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Case Study – Italy

Sustainable Agriculture and Soil Conservation (SoCo Project)

Ezio Rusco, Brechje Maréchal,
Mauro Tiberi, Cristina Bernacconi, Giovanni Ciabocco, Paolo Ricci, Enrico Spurio

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Sustainable Agriculture and Soil Conservation (SoCo Project)

The project 'Sustainable Agriculture and Soil Conservation (SoCo)' is a pilot project commissioned by the Directorate-General for Agriculture and Rural Development, in response to the request of the European Parliament (Administrative Arrangement AGRI-2007-336).

Authors:
Ezio Rusco, Brechje Maréchal[1], Mauro Tiberi, Cristina Bernacconi, Giovanni Ciabocco, Paolo Ricci, Enrico Spurio[2]

Editors:
Stephan Hubertus Gay, Frank Sammeth, Monika Schmidt[3]

1 Food and Agriculture Agency for the Marche region, Soil Service
2 European Commission, Joint Research Centre (JRC), Institute for Environment and Sustainability (IES)
3 European Commission, Joint Research Centre (JRC), Institute for Prospective Technological Studies (IPTS)

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European Commission
Joint Research Centre
Institute for Prospective Technological Studies

Contact information
Address: Edificio Expo. c/ Inca Garcilaso, 3. E-41092 Seville (Spain)
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 954488318
Fax: +34 954488300

http://ipts.jrc.ec.europa.eu
http://www.jrc.ec.europa.eu

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Preface

Agriculture occupies a substantial proportion of European land, and consequently plays an important role in maintaining natural resources and cultural landscapes, a precondition for other human activities in rural areas. Unsustainable farming practices and land use, including mismanaged intensification and land abandonment, have an adverse impact on natural resources. Having recognised the environmental challenges of agricultural land use, in 2007 the European Parliament requested the European Commission to carry out a pilot project on 'Sustainable Agriculture and Soil Conservation through simplified cultivation techniques' (SoCo). The project originated from close cooperation between the Directorate-General for Agriculture and Rural Development (DG AGRI) and the Joint Research Centre (JRC). The JRC's Institute for Prospective Technological Studies (IPTS) coordinated the study and implemented it in collaboration with the Institute for Environment and Sustainability (IES). The overall **objectives of the SoCo project** are:

(i) to improve the understanding of soil conservation practices in agriculture and their links with other environmental objectives;

(ii) to analyse how farmers can be encouraged, through appropriate policy measures, to adopt soil conservation practices; and

(iii) to make this information available to relevant stakeholders and policy makers EU-wide.

In order to reach a sufficiently detailed level of analysis and to respond to the diversity of European regions, a case study approach was applied. Ten case studies were carried out in Belgium, Bulgaria, the Czech Republic, Denmark, France, Germany, Greece, Italy, Spain and the United Kingdom between spring and summer 2008. The case studies cover:

- a screening of farming practices that address soil conservation processes (soil erosion, soil compaction, loss of soil organic matter, contamination, etc.); the extent of their application under the local agricultural and environmental conditions; their potential effect on soil conservation; and their economic aspects (in the context of overall farm management);
- an in-depth analysis of the design and implementation of agri-environmental measures under the rural development policy and other relevant policy measures or instruments for soil conservation;
- examination of the link with other related environmental objectives (quality of water, biodiversity and air, climate change adaptation and mitigation, etc.).

The results of the case studies were elaborated and fine-tuned through discussions at five stakeholder workshops (June to September 2008), which aimed to interrogate the case study findings in a broader geographical context. While the results of case studies are rooted in the specificities of a given locality, the combined approach allowed a series of broader conclusions to be drawn. The selection of case study areas was designed to capture differences in soil degradation processes, soil types, climatic conditions, farm structures and farming practices, institutional settings and policy priorities. A harmonised methodological approach was pursued in order to gather insights from a range of contrasting conditions over a geographically diverse area. The case studies were carried out by local experts to reflect the specificities of the selected case studies.

This Technical Note is part of a series of ten Technical Notes referring to the single case studies of the SoCo project. A summary of the findings of all ten case studies and the final conclusions of the SoCo project can be found in the **Final report on the project 'Sustainable Agriculture and Soil Conservation (SoCo)'**, a JRC Scientific and Technical Report (EUR 23820 EN – 2009). More information on the overall SoCo project can be found under http://soco.jrc.ec.europa.eu.

BE - Belgium	**West-Vlaanderen** (Flanders)
BG - Bulgaria	**Belozem** (Rakovski)
CZ - Czech Republic	**Svratka river basin** (South Moravia and Vysočina Highlands)
DE - Germany	**Uckermark** (Brandenburg)
DK - Denmark	**Bjerringbro and Hvorslev** (Viborg and Favrskov)
ES - Spain	**Guadalentín basin** (Murcia)
FR - France	**Midi-Pyrénées**
GR - Greece	**Rodópi** (Anatoliki Makedonia, Thraki)
IT - Italy	**Marche**
UK - United Kingdom	**Axe and Parrett catchments** (Somerset, Devon)

Table of content

List of tables

List of figures

Acronyms

AGEA	Agenzia per le Erogazioni in Agricoltura (*in English:* Agency for Agriculture Allocation)
AP	Alluvial Plain
APA	Provincial Breeder Association (Associazione Provinciale Allevatori)
ARA	Regional Breeder Association (Associazione Regionale Allevatori)
ASSAM	L'Agenzia per i Servizi nel Settore Agroalimentare delle Marche (*In English:* Food and Agriculture Agency for the Marche region)
AV	Agricultural added value
AWU	Agricultural work unit
BCAA (IT) GAEC (EN)	Buone Condizioni Agricole e Ambientali Good Agricultural and Environmental Condition
CAA	Centro di Assistenza Agricola (*in English:* Centre for agricultural support)
CAP	Common Agricultural Policy
CGO (IT) OMC (EN)	Criteri Generali Obbligatori Obligatory Management Criteria
CMO (*in Italian* OCM)	common market organisations
DGR	Regional Council Decree of the Marche
DOC	Denominazione di Origine Controllata (*In English:* Denomination of Origin Controlled)
DOCG	Denominazione di Origine Controllata e Garantita (*In English:* Denomination of Origin Controlled and Guaranteed)
DPSIR	Driving force-Pressure-State-Impact-Response
EAFRD	European Agricultural Fund for Rural Development
ELU	Enterprise Land Units
EU27	27 members states of the European Union
F1 measure	Agro-environmental measure
F2 measure	Agro-environmental measure
FESR	Fondo europeo di sviluppo regionale (*In English:* European Agricultural Fund for Rural Development, EAFRD)
FSE (IT)	Fondo Sociale Europeo European Social Fund

GAEC	Good Agricultural And Environmental Conditions
GAL *(in English* LAG)	Local Action Groups
GDP	Gross Domestic Product
GIS	Geographical Information Systems
IEEP	Institute for European Environmental Policy
INEA	Istituto Nazionale di Economia Agraria *(In English)* National Institute for Agricultural economics
ISTAT	L'Istituto nazionale di statistica (*In English:* National Institute for Statistics)
LEADER	Liaison Entre Actions de Développement de l'Économie Rurale (*In English*: Links between the rural economy and development actions
LDP	Local Development Plan
LFA	Less Favoured Areas
MS (*in Italian* SC)	Management system
NVZ	Nitrate Vulnerable Zones
OAM (IT)	Osservatorio Agroalimentare delle Marche (*In English*: Food farming Observatory of Marche Region)
OECD	Organisation for Economic Co-operation and Development
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
PPP	Polluter Pays Principle
PSN (IT)	Piano Strategico Nazionale, National Strategic Plan
RDP (*In Italian*: PSR)	Rural Development Plan
SC	Management System (IT)
SCI	Sites of Community Importance
SGM	standard gross margin
SIFIM	Financial Intermediation Services Indirectly Measured
SMR (*in Italian* CGO)	Statutory Management Requirements
SPA	Special Protection Areas
TEO	Technical And Economic Orientation
TSG	Traditional Specialty Guaranteed
UAA	Utilized Agricultural Area
UDE	Economic Dimension Unit
WCED	World Commission on Environment and Development
WU	(Agricultural) work unit
ZALF	Leibniz Centre for Agricultural Landscape Research

Executive summary

1. The project “Sustainable Agriculture and Soil Conservation” includes 10 case studies that are representative for the EU 27 Member States.
2. The case studies aim to acquire detailed information on the implementation of agricultural policies and measures, their effectiveness and their consequences for soil conservation, compared to the analysis carried out on a continental scale in WP1. Further analysis and evaluation were carried out on the applicability of the measures that are included in the concept of conservation agriculture and/or organic farming.
3. The Marche region was selected for the Italian case study because of its geography. The geography of the Marche region is very diverse, from coastal areas to the Apennine mountain range and is common to many regions in Italy. Moreover, occurring soil degradation, such as erosion, are widespread in Italy and the entire Mediterranean area. These factors allow for the extrapolation of the results of the case study to a wider area.
4. The report was prepared according to the guidelines and the framework methodology developed for the SoCo project by IEEP, Humboldt University and ZALF. The Italian case study combined this methodology with a more specified geographic assessment.
5. This geographic assessment was conducted using information layers. These information layers are homogeneous areas based on geomorphology and altitude. The analysis focuses on four elements: soil data, crops, distribution of management systems and geo-referenced data on the application of the 2006 Marche’s Rural Development Plan measures, especially the 2nd pillar (improving the environment and the countryside).
6. The homogeneous areas are the focal point of this assessment. Biophysical and socio-economic factors determine the crops that are cultivated in a specific location. Based on this, 14 management systems have been identified in the Marche region that are analysed according to their respective homogeneous area.
7. Furthermore, land degradation is mapped using models for assessing the risk and vulnerability of the area to erosion, compaction and decline of organic matter content.
8. Subsequently, the data relating to policies were geo-referenced and mapped. Cross compliance (1st pillar of the Common Agricultural Policy) and thus compliance with the Statutory Management Requirements and Good Agricultural and Environmental Condition (as defined in Articles 3.4 and 5 and in Annex III and IV of Reg. EC 178/2003), is mapped using the database of AGEA. Agro-environmental measures (2nd pillar of Common Agricultural Policy) relating to the 2000-2006 Rural Development Plan of the Marche region were mapped using data derived from regional databases.
9. As a result all elements subject to analysis and evaluation are addressed according to the well structured geographical component in the Italian case study.
10. The evaluation on the basis of homogeneous environments and management systems was conducted in an integrated manner. The evaluation of the operational techniques with emphasis on conservation practices, their effects on the environment and the risk these techniques pose to land degradation, together with the evaluation of policies and other situations affecting the development of sustainable agriculture all form part of this integrated assessment.
11. Following the integrated evaluation, suggestions and prospects for management systems aimed at sustainable development in the homogeneous areas of the Marche region have been outlined.
12. The analytical process facilitated the formulation of proposals and initiatives linked to strategic elements as territory, businesses and production sectors.
13. A series of questionnaires was designed for the different actors involved in soil conservation: policy makers, farmers, administrative and governmental actors and actors operating outside public bureaucracies. Through these questionnaires it was possible to assess the actors’ perception of related policies and their effectiveness, the risks of soil degradation and the effectiveness of agricultural measures aimed at soil conservation, etc.

