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Frameworks for sustainable agriculture and forestry: applications to Finland and Spain

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Abstract: The main aim of this paper is to provide examples of frameworks and indicators used for assessing the sustainability of agriculture and forestry especially in the EU and to set the discussion agenda on the relation of sustainability and structural and natural conditions. Finland and Spain are used as examples. Although there are very different circumstances with very different opportunity costs the same policies or policy frameworks related are applied in both countries. Examples show that common policies or frameworks can be implemented in very different ways. The flexibility of the policies, the scope for inclusion of regional interest and recognition of structural differences are essential in order to be able to utilize resources in a way that is sustainable, but most suitable for an individual country. Furthermore, due to cross-sectorial nature of sustainability there is a need for integrated policy approaches. This paper is a part of EU financed SUSTAINMED project. The results of the working paper will be used as a basis for assessing the factors of sustainable agriculture and forest management in selected Mediterranean Partner Countries of EU (Egypt, Tunisia, Morocco) and Turkey in the later phases of the project.
Keywords: *sustainable development, agriculture, forestry, indicators, Finland, Spain, EU*

Matleena Kniivilä – Stefan Bäckman – Paula Horne – Javier Martinez-Vega – Samir Mili – Perttu Pyykkönen. 2012. KESTÄVÄN MAA- JA METSÄTALOUDEN KEHIKOT JA NIIDEN SOVELTAMINEN SUOMESSA JA ESPANJASSA. PTT työpapereita 137. 73 p. ISBN 978-952-224-103-0 (pdf), ISSN 1796-4784 (pdf).
Tiivistelmä: Tämän työpaperin tavoitteena on esitellä ja selventää sitä, mitä kestävällä maa- ja metsätaloudella erityisesti EU:ssa tarkoitetaan ja minkälaisia teoreettisia kehikkoja ja indikaattoreita on kehitetty kestävyyden mittaamiseksi. Työpaperissa arvioidaan myös kestävyyden suhdetta luonnonolosuhteisiin ja yhteiskuntien rakenteellisiin eroihin. Raportissa käytetään esimerkkeinä Suomea ja Espanjaa. Vaikka maat ovat monessa suhteessa hyvin erilaisia, niissä toteutetaan samoja eurooppalaisia politiikkoja tai käytetään yhteisiä, yleisempiä politiikkakehikkoja päätöksenteon apuna. Raportissa esitetyt maaesimerkit näyttävät, että yhteistä politiikkaa voidaan toteuttaa hyvin eri tavoin. Jotta luonnonvaroja ja muita resursseja pystyttäisiin käyttämään kestävästi, mutta kullekin maalle parhaiten sopivalla tavalla, on yhteisen politiikan oltava mahdollisimman joustavaa ja sen on mahdollistettava rakenteellisten ja alueellisten erojen huomioiminen. Koska kestävyyteen liittyvät asiat ylittävät sektorirajat, on myös politiikan oltava integroitua. Tämä työpaperi on osa EU:n rahoittamaa SUSTAINMED-hanketta. Työpaperin tuloksia käytetään hankkeen seuraavissa vaiheissa kestävälle maa- ja metsätaloudelle keskeisten tekijöiden määrittämiseen valituissa EU:n Välimeren partnerimaissa ja Turkissa.
Avainsanat: *kestävä kehitys, maatalous, metsätalous, indikaattorit, Suomi, Espanja, EU.*

SUMMARY

The main aim of this paper is to provide examples of frameworks and indicators used for assessing the sustainability of agriculture and forestry especially in the EU and to set the discussion agenda on the relation of sustainability and structural and natural conditions. This working paper has been produced as a part of a collaborative EU financed project, SUSTAINMED (Sustainable agri-food systems and rural development in the Mediterranean Partner Countries). The results of the working paper will be used as a basis for assessing the factors of sustainable agriculture and forest management in selected Mediterranean Partner Countries of EU (Egypt, Tunisia, Morocco) and Turkey in the later phases of the project.

Within the EU the frame for agricultural sector is largely formulated by the common agricultural policy. Rural Development Programmes are the key policy instrument used in order to increase sustainability in agriculture and rural countryside. Compared to agricultural policy forest policy in European Union is clearly more national. Criteria and indicators for sustainable forest management have been developed in the FOREST EUROPE process, which is pan-European and not an EU process. Both in the CAP and FOREST EUROPE importance to consider all three aspects of sustainability - economic, environmental and social - are emphasized.

Common policies and frameworks are an important tool for aiming at goals that are considered globally or regionally essential. Finland and Spain, which are presented in this paper as examples, show that common policies or frameworks can be implemented in very different ways. The flexibility of the policies, the scope for inclusion of regional interest and recognition of structural differences are essential in order to be able to utilize resources in a way that is sustainable, but most suitable for an individual country. Furthermore, due to cross-sectorial nature of sustainability there is a need for integrated policy approaches. Obvious is that when trying to achieve more sustainable agriculture or forestry, all factors of sustainability has to be taken into account. However, as countries differ, there are and there have to be differences in the emphasis of sustainability factors.

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1 Introduction

This working paper has been produced as a part of a collaborative EU financed project, SUSTAINMED (Sustainable agri-food systems and rural development in the Mediterranean Partner Countries). The overall objective of the project is to examine and assess the impacts of EU and national agricultural, rural, environmental and trade policies in the Mediterranean Partner Countries (MPCs) and Turkey[1]. SUSTAINMED will provide relevant research to support the promotion of sustainable agriculture and forestry in the study countries.

This working paper is a part of a work package, which specifically aims at providing methodology for carrying out sustainability analyses in the study countries. Sustainable development is a very wide, and to some extent also vague, concept. A practical and efficient tool for measuring sustainability is to use sustainability indicators. Indicators can be used to measure e.g., the state of certain factors, their development over time as well as to examine the impact of different policies. In this working paper a draft framework based on European experiences is set to be used as a starting point for measuring sustainability of agriculture and forestry in the MPC countries. The paper presents factors of sustainable agriculture and forestry as well as examples of indicators used in the European context. Based on the framework presented a detailed framework for MPCs and Turkey, including factors and indicators of sustainability, will be defined in the later phases of the project.

The report proceeds as follows. Chapter 2 discusses briefly about the challenges that agricultural and forest sectors are currently facing in the world and MPCs. Chapter 3 focuses on the conceptual framework: what sustainable development and sustainable agriculture and forestry are, and how these concepts have evolved. Chapter 4 discusses generally about the European policies related to the sustainable development and sustainable agriculture and forestry, and presents general frameworks as well as illustrative indicators used for assessing sustainability in Europe. In Chapter 5 two EU countries, Finland and Spain, are presented as examples on that how EU polices and other European frameworks targeting sustainable agriculture and forestry have been implemented at the national level. The chapter describes agricultural and forest sectors of these countries and discusses about the factors impacting on sustainability. Chapter also analyzes how common frameworks can be implemented in different countries and shows examples of combining indicators of sustainability in Finland and Spain. Chapter 6 concludes and based on the examples of Finland and Spain draws attention to the issues that should specifically be considered when sustainability is addressed.

[1] Project countries include Egypt, Morocco, Tunisia, Syria and Turkey. Turkey is a candidate country for EU membership, other four countries are Mediterranean Partner Countries (MPCs).

2 Agricultural and forest sectors facing major challenges in MPCs and globally

Agricultural and forest sectors are both facing major challenges in the near future and coming decades. Both sectors are facing increasing demand for their produce, competition for land from the part of other sectors, and decreasing quality of land. As global population is increasing, demand for agricultural products will substantially increase. Not only the pressure for the volume of products will raise, also the structure of demand will change. As wealth is expected to increase globally, the demand for more varied, high-quality, protein rich diet will increase. This will further increase production demand requiring additional inputs (Foresight - the Future of… 2011). At the same time competition for land, water and energy will increase. For example, more land is required for biomass energy production. Potential land and ecosystem degradation may further impose additional challenges.

There has been high volatility in food prices during the last couple of years, but the global food system continues to provide enough food at an affordable price for the majority of the world's population (Foresight - the Future of 2011). Still, hunger remains widespread and not all systems of food production are sustainable. Agricultural sector has so far been able to increase production and productivity to meet the increasing global demand. However, possible degradation of the environment may decrease the possibilities to respond to increasing needs in a long run. Food production also contributes to biodiversity decrease, land and soil degradation, local overconsumption of water resources as well as to climate change.

Also forest sector is facing major challenges. Global forest cover is decreasing with alarming pace. In 2010 United Nations Food and Agricultural Organization estimated that the net annual loss of forest area is 5.2 million hectares (FAO 2010), i.e. more than half of the size of Portugal. Deforestation has global impacts and especially its impact on climate change has been recognized during the recent years. It is estimated that deforestation causes one fifth of the global CO_2-emmissions. Impacts of the degradation of forest cover are not restricted to global warming, but it also decreases biodiversity and availability of other ecosystem services. Apart from fiber production, forest also provides important ecosystem services, such as erosion prevention, wind breaks, and nutrient recycle. These services contribute to the sustainability of agriculture as well.

Rural population is large in the Mediterranean partner countries (MPCs) and Turkey. Despite migration rural population has increased in absolute terms in many of these countries, and rural poverty has remained high compared to urban poverty (Benoit and

Comeau 2005). Unemployment in rural areas is also higher than in urban areas. As the livelihood of rural population is highly dependent on agriculture, productivity, growth and sustainability of agriculture have a direct impact on poverty.

MPCs are dependent on food imports, and increasing food prices have been among the reasons causing social unrest. In addition to structural problems and low agricultural productivity, problems arise e.g. from the lack of water and soil degradation (for Egypt see e.g. Soliman and Mashhour 2010). Continuing degradation of natural resources and the rise in the number of droughts have decreased agricultural production and increased rural poverty in the region (Benoit and Comeau 2005).

Forest covers about two per cent of land in Northern Africa (FAO 2010). In the last decade deforestation has nearly stopped being about 0.05 % between 2000 and 2010. Even though wood based industry is not of major importance in MPCs, the forests plays a role in providing ecosystem services.

The costs of land degradation are high in the Mediterranean countries. Direct costs include losses in agricultural production and loss of forest benefits – commercial wood, firewood, protective benefits, fodder and non-wood forest products. However, indirect costs caused by degradation can be even larger than direct costs (Benoit and Comeau 2005). These costs arise e.g. by the degradation of watersheds, increased floods and landslides and by the loss of biodiversity. Southern Mediterranean countries may also be among the most affected regions by eventual climate change. Extreme weather events and incremental changes in climate could lead to cuts in agricultural productivity in the region during the coming decades. The Stern report estimates agriculture to be the most sensitive sector to climate change impacts (Stern 2007). Extreme weather conditions accelerate environmental degradation and further decrease living conditions of the poor.

3 Sustainable development and environment

3.1 Linking sustainable development and natural resources

Sustainable development and sustainability are recognized, even if often neglected, principles in many livelihoods. In agriculture one has always had to take care of the productivity of the soil in order to guarantee the future harvests. The same applies to forest management. As natural resources are not infinite the economic growth may be hampered if sustainability is not taken into consideration and finally this leads to decrease in the overall welfare. The principle of sustainable use of renewable resources requires that the utilization of the resource during a given time period should not exceed the growth of the resource at the same time period. Thus the stock of the resource remains stable.

Despite recognition of the importance of sustainable practices sustainable development as a concept emerged to the wider public relatively late, in the 1980s. In economics and natural sciences the concept had been widely discussed already in the 1960s (e.g. Lipton 1968). A lot of the discussions and policy processes related to sustainable development have occurred within the UN framework. In developing world the main concern in the 1960s was on the inequity of trade and development. At that time also in the developed countries environmental concerns were only beginning to enter the politics. Importance of environmental issues was, however, recognized.

A definition for sustainable development was presented as a concept for the first time in the Brundtland report (World Commission on…. 1987), in which environmental and development aspects were merged. The report defined sustainable development as follows:

> *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:*
> *the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."*

The concept of sustainable development truly arrived to the international scene a few years later at the United Nations Conference on Environment and Development

(UNCED) in Rio de Janeiro in 1992 (Vogler 2007). At the conference governments adopted three major agreements: Agenda 21, the Rio Declaration on Environment and Development, and the Statement of forest principles for the sustainable management of forests. In Rio de Janeiro the balance was noticeably shifted from environmental matters towards a range of socio-economic concerns (Vogler 2007), and it was recognized that environmental protection and natural resources management must be integrated with socio-economic issues of poverty and underdevelopment. Ten years later the Johannesburg Conference (the World Summit on Sustainable Development, WSSD) further confirmed the importance of socio-economic pillars of sustainable development and highlighted the urgency of poverty alleviation. Some sustainability issues, which are considered to need special attention, are among the eight Millennium Development Goals (MDGs) of the United Nations, which were adopted by the world leaders in 2000 and set to be achieved by 2015. The MDGs include e.g. goals which urge to eradicate extreme poverty and hunger (Goal 1) and to ensure environmental sustainability (Goal 7). At the EU level the renewed EU Sustainable Development Strategy (Council of the European Union 2006a) provides a framework for policy actions related to sustainable development. During the years sustainable development has become incorporated in to decision-making. In addition to international level significant progress has been seen at national level especially in developed countries as well as in business.

In general three dimensions are recognized when considering sustainability: economic, social and environmental. Different factors affect the different dimensions, but the sustainability concept brings the dimensions together and opts for that if one dimension is not intact then sustainability suffers. The concept and the interactions with policies and institutions are thoroughly analyzed in Gatzweiler et al. (2001). A concept that is often used in conjunction with sustainability is the concept of resilience. The resilience concept asks how permanent a change or an eventual damage is for either dimension. Most often the resilience is thought of as addressing the environmental dimension, but is valid also on the other dimensions. In comparison of different systems a system that has a less permanent effect on environment is to be preferred.

Indicators are often used for measuring sustainability. Indicators and factors are mostly categorized in the following groups: state and impact, pressure and benefits, driving forces and responses. The state tells about the quality or quantity at the moment. The pressure tells about possible depletions, pollutions or environmental benefits from actions. The driving forces are general trends, technological developments and management developments. The responses are commitments, rules, policies and market demands.

3.2 Sustainable agriculture

Agricultural sector contributes to around four per cent of global GDP. The share of GDP is relatively small, but the sector is vital for the existence of human-beings. Also the prices of food products are important to both production and consumption at the global scale. The high price on energy and especially oil has triggered the price also on food products. Especially in countries and areas with uneven income distribution and low incomes, high prices on food cause malnutrition.

Half of the world's population lives in rural areas (World Bank 2012) and especially in developing countries the rural population is mostly identified with the agricultural population. Thus, the productivity and sustainability of agriculture and rural development have major importance, especially when global population is increasing. As food is a necessity for life, agriculture has more immediate links on the poor and poverty reduction than many other economic sectors.

Sustainable agriculture has been defined in several ways. Based on his review Christen (1996) claims that the sustainable agriculture should: 1) ensure inter-generational equity, 2) preserve the resource base of agriculture and obviate adverse environmental externalities, 3) protect biological diversity, 4) guarantee the economic viability of agriculture, enhance job opportunities in farming and preserve local rural communities, 5) produce sufficient quality food for society, and 6) contribute to globally sustainable development. It can be debated if it is possible and desirable to fulfill all these objectives simultaneously (see e.g. Tisdell 2007).

The major objective of sustainable agriculture and rural development as spelled out in Chapter 14 of Agenda 21 is to increase food production in a sustainable way and to enhance food security. Also the World Summit on Food Security in 2009 and the World Summit on Sustainable Development in 2002 have stressed the importance of urgent actions to eradicate hunger from the world. The United Nations Millennium Development Goals in 2000 set a target to halve, between 1990 and 2015, the proportion of people who suffer from hunger. However, sustainability of agriculture does not include only securing of food availability and decreasing poverty, but it also has close links to other objectives of Agenda 21. In addition to the volume of agricultural production the manner of agricultural production is also important. It includes a large range of issues starting from practical methods used in agriculture and their impact on the surrounding nature, but also more political and wider social and economic issues like social equity, employment, property rights etc. In addition to food security, Johannesburg Plan of Implementation mentions e.g., the importance of the enhanced participation of women in sustainable agriculture and food security, guaranteeing well-

defined and enforceable land and water use rights, promotion of legal security of tenure, and the support for traditional and indigenous agricultural systems.

FAO has defined sustainable agriculture and rural development as a process, which meets the following criteria (FAO 1995):

- Ensures that the basic nutritional requirements of present and future generations, qualitatively and quantitatively, are met while providing a number of other agricultural products.
- Provides durable employment, sufficient income, and decent living and working conditions for all those engaged in agricultural production.
- Maintains and, where possible, enhances the productive capacity of the natural resource base as a whole, and the regenerative capacity of renewable resources, without disrupting the functioning of basic ecological cycles and natural balances, destroying the socio-cultural attributes of rural communities, or causing contamination of the environment.
- Reduces the vulnerability of the agricultural sector to adverse natural and socio-economic factors and other risks, and strengthens self-reliance.

