliance with the principles of Regulation (EEC) No 2092/91 can be labelled as "Organic farming".

**Council Regulation  
(EEC) No 1804/1999**

19 July 1999, that completes, for animal production, the Regulation (EEC) No 2092/91 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs

*Official Journal No, L  
222 of 24/08/1999*

This Regulation harmonises the rules on production, labelling and inspection of the major animal species. In organic farms, livestock husbandry is a basic element for the organisation of agricultural production, since it meets the organic matter and nutrient requirements of agricultural soil, thus contributing to improve soil and develop sustainable agriculture.

To prevent damages to environment, and to natural resources in particular, like soil and water, livestock husbandry practised through organic methods has generally to envisage a close link between this production and the land, adequate several year rotation and animal feeding with plant products obtained through organic methods in the same farm.

To prevent water pollution by nitrogen compounds, farms practising organic livestock husbandry are supposed to have adequate storage capacity and schemes for spreading manure or slurry.

For the purposes of conservation and enhancement of the potential of abandoned areas, organic sheep rearing is a rather appropriate activity.

The Regulation intends to promote wide biological diversity in livestock husbandry: the choice of breeds should be made depending on the capacity of adaptation of animals to existing environmental conditions.

Genetically modified organisms (GMO) and the products obtained from them, are not compatible with organic production methods; to maintain consumers' trust in this type of production, genetically modified organisms, parts of them and products obtained from them in products bearing the logo of biological production should not be used.

Guarantees should be given to consumers that the product is obtained in compliance with the provisions of this Regulation; as far as technically feasible, such guarantees should be based on the traceability of livestock products;

Animal feeding has to consist of grass, fodder and feed materials obtained through organic methods. Under the present circumstances, animal breeders may encounter difficulties in the supply of feed materials for animals raised following organic methods and the possibility should be temporarily foreseen of authorising the use, in small amounts, of a limited number of feed materials not produced organically. Moreover, to meet the basic physiological requirements of animals, it can be necessary to use some minerals, trace nutrients and vitamins, under well-defined conditions.

Animal health should be controlled mainly by prevention, through measures like appropriate selection of breeds and strains, balanced and healthy feeding and favourable environment, especially from the point of view of animal livestock density, housing and raising practices.

The preventive use of chemically synthesised allopathic medicinal products is not permitted in organic farming, however, if an animal becomes sick or injured, it must be treated immediately, giving preference to homeopathic or phytotherapeutic products and limiting as much as possible the use of allopathic chemically synthesised medicinal products. To ensure consumers the quality of organic production, it should be possible to adopt restrictive measures, for instances by doubling the time of suspension after using allopathic chemically synthesised medicinal products. In most cases, animals should be allowed free-range areas whenever the weather conditions permit it; such pastures should generally be managed following appropriate rotational schemes.

For all the animal species, livestock buildings should meet the requirements of animals in terms of air circulation, light, space and well being and they should be provided with adequate space for each animal to move freely and develop natural social behaviour. Systematic operations that create suffering or distress, damages, diseases to the animals during raising, handling, transport and slaughtering should be reduced as much as possible; however, some specific interventions, essential for some products can be permitted; the use of substances to promote growth and control reproduction of animals is not compatible with the principles of organic farming.

Beekeeping, by its peculiarities, necessitates adequate provisions, in particular in order to guarantee the availability of adequate pollen and honey in terms of quantity and quality.

All the operators that market products resulting from organically raised animals should be subject to regular and uniform inspection; information on animals arriving at the holding or leaving the holding as well as treatments supplied, should be permanently reported in a register kept available at the farm.

The regional differences as far as organic farming and weather conditions are concerned, require some transitional periods for some methods and for the characteristics of housing premises and equipment.

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