14. Focussing on soil conservation, firstly actors have been identified that are involved in policy design at different administrative levels (Europe, country, region), secondly actors involved in agricultural production and thirdly external factors influencing the farmers' choices.
15. The intense process of acquiring data and carrying out the integrated assessments was concluded with a regional stakeholder workshop in which suggestions and statements of the stakeholders were collected referring to agricultural development, soil conservation, agricultural practices and current or future conservation policies (Health Check).
16. Conclusions drawn from the Italian case study can be summarised as follows:
17. The geographical aspect must be taken into account while defining policy and measures.
18. Soil is an integral part of this geographical approach.
19. Extensive knowledge of soils and of the delicate balance that maintains the soil's multiple functions is essential for soil conservation.
20. Conservation agriculture cannot be interpreted as a series of separate transactions (minimum tillage, sod seeding, reduced tillage, cover crops, etc.) but must be analysed in relation to the local geography and based on the characteristics and quality of the soil. Furthermore, the concept of conservation agriculture cannot be limited to simplified tillage techniques but must also consider integrated pest management and fertiliser application. Only through an integrated approach, taking into account all aspects of the agricultural production process, a realistic interpretation and actual application of conservation agriculture can be achieved.
21. Sustainable agriculture is the achievement of a balance between the socio-economic and environmental factors.
22. The environmental objectives are the cornerstone of the Common Agricultural Policy.
23. The 1st pillar of the CAP, cross compliance, introduces a strong innovative element for environmental protection.
24. In the 2nd pillar of the CAP the geographical aspect is fully respected. The CAP reform allows for the transition to more local policies and facilitates the definition of regulations based on the characteristics of the area (geography).
25. Several objectives of other environmental policies are already taken into account in the statutory management requirements (SMR) of cross compliance in the 1st pillar of the CAP. Nevertheless, soil conservation through sustainable agriculture contributes to achieving the goals set by other policies as well: Nitrate Directive, Sewage sludge Directive, Water Framework Directive, etc.
26. The effectiveness of current policies and measures should be assessed through a monitoring network.
27. The questionnaires clearly show that the famers perceive soil degradation, although generally their perception of the intensity of the problem ranges from low to medium.
28. The main risks of soil degradation as identified by the farmers are erosion, decline in organic matter content and reduced water retention capacity.

1 Natural characteristics of the Marche region

1.1 Climate

The Marche region has a maritime climate with harsh winters and hot summers. The seasonal differences are influenced by winds from the Atlantic and central-eastern Europe. In winter cold winds are prevalent, in summer humid and warm winds. The temperature varies between 14-16 °C depending on the altitude.

Table 1.1: Climatic data Marche region

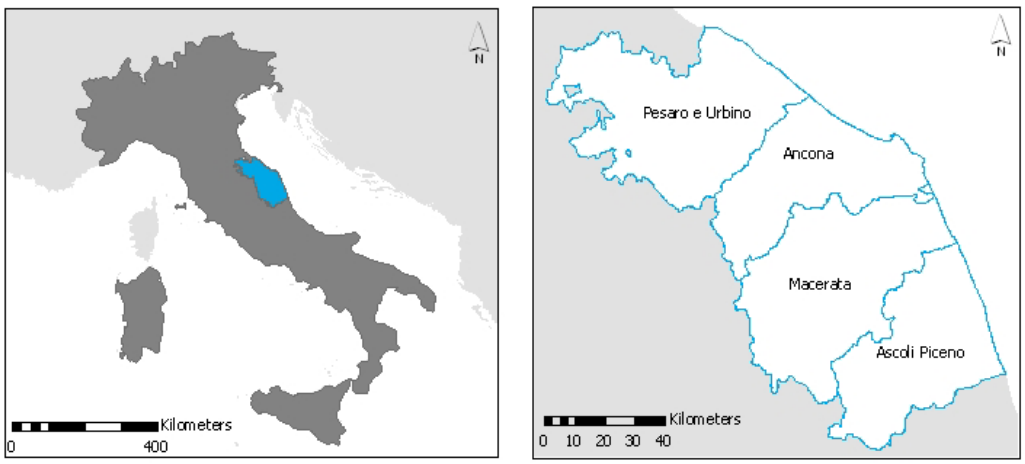
Temperature, precipitation and wind	1999	Climate average 1951-1997
Maximum temperature	36.6 °C	34.6 °C
Minimum temperature	-3.0 °C	-6.6 °C
Maximum summer temperature (average)	28.0 °C	25.0 °C
Minimum summer temperature (average)	17.6 °C	13.9 °C
Maximum winter temperature (average)	10.1 °C	10.9 °C
Minimum winter temperature (average)	2.1 °C	3.2 °C
Annual precipitation	638 mm	702 mm
Nr of rainy days	119	119
Predominant wind direction	north	North
Maximum wind velocity	28.4 m/s	41.2 m/s

Source: Istat, 2001

1.2 Morphology

The Marche is located in Central Italy bordering Emilia-Romagna to the north, Abruzzo to the south and the Adriatic Sea to the east. From the relatively narrow coastal plains the land rises sharply to the peaks of the Apennines which form a natural boundary with Umbria and Tuscany to the west. The Marche is divided into 4 administrative provinces: Pesaro e Urbino, Ancona, Macerata e Ascoli Piceno, arranged in parallel chains between the rivers that run from the Apennines to the Adriatic Sea.

Figure 1.1: Location of the case study area divided into four administrative provinces



A description of the landscape includes many factors, i.e. geomorphology, topography, litology, land use and human activities. The landscape of the Marche region can be divided into sections that run parallel to the coast, with a gradual increase in relief, moving from coastal areas to low hills of Apennines, to high hills and finally to the mountainous areas. The regional territory is furrowed by main rivers that cross it perpendicular to the coastline. The relief distribution (Figure 1.2) is clearly visualised by the DTM (40 m of resolution) and by the elevation belts (Figure 1.3).

Figure 1.2: Altitude belts Marche

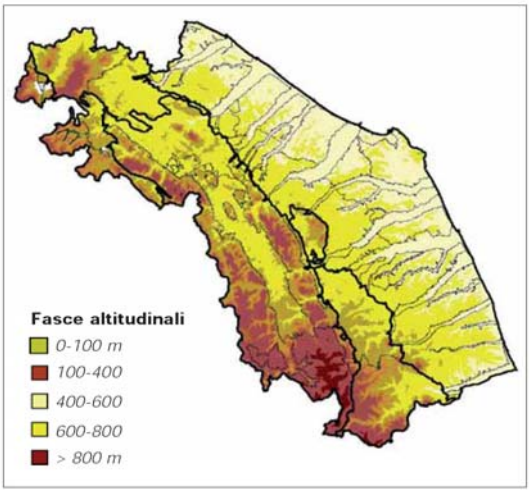
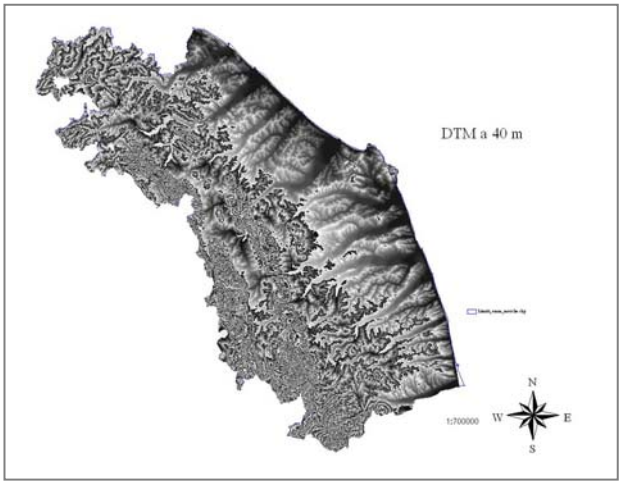


Figure 1.3: Digital Terrain Model Marche



According to the above definition of the landscape the Marche region has been subdivided into three main levels. The first level is defined by the general definition of landscape, i.e. high hills, mountains, etc.

Few parameters, like general geomorphology, climate and parent material, are taken into account for definition of the landscape at first level that are subsequently subdivided into the second and third level of landscape using more parameters with a higher resolution, i.e. land cover/land use, geomorphology, slope, elevation, etc.

The highest point in the Marche is Monte Vettore in the Sibillini Mountains at 2,476 metres. The coast itself boasts long sandy strands and apart from the limestone Conero peninsula (572 m), it is virtually all flat. The coastline is 180 km long. The division between the coast and the hilly and mountainous inland areas is illustrated in table 1.2.

Table 1.2: Relief distribution in the Marche

Landscape	Area	Percentage
Coastal hills (< 700 m)	3,165 km^2	33 %
Inland hills (< 700 m)	3,508 km^2	36 %
Inland mountains (> 700 m)	3,022 km^2	31 %

The inland mountainous zones are mostly limestone and are noted for bare peaks, rushing torrents, dramatic gorges and many cave complexes. In contrast, the areas nearer the coastal plain are celebrated for their fertile rounded hills topped by ancient fortified towns.

The landscape subdivision will be fundamental and is used as the basis for the analysis for the case study of the Marche region. Different farming system will be identified according to the different landscapes and at this distribution the analysis will be performed.

Figure 1.4: Three level landscape subdivision

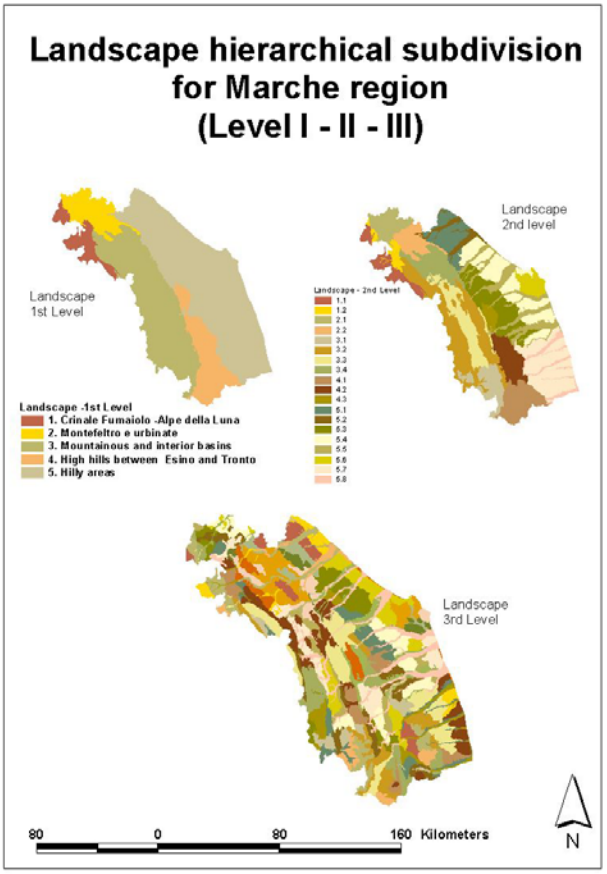
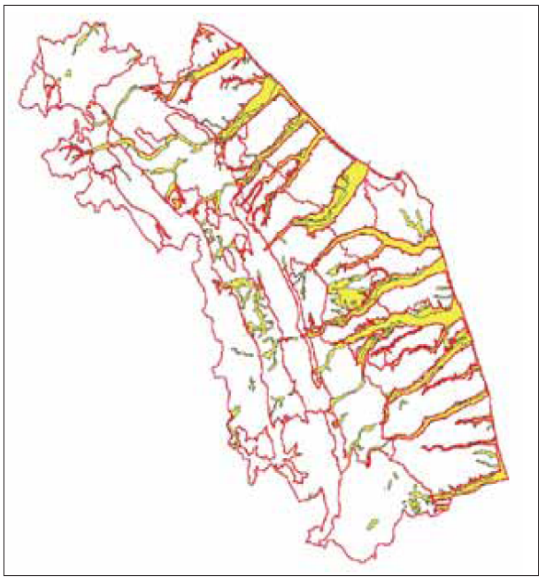


Figure 1.5: Alluvial planes of the Marche rivers



1.3 Soils

The parent material is one of the fundamental parameters that define the landscape. There are 11 major alluvial plains in the Marche region (picture 5). The alluvial deposits are characterized by recent alluvial materials, four levels of ancient fluvial terraces of Pleistocene. The alluvial material, recent and ancient, is with variable texture, from gravel to clay, but it is always calcareous.

In the hilly landscape it is possible to identify Pliocene/Pleistocene materials. They are mainly composed of claystone, mudstone, siltstone, clayey and silty flysch and sometimes conglomeratic flysch and marly limestone (picture 6). In these areas the higher clay fraction explains the severer slope instability, presence of shallow soils on steep slopes, a higher risk of erosion and the manifestation of the vertic characteristic of the soils (cracks)(Figure 1.8a).