There is also a debate on aiming at balancing conflicts, impacts and costs against the benefits of biofuels and its relationship with the sustainability of agriculture, with food prices and with food security at a global level (Pimentel and Patzek 2005, Pimentel et al. 2009, Altieri 2009, UNDP 2010). Rosset (2009) claims, that the world faces a set of sub-crises - climate, energy, food and financial - and that renewable biofuels are related to all of these aspects of this multidimensional crisis. Ortiz (2011) identifies four types of conflicts caused by this type of energy crops: territorial conflicts, economic disputes, social conflicts, and environmental conflicts. Although biofuels are intended for the populations of developed countries, territories of the peripheral countries of Latin America, Asia and Southeast Asia and Africa are contested. In these places, farms linked to a traditional family farm model have been replaced by large monoculture plantations of energy crops, displacing thousands of farmers from their rural communities. This refers to territorial conflicts. Biofuels are closely linked to the transnational companies and exporters, which requires high technological capabilities and large investments for its implementation. Small agricultural companies, linked to local family agriculture are less likely to produce biofuels. Moreover, currently it is assumed that the increase in demand for biofuels is partly responsible for the rising prices of staple food such as corn or wheat (OECD-FAO 2007). Furthermore, security and food sovereignty are not guaranteed as a result of the intensive production of biofuels. According to FAO data (UNDP 2010) more than 1,400 million people live in poverty and about 1,000 million people are undernourished in the world. These issues refer to economic disputes and social conflict. Biofuel production causes also environmental conflicts. Despite the benefits of biofuels - reducing greenhouse gases, reducing air pollution and improving

energy efficiency - production and territorial implementation of these crops may generate harmful environmental impacts like deforestation, biodiversity loss, degradation of the landscape, soil and water pollution by agricultural chemicals and increase nutrient reduction. These further exacerbate the ecological crisis and climate change.

However, with renewable energy the purpose is to answer to souring energy prices. The high energy prices are due to the high consumption of energy. Biofuel production is unprofitable in a case of lower energy prices, and do not compete with food production in this case. The local and global problems caused by production and allocation of resources have to be solved on a long term basis in a sustainable manner and biofuel has to be produced in a sustainable manner. Food security has to be considered in all areas and all cases, also in the case of high energy prices.

3.3 Sustainable forestry

Forestry is often considered as a sub-sector of agriculture, but the roles of these two sectors, however, differ. At the global scale and in a big picture the main role of agriculture is to provide food, fiber and energy for increasing global population. Forests provide fiber, fodder and fuel for industrial and subsistence use. In addition, forests have also a major role in securing ecosystem services both at local (e.g. erosion prevention, wind breaks, temperature locally) and global (biodiversity and carbon sequestration) levels. During the recent years emphasis has been given especially to the role of forests and deforestation in climate change.

At the UNCED in 1992 forests was a controversial issue causing tensions between developing and developed countries. Discussions led to the adaptation of non-binding statement of forest principles. After the UNCED discussion on forests and their role for sustainable development further intensified. Several regional processes for formulating and adopting criteria and indicators for sustainable forest management (SFM) have been launched. According to the United Nations Forum on Forests SFM is a dynamic concept that aims to maintain and enhance the economic, social, and environmental values of forests, for the benefit of present and future generations. In the pan-European policy process (The Ministerial Conference on the Protection of Forests in Europe, currently FOREST EUROPE) for the sustainable management of the continent's forests sustainable forest management has been defined as follows (Helsinki Resolution H1 1993):

> *The stewardship and use of forests and forest lands in a way and at a rate that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems.*

There are ten different collaborating regional SFM processes including FOREST EUROPE (includes also e.g. Russia), Montreal process for non-European countries with boreal and temperate forests (includes also Russia), Near East process and African Dry-Zone Process.

4 Sustainable agriculture and forestry in Europe

4.1 Sustainable development in the EU: the strategy and the main factors impacting sustainability

The renewed EU Sustainable Development Strategy (Council of the European Union 2006a) reaffirmed that sustainable development has to be integrated into all policy-making and it aims to link economic development, protection of the environment and social justice. In the strategy sustainable development is defined to be based on the principles of democracy, gender equality, solidarity, the rule of law and respect for fundamental rights, including freedom and equal opportunities for all. The key objectives, approved by the European Council in 2005 and defined in the strategy, are related to environmental protection, social equity and cohesion, economic prosperity, and meeting the international responsibilities of the EU.

As key challenges the renewed EU sustainable development strategy specifically identifies seven issues: climate change and clean energy, sustainable transport, sustainable consumption and production, conservation and management of natural resources, public health, social inclusion, demography and migration, and global poverty and sustainable development challenges. The strategy is monitored by using sustainable development indicators (SDIs). In all, there are more than 100 indicators, but eleven of those, in ten themes, have been identified as headline indicators (Table 1). Issues related to agriculture and forestry especially belong to the themes "sustainable consumption and production", "climate change and energy", and "natural resources". However, agricultural and forest sectors have naturally impact on general socioeconomic development and also on social inclusion, which can be measured e.g. by at-risk-of-poverty rate.

In addition to EU's sustainable development strategy, there exist also sub-regional sustainability strategies or initiatives, which aim at adapting international commitments to regional conditions and to guide national sustainable development strategies. Mediterranean Strategy for Sustainable Development (UNEP-MAP 2005), including both Southern and Northern Mediterranean countries, was launched in 2005 by the UNEP. The strategy defines as priority areas water resources, energy management and addressing impacts of climate change, transport, tourism, urban development, agriculture and rural development, and management of the sea, coastal areas and marine resources. The strategy includes also 34 indicators for the follow-up. There exist

also other regional strategies, e.g. the regional strategy for the Baltic Sea Region and for Danube Region, which have been formulated by the European Commission.

Table 1. *Sustainable development themes and main subthemes for the EU according to report on the sustainable development in the EU (EUROSTAT 2009). In parenthesis headline indicator of each theme.*

Theme	**Subthemes**
Socioeconomic development (*HI: Growth of GDP per capita*)	Economic development Innovation, competitiveness and eco-efficiency Employment
Climate change and energy (*HI: Greenhouse gas emissions, Consumption of renewables*)	Climate change Energy
Sustainable transport (*HI: Energy consumption of transport relative to GDP)*	Transport and mobility Transport impacts
Sustainable consumption and production *(HI: Resource productivity)*	Resource use and waste Consumption patterns Production patterns
Natural resources (*HI: Abundance of common birds, Conservation of fish stocks*)	Biodiversity Freshwater resources Marine ecosystems Land use
Public health (*HI: Healthy life years*)	Health and health inequalities Determinants of health
Social inclusion (*HI: Risk of poverty*)	Monetary poverty and living conditions Access to labour market Education
Demographic changes (*HI: Employment rate of older workers)*	Demography Old-age income adequacy Public finance sustainability
Global partnership *(HI: Official development assistance)*	Globalisation of trade Financing for sustainable development Global resources management
Good governance *(no headline indicator)*	Policy coherence and effectiveness Openness and participation Economic instruments

4.2 Sustainable agriculture and forestry in the EU: framework, strategies and main factors

4.2.1 Agriculture

In the EU the frame for agricultural sector is largely formulated by the common agricultural policy (CAP). The initial objectives of CAP were set out in the Treaty of Rome (Treaty of Rome 1957). The objectives of the treaty are increasing of agricultural productivity, ensuring a fair standard of living for the agricultural community, market stabilization, securing the availability of supplies, and ensuring that supplies reach consumers at reasonable prices. Thus, the main emphasis was given to economic sustainability and food security, and to some aspects of social sustainability. Later, especially after the Rio Summit (1992) the need for environmental sustainability of agriculture was more widely recognized and e.g., agro-environment schemes were introduced.

In Agenda 2000 (European Commission 1999) it is defined that the CAP should improve the competitiveness of agriculture of EU, guarantee food safety and quality, and stabilize farm income, but also provide environmental benefits, enhance the rural landscape and support the competitiveness of rural areas across the EU (Commission of the European Communities 2006). This is in general strengthening the sustainability of the agricultural sector.

The first pillar of the CAP covers market-related support systems and direct aid for farmers, supporting thus principally food production. The main aim of the second pillar of the CAP is to support rural development more widely. Rural areas count for more than 90 per cent of the land area of EU. Agriculture and in some regions also forestry are significant sectors in rural areas, and thus have a major role in sustainable rural development. Steps towards more sustainable agriculture in EU were taken by the changes in the CAP in 1999.

Specific attention has been given to the integration of environmental concerns into the CAP. The Helsinki European Council in 1999 adopted the strategy for integrating the environmental dimension into the CAP (Commission of the European Communities 2006). The strategy sets environmental integration objectives for *water, land use and soil, climate change and air quality,* and also *landscape and biodiversity*. In its conclusions, the Council requested a regular reporting on progress in integration, based on agri-environmental indicators (AEI). By the end of 2005 the development of a set of agri-environmental indicators was finalized. Indicators are presented in Annex I. Agri-

environmental indicators are used to monitor the environmental impacts of the implementation of CAP.

The agricultural environment in EU differs amongst member countries. Around the Baltic Sea the water protection has an import role since the vulnerability of Baltic Sea for excess nutrients from amongst others the agriculture. The Mediterranean coastal areas are less prone to nutrient losses due to the dryer climate. There are also common policies e.g. The Nitrate Directive that aims to protect the ground waters from N-leaching. The Nitrate Directive gives a clear per hectare limit on applications of organic fertilizers. However, the implementation of the directive varies amongst the EU countries, depending on the situation of the environment and agriculture.

The sustainable agriculture principles are given in EU within the community strategic guidelines for rural development (Council of the European Union 2006b). Valid programme period is the one for the period 2007 to 2013. The main sustainability factors in this programme are the following three:

1. Improving the competiveness of the agricultural and forestry sector
2. Improving the environment and the countryside
3. Improving the quality of life in rural areas and encouraging diversification of the rural economy.

These factors coincide well with the three sustainability dimensions (economic, ecological and social sustainability), and they are used in this paper as the main factors of sustainable agriculture in EU.

Based on the strategic guidelines the member states present their own rural development programmes (RDP). There is a large set of indicators to use for evaluating the rural development programme (for examples of baseline indicators see Table 2) and some of these can be used to evaluate sustainability in general. Furthermore, under the RDP all EU countries have the possibility to add environmental programmes for agriculture with some national discrepancy. The overall EU policy tends to promote not only EU's own production, but also to consider possible external effects outside EU.

EU's rural development indicators have been developed mainly from the viewpoint of the monitoring the financing of rural development while the OECD indicators complements the RD indicators due to the more specialized agricultural activity measuring. Besides the baseline indicators, there are sets of specialized indicators of which most are closely associated with rural development and the Common Agricultural Policy (CAP). In the rural development the forestry and agricultural activities are mostly considered together.

In the Mediterranean strategy for sustainable development, similar objectives and indicators has been developed (Pintus & Giraud 2009, Table 3). The environment and the existing institutions in the specific countries influence the development of the set of indicators to use for sustainable rural development. The OECD has a set of more agricultural specific indicators for overall sustainability. The framework coincides relatively well with the sustainability factors presented in the EU's rural development programme, but the approach is more restricted and focused on agriculture alone. A sample of indicators is given in Table 4. The factors that are important from sustainability point of view differ between countries mostly because of the varied environmental, political and economic contexts.

Table 2. *Examples of EU baseline indicators for rural development with some modifications (for original indicators see European Commission (2006)).*

Axis	**Factor**	**Indicator**
Horizontal	Economic development	GDP/capita
	Employment	Employment rate
	Unemployment	Unemployment rate
Competitiveness	Training and education	Farmers education
	Age structure in agriculture	Ratio of young farmers
	Labour productivity in agriculture	Gross value added/annual work unit (GVA/AWU)
	Gross fixed capital formation (GFCF) in agriculture	GFCF in agriculture
	Employment development of primary sector	Employment
	Importance of semi-subsistence farming in NMS	Number of farms
Environment	Biodiversity	Population of farmland birds
	Biodiversity	High Nature Value farmland and forestry
	Biodiversity	Tree species composition
	Water quality	Gross Nutrient Balances
	Soil	Areas at risk of soil erosion
	Soil	Utilized agricultural area under organic farming
	Climate change	Production of renewable energy from agriculture
	Climate change	Emissions of greenhouse gases and ammonia from agriculture
Wider rural development	Supporting rural activities	Employment opportunities in non-agricultural activities
Leader	Development of local action groups	Share of population covered by local action groups

Table 3. *Indicators from Mediterranean strategy for sustainable development (Pintus & Giraud 2009, own modification).*

Factor	Objective	Indicator
Environment	To protect biodiversity and landscapes	Percentage of protected areas Existence of an inventory of indigenous genetic plant and animal resources Afforestation rate (wooded lands)
	To combat desertification and the loss of productive land	Loss of arable land Rangeland stocking rate Foliar index for wooded lands
	To promote rational farming	Ratio of fertilizer quantity to GAP Ratio of pesticide quantity to GAP Ratio of mechanical power to GAP Ratio of volume of water consumed to GAP
Economy	To promote agricultural development schemes and sustainable development programmes	Share of public budget allocated to sustainable rural development programmes
	To promote Mediterranean diversity and quality and increase the value added through development, recognition and marketing	Proportion of quality agricultural products Share of farmland used for organic farming Number of labeled/certified products/ total Existence of legal framework for quality products Share of processed products in agricultural exports
Social	To reduce rural poverty and the social gap between the rural and urban population	Share of family income allocated to food consumption Percentage of farms with an acerage of less than 10 ha Share of paid agricultural labour
	To strengthen the governance of local communities and the role played by women	Number of women's groups Local levies and transfers not allocated from state budget to local communities Local government elections
Rural livelihood	To diversify the rural economy by developing non-agricultural activities (outside the scope of this project)	Ratio of the farm population to the rural population Share of agricultural employment in rural areas Numbers of non-farming enterprises in rural areas

Table 4. *OECD indicators for sustainable agriculture (OECD 2008, own modifications).*

Dimension	Factor	Indicator	Indicator type (SPIR-types)
Environment	Water quality	Nitrate in groundwater	State
		Fertilizer use	Pressure
		Agricultural-environmental programme participation	Impact
	Water use intensity	Groundwater level	State
		Irrigation (technology, use)	Pressure
	Biodiversity	Species diversity	State
		Genetic diversity	State/pressure
	Land use	Utilized agricultural land	State
		Arable land	State
		Unutilized agricultural land	State/Pressure
	Landscape	Man-made objects (cultural features)	State
		Land use patterns	State
Economic	Farm financial	Farm income (sum of activities)	State
		Farming profitability (activity based)	State
	Farm output	Partial productivities (yield per ha, milk l/cow	State/pressure
	Farm management	Environmental plan	State/pressure
		Organic farming	State/pressure
	Pesticide management	Pesticide use skills	Pressure
Social	Welfare	Employment	Pressure/impact
		GDP	State
		Income distribution	Pressure/impact

All these three different sets of indicators have many similar features. Mostly the scale and purpose create a bit different indicator needs. For the EU context the EU baseline indictors are rather well suited for analyzing and developing of rural development policies within EU. Likewise the Mediterranean set functions best for the Mediterranean context. The OECD set complements both sets since there are also some additional farm measurements on agricultural activities. The indicators to focus in the different countries depend on the importance of different sustainability factors, context and the institutional settings of the countries.

4.2.2 Forests

Within the EU there are considerable differences between countries in natural conditions as well as in economic and social role of forests. Climate zones and ecological site conditions vary in a remarkable way and European forests include boreal, temperate and Mediterranean forests as well as mountain forests, which have clear differences e.g. in tree species and other vegetation. Within the EU there exist semi-natural forests, plantations as well as pristine forests.

The role of forests in the national economy also differs between the countries. For some member countries – especially Finland, Sweden and the Baltic countries – forestry and forest industry have high economic importance in addition to the environmental and social values related to forests. Finland, for example, receives 18 per cent of its export incomes from the export of products of forest industry, and the share of forest sector in the GDP is more than five per cent, whereas in the whole EU the share is only one per cent (Finnish Forest Research Insitute 2010).

Compared to agricultural policy forest policy is in European Union clearly more national and there is no detailed common policy as there is for agriculture. The Forest Strategy for the EU (1998) states that forest policy lies on the competence of the member states, but that the EU can contribute to the implementation of sustainable forest management (SFM) through common policies, based on the principles of subsidiarity and the concept of shared responsibility. On the basis of the Forest Strategy also the EU Forest Action Plan has been prepared and adopted in 2006.