Figure 1.6: Pliocene/Pleistocene materials

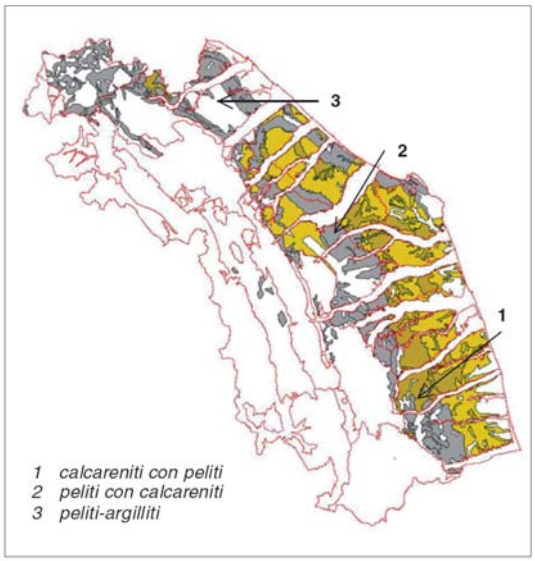


Figure 1.7: Distribution of sandy stone materials in the internal basins

Other material is represented by sandy flysch (green area in figure 1.8 b) and c). The behaviour of sandy flysch soils is different from the other flysch soils because the land use is predominantly agro-forestry or forest.

Figure 1.8: a) Cracked soils; b) and c) shallow soil with sandy flysch

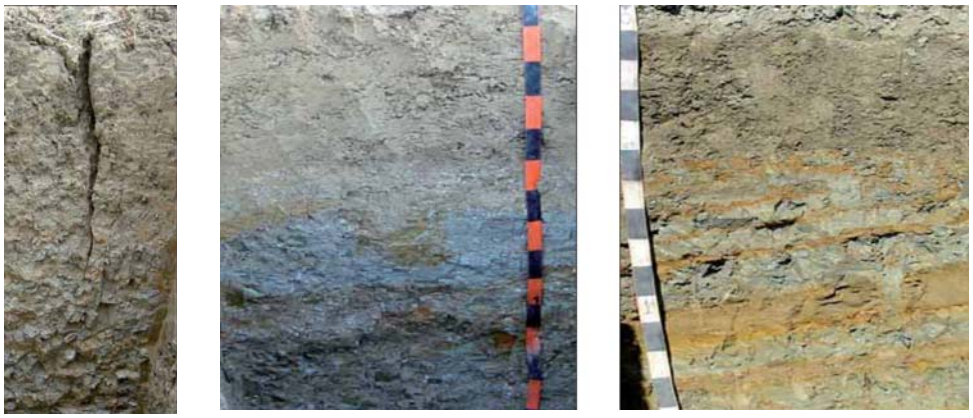
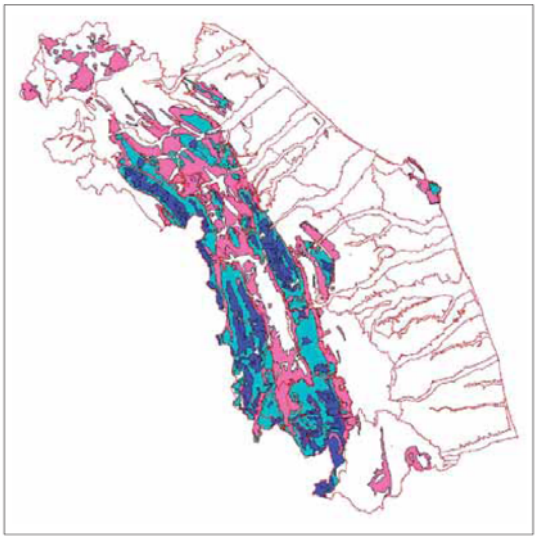


Figure 1.9: Marl, marly limestone and hard limestone



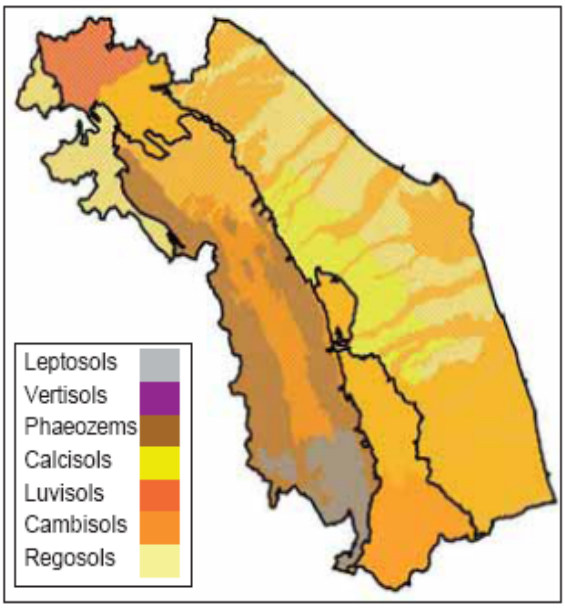
In the mountainous areas the parent material is consisting of calcareous rock with hard limestone and marly limestone. Due to the permeability of these types of rocks the river network is practically absent; but on the other hand the groundwater circulation is highly developed.

The soils present on these parent materials are generally shallow, the stoniness is high but generally the humus is abundant due to the forest litter.

Figure 1.10: Fractured limestone

Cambisols are the most widespread in the Marche (32 %) characterised by a thin layer with physical alterations and chemical transformations (cambic horizon) due to soil erosion.

Figure 1.11: Dominant soil groups in each province and pedologic region



In the hilly areas calcisols, soils with a significant redistribution of calcium carbonate, are abundant (19 %).

Phaeozems (12 %) with shallow horizons and rich in organic matter are typical in pastures and natural vegetation in mountainous areas.

Leptosols (8 %), lightly covering rocks, are concentrated in the high mountainous areas of the Sibilini.

In the Montefeltro area (mountainous area in Pesaro province) there is a presence of soils with vertic characteristics (1 %) on clayey substrate. Luvisols, soils with a differentiated soil profile and a presence of a clayey alluvial horizon cover also 1 % of the region, province and pedological region.

1.4 Land use

Figure 1.12: Corine Land Cover 2000 Marche region

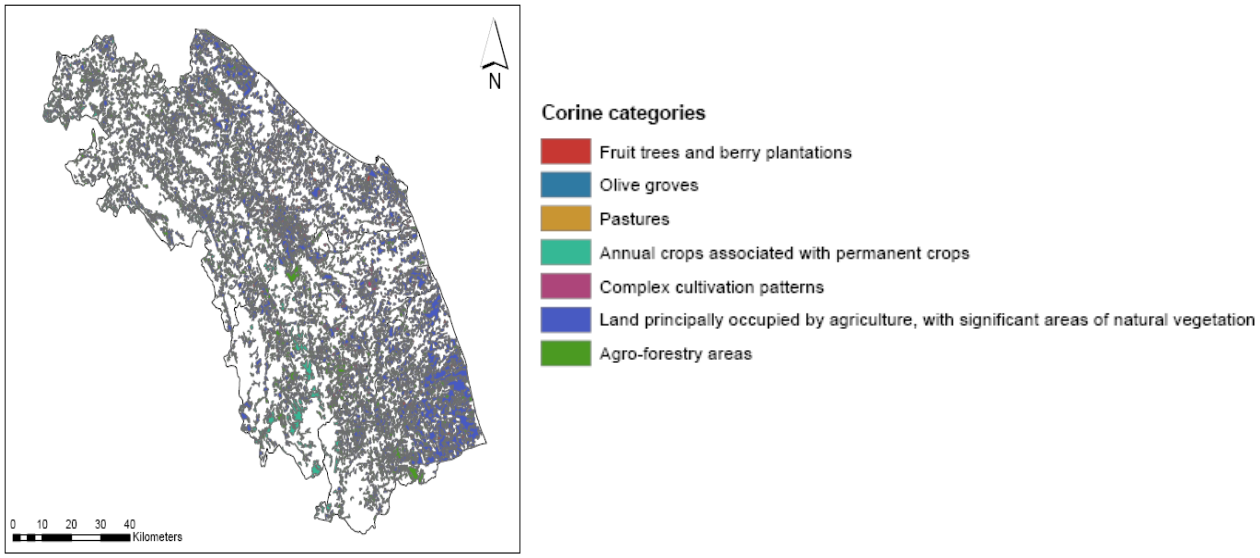


Table 1.3: Utilised agricultural area in the Marche

	Total UAA Marche		Urban areas		Rural indu-strialised areas		Rural areas with low population density		Rural areas with natural limita-tions		Rural areas with develop-ment problems	
	(ha)	%	(ha)	%	(ha)	%	(ha)	%	(ha)	%	(ha)	%
UAA arable land	403,374.1	79.5	20,685.79	4.08	91,998.05	18.14	18,5016.62	36.48	52,029.36	10.26	53,644.28	10.58
UAA pas-tures	65,358.35	12.9	1,023.67	0.20	787.42	0.16	8,871.60	1.75	7,701.60	1.52	46,974.60	9.26
UAA peren nial crops	38,448.17	7.6	2,717.26	0.54	8,425.67	1.66	21,236.11	4.19	2,694.45	0.53	3,374.68	0.67
Total	507,180.62	100	24,426.72	4.82	101,211.14	19.96	215,124.33	42.42	62,425.41	12.31	103,993.56	20.50

Protected areas cover 89,375 ha equal to 9.2 % of the Marche region and consist of two national Parks (Monti Sibillini and Gran Sasso and Monti della Laga), four regional parks (Monte Conero, Sasso Simone e Simoncello, Monte San Bartolo, Gola della Rossa e di Frasassi) four natural reserves (Abbadia di Fiastra, Montagna di Torricchio, Ripa Bianca and Gola del Furlo). There are 29 Special Protection Areas (SPA) and 80 Special Areas of Conservation (PSR, 2007). The only natural lake is Lago di Pilato (at 1,950 m) formed by melting glaciers.

2 Methodology

2.1 Objectives

The objectives of the project are based on two main themes:

- sustainable agriculture and soil conservation;
- the implementation of agricultural policies at a regional scale.

Sustainable agriculture and soil conservation refers to three factors in particular:

- the actual agricultural situation in the Marche region;
- the evaluation of the agricultural practices adopted by farmers in relation to the environmental sustainability and soil conservation;
- the feasibility of the conservation practices and their effects on the environment.

The impact and effectiveness of the Fischler Reform (1st and 2nd pillar) will be analysed as well as the integrated assessment of the policies in relation to soil conservation (rural development policies, environmental policies, socio-economic aspects, etc.).

2.2 Definitions

2.2.1 Rural area

"*Rural area*" is defined by the European Union as the complex of areas extending "*through regions, natural and agricultural landscapes, forestry, small centres, industrial areas. It comprises a complex variety of economic and social activities involving agricultural enterprises, small and commercial activities and small and medium size enterprises. Environments rich in natural resources, habitats and cultural traditions where the recreational activities take an increasing importance …(EU Commission – DGVI, 1997)*.

Rural development focuses on environmental protection and the improvement of the quality of life of the inhabitants and of those who work in rural areas.

Rural agricultural policy is limited by the fact that agriculture is not concentrated in certain locations but spread out across geographic boundaries. The concept of districts, borrowed from industry, seems to be in contrast with that of rural development, where economic activities consist of a balance between various sectors. Thus the inherent characteristics of an individual area cannot be identified by the administrative borders alone. The integration between agriculture and other economic activities imposes a multidisciplinary approach to understand and evaluate problems and local resources, but above all to stimulate the positive effects derived from coordinated and consistent actions.

In "*rural areas*", the role assigned to agriculture is that of producer of goods and services. The multi functionality of agriculture is one of the key concepts of rural development and includes tourism, artisanal manufacture and environmental services. The recognition of specific products based on its geographic origin is gaining importance. It should not only be identified as typical products respecting local traditions, but as a tool of supply differentiation and of strategic placement in a global competitive context.

2.2.2 Concept of "sustainable agriculture" and evaluation methods

The traditional agro-silvo-pastoral activities are gradually acquiring new purposes and functionalities surpassing production. More attention is paid to the production method rather than to the product. The management of agricultural and forestry businesses and the productive processes adopted have to meet environmental protection goals and protect the added value of the rural landscape.

Therefore, the strengthening of multi functionality and rural development prospects has to be based on the environmental sustainability of the agricultural activities and on the protection of the natural resources.

The World Commission for Environment and Development established by the United Nations defines sustainability as “development which satisfies the needs of existing generations, without compromising the possibility of the future generations to satisfy their needs” (WCED, 1987: Bruntland Report). In more detail sustainable agriculture includes a series of characteristics linked to soil and soil use, as landscape, habitat and biodiversity protection as well as factors connected to the quality of drinking water and of the air.

Agricultural sustainability also includes societal concerns regarding the social functions of agriculture, the rural communities and a balanced development model. Thus, sustainable agriculture reflects the productive, environmental and social functions (multidimensional sustainability) (Agenda 21)[4].

Translating the theoretical principles of sustainability into concrete actions is complex. Interrelations between the different economic systems and the three factors of productive, environmental and social sustainability makes it impossible to apply the sustainability principles to one sole economic sector and one single area. The effects the practical application of these principles may have on a single economic sector or in a specific area in relation to other sectors or territories need to be assessed.

To verify and measure the “sustainability”, different Institutions and research organisms identified specific indicators summarising, simplifying or communicating information on these complex natural phenomena. In agro-forestry a distinction can be made between economic, social and environmental sustainability (Measuring sustainability INEA, 2004). Every dimension can be described by specific indicators for every territorial unit considered. The indicators provide the base for the evaluation of the progresses towards long term sustainable development (European Commission, 2001).

The “economic dimension” refers to the efficient use of the resources, to the competitiveness of businesses and to their profitability.

The “social dimension” concerns the equal opportunities among rural areas, economic sectors and social groups.

The “environmental dimension” concerns the management and the conservation of the natural resources. The environmental system is assessed as a function of landscape and biodiversity protection, and the protection of water resources, soil and air.

The information, the evaluations and the results can be structured and organised through the DPSIR model (Driving force-Pressure-State-Impact-Response).

2.2.3 The definition of rural development

Since Agenda 2000, the CAP reform process has been paying increased attention to the integration of environmental, economic and social objectives. This has lead to the “Polluter Pays Principle” (PPP). The Fischler Reform pays particular attention to the enterprise audit and assigns a central role to regional services, which have to guarantee valid information for proper land management and respect of agreements required by CGO and GAEC. From this point of view, particular relevance is given to the knowledge of:

- the natural resources;
- the sustainable management of rural areas;
- monitoring and dissemination activities.

[4] Agenda 21 is a complete adoption plan to be realised at global, national and local levels by organisations of The State United Nations and by the Interest Groups, in every area where human activities generate impacts on the environment.

The main juridical base of reference for the realisation of the new rural development policies lies with regulation 1698 on rural development support by the European Agricultural Fund for Rural Development (EAFRD), in conjunction with the Regulation 1290/05 of the Council, concerning the common agricultural policy financing. The 2007-2013 plan primarily compares the principal priorities of the European Union, as indicated in the conclusions of the European Council of Lisbon and Goteborg, and tries to put them into practice through the new rural development policies.

Furthermore, the European Conference on Rural Development in Salzburg identifies some fundamental principles of rural development, as the importance of rural territory vivacity, the territory safeguard through multi functionality, the increase in competitiveness of the agricultural sector, the subsidiarity principle and the pursuit of the society general interests.

The European Council, with Regulation 1698/2005 on rural development indicates how the challenges of the future rural development policy are of economic, social and environmental order, in line with a focus on sustainable development, stating the need to operate on one hand in a sectoral perspective, and on the other hand on a territorial approach.

Regarding the Goteborg strategy, the European Council also states that the two CAP pillars contribute to sustainable development, through the promotion of food safety and product quality, as well as the organic production, use and production of renewable materials and biodiversity protection. Within the community strategic orientations of the Council it is also stated that the future rural development policy is focused on three main areas: the economy of agro-feeding production, the environment, and the population of the rural areas.

The strategic aims pursued through the rural development are summarised as follows:

- Agricultural, agro-feeding and forestry sector competitiveness;
- Environment and territory management;
- Diversification of the rural economy and quality of life in the rural zones.

The competitiveness axis includes all the measures directed at human and physical capital within agriculture and forestry, and high quality productions.

The environmental and land management axis comprises the measures aimed at natural resource management and strengthening; at the conservation of the agricultural activity and of forestry systems with high natural value; and of the cultural context in the rural area.

The diversification and quality of life axis aims instead to develop local infrastructure and human capital in the rural area to improve the creation of work in all sectors and promote the diversification of economic activities.

The Leader Axis is added to these three axes, based on a local approach to participatory rural development, confined so far to Leader Community Initiative, but potentially extending it to all the RDP measures.

In brief, future land use will have to meet different integrated needs: productive, protective and value adding of territory and landscape.

Soil and land evaluation offers a valid contribution for better environmental management and for the identification of valid territorial development strategies. To identify the specific potentials and the best development strategies for a specific area, while ensuring natural resource management, the landscape added value and the environmental sustainability of human activities, it is necessary carry out an integrated evaluation of the “land” (territorialisation and integration, Fischler Reform).The integrated evaluations are specific for every “Land Unit” (Land) and are based on multi criteria methods which examine the productive capacity in relation to usage (environment/cultivation interaction); the degree of sustainability which can be reached, measured through the three environmental, social and economic dimensions and the prospects of actual rural development.

2.2.4 The definition of land and soil

Soil is influenced by evolution and by formation processes (pedogenesis), which are determined by a group of factors such as climate, geological substrate, morphology, micro organisms, vegetation and human activity. The interdisciplinary study of the soil formation processes, involving climatology, geology, physics, chemistry, botany, agronomy, explains the differences among the soils for morphological, chemical, physical and biological characteristics. Therefore, the soil is a living body in continuous development composed of inorganic particles, organic substances, air and water, where the necessary biogeochemical cycles for the plants and the maintenance of all living beings occur. The high variability of the pedogenetic factors entails a high differentiation of the soils in time and space.

Soil assures a series of functions which are clear from an environmental, economic, social and cultural point of view and are indispensable for life. Soil is a vital resource subjected to increasing pressures which has to be protected to assure the sustainable development.

Therefore, soil protection policies have a particular importance to guarantee the sustainable management of agricultural soils for the protection of the soils' fertility. Knowledge on soil and soil management on an enterprise scale is of fundamental relevance for the definition of the most correct soil management strategies which have to maintain the balance between productive needs and conservation of the environment. Sustainable agriculture essentially means managing the soil resource while maintaining its fertility and production potentials, in balance with the ecosystem.

The term Land expresses a wider concept than the term soil. We can state that land is composed of a soil with a specific morphology and climatic situation. Land does not only refer to soil, but includes geology, morphology, climate, hydrology, vegetation and fauna, including insects and micro fauna with their diseases. These factors have influenced and have been influenced by the development of vegetal and animal life and allowed certain land use. The physical results of past human activity (forest cut, reclamations), the degradation provoked (erosion, vegetation degradation) are part of the definition of Land. The economic and social aspects, even though being considered in the assessment procedures, are not part of the concept "Land".

Soil knowledge at an enterprise level passes through the identification of the Enterprise Land Units (ELU), identifying plots that have the same kind of soil and the same crop rotations. Plots or plot portions belonging to the same ELU present the same soil use (rotation, mono succession, woody crops, meadows), a comparable level of fertility connected to the enterprise management. Thus an ELU includes several peat and non-peaty soils, plots where a systematic and repeated use of soil improvers has been applied and plots where this did not occur, as well as irrigated and non irrigated areas, soils with similar chemical or physicochemical properties (texture, permeability, pH, limestone), drainage (aquifer, drainage network) and topographic position (morphology, slope). Therefore, an ELU is a "homogeneous management unit at an enterprise level".

2.2.5 The definition of a management system

A management system" (MS) means the complex of components allowing to evaluate the management of the cultivated lands over time. The systems' components are cultivation, soil and other biota interacting with each other, subjected to a specific climatic situation and human interventions. Human interventions aim to produce a positive effect on the crops, the soil and the microclimate (irrigation), and favour one crop with respect to other vegetal and animal organisms coexisting on the same area (weeds, insects and pathogens).

To evaluate the complex problems occurring in real conditions over time, these components are often insufficient. For example, in the case of an application of new management models in a specific rural territory, even though they are valid from a technical and scientific point of view, they can prove to be less acceptable by the directly involved subjects. For a complete and integrated assessment of the management models adopted in a rural area, the

management system has include the verification of external factors, as agricultural policies, the market, socio-cultural factors, evolving available techniques, the change in the mentality of the persons living and acting inside or outside the system, and who determine or undergo the effects in different ways.

The factors identifying the different management systems can be divided into two groups:

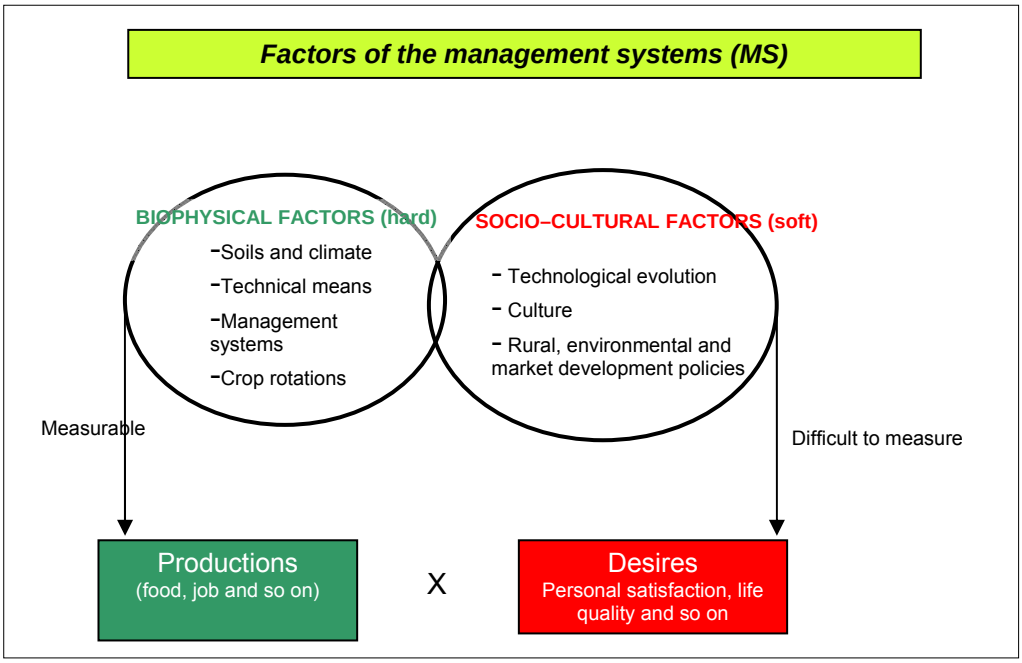
- measurable factors related to biological aspects (hard);
- factors related to socio-economic aspects, difficult to measure (soft).

The biophysical factors connected to the vegetative cycle are soil, climate, technical means, crop rotations and management system. The most relevant are crop rotations, tillage, chemical weeding, inorganic fertilisation and the use of organic soil improvers.

Socio-economic factors, for example technological developments, social and cultural aspects and market policies, from which personal satisfaction, quality of life and farmer status improvement expectations are derived, are hardly measurable and identifiable but influence the farmer choices and thus the effects of the adopted management systems.

Therefore, a Management System derived from an analysis carried out in a “SYSTEM” perspective points out the possible interactions among the various technical and biological components of the MS, guaranteeing the highest balance between productive results and conservation and thus contributes to the improvement of the natural resources.

Figure 2.1: Elements of a generic Management System



2.2.6 Agrarian management systems

The meaning of *agrarian management* refers to the individual farm business and comprises all the structural and organisational components that the entrepreneur brings into play to achieve the expected productive results respecting all the obligations assigned to him. In terms of adopted techniques and obtained productions, the management concept goes beyond the meaning of agricultural cultivation linked to the productive cycle of the cultivation in progress The management concerns the whole enterprise over a long period and within a precise territorial domain (land unit).