EU Forestry Strategy (Council of European Union 1999) emphasizes the sustainable forest management and the multifunctional role of forests, as has been defined in the MCPFE process (The Ministerial Conference on the Protection of Forests in Europe). MCPFE is currently called as FOREST EUROPE and it is the pan-European policy process for the sustainable management of forests of Europe. Countries participating in the process have committed to implement sustainable forest management.

In the pan-European process common strategies for member countries and the European Union have been developed concerning sustainable management and protection of European forests. Pan-European policy process is not limited to EU countries, but there are 46 countries involved. E.g. Russian federation and Turkey are among the countries participating the process.

The pan-European policy process has led to the development of criteria and indicators for sustainable forest management. The criteria highlight the diverse role of forests and the essential factors in sustainable management of forests. The member countries have

agreed on a joint definition of sustainable forest management. It is defined as the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil*l*, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems (see e.g. FOREST EUROPE, UNECE and FAO 2011).

Currently there are six criteria for sustainable forest management and 35 quantitative indicators under the criteria (FOREST EUROPE, UNECE and FAO 2011) (Table 5). In addition, there are five qualitative indicators used to monitor overall policies, institutions and instruments for sustainable forest management and 12 qualitative indicators to inform about policies, institutions and instruments used to address specific topics corresponding with the quantitative indicators. Qualitative indicators build a bridge between sustainable forest management on the ground (and quantitative criteria related to that), and related policies and institutions that govern the management and use of forests.

Pan-European forest process as well as similar processes elsewhere forms the basis for the forest certification system PEFC, which according to the PEFC, covers two-thirds of all certified forests globally. Furthermore, in European Union's green public procurement criteria forest management using pan-European principles is considered as sustainable forest management, and if sustainable management can be verified, it benefits the potential supplier of the wood products.

At national level criteria and indicators for sustainable forest management are used in preparation and monitoring of forest policies, for monitoring the sustainability of forest management, reporting on the conditions of forests, setting the direction of forest management and publishing information about forests and forestry to political decision makers (e.g. Ministry of Agriculture and Forestry & Finnish Forest Research Institute 2011). As there are differences between forests in Europe, common quantitative target levels for sustainable forest management have not been defined. There are also differences between countries in the importance of each criterion due to differences in the role of forests in the society, and there are differences in national applications. The pan-European criteria for sustainable forest management include aspects of all three dimensions of sustainable development (see Figure 1). Criterion 1 (Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles) and Criterion 2 (Maintenance of forest ecosystem health and vitality) have clear linkages to all dimensions of sustainability, as the existence of healthy and vital forests is the basis for all other benefits gained from forests. Criterion 3 (Maintenance and encouragement of productive functions of forests) refers directly to economic benefits of forests and Criterion 4 (Maintenance, conservation and appropriate enhancement of

biological diversity in forest ecosystems) to ecological sustainability, but both have some linkages to other dimensions as well. Criterion 5 (Maintenance and appropriate enhancement of protective functions in forest management, notably soil and water) refers especially to social and ecological dimensions of sustainability, but have also linkages to economic benefits of forests. Criterion 6 is directly related to other social and economic benefits of forests.

Table 5. *The criteria for sustainable forest management in Europe and the quantitative indicators for monitoring (FOREST EUROPE, UNECE and FAO 2011).*

Criteria	**Indicator**
C1: Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles	forest area growing stock age structure and/or diameter distribution of forest carbon stock
C2: Maintenance of forest ecosystem health and vitality	deposition of air pollutants soil condition defoliation forest damage
C3: Maintenance and encouragement of productive functions of forests (wood and non-wood)	increment and fellings roundwood non-wood goods services forest under management plans
C4: Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems	tree species composition regeneration naturalness introduced tree species deadwood genetic resources landscape pattern threatened forest species protected forests
C5: Maintenance and appropriate enhancement of protective functions in forest management (notably soil and water)	Protective forests – soil, water and other ecosystem functions Protective forests – infra-structure and managed natural resources
C6: Maintenance of other socio-economic functions and conditions	forest holdings contribution of forest sector to GDP net revenue expenditures on services the forest sector workforce occupational safety and health wood consumption trade in wood energy from wood resources accessibility for recreation cultural and spiritual values

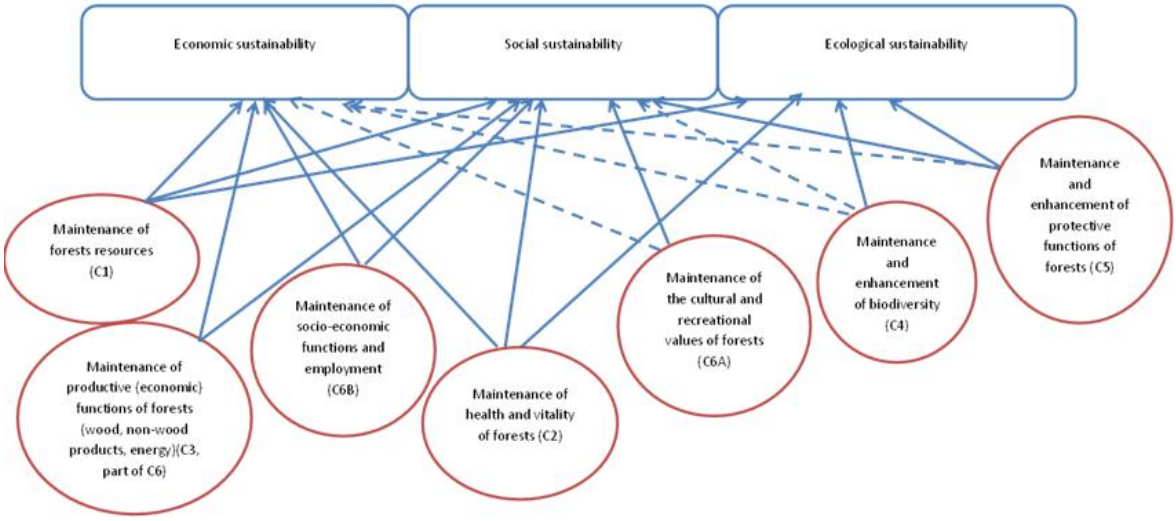

Figure 1. *Factors impacting on the sustainability of forest management. Division here is based on the pan-European criteria for sustainable forest management (FOREST EUROPE, UNECE and FAO 2011) with some modifications.*

4.3 Common policy with national applications – example of the Rural Development Programmes in the EU

As mentioned in Chapter 4.2 the Rural Development Programmes (RDP) comprises the key policy instrument in order to increase sustainability in agriculture and rural countryside. The EU links RDP closely to its Lisbon and Gothenburg Strategies just for sustainability reasons. The three dimensions of sustainability have been compressed in these few sentences: "Many of our rural areas face significant challenges. Some of our farming and forestry businesses still need to build their competitiveness. More generally, average income per head is lower in rural regions than in our towns and cities, while the skills base is narrower and the service sector is less developed. Also, caring for the rural environment often carries a financial cost." [2]

In principle, individual EU Member States could decide and operate completely independent rural development policies. Several issues addressed through rural development policy do not divide up neatly at national or regional boundaries, but have a broader effect (for example, pollution crosses borders all too easily; and more generally, environmental sustainability has become a European and international concern). Also, rural development policy has links to a number of other policies set at EU level.

[2] The quotation is taken from EU website on RDP's. (http://ec.europa.eu/agriculture/rurdev/index_en.htm). The other introductory text in this chapter is based on the same source.

EU has decided on a common rural development policy, which nonetheless places considerable control in the hands of individual Member States and regions. The policy is funded partly from the central EU budget and partly from individual Member States' national or regional budgets. One of the key features of the common policy is that in order to ensure a balanced approach to policy, Member States and regions are obliged to spread their rural development funding between all three dimensions of sustainability (or axes as they are defined in the RDP). As mentioned in Chapter 4.2, there are three thematic axes (competitiveness: Axis 1, environment: Axis 2, quality of life and diversification: Axis 3) and in addition to these, a further requirement is that some of the funding must support projects based on experience with the Leader Community Initiatives (Axis 4).

As before 2007, every Member State (or region, in cases where powers are delegated to regional level) must set out a rural development programme, which specifies what funding will be spent on which measures in the period 2007 to 2013. A new feature for the period of 2007-2013 is a greater emphasis on coherent strategy for rural development across the EU as a whole. This is being achieved through the use of National Strategy Plans, which must be based on EU Strategic Guidelines.

Thus, this policy approach should help to:

- identify the areas where the use of EU support for rural development adds the most value at EU level;
- make the link with the main EU priorities (for example, those set out under the Lisbon and Gothenburg agendas);
- ensure consistency with other EU policies, in particular those for economic cohesion and the environment;
- assist the implementation of the new market-oriented CAP and the necessary restructuring it will entail in the old and new Member States.

Thus, the policy framework is common, the individual Member strategies (or regional strategies, in large countries like Spain, Italy and Germany there are several regional programmes) should support each other and even the priorities (inside each of the axes) are the same for each Member state (e.g. supporting young farmers, modernization of agricultural holdings and adding value to agricultural and forestry products in Axis 1, LFA and environmental support in Axes 2). However, there is a wide range of national possibilities to differentiate the policy inside the priorities and funding according to the above mentioned principles. Of course, the national applications have to be notified and accepted at EU level. Thus, the common policy gives quite a few possibilities to take into account e.g. specific national environmental conditions and specific needs in different dimensions of sustainability. That can be easily seen in the Figure 2, in which the RDP funding has been compared between different axes in each of the programme.

The weight of the Axis 2 is very large e.g. in Nordic countries (Denmark, Sweden and Finland) as well as in UK (England, Wales, Scotland) and Ireland. The figure illustrates very well the possibilities to differentiate the policy in spite of common framework. Of course, this picture does not give the total picture of the situation in different regions. We have to bear in mind that RDP is not the only policy that targets sustainability issues. In addition, similar kind of policies and priorities are applied purely on national basis. This is the case e.g. in Finland where one reason for the quite low share of funding in Axis 1 is due to the fact that similar activities are also funded by national funds. The availability of EU funding restricts the possibilities to cover all the needs with this funding.

Another aspect in looking at the weights of different dimensions and priorities is to look at the "unit impact" of the funding. Therefore, we have divided the funding in different axes by the amount of arable land in order to have the funding/ha figures. Thus, we are able to compare the amount of overall funding between countries (Figure 3).

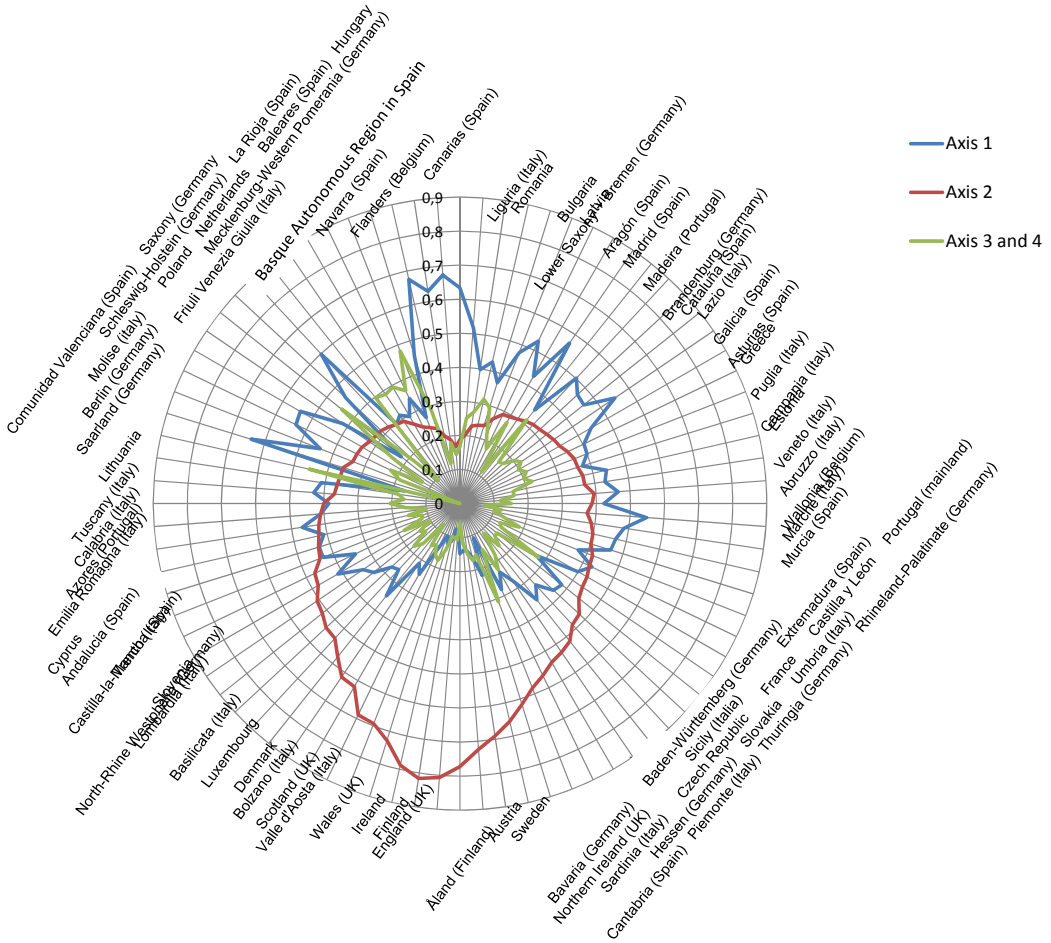

Figure 2. *Share of funding in different Axes in national/regional RDP's (data source: EU Commission, Rural development policy 2007-2013, country files, see http://ec.europa.eu/agriculture/rurdev/countries/index_en.htm).*

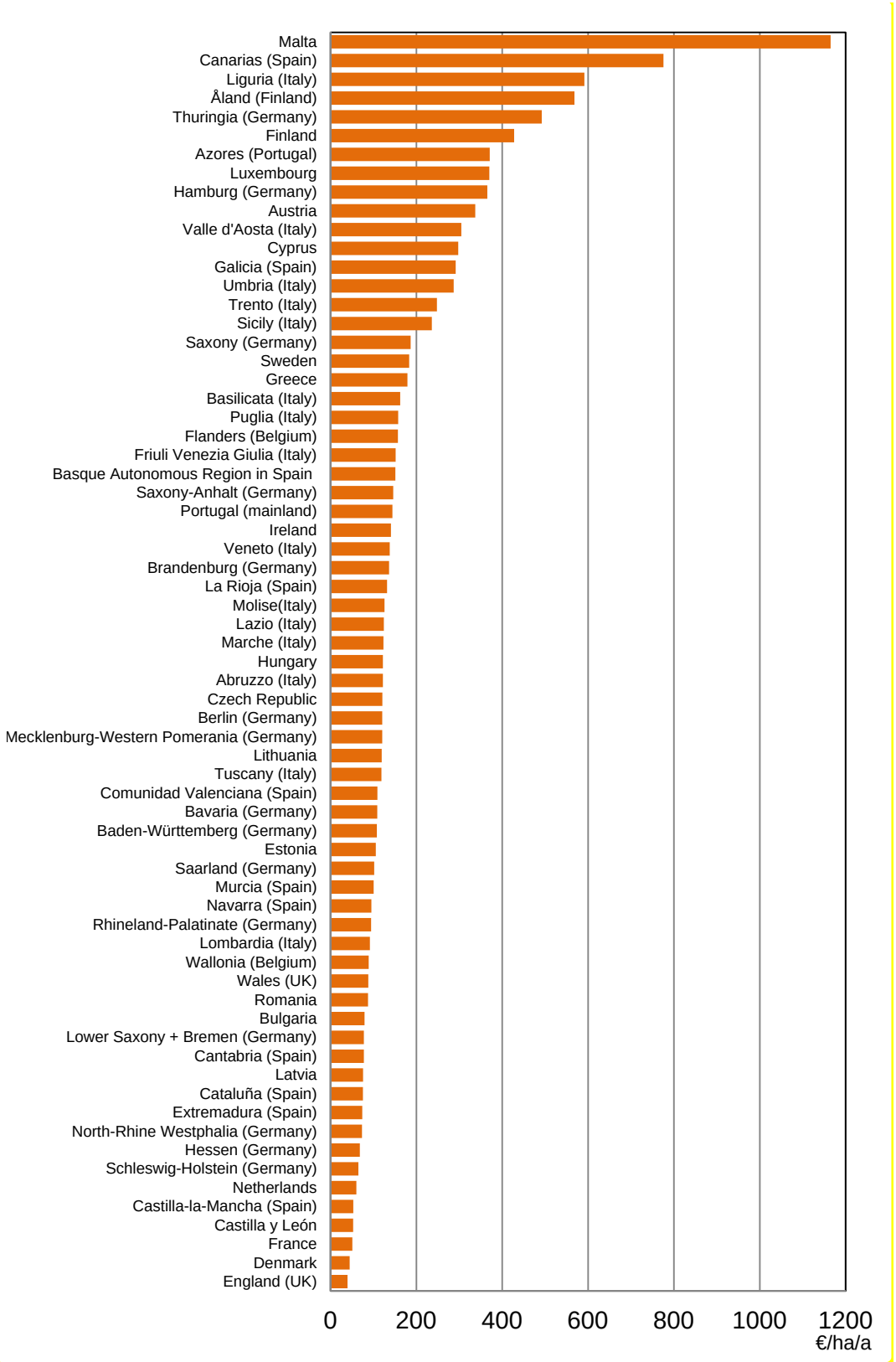

Figure 3. *Total RDP payments and compensations in different regions (eur/ha/year) (data sources: Eurostat and EU Commission, Rural development policy 2007-2013, country files, see http://ec.europa.eu/agriculture/rurdev/countries/index_en.htm).*

Again, this does not tell very much of the policy impacts on sustainability since the cost levels vary (what is possible to achieve with this money in one country is not possible in another country). However, this enlarges the view and further illustrates the possibilities to differentiate the policy within a common framework.