The assessments and the crop management choice, besides single cultivation techniques, take into consideration the technical programmes applied over the different plots (Enterprise Land Units, ELU), which over time have to guarantee the maintenance of the production potential, the conservation of the functional qualities of the natural resources (soil, water, air) and the progressive improvement of the environmental condition.

The agrarian management systems can be identified by the following principal components:

- structural endowment;
- organisational structure;
- adopted management systems.

The structural endowment includes the cultivated land surface; the present land improvement (road system, hydraulic-agrarian arrangements, availability of irrigation water and related distribution systems); the available equipment, machinery and labour.

The organisational structure is linked to land tenure: property or lease; the type of sale commercial organisation (transformation and direct sale, traditional primary production, sale of complementary services); the type of management: family, capitalist, through outside labour.

These extremely diversified factors inside the agricultural productive context of the Marche region, along with outside factors from the market and agrarian policy initiatives, result in a chosen and adopted management systems within the agricultural enterprise. It is possible to find highly varied cases: extremely specialised farms with only one or just a few Management Systems or situations aimed at the productive diversification with different management systems adopted (crop rotation, vineyard and olive grove).

2.3 Materials and methods

2.3.1 Materials used

The Soil Information System managed by the Soil Service of ASSAM provided the following information:

- environmental factors connected to the soil formation and development processes (geology, geomorphology, climate, vegetation, land uses and covers);
- the soils and their distribution on a regional scale: soil map, scale: 1:250,000;
- the main soil degradation threats in the Marche region (erosion risk, organic matter, compaction risk).

For the evaluations of the agricultural policy implementation, the AGEA data on enterprises benefiting from direct aid (CAP contribution, 1st pillar) have been used; and data concerning the agricultural enterprises which have taken advantage of the contribution of RDP 2000-2006 (2nd pillar).

The data collected for the activities of the SoCo project include statistical data taken from various sources (Istat, INEA, OAM, Regione Marche), from which further elaborations useful to the development of the analysis in a regional context have been derived.

The project activities also referred to the results which emerged from direct investigations, carried out by the technical staff involved in the project and by the questionnaires conducted for the Soco project.

2.3.2 Methods

The research aimed at the identification of:

- Definition of Homogeneous Areas;
- Correlation between Soil Types and Environmental Characteristics;
- Identification of the Management Systems of the Marche;

- Integrated Assessment of the agronomical techniques adopted in relation to the conservation practices and to the type of environment (Questionnaires 1 and 2);
- Assessment of the application of the policies through contributions (CAP and RDP) (Questionnaires 3 and 4);
- Development hypothesis of the current agricultural systems towards a “sustainable agriculture”;
- Suggestions on the future role of policies and the local and community institutions;
- Description of the political and institutional structure for the definition of soil protection policies and the definition of the intervention level;
- Classification of the current policies with direct or indirect implications on soil conservation at the different intervention levels (European, national, regional).

Geographical Information Systems (GIS) have been used to examine the geographical elements of the analysis. The context description and the evaluations were carried out based on statistical data and Rural Development Plan Evaluations as well as expert judgement.

For further support and assessment of the analysis carried out, interviews have been conducted on the basis of four questionnaires respectively addressed to:

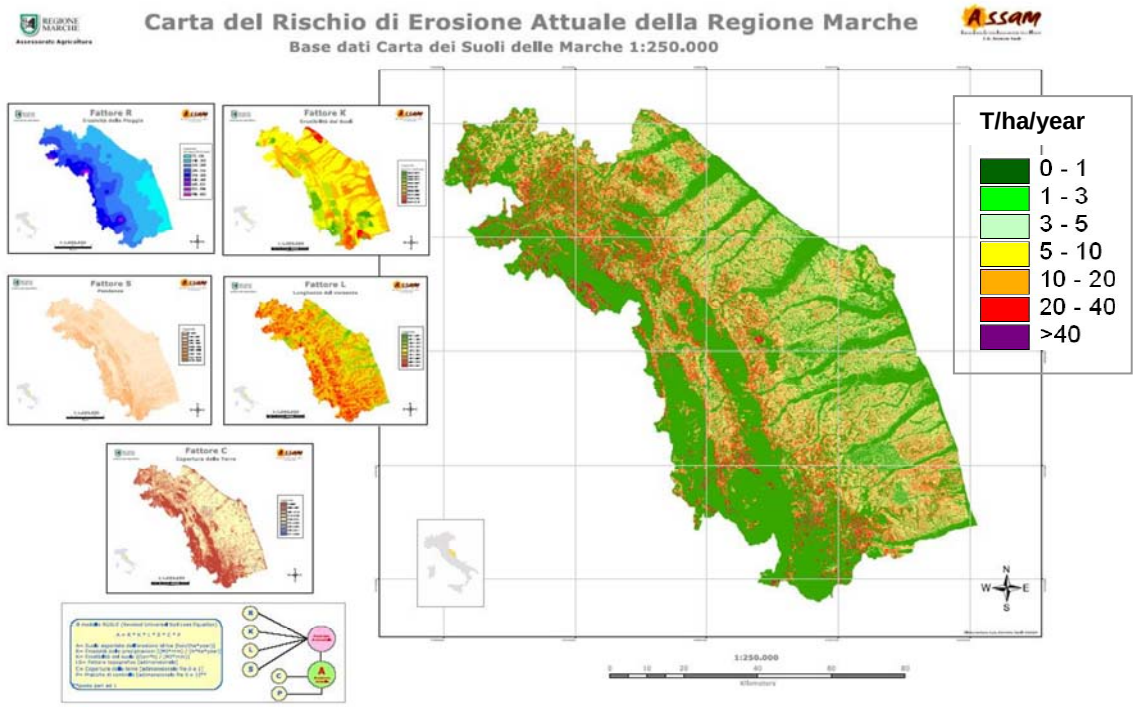
- Experts,
- Farmers,
- Administrative and governmental actors,
- Actors operating outside public bureaucracies.

3 Main soil degradation problems

The main soil degradation problems in the case study area are erosion, loss of soil organic matter (SOM) and soil compaction.

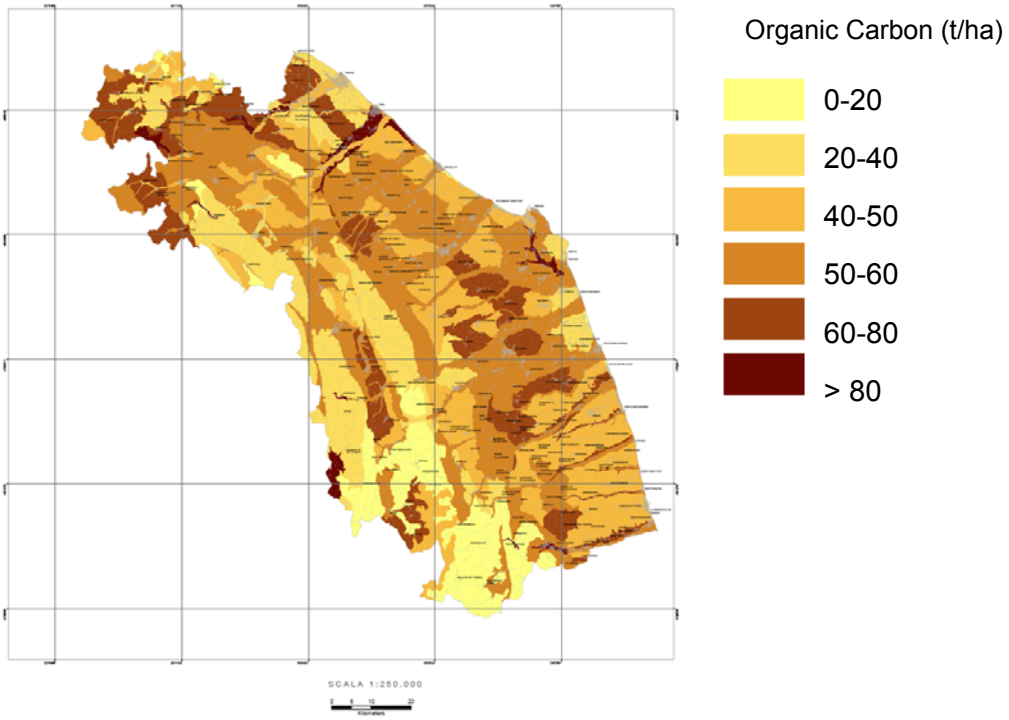
Erosion is a widespread problem in the hilly fields of the Marche, with off-site effects in the plains of suspended sediment in the rivers influencing the water quality. 30 % of agricultural area at risk of soil erosion Evidence of erosion is observed also in the plains, an increased amount of suspended sediment in the rivers.

Figure 3.1: Erosion risk map Marche region



Organic matter decline is a problem in hilly areas where fields previously occupied by cattle are abandoned, but even more in fields susceptible to accelerated erosion due to non conservation agricultural practices.

Figure 3.2: Organic Carbon distribution in the Marche region



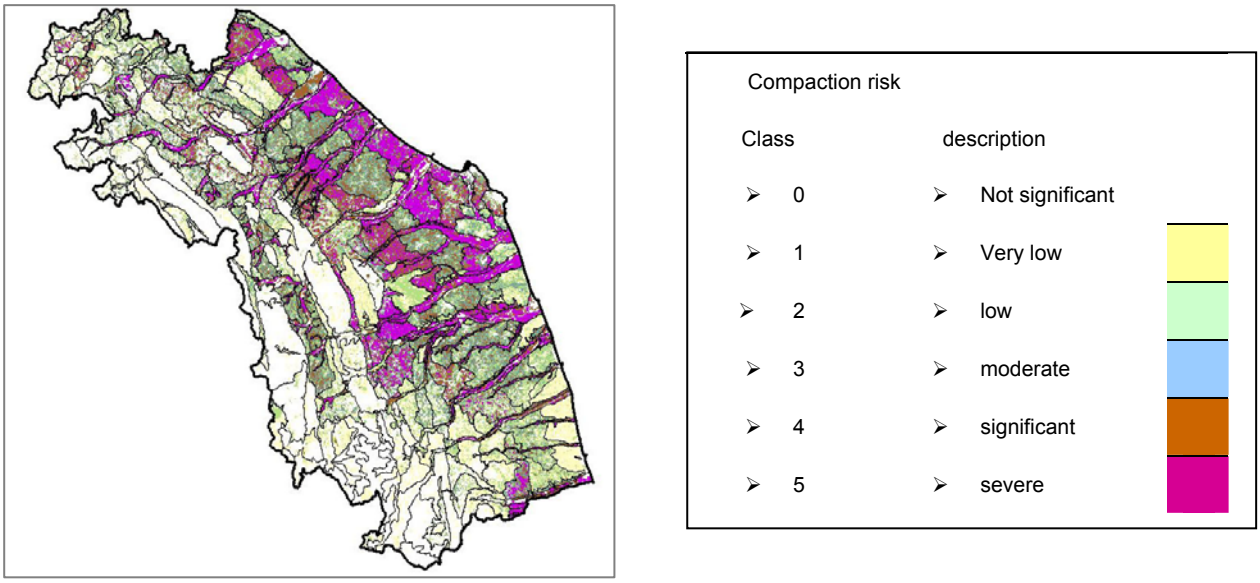
Soil compaction is considered to be strictly linked with agricultural activities even if is difficult to quantify both in terms of areas and magnitude. It is mainly caused by excessive pressure on soil due to agricultural machinery and induces greater strength to plant growth and resistance to roots, a decrease and alteration of porosity in the surface layers, with soil structure degradation. In addition, the compaction of soil influences other degradation processes such as erosion, through the run off, the dynamics of organic carbon and the hydrological parameters of the soil.

Especially dangerous is the compaction and loss of soil structure due to the tracks, between the rows, in the vineyard cultivated along the slope (rittochino). Under these conditions the run off is generally high and the erosion process can be destructive (gully erosion).

Another cause of compaction is, in some cases, the overgrazing, particularly when it occurs on arable land in the period following the cereal harvest after the passage of heavy harvester on soil that causing further compaction of the surface horizons.

It has to be mentioned also the sub soil compaction. This type of soil compaction is mainly related to the arable land when the soil is plough at the same deep for many years and a plough pan is formed. This type of compaction is particularly dangerous because represent the predisposing conditions for land slide processes.

Figure 3.3: Susceptibility to compaction in the Marche



The risk of soil degradation identified on the basis of expert knowledge and models used for determining their quality and quantity and their geographic distribution is confirmed by the results obtained from interviews with farmers and their perception of degradation processes (questionnaire No. 2), both in terms the magnitude and extent of soil degradation. For a more detailed description of the results cited see the Annex IV.

Table 3.1: Main soil degradation problems, causes and impacts

Problem	Cause	Impact
Erosion	Rainfall, runoff	Sedimentation (off-side effects) Soil loss – reduction in soil fertility
Organic carbon decline	Inappropriate cultivation practices (e.g. decreasing livestock number and manure application, inappropriate crop residues management)	Loss of soil structure and permeability, increase of run off, yield reduction
Compaction	Use of machinery on saturated fields Use of heavy machinery on vulnerable soil	Destruction soil structure, loss of air conductivity, reduction in water absorption capacity leading to a reduction in soil biodiversity and reduction in crop yield due to inability of crop roots to fully develop. Increased susceptibility to erosion due to a reduced infiltration rate increasing runoff

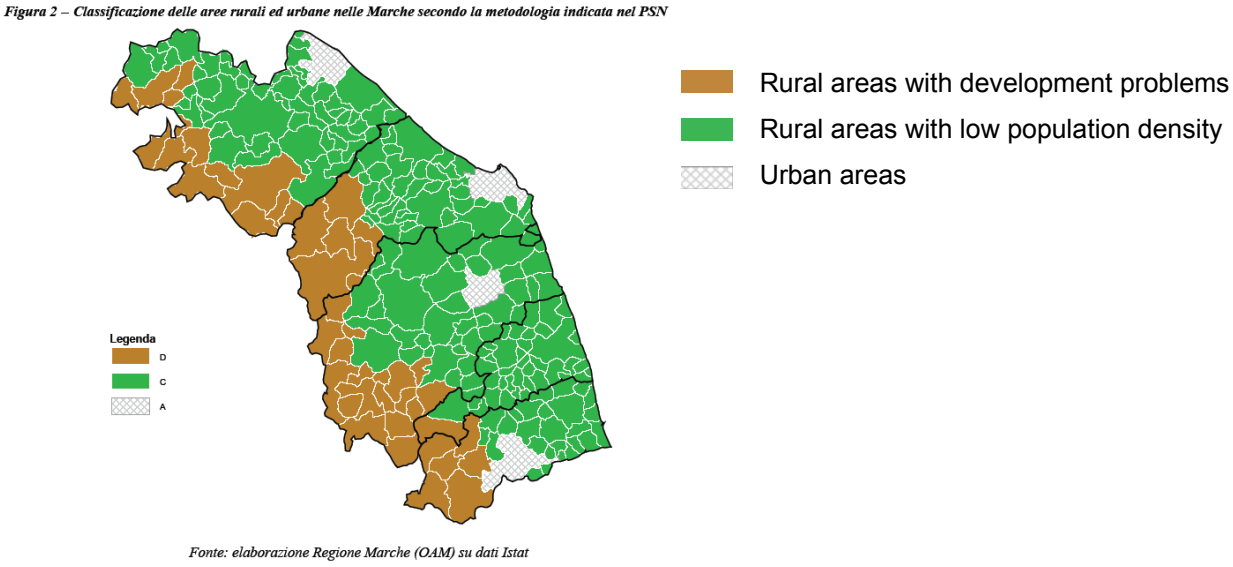
4 Agricultural practices and soil conservation

4.1 Rural character of Marche

4.1.1 Definition of "rural area"[5] of Marche

The Marche is considered to be a "significantly rural" area, according to the OECD's methodology for population density. All Marche provinces are within 15 % to 50 % of the parameter's reference value of 150 inhabitants per square kilometre. The result is reported at a community level in figure 4.1. As of its extreme simplicity, this area classification is not able to distinguish within Italian provinces, even though there are considerable differences both regarding social and economic aspects. Therefore, the OECD method has been reviewed at a national level adding the following adjustments: First, the principal province cities with more than 150 inhabitants per km^2 were selected and excluded from further elaborations aimed to pick out the different rural areas. At the regional level, the four regional capitals were excluded. Then the OECD method was applied to the remaining towns, selecting the areas (mainly urban, significantly rural and mostly rural) not at a provincial level, but looking at the landscape (relief) within each province. In the last stage, we cross checked the reviewed OECD areas with the three relief zones and the three Italian territorial districts (North, Centre, South) obtaining 36 types of areas, plus one concerning principle provincial cities.

Figure 4.1: Classification of urban and rural areas according to the OECD methodology



Source: elaboration by Regione Marche (OAM) on Istat data

[5] Definition of rural area: "*Rural area*" is defined by the European Union as the complex of areas extending "*through regions, natural and agricultural landscapes, forestry, small centres, industrial areas. It comprises a complex variety of economic and social activities involving agricultural enterprises, small and commercial activities and small and medium size enterprises. Environments rich in natural resources, habitats and cultural traditions where the recreational activities take an increasing importance … (EU Commission – DGVI, 1997)*.

Table 4.1: Typology of areas provided by PSN classification

Typology of national aggregation	Typology identified with adapted OECD method
A. Urban centres	1. Principal province cities > 150 inhab./km^2 2. Highly urbanised areas
B. Rural areas with specialised intensive agriculture	1. Urbanised rural areas in the 2. Urbanised rural areas in hilly areas 3. Predominantly rural areas in the plains 4. Significantly rural areas in the plains
C. Intermediate rural areas	1. Predominantly rural areas in hilly areas 2. Significantly rural areas in hilly areas 3. Significantly rural areas in hilly areas 4. Significantly rural areas in a mountainous area
D. Rural areas with complex development problems	1. Predominantly rural areas in a mountainous area 2. Predominantly rural areas in hilly areas 3. Significantly rural areas in a mountainous area

Applying the criteria established by the Rural Development Plan for the Marche region produced the zoning represented in the following thematic chart. According to this classification, rural areas with specialised intensive agriculture do not exist in the Marche, whereas the other types are present and correspond to principal province cities (area A), to Apennine towns (area D), the rest comprising mostly hilly zones (area C). The following table quantifies the area size in terms of population and surface, and the incidence with relation to the regional total.

Table 4.2: Towns, territorial surface and resident population and population per area

		Towns		Surface		Population		Density
Area	Type	number	%	km^2	%	thousands	%	Inhab./km^2
D	Rural with development problems	45	18 %	3,022	31 %	112	8 %	37
C	Intermediate rural	197	80 %	6,170	64 %	1,075	73 %	174
A	Urban areas	4	2 %	501	5 %	284	19 %	567
	Marche total	246	100 %	9,693	100 %	1,471	100 %	152

To support a larger modulation of the intervention strategies on the regional territory, we have divide area C (intermediate rural areas) further into three zones identified as follows:

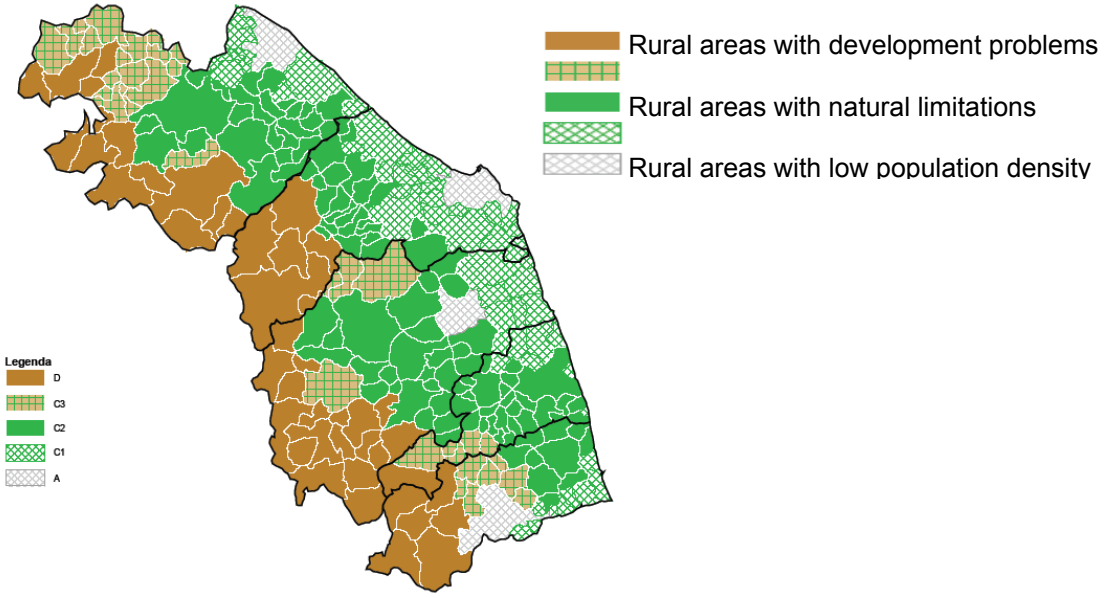
C1 – intermediate industrialised rural areas;
C2 – intermediate rural areas with a low population density;
C3 – intermediate rural areas with natural limitations.

The first two zones have been identified on the basis of two indicators:

- the proportion of rural areas within the town;
- the density of manufacturing industry.

The first was calculated as a percentage of affiliated towns counting less than 150 inhabitants per km² taking into account the entire territory of the town, using the general population census data of 2001.

Figure 4.2: Classification of the Marche region



Fonte: elaborazione Regione Marche (OAM) su dati ISTAT 2001

Source: Elaboration by Regione Marche (OAM) on Istat data

4.1.2 Socio-economic aspects

In a nationwide context, the Marche is a medium-small region both for extent and population. In 2004 (table 4.3) the population was around 2,500,000 and Ancona was the most populated province with the highest population density.

Table 4.3: Resident population and territorial surface per province

	Resident population (2004)		Average annual variation (2004/94)	Territorial surface		Population density	Per capita income[1] (2001)
	Number of inhabitants	%	%	Km²	%	Inhab./km²	Euro
Pesaro and Urbino	365,249	24.0	0.77	2,892	29.8	126	15,313
Ancona	461,345	30.4	0.50	1,940	20.0	238	15,753
Macerata	313,225	20.6	0.56	2,774	28.6	113	15,790
Ascoli Piceno	378,961	25.0	0.46	2,088	21.5	182	14,593
Marche	1,518,780	100	0.57	9,694	100	157	15,046

[1] Elaboration on Istat and Istituto Tagliacarne data

Source: Istat – Geodemo

The regional demographic dynamics, registered during the last decade, is the result of flows from internal areas of the coastal region. The population has grown in small towns around the urban centres and near the main road junctions between the motorway axis and the lines of communication along the main valleys. However, the most noticeable demographic phenomenon is ageing. In Marche life expectancy at birth is 78 years for men and 83.7 for women[6], these figures are among the highest at a national level. This lengthening of the average life span modified the demographic age class structure: from 1991 to 2001 the percentage of the population being under 24 years old decreased by more than 20 % against a 30 % growth of the percentage of persons being over 75 years old. These ongoing demographic changes are causing significant consequences on the regional socio-economic system.

The regional per capita income is slightly over a € 15,000 yr^{-1}, and this value places Marche below the average of Central Italy but above the national average. The economic activities are concentrated in the services sector which accounts for two-thirds of the regional added value (Table 4.4).