Finally, we present a figure where funding has been presented in two European countries that differ from each other in cultural, topographic, climatic and environmental aspects. One is Finland, the northernmost EU member and the other is Spain one of the Mediterranean countries from Southern EU. We have chosen them as examples which we are going to look at more thoroughly later in the study (Chapter 5). The RDP funding in different axes is presented in Figure 4.

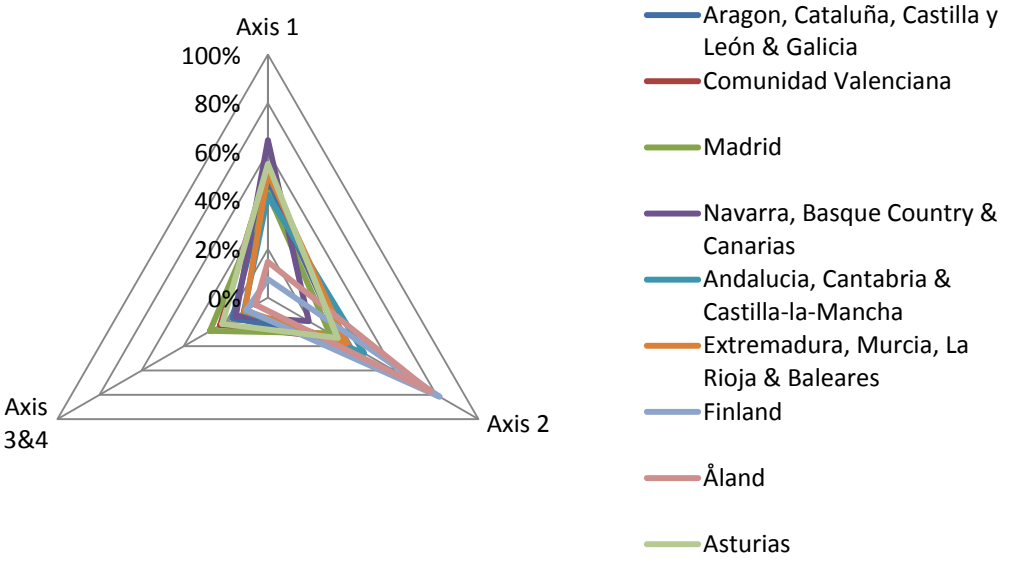

Figure 4. *Division of RDP funding in different axes in selected regions in Spain and in Finland (data source: EU Commission, Rural development policy 2007-2013, country files, see http://ec.europa.eu/agriculture/rurdev/countries/index_en.htm).*

Basically, the Finnish emphasis is on Axis 2, maintaining agriculture (LFA support) and in environmental issues (agro-environmental support). In Spain much more emphasis has been placed on modernization of agriculture. This example clarifies very well the situation in Europe: policy framework is common, but national applications can vary according to the national conditions and priorities.

5. Sustainable agriculture and forestry in Finland and Spain

5.1 Finland

Basic facts: Finland

Finland lies in an intermediate zone between maritime and continental climates and most of the country belongs to the boreal vegetation zone. Due to the Gulf Stream the climate in the country is significantly more favorable than e.g., in the Northern America at the same latitude.

Finland is the most rural country in Europe as 98.5% of the land area is classified to belong to rural countryside. The share of population living in rural areas is around 67 per cent of the total population. In the whole country population density is 17 inhabitants/km^2. However, large areas have a much lower density. This concerns especially the eastern and northern parts of the country with around five inhabitants/km^2. Some areas in the eastern and northern part are even classified as not populated by definition. Finland is also the most forested country in Europe, and as much as 75% of the country's land area is covered by forests (Finnish Forest Research Institute 2010). The share of arable land is one of the smallest in Europe, seven per cent. Northern conditions and geography constrain the production possibilities in agriculture as well as in forestry. However, cold winter also gives some advantages. E.g. crop diseases, fungi and insect infestation are much rarer in Finland than elsewhere in Europe. Due to harsh climatic conditions also energy consumption is quite high in Finland.

5.1.1 Agriculture in Finland

The share of agriculture of the GDP of Finland is approximately 1% (Statistics Finland 2010) and it has been decreasing. One of the major challenges of the agriculture in Finland is to increase productivity and farm size. In 2007 about 3.9 % of all the employed persons were employed in agriculture, but less than 1% of wages and salaries

come from this sector. Of all enterprises of the country about 17% are agricultural producers.

The total number of farms has been decreasing by more than three per cent a year. There are currently about 60 000 farms in the country, 60% of which are arable farms and 16% dairy farms. Most of the farms derive some small additional income from on and off farm activities. The arable farms produce cereals and especially barley, oats, wheat, rye, oilseeds and potatoes are commonly grown. The average arable area of farms in Finland was in 2011 about 37 hectares (Statistics Finland 2012). In addition to that, many of the agricultural producers own also forest. Agriculture in Finland is mostly based on family farms.

After the Second World War maintaining self-sufficiency in food production was one of the main objectives of the agricultural policy. In crop production self-sufficiency rate is currently over 100 per cent except for rye which is lower. In dairy products self-sufficiency is about 99%, in beef meat production 86%, while for pork and poultry slightly over 100% (Statistics Finland 2010).

The growing conditions for agricultural production are harsh. Most of Finland has annual snow coverage over 100 days and more than half of the country has a snow coverage of more than 150 days. Only the southwestern costal area has average annual snow coverage of less than 100 days. The coldness and snow limit the agricultural production severely. However, the light intensive summers of the north can give yields of early varieties of cereals and other grasses, even some perennial crops are produced. For the main grains the average yield has been about 3300 kg/ha over the last 15 years (Ministry of Agriculture and Forestry 2011).

5.1.2 Objectives of the agricultural policy and implementation of the European framework in Finland

Objectives of the agricultural policy in Finland

The main objectives of the agricultural policy in Finland are defined in the Government's review of agricultural policy (Valtioneuvoston maatalouspoliittinen… 2005). In the review three aspects of agricultural sector are emphasized: the needs of consumers (production should be efficient and environmentally friendly thus fulfilling the expectations of consumers), rural development (agricultural policy should be multifunctional and increase the vitality of rural areas), and farmers and the food chain

in Finland (agricultural policy should be such that it helps creating supportive, stable and predictable operational environment).

The main objectives defined in the Rural Development Strategy (Ministry of Agriculture and Forestry of Finland 2006) are:

- maintaining open and managed agricultural areas, and maintaining biological diversity;
- reducing the environmental load from agricultural sources;
- improving the productivity and competitiveness of agriculture and the whole food production chain;
- developing basic economic activities in the rural areas in the changing operating environment
- diversification of rural industries and improving their competitiveness.

Furthermore, mitigating regional disparities reflecting economic development and welfare especially in the sparsely populated rural areas is considered essential in the rural strategy. The most important standards of agricultural policies in Finland are set by the common agricultural policy (CAP) of the EU. The cross-compliance elements to environmental schemes and reliance to sets of common farming practices gives the baseline of instruments and flexibility required to regulate sustainable use of the agricultural resources. The purpose of these instruments is to ensure the protection of air, water and soil quality.

About 90% of the farms in Finland participate in the voluntary agricultural environmental programme. The voluntariness can be interpreted with caution since the agricultural support policies are utilizing cross-compliance measures to the agricultural environmental programme and thereby enforcing participation.

In addition to specific agricultural policies also e.g., policies related to climate change have impact on agriculture. The Finnish climate change mitigation plan (2008) aims at decreasing the use of nonrenewable energy and increasing the share of renewable energy of energy consumed. The aim is that by the year 2020 the share of renewable energy should be 38 %. In addition to forestry the role of agriculture can be seen as important as it is a provider of renewable energy through field and animal waste products. The forest property of almost all private farms in Finland gives from energy perspective additional potential for utilization of renewable energy at farms.

Finland's national strategy for adaptation to climate change was completed in 2005 and the current version is from 2009 and will be revised in 2011-2013. The Ministry of Agriculture and Forestry has the central role in this strategy. The purpose is to reduce the cost of eventual climate change impacts for Finland. Special early warning systems

are under development. Considerations are taken for the next rounds of international negotiations.

National implementation of the European framework related to sustainable agriculture and major factors of sustainability

The aims of the Rural Development Plan of Finland are as follows. Firstly, agriculture and forestry are practiced in a way that is economically and ecologically sustainable as well as ethically acceptable in all parts of the country. Secondly, aim is to take actions favoring and furthering the competitiveness of businesses, new enterprises and networking among entrepreneurs to diversify rural economies and improve employment, and thirdly, to strengthen local initiatives to improve the viability and quality of life of the rural areas.

The Rural Development Programme consists of three axes as mentioned in earlier chapters. Axis 2 has the largest budget. The main priorities of Axis 1 (of which the contribution of the EAFRD will be 227 million euros, 11% of RDP) are "Young farmers" (32%), "Modernization of agricultural holdings" (23%) and "Adding value to agricultural and forestry products" (22%). The main focus of Axis 2 (of which the contribution to the EAFRD will be 1 513 million euros, 74% of RDP) are natural handicap payments (55%) and agri-environmental payments (43%). For the Axis 3 budget allocation of the EAFRD is 195 million euros (14% of RDP). Majority of Axis 3 financing goes to the diversification of non-agricultural activities (39%) and creation and development of micro-enterprises (37%). Furthermore there is a Leader budget allocation of the EAFRD, which will be 109 million euros (5%) and will be implemented on all axes, majority of the financing envisaged for the Axis 3.

The voluntary agri-environmental scheme involves a part with compulsory elements and a part with additional elements that are optional. One part of additional selection is the certified organic farming. Certified organic farming includes about 6% of farms and 7% of arable land in Finland. This means that the organic farms are a bit larger than average farms in Finland. There are national goals to increase the share of organic farming in Finland.

The main challenge of the sustainability of agriculture in Finland is the low profitability. The low profitability is mostly a cause of unfavorable agricultural production conditions, but also due to the opportunity cost of labor and capital. During the last years almost all kind of agriculture has been unprofitable the profitability index being as low as 0.04 for arable production in 2009 (1 indicating zero profit, but full return on capital and labor) (Agrifood Research Finland 2011). There has been a very fast decline in the number of farms, almost 30 000 farms less since joining EU in 1995. However,

there are also some sustainability strengths of agriculture in Finland. Clean water is well available and seldom limiting production. There are more than 180 000 fresh water lakes, most of them small ones, distributed almost over the whole country. The quality of the water is mostly rather good or passable. Irrigation is mainly used only for potatoes and other special crops. The total area of arable land has also remained about the same during the last decades.

5.1.3 Forest sector in Finland

Finland is the most forested land in Europe and about 75 per cent of the country's land area is covered by forests (Finnish Forest Research Institute 2010). The main species are pine, Norway spruce and birch. The majority of forests in Finland are predominantly coniferous. The use of forests has always had a significant role in the Finnish economy. Forests are also an inseparable part of the Finnish culture, lifestyle and national identity. An indication of this is the ancient Everyman's Right, which gives everyone a free access to forests and possibility for large-scale utilization of forest services and non-wood forest products.

Currently the share of sector (forestry and forest industry) in Finland's GDP is approximately five per cent (Statistics Finland 2010), 60 per cent of which comes from forest industry. Even if forest sector's relative importance has declined during the recent decades, forest industry is still among the most important industrial sectors of the country. Its importance seems evident especially when export income is considered: the share of forest industry of total export income is approximately 20 per cent. Main products exported are paper and paperboard, pulp and wood-products.

Forest sector employs approximately three per cent of the Finnish workforce. There are, however, differences among regions in the importance of the sector both in employment and in its share of regional GDP. In some regions, especially in Eastern Finland, the sector still employs nearly ten per cent of the workforce or even more. Furthermore, there are several provinces in which the sector produces more than 15 per cent of the regional GDP.

Most of the forests (approximately 60%) in Finland are owned by private persons or families. Other owners with significant forest area are the state and municipalities (29%) and companies (9%) (Finnish Forest Research Institute 2010). As the main part of the Finnish forests is owned by private persons, mostly families, their objectives for the forest ownership is highly important when the management of the Finnish forests as a whole is considered. Many of the private forest owners are farmers, but the share of urban forest owners has steadily increased. Due to the change also the objectives for the

forest ownership are changing and becoming more diverse, including e.g., more emphasis on recreational and nature values. However, forest owners still consider income from timber as an important objective for the ownership.

Nearly all forests in Finland are PEFC certified. Also the share of conserved forests is high as approximately 10 per cent of the Finnish forests are conserved (pan-European classification) (Finnish Forest Research Institute 2010). The share is high in European context and one third of Europe's strict conservation areas (Russia excluded) are located in Finland (FOREST EUROPE, UNECE and FAO 2011).

Climate change is likely to increase annual growth of the forests of Finland, but it is also likely to increase storm, snow and insect damages. However, there are uncertainties about the impact of climate change on forest ecosystems. As forests act as carbon sinks the role of forests in the mitigation of climate change is significant in Finland. The ability of the Finnish forests to sequestrate carbon has doubled during the last two decades. Forests also provide renewable energy and raw material, thus decreasing dependence on fossil fuels. Approximately one third of the Finnish forestry land is mires and, thus, also issues related to the use of peat as a source of energy are relevant. As sustainable use of wood is easily accepted when climate change is considered, the use of peat is much more controversial, both from climatic and environmental aspects.

5.1.4 Objectives of the forest policy and implementation of the pan-European framework in Finland

The main and guiding principle in forestry in Finland is sustainable forest management. The principle is old as some aspects of that were already written in the Forest Act issued in 1886. In the current forest law (1996) the economic, ecological and social sustainability has been defined as the guiding principle for the use of forests.

One way to evaluate the success of forest policy is to use the criteria and indicators for sustainable forest management. Sustainability in Finnish forests is evaluated using the frame of Pan-European Criteria and Indicators. There are further national indicators in some areas, and some of the Pan-European indicators have been adapted to the national circumstances (Ministry of Agriculture and Forestry & Finnish Forest Research Institute 2011). E.g., criteria concerning protective functions of forests includes in Finland indicators on timberline forests and on impacts of forest management on waters, which have significance in Finland. The new indicator set for Finland was published in 2011. New indicators have been developed for wood construction, ecosystem services, wood energy, impacts of climate change on forests and impacts of forestry on waters.

In Finland the indicators have been used in particularly in the presentation of and reporting on forestry and in the monitoring and preparation of the national and regional forest programmes (Ministry of Agriculture and Forestry & Finnish Forest Research Institute 2011). Furthermore, they have been used to steer practical silviculture and forest certification.

The National Forest Programme is one of the tools to implement sustainable forest management and the pan-European forest principles. The national forest programme (Ministry of Agriculture and Forestry… 2010) sets as major objectives for the forest policy the following: strengthening the forest-based business and increasing the value of production, improving the profitability of forestry, and strengthening forest biodiversity, environmental benefits and welfare implications. The national forest programme also sets the specific quantitative indicators and the measures for achieving the goals. Whereas the pan-European indicators give a relatively general view of the sustainability in the forest sector and by utilization of time series allow for monitoring of development, goals and indicators of the National Forest Programme are more operational and designed for a specific timespan.