Table 4.4: GDP and added value to base prices

	Millions of Euros	%	Average annual variation in % (2003/93)[2]
GDP	33,462	-	2.4
Total added value [1]	31,049	100.0	2.4
- agriculture, forestry and fishing	728	2.3	-0.9
- industry	9,447	30.4	1.9
- services	20,874	67.2	2.9

[1] gross SIFIM (financial intermediation services indirectly measured)
Variation calculated on constant prices
Source: Elaboration on Istat data, Regional income statements, 2003

The GDP is growing rather quickly, with an average annual rate of over 2 %, driven by the tertiary sector and industry. Ultimately, agriculture is the only economic sector registering a negative variation on the basis of constant prices from 1993 to 2003, a dynamics which is in line with the national course. When including the food industries the percentage of added value reaches 5 % and has maintained, as opposed to the primary sector, its economic role in the regional economy. From the occupation point of view, the labour force ratio among economic sectors does not vary much; in fact 59 % of workers belong to services sector, 36.7 % to industry and slightly less than 4 % to agriculture (Istat, 2003).

- the regional agricultural sector

Agriculture plays a marginal role in the regional context under the economic and occupational profile, and its position is still further declining. Its presence in terms of managed surface is notably different. The UAA (used agricultural area) covers more than a half of the territory, a percentage which reaches nearly 80 % considering all farmland.

[6] Istat, Demographic indicators 2004

Table 4.5: Added value to base prices of agriculture, forestry and fisheries

	Agricultural added value (millions of Euros)	agr. AV/total AV (%)	AV/UAA[1]	AV/LU (local unit)
Pesaro and Urbino	141.6	2.1	1,030	26,222
Ancona	230.1	2.3	1,925	35,953
Macerata	180.9	3.1	1,242	24,120
Ascoli Piceno	226.9	3.1	2,205	25,211
Marche	779.5	2.6	1,542	27,544

[1]the UAA data refers to agricultural census of 2000
Source: Elaborations on Istat data, Occupation and added value in the provinces, 2002

Agricultural added value is distributed fairly uniformly among the four provinces (see table). The total added values indicate that the southern provinces (Macerata and Ascoli) are the most agricultural. In particular, the highest unitary productivity is found in Ascoli, with more than € 2,000 ha^{-1}. In fact, the agricultural productions with the highest regional unitary added value (fruit and vegetables) are concentrated along the coast and the main valleys of the Ascoli area.

Table 4.6: Agricultural work units

	Agricultural work units	agr. WU/tot. WU (%)	Annual average variation in % (2002/95)
Pesaro and Urbino	5,400	3.4	-37.5
Ancona	6,400	3.1	-38.7
Macerata	7,500	5.4	-33.4
Ascoli Piceno	9,000	5.5	-33.5
Marche	28,300	4.2	-35.7

Source: Elaborations on Istat data, Occupation and added value in the provinces, 2002

Ancona province has the highest productivity of the region, thanks to the high degree of agricultural mechanisation. It has the highest decrease in agricultural work units, which in 2002 constituted slightly more than 3 % of the total units, compared to 5.5 % in Ascoli Piceno. In general, the reduction in agricultural labour contributes to one third of AWUs (agricultural work units) from 1995 to 2002. This phenomenon has to be compared on the one hand with the constant reduction of the production (-18 % of farms during the period between the two last censuses) and on the other hand with the growing specialisation which leads to a reduction in labour.

Table 4.7: Production, intermediate consumptions and agricultural added value

	Millions of Euros	%	Annual average variation in % (2004/94)[1]
Agricultural crops	729	65.4	-1.9
- Herbaceous	*537*	*51.0*	*-1.4*
- Fodder	*66*	*5.8*	*-1.6*
- Woody	*126*	*8.6*	*1.1*
Breeding	327	28.3	0.8
Annex services	83	6.3	1.3
Gross total production	1,138	100.0	-1.0
Intermediate consumptions	517	39.5	-0.8
Added value to base prices	621	60.5	-1.2

Variation calculated on constant prices.
Source: Elaboration on Istat data, Regional income statements, 2004

The regional agricultural production (table 4.7) consists of more than 50 % of herbaceous crops and, among these, grain farming is most characteristic for the agriculture of the Marche. In the ‘70s and ‘80s mainly grain farming and animal husbandry was practised. Supported by community policies and by the general spread of family diversification tending to reduce the labour in agriculture to pursue other occupations, a specialisation occurred towards grain farming (durum wheat). Despite the strong decline in animal husbandry during last decades, breeding farms still contribute to more than one-fourth of gross total production, and in particular meat productions are regaining their position in comparison with the crisis of the ‘90s; while industrial poultry, rabbit and pig farms are undergoing a difficult period after the expansion that occurred during the ‘80s.

Even though regional agriculture loses its economic importance, it substantially retains its territorial importance, as shown by the modest UAA reduction with respect to the drop of the number of farms (table 4.8).

Table 4.8: Farms and relative agricultural surface used per province

	Farms (n.)	UAA (ha)	Farms (%)	UAA (%)	Farms (Annual average variation in % 2000/90)	UAA (Annual average variation in % 2000/90)
Pesaro and Urbino	13,909	137,531	23.0	27.2	-2.2	-0.9
Ancona	14,336	119,523	23.7	23.6	-2.1	-0.5
Macerata	14,326	145,651	23.7	28.8	-2.7	-0.7
Ascoli Piceno	17,838	102,906	29.5	20.4	-1.9	-1.1
Marche	60,409	505,611	100.0	100.0	-2.2	-0.8
Marche 2003[1]	55,582	512,378	-	-	-	-
- among which public bodies	45	21,083	-	-	-	-

[1] Istat, Struttura e produzione delle aziende agricole, 2003, Universo CE.
Source: Istat, Censimento dell'agricoltura 2000 e 1990, Universo CE

Table 4.9: Breeding farms (Public bodies excluded)

	Firms with breeding	Heads	Firms (Annual average variation in % 2003/90)	Heads (Annual average variation in % 2003/90)
Cattle[1]	3,432	72,504	-7.2	-3.7
Sheeps	3,458	221,254	-6.6	-0.1
Goats	622	7,733	-8.3	-3.8
Pigs	12,111	114,448	-6.5	-5.8
Avian	16,501	5,606,172	-8.2	-3.8

[1]In census of 1990 this data comprises buffalo calves.
Source: Data elaborated by Istat, Struttura e produzione delle aziende agricole, 2003; Istat, Censimento dell'agricoltura 1990, Universo CE

Animal husbandry is decreasing at a lower rate than the variation in the number of breeding farms. This differential is less dramatic for pigs. Pig and in particular avian breeding farms are important even under the industrial profile.

Table 4.10: Farms distribution and relative agricultural surface used for UAA classes

Farm size (ha)	Farms (n.)	UAA (ha)	Farms (%)	UAA (%)
<2	20,543	20,042	37.0	4.1
2-5	16,015	50,410	28.8	10.3
5-20	13,812	121,752	24.9	24.8
20-50	3,439	101,487	6.2	20.7
50-100	1,141	84,359	2.1	17.2
>100	587	113,244	1.1	23.1
Total (Public bodies excluded)	55,537	491,295	100.0	100.0
Public bodies	45	21,083	-	-
Total	55,582	512,378	-	-

Source: Data elaborated by Istat, Struttura e produzione delle aziende agricole, 2003 (Public bodies excluded)

Regional farms are generally small; 90 % of units comprise less than 20 hectares (table 4.10). However, these farms occupy less than 40 % of the agricultural surface, suggesting the important role big farms play in the primary sector. Under the surface management profile (table 4.11), 80 % is assigned to crops of which 40 % to cereals. It is followed by green fodder. Industrial and protein crops play a relevant role, especially sunflower and beetroot. Many business activities are connected to this crop including in the beet-sugar factory, currently shrinking due to the changes the specific common market organisation. There is a slight drop in viticulture but wine continues to be the main agricultural export product of the Marche. Olive oil is following close behind, but the area assigned and the amount produced is still too low. Pressure on land left fallow may rise as farmers will increasingly consider these as an income opportunity.

Table 4.11: Agricultural surface used for main cultivations (public bodies included)

	Surface (ha)	%	Annual average variation in % (2003/90)
Crops	414,181	80.8	-0.2
- Cereals	*219,851*	*42.9*	*-0.2*
- Industrial and protein crops	*72,414*	*14.1*	*n.a.*
- Garden crops and potato	*7,685*	*1.5*	*-2.4*
- Rotation crops	*99,881*	*19.5*	*-0.3*
- Other crops	*3,120*	*0.6*	*n.a.*
- Fallow	*11,230*	*2.2*	*n.a.*
of which Public bodies	*5,324*	*1.0*	*n.a.*
Woody cultivations	34,274	6.7	-0.9
- Vine	*23,455*	*4.6*	*-0.9*
- Olive three	*6,626*	*1.3*	*0.6*
- Fruit	*2,444*	*0.5*	*-5.9*
- Other woody cultivation	*1,750*	*0.3*	*n.a.*
of which Public bodies	*161*	*0.0*	*n.a.*
Permanent grassland and pastures	63,923	12.5	-1.6
of which Public bodies	*15,598*	*3.0*	*n.a.*
Total (public bodies excluded)	491,295	95.9	*n.a.*
Public bodies	21,083	4.1	*n.a.*
General total	512,378	100.0	-0.5

Source: Data elaborated by Istat, Struttura e produzione delle aziende agricole, 2003; Istat, Censimento dell'agricoltura 1990, Universo CE

There is an evident drop in fruit, garden crops and pastures sector. Farm restructuring has favoured mechanisation reducing labour and costs. This phenomenon ignores the potential development of irrigated crops. Farmers seem to be wary of taking risks and without a strong incentive from public resources no investments will be made for the expansion of irrigated agriculture. The infrastructure needed for irrigation sets limits for the location of irrigation agriculture while the competition from the non agrarian sectors for the fertile soils near water sources has in fact moved crops away from the coast and the main rivers. The drop in perennial crops is connected to a reduction of the farms based in the Apennines.

The classification on the basis of technical-economic orientation and economic size (Table 4.12), allows evaluating the degree of specialisation in relation to their potential to produce income rather than investments in resources.

Table 4.12: Farms and UAAs on the basis of technical and economic orientation and of UDE1 (economic dimension unit) classes (public bodies excluded)

	Farms (n.)	UAAs (ha)	Farms (%)	UAAs (%)
Technical and economic orientation				
crops	33,573	328,691	55.8	65.1
Fruit, vegetables and flowers	603	2,510	1.0	0.5
Permanent crops	9,268	27,652	15.4	5.5
Herbivores	3,288	60,606	5.5	12.0
multi cropping	10,468	52,708	17.4	10.4
Mixed livestock production	583	3,336	1.0	0.7
Cultivations and livestock	2,404	29,456	4.0	5.8
UDE classes:				
<4 UDE	36,543	79,503	60.7	15.7
4-16	17,176	148,169	28.5	29.3
16-40	4,437	108,084	7.4	21.4
>40	2,031	169,257	3.4	33.5
Total	60,187	505,013	100.0	100.0

[1] 1 UDE = 1,200 euro.
Source: Data elaborated by Istat, Struttura e produzione delle aziende agricole, 2003

The TEO (technical and economic orientation) shows most farms (>80 %) are specialised and less than a quarter of all farms practise mixed farming. Among the specialised orientations the role of crops is important, and among the mixed farms multi cropping. Also the percentage of “crops and livestock” is significant, indicating that the link between animal husbandry and agriculture has not completely disappeared.

Over 60 % of farms do not exceed € 4,800 yr^{-1} as standard gross margin (SGM) and this value increases the evidence of the modest rate of agricultural entrepreneurship, when considering agriculture as an activity with a principal economic aim. However, three-quarters of UAA can be attributed to greater productive units, and in particular one-third to farms with more than 48,000 of SGM. Big farms are set to increase as small farms will be taken out of production by ageing farmers.

4.2 Management Systems

4.2.1 Historical Management Systems in Marche region

As well known local environmental conditions influence social and economic development and the distribution of certain agricultural crops. The climatic characteristics, soil with high levels of fertility and geomorphological structure has over time influenced the crop development in the Marche.