The National Forest Programme also sets goals on how to increase carbon sequestration of the forests and enhance their adaptation to the climate change. Some specific questions related to the nature conservation are examined in the METSO forest biodiversity programme for the Southern Finland, which supplements the National Forest Programme.

In Finland, as in other countries, some aspects of sustainable forest management are emphasized more than others. The focus in forest management has also shifted during the decades. When considering the past forest policy and forest management in the framework of the current pan-European criteria, the Criteria 1 ("Maintaining forest resources") and 3 ("Maintaining productive functions of forests") have had historically high importance in Finland. As forest sector's role in the Finnish economy has been much more important than in most of the other European countries, also productive functions of the forests have been emphasized more than in Europe on average. As a consequence e.g., the volume of growing stock has increased more than 40 per cent during the last 40 years and the annual increment of growing stock significantly exceeds at the moment the annual total outtake (Ministry of Agriculture and Forestry & Finnish Forest Research Institute 2011). Criteria 1 and 3 are still important in the Finnish forest policy. Also Criterion 6 ("Socio-economic functions") is highly relevant in the Finnish context due to forest sector's economic importance in the society. Concerning social-economic functions focus in policy-making has traditionally been especially on employment and other economic impacts. However, issues which are difficult to measure in monetary terms (e.g. recreational and cultural values), but which have

significance for the overall well-being of the Finns, have got more emphasis during the recent years.

During the last 15 years a special focus in the Finnish forest policy has been on the protection of the biological diversity of forests (Criterion 4). This has led to the establishment of new conservation areas, renewal of forest and nature conservation laws and practical guidelines in forest management. Criterion 2 ("Health and vitality of forests") is directly linked to other criteria, but has in Finland somewhat less importance than in Central Europe. However, as climate change may increase storms, forest fires and occurrence of harmful fungi and insects, importance of this criterion may increase in coming years. Also the importance of Criterion 5 ("Maintenance of protective forests") differs in Finland somewhat from its importance e.g., in the Central European countries. As land surface in Finland is mainly fairly flat, soil erosion does not cause any major problems. Protective functions therefore mostly focus on protective forests in the timberline area in the northern Finland (Ministry of Agriculture and Forestry & Finnish Forest Research Institute 2011). However, issues relating to the protection of water systems receive special attention in forest management.

During the recent years especially issues related to climate change have emerged. Also ecosystem services as a concept and as a holistic approach for benefits created by forests have gained emphasis. These issues were earlier covered inadequately in the criteria and indicators, but have been included in the most recent set of national indicators published in 2011.

5.2 Spain

Basic facts: Spain

Spain is the second largest country in the EU after France. Its shape as a peninsula lends the country certain special traits from the physical, ecologic and socioeconomic aspects. On the other hand, the Canary and Balear Archipelagos complement the mainland with Mediterranean and African characteristics of utmost interest for agriculture and biodiversity. Tropical crops introduce variety to the food supply. Species and habitats on the Canary Islands are peculiar within the biological whole of the European Union.

Spain has 46.7 million inhabitants and a population density of 92.4 inhabitants/km^2, lower than the EU-27 average. Since 2009 population grew in Spain at a lowering rate and that rate is expected to drop further in the next decades. Ageing of the population is unavoidable in the long run. The Spanish unemployment rate was 20.3 % in 2010. It is the highest in all EU member countries. The GDP per capita at current prices that year was about 23 000 euros, which is 0.5 % more than in 2009. Measured in purchasing power parity (PPP), the Spanish GDP/inhabitant lays 3% above the EU-27 average.

In 2010 the Spanish rural population numbered 9.9 million inhabitants, which is 21% of the total population. Considering provincial level, there is a duality between the interior provinces and the coastal ones. Most interior and southern provinces, and also the ones along the Pyrenees, are overwhelmingly rural according to the OECD typology. According to that criterion the provinces along the Cantabrian and Mediterranean shores are intermediate, while Madrid, Barcelona, Valencia, Seville, Malaga, Zaragoza and the Basque Country are mostly urban. Considering the local level, most population units in Spain are hamlets and villages, with a clearly rural structure and function. Those rural areas are characterized by a low fraction of child population and increased aging.

According to data from the Corine – Land Cover project, sealed surfaces have increased by 25% in Spain between 1990 and 2000 as a consequence of the real estate bubble and the urban expansionary process, especially in the so called wide-spread cities - sprawlings with a medium urban density.

5.2.1 Agriculture in Spain

Spanish agriculture is subject to an array of limiting factors of geographic nature and also to some other factors that act positively on this activity's development. Among the most important limiting factors of physic nature is topography, being sometimes insurmountable for the competitive development of agriculture (Martín Lou and Martínez-Vega 2002). The mountain ranges of Cantabria, the Pyrenees, Iberic, the Central System and the old mountain massifs of Castile-La Mancha, Extremadura, Andalusia and the Betics, with peaks above 1000 m, cover about one fifth of the Spanish area (Figure 5). High plateaus and mesetas in the Pyrinees and Betic ranges represent another 40% of the country´s area.

In short, more than 60% of the agricultural area is subject to harsh topographic conditions and the climatic characteristics linked to it. Other problems stem from these topographic traits like slopes steeper than 15% that set the limit between agricultural and forestry land (Figure 6). The presence of shallow and not very developed soils in these areas creates favorable conditions for mixed agricultural systems sustaining livestock and forestry activities.

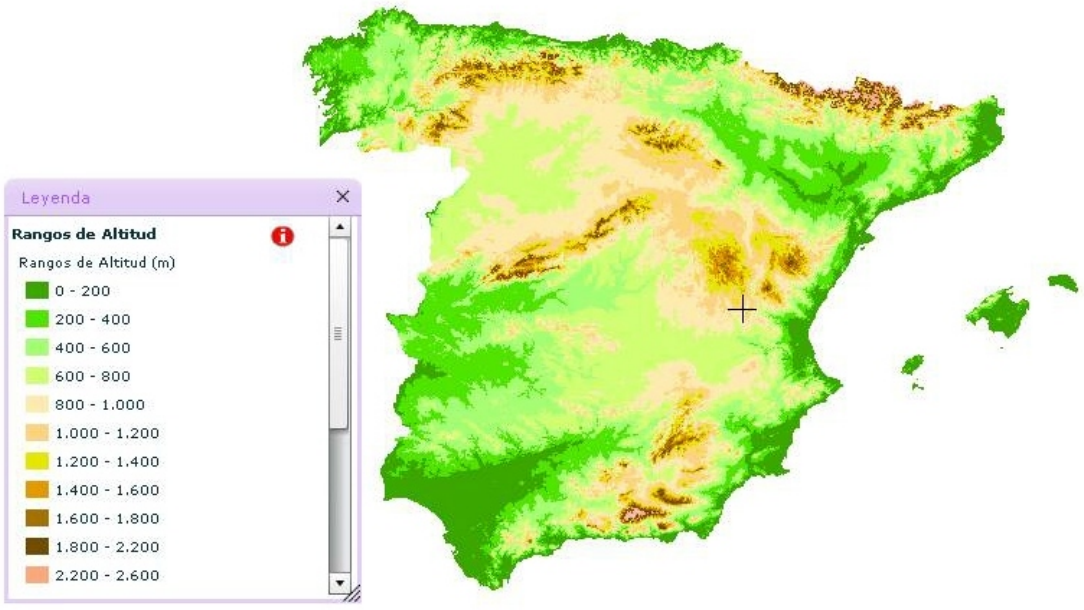

Figure 5. *Topographic map of Spain. Source: Sistema de Información Geográfica de Agricultura (SIGA); http://sig.marm.es/siga/*

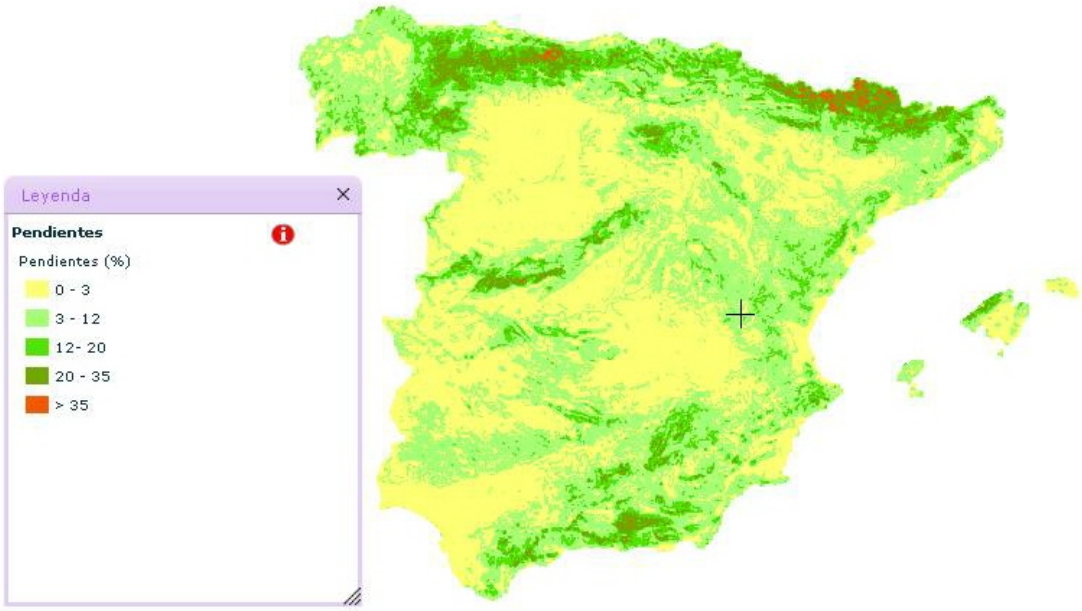

Figure 6. *Slope map of Spain. Source: Sistema de Información Geográfica de Agricultura (SIGA); http://sig.marm.es/siga/*

Large climatic differences between "humid" and "arid" Spain are very noticeable. "Dry" Spain covers more than two thirds of the country's area. A large difference exists between precipitations in the Cantabric and Atlantic regions, where a yearly average of more than 1500 mm is registered, and the arid zones of the peninsula's southwest or the Canary Islands, where yearly precipitation is below 200 mm. The distribution of those precipitations along the year makes the physical limitations imposed by climate even sharper. Torrential rainfall events are rather frequent on the whole Mediterranean coast making its seasonality more uneven (Martin Vide 1994).

Other geographic and climatic traits and Spain´s location in a transition zone between Atlantic, Mediterranean and subdesert biophysical areas can be considered as positive for the development of agriculture. The strategic advantage lies on a large biodiversity and on the large variety of agricultural products grown. Many of them are cropped early in the season and are easily traded with high added value on the international markets.

Spain has 24.9 million hectares of utilizable agricultural area, and it is the second EU country regarding this indicator. About 75 % of that area is located in the regions of Castile – La Mancha, Castile and Leon, Andalusia and Aragón, i.e. in the central and southern parts of the Spanish peninsula.

Herbaceous are the most important crops, grown on 73% of the tilled area. Spain holds the second position in the EU ranking for this indicator. More precisely, grains covered 6.2 million hectares in 2007. Vineyards and olive groves, with 1 and 2.2 million hectares

are also very important – 32% and 50% of the total EU area for these two crops. According to the FAO Spain holds the first position in the world regarding olive oil and olives production area. In the last decades vineyards have lost slightly on total area, but have increased remarkably the share of the area (30%) dedicated to the production of high quality wine. Spain holds also the first position in the EU (33%) regarding fruit groves area (apples, pears, peaches, apricots, oranges, lemons). In 2007 citrus covered about 316 000 hectares. According to data published by the Ministry for Environment, Rural and Marine Areas (MARM), in the last decade ecologic farms have doubled their numbers (24 000 farmers in 2008) and their area has multiplied by four (1.3 million hectares in 2008). About one fifth of the cultivated area in Spain is irrigated. Most of the water is obtained from surface sources.

In 2007 Spain had the fourth highest number of farms in the European Union. More than million units were registered. Number of farms has diminished during the last decades. The number of small farms has sunk and middle and large sized farms have moderately increased the average unit area. According to the Agricultural Census of 1999 the average farm size was 24 hectares. The economic size of most of the Spanish farms is small-medium as registered by Eurostat. In 2007, 63% of all farms had a size between 1 and 16 ESU (European Size Unit). 24% had a size between 16 and 100 ESU.

In 2009, according to data from the National Accounting, agriculture and fisheries originated about 2.7% of the GNP. The MARM estimates that the Spanish agricultural income in 2010 was about 22.5 milliard euros. Eurostat estimated in 2009 that the Spanish agricultural gross value added was 21.3 milliard euros, i.e. 17% of the total agricultural gross value added of the European Union.

In 2009 the Spanish agriculture consumed a total of 781 000 t of nitrogen fertilizer, 264 200 t of phosphate fertilizer and 166 000 t of potassium fertilizer. Nevertheless, the use of these types of fertilizer - in terms relative to agricultural production value - has diminished dramatically in the last few decades. Some years ago, 200 t nitrogen fertilizer/million euro of agricultural production value were spent. Nowadays it is one fourth of that number. Regarding phosphorous and potassium, the tendency is very similar. In 1980 average was 80 t/million euros of agricultural production value, but in 2008 the amount was 15 t/million euros (Garrido et al. 2011).

In spite of the negative tendency in the use of fertilizer, productivity and yields are increasing. This indicates more efficient application and also the increased use of manure and other organic fertilizers from livestock and other organic sources.

Moreover, according to Eurostat, agriculture was responsible for 3% of the total Spanish energy consumption in 2007. However, this data, which is above the average for the EU-

27 depends on the size and intensity of agriculture and the power consumption of other economic sectors in each country. For that reason an alternative indicator is energy consumption per hectare of agricultural area. In this case, and again according to Eurostat 2007, Spain has an energy consumption of 120 kg oil equivalents/ha. This value is lower than the EU-27 average and lower than in the Netherlands, Belgium, Germany, UK, France, Ireland, Poland, Check Republic, Austria, Sweden, Finland, Greece, Denmark or Italy.

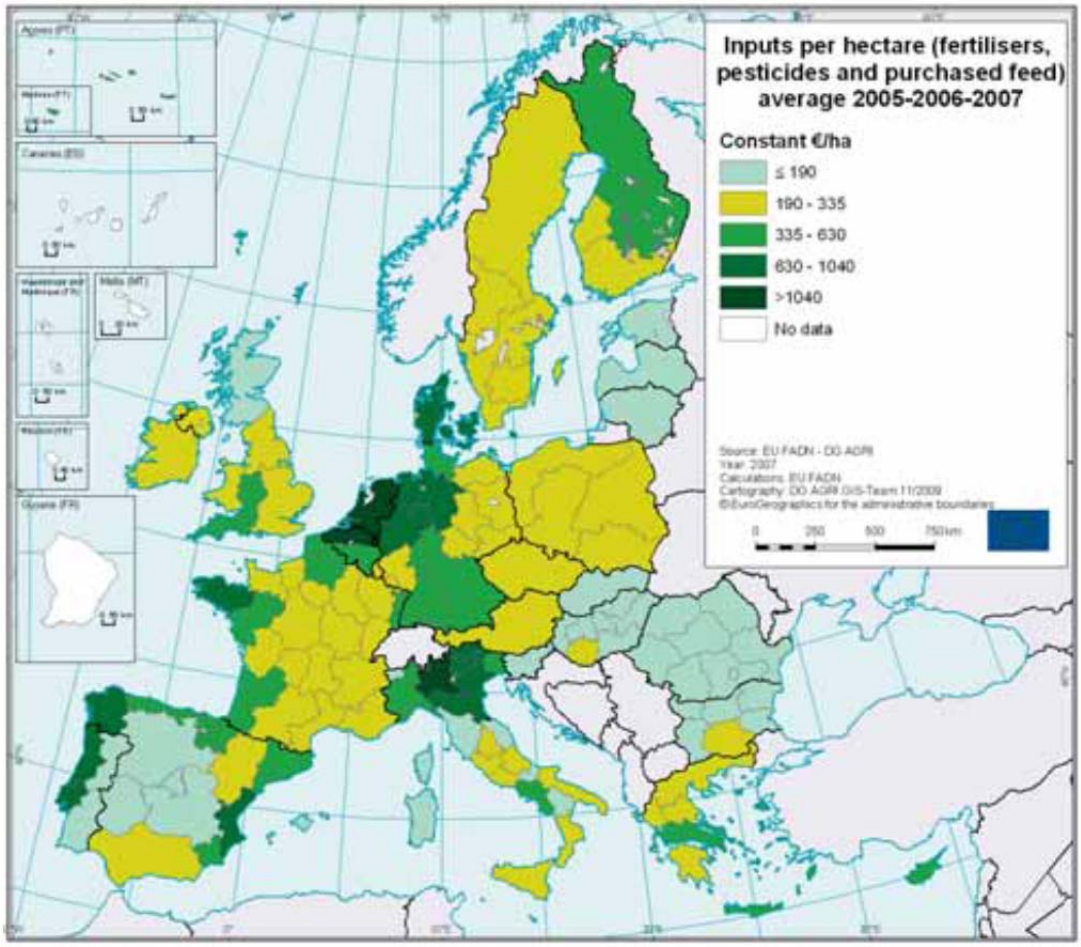

Figure 7. *Expenses in feed, fertilizer and pesticides in EU regions between 2005 and 2007 (DG AGRI, FADN, source: Baudouin and Kremer 2010).*

Most of the agricultural area in Spain (65%) is managed through a low intensity model, as opposed to other areas (14 %) managed under intensive conditions. The first case includes farms that do not need large amounts of inputs. Eurostat estimates that input expenses are under 125 euros/ha/year. On the other hand, intensive managed farms expend more than 295 euros/ha/year in fertilizers, pesticides and other products to increase yields. Those products, however, also have negative environmental impacts on soil, surface and underground water and atmosphere.

According to Eurostat Spanish agriculture employed a labor force of 1.96 million workers in 2007. Regular farm workers adding up to 932 000 agricultural work units AWU. Most of those working units were staged by family labor (64%). On the other hand, data from the European farm structure survey from 2007 shows that Spanish agriculture employs 1 agricultural work unit AWU each 25.6 ha of agricultural area, which is above the EU-27 average.

Between 1990 and 2007 emissions of CO_2 equivalent due to agriculture increased by 15% in Spain. Emissions originated from agricultural soils, burning of residues, fermentation processes and manure handling.

Moreover, tillage in marginal zones displaying slopes steeper than 7% – and sometimes 15% – causes soil losses due to erosion. According to the National Geographic institute of Spain, 2006 was a year of extreme erosion processes, erosion being intense or very intense in 12.6 % of the agricultural area.

The increase of irrigated surfaces in the 80's and 90's has had, in some cases, negative environmental impacts due to overexploitation of water resources. A paradigmatic example is the overexploitation of the underground aquifer nº 23 located under the western La Mancha plain in the provinces of Ciudad Real and Albacete (Martínez Vega et al. 1995, Martínez Vega and Echavarría 2008). Changing from a traditional dry-farming production system with overwhelming presence of the "Mediterranean trilogy" (grain, vineyards and olive groves) to a more intensive system involving an irrigated rotation of corn, alfalfa and sunflower, demanding a great amount of hydric resources in the summer months, has all but drained off a 5000 m^2 aquifer and caused an important environmental damage:

- Drying of important ponds and wetlands, some of them included since 1973 in the national park Tablas de Daimiel.
- The degradation of that national park has caused losses in fauna and flora.
- Losses in the peat bogs of the Guadiana River through subsidence and spontaneous combustion.
- Drying of some river beds in La Mancha plain. When those rivers carry some water, it is very quickly transferred to the empty aquifer. A very dramatic case is the Guadiana River. It has a very regular water volume but has disappeared due to the lowering of the piezometric levels of aquifer 23.
- Intensive use of chemical fertilizer and phytosanitary products has caused diffuse contamination of the groundwater table.

Some other worrisome examples are some of the underground coastal water sources in the provinces of Almería and Alicante, where fresh water overexploitation has caused intrusion of sea water in the groundwater.

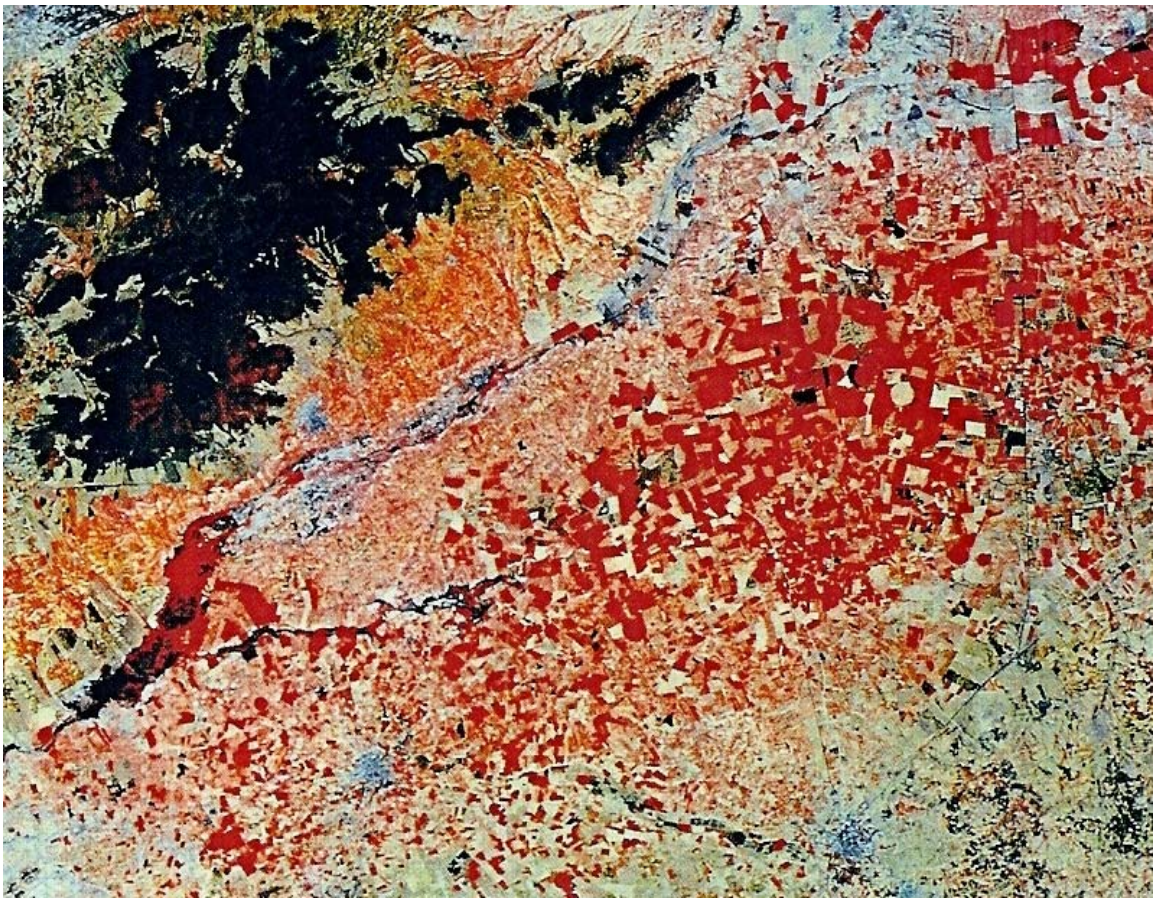

Figure 8. *Satellite Image Thematic Mapper 201-033/2 from Landsat 5, in false colors, taken in August 1988, the moment of maximal extension of irrigated crops (red in the picture) in Western La Mancha, Spain. In the southwestern angle is the national park "Tablas de Daimiel", at the confluence of the Guadiana and Gigüela Rivers (Source: Martínez-Vega and Echavarría 2008).*

Finally, it is worth mentioning that the geographic location of Spain, in a transition zone between atlantic and subtropical climates, makes desertification more intense. According to the estimations of MARM in 2003 about 11% and 20% of the national area were at a very high or high risk of suffering from desertification processes.

Spain is also an important livestock producer. Most important are pigs. Spanish farms have more than 25 million pigs and the country is the second largest pork producer in the EU. The Spanish swine sector produces 15% of the European pigs. Counting in livestock units, those animals represent 42% of the total livestock units. Catalonia has the largest number of swine heads (27%). Numbers have grown steadily in the last few decades. Since 1962 the number of pigs has increased fourfold. The livestock census counts also some 20 million of sheep, Spain being the second largest EU producer. Cattle represent 28.4 % of the Spanish livestock units.

Cattle farms have shown a similar development as the crop farms. In the last decades their numbers have diminished, but the number of livestock heads in each farm has increased. According the agricultural census of 1999, average number of livestock heads in each farm was 170 sheep, 100 pigs or 35 cattle.

In 2009, 5.4 million tons of meat and more than 7000 million liters of cow, sheep and goat milk were produced. The value of animal production (meat, milk, eggs etc.) in Spain in 2010 was some 12 600 million euros.

5.2.2 Objectives of the agricultural policy and implementation of the European framework in Spain

The Spanish Strategy of Sustainable Development was published in 2007. It has an exposition according to the European Strategy, promoting an integrated approach of the economic, social, environmental and global dimension of the sustainability with following aims:

1. support economic prosperity
2. assure environmental protection
3. avoid degradation of natural resources
4. promote social cohesion
5. support development of less favored countries to achieve global sustainability.

In 2007 the Spanish Government published Act 45/2007 for the Sustainable Development of the Rural Environment. It expresses the need for a change from a purely agricultural sectorial policy to a territorial and integrated approach. This law sets the foundation for a rural policy at state policy level, which will allow complementing the application of the European policy instruments and the conventional sector policies in order to achieve a sustainable development on the rural environment.

In 2010 the 752/2010 Royal Decree approved the First Programme of Sustainable Rural Development, for the period 2010-2014, in application of the Law 45/2007. In this programme it is defined a rural development strategy based on the delimitation of priority areas to start with. A large number of rural zones (219) are delimited and qualify, by Autonomous Communities[3]. The contents that Zone Plans must include are defined as tools to plan its application in each rural zone and the frame of cooperation between the Public Administrations that converge on the rural environment is defined.

[3] In Spain, the Autonomous Communities are equivalent to the regions. There are a total of 17 Autonomous Communities.

In order to put it in practice, the budget and the financing system are defined and the programme concludes with an evaluating and follow-up system. Within this frame 102 actions have been started: 53 of them are of regional responsibility and 49 of state responsibility. As a whole it is expected that these actions will stimulate the development in the rural environment, mainly in those areas that suffer a major socioeconomic lag.

Since 2005 in Spain has existed an independent organization that evaluates sustainability. The institution is called as the Observatory on Sustainability in Spain, OSE. OSE has designed a set of indicators for evaluating sustainability. On the other hand, Regulation (EC) 73/2009 of January 19th, 2009, regulating both basic supports of Conditionality, has been adapted to Spanish legislation through Royal Decree (Real Decreto) 486/2009 of April 3rd. This piece of legislation states the legal requirements for management, good practice and agricultural and environmental conditions of compliance for farmers obtaining direct payments within the frame of the Common Agricultural Policy and the recipients of some support linked to rural development. Good agricultural and environmental practices are structured within a frame of three sets of measures linked to soil conservation and protection, to maintain a minimal amount of crop areas and to habitat conservation. Management legal requirements are gathered in five sections related to environment and natural resource conservation, to public health, animal welfare and identification and registration of animals.

Climate change is one of the great environmental and socio-economic challenges of our times. Its potential impact on Spanish agriculture is large as consequence of the geographic situation of the country, located in the transition area between the Mediterranean and subtropical climatic zones, both especially vulnerable. Temperature increases and rain decreases are predicted (de Luis et al. 2010, García-Ruiz et al. 2011), coupled with water scarcity, droughts and increasing aridity, all with serious consequences for future food production.

Spanish policies to fight climate change are based on the National Climate Change Adaptation Plan. It aims to implement mitigation and adaptation measures according to the new, expected scenarios. The plan is based on the review of present production and energy models. Some of these measures are centered on efficient use and savings of energy and in substitution of fossil fuels. Policies aiming at introducing changes in soil uses, promoting sustainable agricultural and forestry are also being considered and designed.

What is needed is a global compromise at the highest level among all agents of different economic sectors and the whole society. The Spanish Office of Climate Change works providing, swapping and spreading information aiming to enhance public awareness about issues of utmost environmental relevance like climate change. It develops also

information, training and awareness activities in collaboration with the national Center of Environmental Education.

5.2.3 Forest sector in Spain

The forest area in Spain is the fourth largest in Europe, a total of almost 28 million hectares in 2010. 67% of that total (18.7 million hectares) has a tree coverage showing a canopy cover larger than 5%. Contrasting with the large areas of coniferous trees in Scandinavian countries, Spain has a large biogeographic diversity.

Among its forestry systems, forests of beech, oak, fir, oak, pine and laurel are found. From Atlantic to Macaronesian environments, including also proper Mediterranean ones. Under the project FIREGLOBE the Simpson diversity index that measures the degree of diversity of forest cover in the Spanish peninsula considering a grid of $1km^2$, has been calculated. The index scale ranges between 0 (no diversity) and 10 (maximum diversity). The most diverse biogeographic regions are the forests of the Cantabrian Mountains and Pyrenees, followed by those in the Iberian mountain range, in the Centralm System, in Sierra Morena and the pastures of Extremadura and Salamanca.

The remaining 33% is treeless forest area occupied by grassland and shrub. The regions with the largest forest area are Castile and Leon, Andalusia, Castile-La Mancha, Extremadura, Aragon and Galicia.

Considering the forest area, most of it is privately owned (64% of the total). Besides, 23% of the area is municipal property and 6% of is state or regional (Autonomous Communities) property. 46% of that forest surface is occupied by deciduous trees while 35% is covered by conifers. The remaining 19% of forest is covered by mixed woodland. According to the National Forest Inventory, Spain has a timber volume with bark larger than 597 million cubic meters.

According to the ”Anuario de Estadística Forestal” (Forestry Statistical Yearbook), Spain produced in 2008 more than 17 million cubic meters of wood from coniferous and deciduous trees, value of which was 872 million euros and nearly 1 million tons of firewood, value of which was 20 million euros. The regions where most of this national production is located are Galicia, Castile and Leon, Catalonia and Asturias.

From the standpoint of forest management, a total of 3.3 million hectares is regulated, which is just 14% of the country's forest area. Despite this overall value, there are regions with more encouraging figures. Half of the forested area in the region of Murcia is regulated, in Navarre it is 41% and 34% in Catalonia. Moreover, in 2007, Spain recorded

an area of t 14% 165 000 ha, certified by the FSC system and more than million hectares certified by PEFC. This modest area hardly accounts for 4.4% of the Spanish forest area. At that time, 77 companies with chain of custody certificate were operating in Spain (Forest Stewardship Council).

Afforestation has been continuous in Spain since the middle of last century. Starting when Spain joined the EU, a programme of afforestation of agricultural land has been promoted. Such programme has been focused on marginal agricultural lands. From 1975 to the present, wooded forest area has increased from 12 to 18 million hectares. From 1994 to 2007 a total of more than 685 000 hectares has been forested. The regions where more land has been replanted have been Castile and León (23% of total), Andalusia (22%), Castile-La Mancha (17%), Extremadura (11%) and Galicia (10%).

Regarding hunting activities according to the Ministry of Environment and Rural and Marine Affairs (MARM) almost 15 million pieces were captured in 2006. Most of them (67%) were feathered game, 31% small game, and a minority (2%) wild game, surpassing the 22 million kilograms. These hunting resources were valued at more than 112 million euros. That year more than 900 000 hunting licenses were issued. Additionally, in 2006 about 10.5 million pieces of fish were caught outdoors, including trout, American crab and carps (Cyprinidae), exceeding the amount of 3.6 million kg, valued at a figure close to 12 million euros. In 2006, between fishing grounds and preserves, about 1900 fishing locations were registered, occupying an area of almost 13 000 hectares and a length of about 140 000 km of rivers.

In addition to their productive function, forest land provides a recreational environment. Spain is one of the richest countries in the EU when biodiversity is considered. In 2007, 9.2% of the land area was protected under various legal systems (national parks, nature parks, biosphere reserves, etc.). Alongside these protected areas, Special Areas of Protection of Birds and Sites of Community Importance are found, integrated into the Natura 2000 network and reaching an area of up to 14.1 million ha, equivalent to 26.4% of the Spanish territory. In addition, marine protected areas and those belonging to the Natura 2000 network, sum up to an area of approximately 799 000 ha.

Within the framework of project FIREGLOBE, the Departments of Environmental Economics at the University of Alcalá and Geography, and of Regional Planning at the University of Zaragoza are working to estimate the socio-economic vulnerability of the forest areas of the Iberian Peninsula, expressed in euros/km^2. This estimation includes the value of lives lost in forest fires, lost home values, the lost value of forest products and services (wood, grasses, fruits, hunting, fishing), recreational function and

environmental services provided by the mountains, sink functions and capture of CO2, etc. Preliminary results indicate the presence of grids valued at 4,020 million euros per km^2, especially in areas of wildland-urban interface.

Figure 9 shows the landscape value, on a relative scale from 0 (worst) to 1 (best), of Spanish forest areas where are considered the intrinsic value of the landscape according to the visual quality of forest landscapes and a series of indices quantitatively related to the scarcity, representativeness and bio-geographic diversity. On the other hand, account is taken of the value of territory on the basis of protected areas such as protected natural areas and areas of "Red Natura 2000" (Special Protection Areas for Birds, Sites of Community Importance and Habitats) and the mountains of the State Public Utility (Martínez-Vega et al. 2012). Later, this scale for qualitative assessment of the landscape will be transformed into a quantitative scale (euros/km^2), taking into consideration the resilience time of the landscape affected by forest fires (Rodrigues et al. 2012).

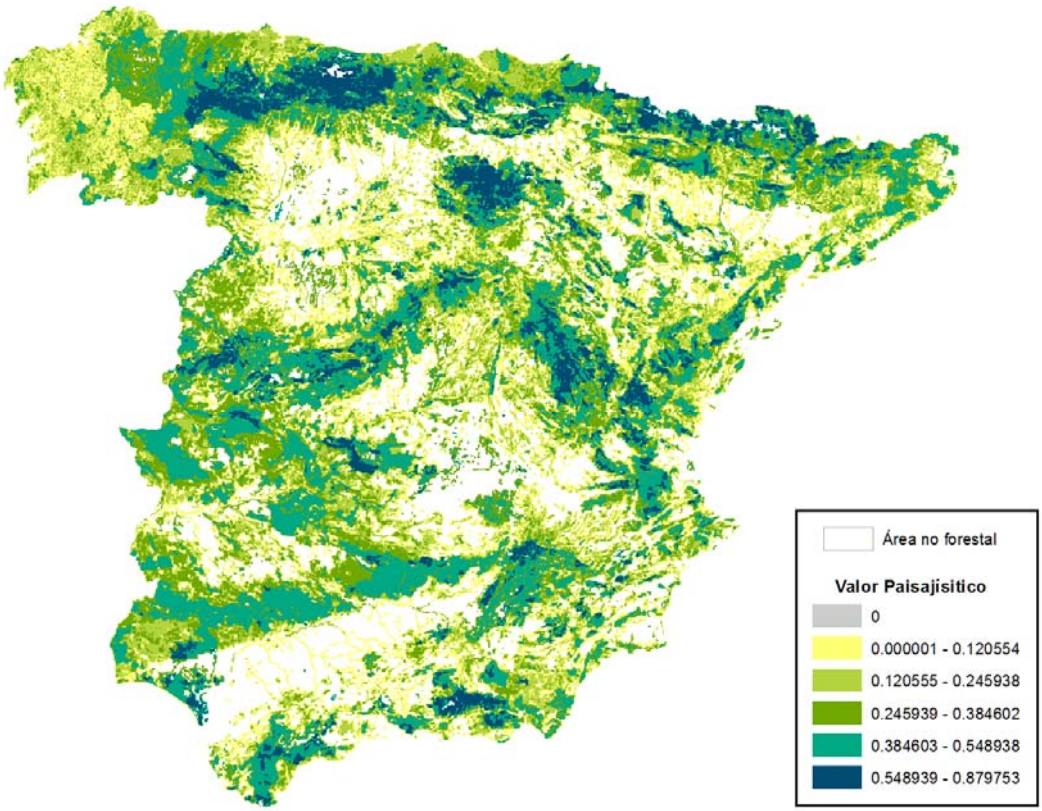

***Figure 9**. Landscape value of the forest areas of the Spanish Peninsula (Source: Martínez-Vega et al. 2012, FIREGLOBE project, http://www.geogra.uah.es/fireglobe/).*

The project FIREGLOBE is working to estimate the overall vulnerability, in euros/km^2 grid, of the Spanish forest areas, considering the previous results that express the

economic value and landscape value. It is expected that most forested areas located on the main mountain ranges (Cantabrian Mountains, Pyrenees, Central System, Iberian Range, Sierra Morena, Sierra Nevada) and the pastures of Extremadura and Salamanca, are the most valuable areas and therefore the most vulnerable to any threats to forest ecosystems, such as wildfires.

Among others, we could cite following factors favoring the forest sector:

1. topographic configuration of Spain. As mentioned above, 60% of the country is mountainous areas or their foothills, where the slopes are limiting factors for agriculture. This fact explains the preservation of much of the rural landscapes in Spain that have maintained their forestry orientation, consistent with adequate soil use and its biophysical potential.
2. the presence of large properties that function as management units.
3. the policies of abandonment of marginal agricultural land, reforestation and environmental programmes of the Common Agricultural Policy that have led to the replacement of agricultural uses by other land cover, whether trees, shrubs or grasses.
4. the availability of forest biomass may enhance the production of renewable energy, developing forest multifunctionality.

Moreover, forests play a capital role in mitigation of climate change through the capture of carbon dioxide from the atmosphere and reducing the effect of greenhouse gases. According to Eurostat, in 2005, about 9.6 milliard tons of CO_2 have been captured by forest ecosystems in the EU-27, of which 75% have been by terrestrial forest ecosystems. In Spain, the same year, forest areas have captured 410 million tons of CO_2, 4.3% of the total amount in the EU.

Conversely, climate change poses a threat to Spanish forests. As a result of increased temperatures and expected reduced rainfall, as well as the increase of dry conditions, a scenario is likely in which the water content in vegetation decreases during longer summer periods. Thus, it is expected that more dead vegetation, with moisture rates below 10% and available to burn, lie on Spanish forests. For this reason, it is expected that the risk of forest fires increases; that, if ignited, the fire would spread faster through the available waste, and, as a consequence, the vulnerability of forest ecosystems increases.

Currently, forest fires are the worst threat to the sustainability of forest resources. Year after year, Spain is among the EU countries with the highest recorded area burned by wildfires.

Between 1990 and 2007, there have been almost 350 000 forest fires in Spain, with an average of nearly 20 000 fires per year. That means that the flames have ravaged a forest area of 2.7 million ha, of which 38% was actual forest and the remaining 62% was occupied by grasslands and shrub. During this period the years 1994 and 1991 were particularly catastrophic due to simultaneous drought and higher temperatures. The low moisture in the wood material, high temperatures and adverse topographical conditions combined negatively. Wildfires burned large areas (about 437 600 ha and 260 300 ha, respectively). In this time series (1990-2007), on each year an average area of 150 000 ha has burnt, two thirds of which are treeless and one-third forested.

However, recent data point to a tendency turnaround. In 2010, both the number of fires developing or initiated but interrupted at an early stage were below the average for the previous decade (2000-2009), the number of claims being 37% lower and the total number of fires, 44 % lower.

Moreover, despite the negative impact of forest fires, according to the Spanish National Inventory, there is a downward trend in emissions of greenhouse gases other than CO_2 caused by this phenomenon (Figure 10). From 1990 to 2007, these emissions have been reduced some 80%. But for the years 2005 and 2006, when a major drought happened and a large number of fires developed, emissions increased by 38% and 200%, respectively.

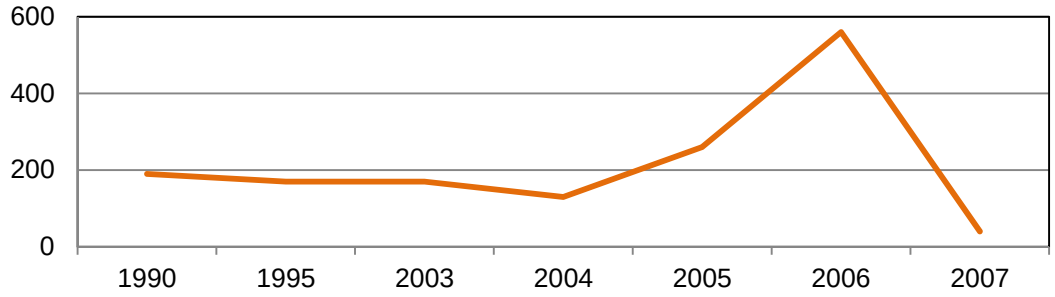

Figure 10. *Evolution of GHGs emissions other than CO_2 (Gt of CO_2-equivalents originated in forest fires). Source: MARM.*

From the standpoint of changes in land use, Eurostat shows change in the forest landscape pattern between 1990 and 2000 at the provincial level in the EU. In Spain, the provinces recording a larger net change have been Huelva, Seville, Murcia and Albacete, with forest losses exceeding 7% of the area. Another threat to the forest area is its increasing fragmentation. According to Eurostat in most Spanish provinces, except Granada and Barcelona, fragmentation of forest patches has increased between

1990 and 2000. The most affected provinces are Guipuzcoa, Vizcaya, Alava,Huelva y Zamora. The fragmentation processes are associated with the loss of ecosystems, increasing the number of forest locations, though more isolated and reduced in size.

Finally, the assessments made between 1987 and 2007 within the frame of National Forest Inventory, provide information on other forest damage. According to the assessment 13% of conifers evaluated undergo a defoliation process that affects more than 25% of the crown. Also, 3.2% of the conifers suffer a bleaching process that affects more than 25% of the crown. According to the same assessment 16% of the leafy species evaluated undergo a defoliation process that affects more than 25% of the crown. Similarly, 2.8% of those leafy species suffer a bleaching process that affects more than 25% of the crown.

5.2.4 Objectives of the forest policy and implementation of the pan-European framework in Spain

The European Forest Strategy, approved as a Council Resolution in 1998, has been transposed into Spanish law. The Spanish Forest Strategy was approved in 1999.The main objectives of this strategy are planning the national forest policy and participation in the work of forums and international forestry institutions. In order to achieve that, it has been necessary to reform some forest policy instruments.

The Spanish Forest Strategy is the starting point of the Spanish Forest Plan, approved by the ministerial cabinet in July 2002. This plan has a validity of 30 years (2002-2032). It aims to develop a forest policy based on the following principles:

1. Sustainable development
2. Multifunctionality of forests
3. Contribution to territorial cohesion through rural development and settling population and employment in rural areas.
4. Contribution to the ecological cohesion, integrating biodiversity conservation into forest management and preserving the forest genetic heritage.
5. Social and public participation in formulating policies, strategies and programmes, proposing the responsibility of society in the conservation and management of forests.

According to the Ministry of Environment and Rural and Marine Affairs, the Forest Plan objectives (MARM 2011) are:

1. Protect the territory from erosion and prevent land and water degradation by restoring the protective vegetative cover, increasing at the same time carbon

sequestration in forest biomass in order to help alleviate the causes of climate change.
2. Promote sustainable management of Spanish forests by promoting correct management and regulated forestry.
3. Encourage and improve forestry production as an economic alternative and engine for rural development, especially in marginal and mountain areas.
4. Ensure adequate protection of the forest against the action of fires, diseases, biotic agents, pollutants and weather elements and defend its territorial integrity and legal status.
5. Promote the conservation of biological diversity through sustainable use of its components in the Spanish forest areas, assuming relevant criteria and actions in forest management.
6. Promote responsible recreational use of our forests and contribute to the dissemination of a new forest education.
7. Maintain and improve the framework for training, information and forest research.
8. Strengthen the framework for collaboration between institutional sectors and social agents involved.

The Spanish Forest Plan proposes a total of 150 measures. Some of the most relevant are:

1. Constant updating of statistics and maps of interest for the forestry sector: National Forest Inventory, Forest Map of Spain, National Inventory of Soil Erosion, Forest Fire Statistics, European damage monitoring networks of damage to forests.
2. Interventions on the related fields of forestry and hydrology.
3. Promote sustainable forest management through Management Plans of Forest Resources, forest planning tools at local scale.
4. Development of a plan for the Spanish ”dehesas”.
5. Support for forest certification.
6. Promotion of silviculture.
7. Support for monitoring, prevention and extinguishing of forest fires.
8. Integration of biodiversity conservation in forest management. Guidelines and management models in forested areas of the Natura 2000 network.
9. Preparation, by the proper authorities, of a Forest Industry Plan.
10. Promotion of forestry associations.

In Spain, the emphasis on different aspects of sustainable forest management has been evolving over time. Specifically, when assessing the Spanish forest policy and forest management in the framework of the current pan-European criteria (Table 5 in Chapter 4.2.2), the Criteria 2 (“health and vitality of forests”) and 5 (“Maintenance of protective

forests") have had traditionally high importance in comparison to other European countries. This high importance draws on the fact that among the main threats affecting forests in Spain stand out the changes in land occupation and forest fires. According to the project CORINE Land Cover, during 1987-2006 a process of intense fragmentation of land triggered mainly by urban constructions and infrastructures has taken place. Regarding the forest fires, the forest surface burned in Spain is relatively high, although it has diminished slightly in the last 15 years. The number of fires is also high, although it has showed a declining tendency in the last years. In order to fight more effectively this problem the current policy prohibits, among other things, the change of use of the forest areas for at least 30 years. The term of 30 years corresponds to the minimum time span that is in the majority of cases needed for the regeneration of forest vegetation. It also avoids expectations of future re-qualification of non-urban land. In addition, it should be pointed out that the marked summer droughts put the forests in the Iberian peninsula at the limit of their possibilities. This characteristic, joined to the high climatic, topographical and edaphic variability confer to these forests a quite high vulnerability. Rodrigues et al. (2012) estimates that in mainland Spain the time of regeneration of the vegetation as a result of forest fires ranges from 2 years, in the case of grassland plant communities, up to 101 years for mass of trees with low germination.

Considering the forest sector's role in the Spanish economy, the Criteria 1 ("Maintaining forest resources") and 3 ("Maintaining productive functions of forests") have a relative importance, close to average European levels. Although forest area is increasing in Spain owing mainly to the abandonment of agricultural practices, in 2008 only 12.3% of the forest surface was under forest management plans (OSE 2011). This figure is quite inferior to the EU-27 levels, where at least 22 countries have more than 45% of their forest surface under a management plan. Meanwhile, during the last years a change in the conception of the forest resource planning has been witnessed: from the organization of forest regeneration and one preferential resource (wood) to forest planning that requires the consideration of the multifunctionality characteristic of the forest systems in Spain.

Criterion 4 (protection and enhancement of biological diversity) gained momentum in Spain during the recent period, a trend that likely will intensify in the coming years. In Spain 40% of forest area is currently under some protection (OSE 2011). The Spanish Law for Natural Heritage and Biodiversity establishes two main instruments for biodiversity planning: the Spanish Inventory of Natural Heritage and Biodiversity and the Strategic Plan for Natural Heritage and Biodiversity. The last Strategic Plan for Natural Heritage and Biodiversity set up for 2011-2017 includes eight milestones and 39 concrete aims, the achievement of which will be monitored and evaluated by means of clearly-defined indicators. The aims 3.2, 3.3 and 3.4 make specific reference to forests and are the following: Aim 3.2: Promote sustainable forest management; Aim 3.3:

Contribute to the monitoring and improvement of the state of health of forests and evaluate their contribution to climate change mitigation and adaptation, and Aim 3.4: Contribute to the conservation of biodiversity through the defense against forest fires.

Criterion 6 ("Socio-economic functions") has had historically less relevance in Spain than in other European countries, though its importance has increased in the last decade. In Spain the change of the conception for forest resource management has led in the last years to a forest planning concept that entails a new consideration of the forest productive functions, with a different and renewed demand for forest products. In this line, forest services gain economic interest. Moreover, there is an increased attention to the social and cultural functions of forests, as well as to setting up innovative financial mechanisms such as the payment for the environmental services provided by forests.

Finally, it is worth highlighting that the Spanish - and by extension Mediterranean - forest ecosystems are especially vulnerable to climate change and changes in land use. The pressing demand for a forest management considering suitably the multifunctionality and the conservation of biological diversity will require new, creative management policies for these forest ecosystems in the future. Sustainable forest planning and management methods should be more flexible and more participative in order to integrate in a consistent framework the high ecological diversity, the multifunctionality of forest systems and the increasingly-complex regulatory setting.

5.3 Development of the sustainability of agriculture and forestry in Spain and Finland

The sustainability of forestry and agriculture is a very complex issue. The development is often looked at in a very myopic way and long term dynamic effects are not easily seen. Utilizing of indicators is one way to get an overview of the current state, but also on the dynamic development if they are monitored over time. The different types of indicators, the state and pressure together with the impact and response, can, if well combined, illustrate both state and development. Furthermore, the indicators can be useful for increasing sustainability, if comparing indicators within a region or over time. Impacts of policies are often seen on a delay and especially this concerns the ecological dimension. The indicators are, however, often highly aggregated and this adds further demands on the ability of the indicator to be representable.

The cobweb analyses is one way of presenting and analyzing different systems or different developments. The cobweb gives holistic advantages since the graphs give a good overview and a comparison simultaneously. The resilience and also the trade-offs and synergies should, however, be carefully analyzed further than by simple cobwebs in

order to give case and effect results as well as policy analyses on existing institutions and rules. Likewise the economic realities and comparative advantages are not to be forgotten.

The agricultural systems in Spain and in Finland differ considerably due to the natural circumstances. Also within the countries there are large differences. Spain has more than nine times more population, but the country is only around 50% larger in area. However, the importance of agriculture is higher in Spain than in Finland. The agriculture in Spain contributes to about 2.7% of GDP and in Finland only around 1%. If forestry is included, the figure is close to that of Spain. In both countries there are large regional differences in economic activities.

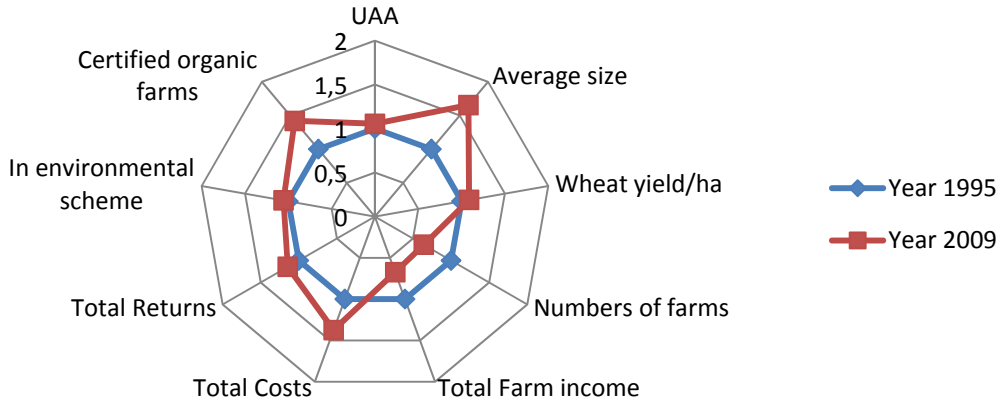

Figure 11. *Comparison of agricultural production in Finland in 1995 and 2009, based on the EU's baseline indicators for rural development (selected indicators). UAA: Utilized agricultural area. Source: Statistics Finland (2010).*

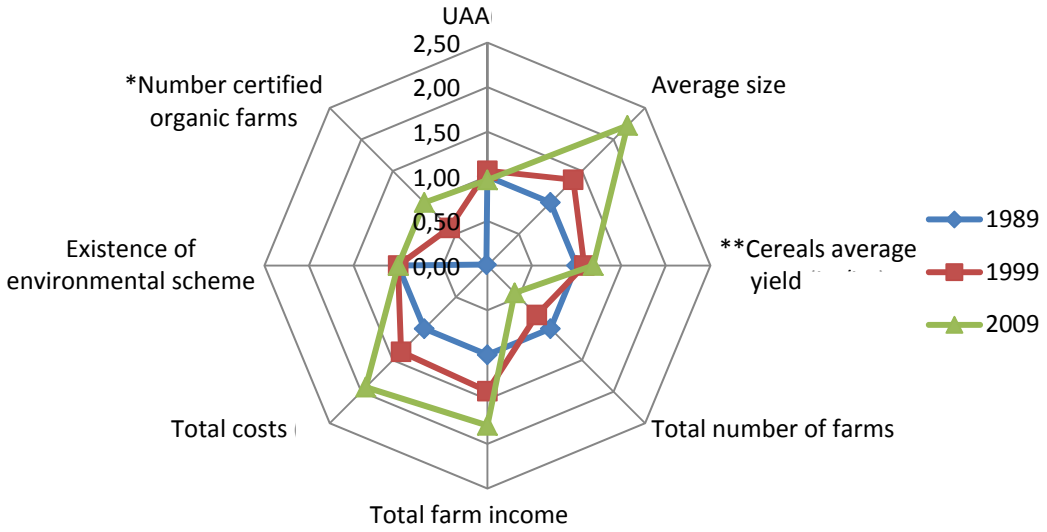

Figure 12. *Development of agriculture in Spain from 1989 to 2009 based on selected indicators (1989 =reference). Data mostly from Agricultural Census (1989, 1999, 2009). *For organic farms where reference year is 2009, data 1999 is 2001 from COAG, **cereals yield indicator from World Bank.*

In Figure 11 and Figure 12 selected indicators for agriculture are presented at several points of time for Finland and Spain. For Finland comparison of agriculture in 1995 and 2009 shows the development clearly. Finland joined the EU in 1995, which is the reference year in the figure. The size of farms, the numbers of organic farms and costs have increased while the number of farms and farm income has decreased. This means that the farmers are working more and earning less in 2009 than in 1995. However, the technological development has also been rather fast. As a consequence of joining the union there was a shift in policies from direct support towards decoupled support systems.

Similar structural development has taken place in the agriculture in Spain. The numbers of farms has decreased and the size of the farms has increased. The economic profitability has also gone down as in Finland since the total costs has grown faster than the total farm income. The number of certified organic farms has increased rapidly and is 70 times higher in 2009 than in 1989. Because of that reference year in the figure for this indicator is 2009 and not 1989 as for other indicators.

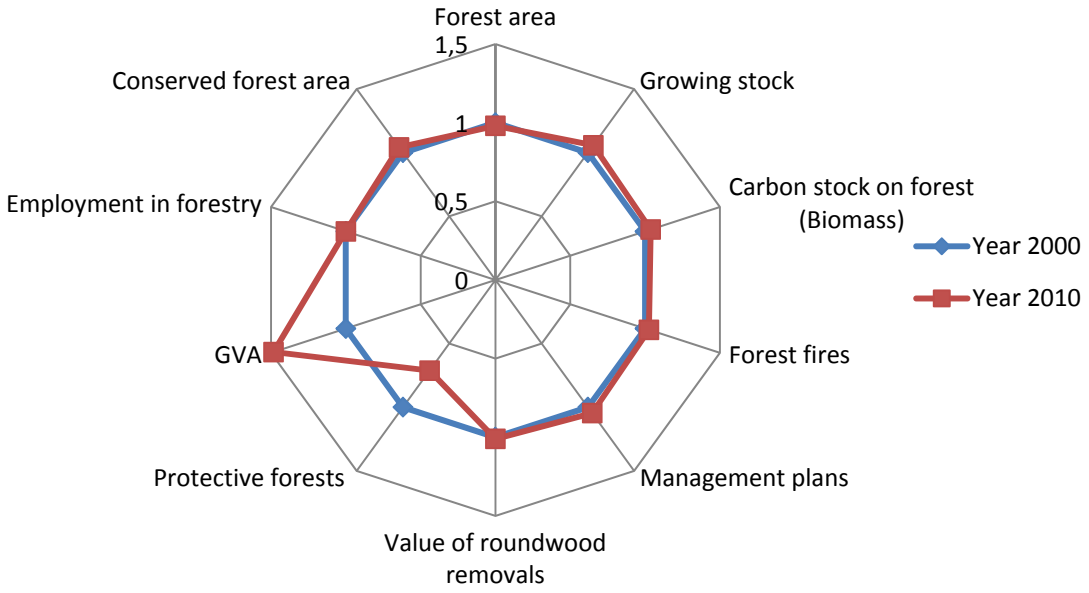

Figure 13. *Selected indicators measuring sustainability of forestry, Finland 2000-2010 (2000=1). Data source: FOREST EUROPE, UNECE and FAO (2011), Finnish Forest Research Institute (2011). Reason for decline in the amount protective forests is change in definition of timberline forests in Finland.*

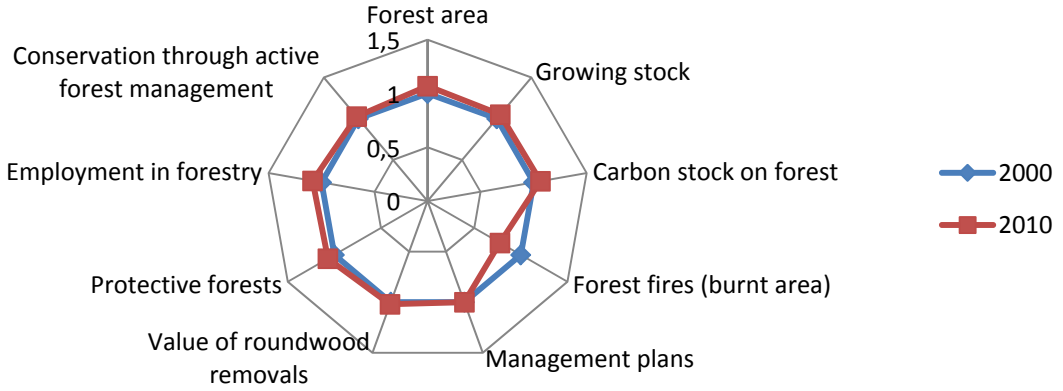

Figure 14. *Selected indicators measuring sustainability of forestry, Spain 2000-2010 (2000=1). Data sources: FOREST EUROPE, UNECE and FAO (2011), Joint Research Centre (2009). For forest fires comparison is between 1990-99 and 2000-2009.*

The development in forestry is illustrated in Figures 13 and 14 by similar methods as for agriculture. In general changes in forest sector have been minor compared to changes in agriculture. In Finland there is an increase e.g., in growing stock and carbon stock as well as in the value added and conserved forest area. Decline in the area of protective forests is only due to change in the definition of timberline forests in Finland and it does not thus tell about decline in sustainability. In general in the Finnish context this indicator can be considered rather vague. Also indictor on forest fires has minor importance. A detailed analysis on the criteria and indicators of sustainable forest management in the Finnish context is presented in the report on the State of Finland's Forests (Ministry of Agriculture and Forestry & Finnish Forest Research Institute 2011). A detailed regional analysis of sustainability of forestry with fuzzy logics is presented in Vehkamäki & Bäckman (2011).

The last two decades have seen a significant increase of forest area in Spain prompted mainly by reforestation activities. This increase has been also favored by the Common Agricultural Policy (CAP) reform of 1992. In the period 1994-1999 the total reforested area in Spain has reached 450 000 ha (50% of the area falling under CAP measures in the whole European Union), whereas in the period 2000-2006 it has been 218 000 ha (MARM 2008). Qualitatively, the afforestation of agricultural land has been a transformative driver of rural areas through its positive effects on landscape and biodiversity. For sustainability of forestry in Spain special significance has the amount of forest area burnt by forest fires. According to the JRC statistics (Joint Research Centre 2009) there has been a significant decline in that during the two last decades. The Mediterranean basin is one of the most sensitive regions to potential changes resulting from climate alterations. The climate forecasts for the region include increases of temperature and reductions of precipitations (García-Ruiz et al. 2011). This will certainly have significant repercussions on forest stock growth, production and survival.

6 Concluding remarks

The main aim of this paper was to provide examples of frameworks used for assessing the sustainability of agriculture and forestry in the EU and to set the discussion agenda on the relation of sustainability and structural and natural conditions. Examples presented here can be used as a basis for formulating frameworks suitable for MPCs and Turkey in the later phases of the SUSTAINMED project.

The concept of sustainability is well established and decades of work have been done to approach higher sustainability in agriculture and forestry. When sustainability in these sectors is pursued, all dimensions of it – economic, social and ecological – have to be considered. Furthermore, as forestry and agriculture are not isolated sectors in a society, impacts by and to other activities and sectors need to be considered. Climate change, increasing global population, biodiversity loss, deforestation and increasing competition for land, energy, water and natural resources in general are among the challenges the world is currently facing. Both agriculture and forestry have significant roles when solutions to these problems are searched. The scarce resources lead to the necessity of taking priorities and making sacrifices in order to increase welfare in a long run.

Within the EU the frame for agricultural sector is largely formulated by the common agricultural policy. In the late 1950s when the policy was created the main emphasis was given to economic sustainability and food security and to some aspects of social sustainability. Only later, especially after the Rio Summit in 1992, the need for environmental sustainability of agriculture was more widely recognized. This reflects the changes in global thinking – importance of environmental aspects and their linkages to economic and social aspects have in a large scale been realized only rather recently. However, in addition to change in the way of thinking, in the EU context economic growth has been an important driver for change. As a consequence of growth, external costs, e.g. pollution or loss of biodiversity, have increased. Decreased welfare due to environmental damage as well as overuse of resources has forced to give more emphasis on environmental aspect. Similar kind of development has occurred also in forest sector.

The cases of Spain and Finland are both different and similar. Both countries have a wide range of natural resources (forests and agricultural land) and high-skilled actors in both sectors. The environment of Spain and Finland are to some extent the extremes of EU, with the southernmost and the northernmost climates, the case of water deficiencies and high temperatures and the case of excess of water and low temperatures. When trying to achieve more sustainable agriculture or forestry, all factors of sustainability

have to be taken into account. However, as countries differ, there are and there have to be differences in the emphasis of sustainability factors.

In forest sector, for example, in Finland maintaining and encouraging productive functions of forests has traditionally had high importance due to economic importance of forest sector for the Finnish society. This is directly linked to maintaining of forests resources as well as to some socio-economic functions of the sector. During the last twenty years much emphasis has been given also to the enhancement of biological diversity in the forests. In Spain, on the other hand, quite different factors have been emphasized. In Finland forest damages are not a major threat and thus there is no special need to emphasis that factor. In Spain, however, maintenance of health and vitality of forests has traditionally had high importance. This is due to the fact that main threats for Spanish forests are forest fires and land-use changes, e.g. because of urban constructions. Also protective functions of forests have special importance in Spain, whereas in Finland due to geographical reasons it is less emphasized. On the other hand, maintenance of productive functions of forests, which are highly important in Finland, has less importance in Spain.

Finland has a long tradition in aiming to maintain the whole country inhabited. Supporting agriculture activities has had a key role in keeping the countryside viable. Thus, the economic development at farm level has related strongly to the dimension of sustainability. At the same time and related to the previous goal the self-sufficiency in food production has been an important goal. Being successful in achieving these goals has also had a large importance to the economic well-being of farms and farm families. Thus, even though Finland has been member of the EU only since 1995 the goals in agricultural policy have been quite similar to the EU policy. The same holds for Spain. The economic and social dimensions of sustainability have both been important. Moreover, due to the technological change and increased market orientation the structural change has been fast during the last decades in both countries.

When we are comparing the ecological dimension of sustainability in Spain and Finland larger differences emerge. In Spain the most important concerns are the scarcity of groundwater in the irrigated areas as well as the concern of climate change. In Finland, the most severe questions concern the nutrient leakages to the surface waters and the energy saving issues. These differences are directly related to the location and climate of the countries. Finland is surrounded by rather shallow and vulnerable Baltic Sea whereas Spain has plenty of deep water around the country. The location of Finland in the north with a very cold climate adds certain production requirements that differ from the more southern countries in EU. Although there are very different circumstances with very different opportunity costs the same policies or policy frameworks are applied in both countries. Common policies and frameworks are an important tool for aiming at

goals that are considered globally or regionally essential. They should also ease national decision-making. Common frameworks and indicators form also a backbone for comparing the state and development of different aspects of sustainability between and within countries. This is essential in order to be able to conduct impact analyses and make conclusions on the effects of different policies as well as in order to be able to give policy recommendations.

Examples on Finland and Spain show that common policies can be implemented in very different ways. The flexibility of the policies, the scope for inclusion of regional interest and recognition of structural differences are essential in order to be able to utilize resources in a way that is sustainable, but most suitable for an individual country. Furthermore, due to cross-sectorial nature of sustainability issues there is a need for integrated policy approaches. These are important aspects also when building common frameworks for sustainable agriculture and forestry in MPCs and Turkey.

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Annex I

Agri-environmental indicators of EU (Commission of the European Communities 2006[4])

Indicator	
1	Agri-environmental commitments
2	Agricultural areas under Natura 2000
3	Farmers' training level and use of environmental farm advisory services
4	Area under organic farming
5	Mineral fertiliser consumption
6	Consumption of pesticides
7	Irrigation
8	Energy use
9	Land use change
10.1	Cropping patterns
10.2	Livestock patterns
11.1	Soil cover
11.2	Tillage practices
11.3	Manure storage
12	Intensification/extensification
13	Specialisation
14	Risk of land abandonment
15	Gross nitrogen balance
16	Risk of pollution by phosphorus
17	Pesticide risk
18	Ammonia emissions
19	Greenhouse gas emissions
20	Water abstraction
21	Soil erosion
22	Genetic diversity
23	High Nature Value farmland
24	Renewable energy production
25	Population trends of farmland birds
26	Soil quality
27.1	Water quality - Nitrate pollution
27.2	Water quality - Pesticide pollution
28	Landscape - state and diversity

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