Present situation

In the coastal area and along the river valleys more intensive management systems are applied with the horticultural crops and rotation cereal-industrial crops. Where irrigation is possible horticulture and field corn are much more developed. Viticulture is concentrated near the coastal hills. Orchards, uncommon in the region, are concentrated in some valleys of the south, particularly in the Val d'Aso an area suitable for flower and garden plant production.

The morphology of the Marches is represented by multiple parameters like elevation above sea level, slope and exposure of the slopes; geo-lithology has directly influenced cultivation method. The *agrarian arrangement and hydrographical government*, so-called "rittochino", that the farmers of Marche region have been able to apply and refine, is unique in the world and an example on how to reconcile the need to cultivate in the direction of maximum slope combined with the rainwater control while maintaining the stability of slopes with medium high steepness and presence of clayey soil. The highly diversified characteristics of the Marche have required the development of diverse crops, agricultural techniques and agricultural products. This has affected the dynamic relationship between the environment and the needs of crops. Also the social and economic needs of the community have lead to a greater differentiation of crops and a higher level of environmental sustainability.

From the 50’s

With the historical period identified by sharecropping (mezzadria), based on local economy often aimed at food needs of the family, the system has brought advantages for the improvement of soil quality, conservation of biodiversity, construction and enhancement of the rural landscape. In this period, ending in the early 50 'and preceding the of “agricultural industrialisation ”, the inclusion of fodder in the crop rotation has led to an increase of livestock and consequently an increase in availability of manure that ensures improved nutrient availability for crops and improves the functions and quality of soil and of the environment in general.

Given the improved production results achieved, farmers are beginning to differentiate the method of cultivation according to different crops. In the case of spring crops and alfalfa the soil is treated with a deep animal drawn plough (Santilocchi, 2007) with the aim of improving the root depth. For cereals the autumn winter ploughing cycle is more superficial.

Mid 60’s onwards

Since the retraction of the sharecropping (mezzadria) in the mid-60’s and the development of small farms, in property and rented, the market transformation was increasingly influenced by National and European policies, (the European Common Market came into existence). The initiation of “agricultural industrialisation was the starting process of profound transformation of the adopted management systems that very quickly lead to radical changes in the management of agricultural businesses with adverse effects on the conservation of natural resources.

The progressive crisis, the lack of manure and the reduction of fodder production lead to the abandonment of the rules applied in the crop rotation. These rules were replaced by the possibilities offered by new technologies promptly made available to farmers (machinery, mineral fertilizers, improved varieties, pesticides, herbicides, etc.). The availability of tractors with increasing power, the availability of tools capable of performing heavy work, and the relatively low cost of fuel encouraged farmers to increasingly plough deeply and repeatedly working for seedbed preparation without carefully evaluating the agronomic effects obtained and the needs of the crops grown. The rapid spread of mechanisation was encouraged by the move of agricultural labourers to the cities and industrial activities, the availability of ever more efficient machines. Weed and pest control, in the past dealt with through agronomic methods (rotation, etc.), was then made easier with greater availability of herbicides and pesticides. The creation of a union with higher internal market prices of agricultural products than the international market has encouraged more productive crops regardless of the cost

of production. The objective of having internal food for EU and the avoidance of surpluses has lead development of some crops at the expense of others.

These extremely fast processes lead to a gradual simplification of the crops system and a gradual increase in the use of chemicals that soon highlighted the negative effects on the conservation of resources:

- Loss of soil fertility,
- Contamination of groundwater and soil,
- Loss of biodiversity,
- Degradation of the countryside,
- Strong reduction in agricultural income as a result of increased prices of technical instruments and, on the other hand, the reduction of prices of agricultural products on international market.

The 90's

In more recent times during 1991-2000 the agriculture of Marche still faced profound changes that affect agricultural production and cultivation system. Labour extensive farming becomes an increasingly evident phenomenon although the area dedicated to it is small (Sotte, 2004). The area still devoted to agriculture in the Marche Region maintains a significantly higher level than the national average.

The main characteristics of the agriculture of recent years can be summarized as follows:

- more difficult to produce income;
- strong outflow of labour to other activities;
- level of mechanisation very high;
- increase of labour extensive farming (1970: 49 working days per year; 2000: 13 working days per year)
- high use of agricultural soils (UAA/total surface 52 % Marche, Italy 44 %)

Source: INEA data source, Istat

The socio-economic dynamics of agriculture brought an end to the cereal-livestock management system of sharecropping (mezzadria), is characterized by a strong specialisation towards commodities (crops: cereals, industrial crops like sugar beet and oilseeds such as sunflower). Cattle breeding declined from 419,000 in 1970 to 79,000 in 2000 (- 81 %). Breeding farms rose from 55,000 (1970) to 5,300 (2000). The ratio of fodder crops/cereals (indicator of cereal/livestock management system and adopting of crop rotation) fell from 80.7 % (1970) to 27.9 % (2000). A more specialized agriculture with the increase in commodities (wheat and other cereals, beet sugar and oil), the emergence of "industrialized agriculture" integrated to the commercial-industrial system are practised alongside traditional agriculture and quality production (wine, oil, fruits, vegetables) which loses weight in terms of land occupied but records improvements in terms of added value.

The development of the "industrialized agriculture" is mainly concentrated around Ancona, Macerata, Senigallia and Fano.

The reason of arable land being developed under "industrialized agriculture" without doubt lies with the Common Agricultural Policy (CAP) that, through the support of market and compensation payments, has pushed the farmers towards the production of commodities. The production is mainly related to wheat, sugar beet and, for some periods, sunflower and sorghum. In the plains and valleys the cereal-livestock system management is replaced by intensive horticulture.

The attention of farmers moved toward "cultivation systems" which are less demanding, easy to manage, highly mechanized and with low demand for labour. During this period "outsourcing" became popular, with by increasing numbers of companies using highly specialised technology i.e. harvesting). This particular type of companies gradually tend to take over even the simplest operations such as ploughing, until the complete management of the land on behalf of the owner is in their hands, which is de facto a different type of lease.

The replacement of labour with machines was certainly encouraged by incentives to purchase and use machines and fuel. In general, at this stage, a defeatist attitude of farmers prevails in the face of growing difficulties of the agricultural market, on one side, and, on the other side, the consolidated benefits related to agricultural policies. In such situation, the farmer even if fully disengaged from the agricultural activities, is able to obtain consistent benefit for which he doesn't need neither initiative nor efforts and tends to gradually lose his ability to conduct business and work. This phenomenon leads to artificially high land values and hence rents, further contributing to hinder new generations from succeeding aging farmers. For a young farmer is increasingly difficult to start a new business due to the high start-up costs. The price of land is determined not only by future income but also by current and potential privileges: direct payments, premiums and CAP contributions, fuel facilities, tax exemptions.

The typical and quality products are an exception to the above mentioned situation even if such type of productions has little importance in terms of area occupied compared to the rest of the agricultural production. Quality agriculture, such as wine and oil, has shown more growth and specialisation. These productions have been integrated and developed with a strong link with the food industry.

The cattle, pig, sheep and goat industry have been able to maintain relations with the production of forage and the processing of food products and quality. Advanced experiments have been carried out in cereal quality production related to the processing and distribution (bread and pasta).

The areas that produce quality products as wine and olive oil are mainly concentrated in the Ascoli province, Castelli di Jesi (Verdicchio dei Castelli di Jesi – wine) and part in Pesaro province.

In addiction to the quality agricultural products additional services have been put in place. The new concept is that the agriculture begins to become "multifunctional" and the innovative services are part of this transformation process: e.g. farms show a strong growth compared to other Italian regions (171 firms in 1988, 379 firms in 1999). Some measures are put in place for the protection of some products that require the use of agricultural eco-sustainable techniques. In this context the area used for organic farming increased from 3,426 ha in 1993 to 32,423 ha in 1999. Organic farming still remains a minority over the total of the agricultural sector and it represents 15-25 % of GDP derived from agriculture and 10-15 % of UAA.

The High Mountain area and foothills is the most problematic in terms of socio economic aspects, the area is characterized by permanent crops and grassland and are more susceptible to marginalisation and abandonment due to lack of succession.

Organisational structure of Marche agriculture

To better understand the processes in the agricultural sector of the Marche, it is necessary to refer to the organisational structure of the agricultural sector. Many farms in Marche region are small and can not be classified as "professional farms"; on the other hand, a limited concentration of farms classified as "professional" occupy 44 % of UAA. From an organisational structure point of view the most significant process is the lack of succession of aging farmers. The farmers above 55 years account for 55 % compared to 3.4 % of young farmers aged below 35 years.

Maintaining these few young farmers in the area will be one of the key issues for rural development and agricultural policies of the Marche.

Agri-environmental measures

The transformation of agriculture to more environmentally friendly agriculture was mainly driven by the agri-environmental measures accompanying the CAP (EEC Reg 2078/92). These represent a real and significant step towards reducing the impact of agriculture on natural resources. The adopted measures (on a voluntary basis) have introduced new systems of cultivation and breeding, measures for the care of abandoned land, infrastructure

and public education activities. The recipient of such measures, the farmer, has been interpreted as a "target" on which to transfer technical knowledge and scientific decisions taken by the institutions through incentives and bans.

Analysis performed on the results achieved with the agri-environmental measures in Marche region highlighted many weaknesses (Toderi, 2003). Difficulties in implementing this regulation in other EU countries have launched a process of thorough review of agri-environment measures at European level. One of the main obstacles to achieving the targets was the communication difficulties between researchers, political and government, agricultural organisations and farmers. The lack of communication has not allowed a timely planning and coordination of protocols for certified production. Agri-environmental measures have been an important factor in raising the awareness of farmers on agri-environmental problems especially in areas where the application of the measures was based on landscape, i.e. relief (Toderi, 2003). In these areas the implementation of the regulation has introduced significant changes in the agronomic practices and in particular fertilisation.

On the path of the CAP reform process there was a central role in promoting sustainable development of rural areas (Cork Declaration - European Conference on Rural Development, Cork, Ireland 1996). With the "Agenda 2000" EU stated clearly the choice of converting the traditional agricultural policies towards policies of "integrated rural development" in which the distinction between the various productive sectors (agriculture, industry and services) is not anymore clearly defined promoting the “multifunctionality of agriculture” and the rural area. The crucial role farmers play for environmental protection and natural resources is also officially recognized.

Agenda 2000 is made operational by various regulations as well as control systems, through monitoring and evaluation of achieving environmental conservation targets, on the programs carried out.

Incorporating and interpreting European recommendations at national and regional level brought incentives into the rural development program to encourage low environmental impact farming practices and restore elements of ecological stability. In the mean time more suited planning tools are proposed for the integrated use of resources and the construction of a rational system of land management.

The introduction of Rural Development Plans (2000) is based on greater attention to evaluation, tying the funding system to the implementation of specific measures and monitoring the attainment of objectives.

At the stage of "post-industrial rurality" (Sotte, 2004) the agriculture of the Marche region is focused on the rediscovery of the traditional cereals-livestock system management of sharecropping (mezzadria) and assessed the benefits for environment and base its development strategies on differentiation of production and the relationship between the originality and territory. From the history of rural areas the farmers rediscovered abandoned crops (grain legumes such as peas, lentils, chickpea, etc.) or tried to introduce new crops (Short Rotation Forestry –SRF -, new plants, etc.).

One of the weaknesses revealed in the course of implementing the RDP is the lack of overall territorial vision and the application of measures, given the voluntary incentives to individual farmers left without any guidance or coordination by the Regional and Provincial institutions who could have facilitated the implementation of actions in line with the specific problems (Mennella and Monconi, 2006).

EU program LEADER promotes integrated development strategies for rural areas aimed at improving the quality of life in rural areas, exploitation of local products, the facilitation of access to markets for small production facilities, exploitation of natural resources and cultural sites including the Site of Community interest (SCI). To date, despite the monitoring activities and assessments made, is not yet possible to assess the actual validity of the actions taken because the effects on sustainable development processes require a very long time.

The goals of "integration" and "territoriality" of agricultural policy interventions lead the process of reforming the Common Agricultural Policy towards an ever more obvious synergy and complementarity between direct income support, rural development and environmental issues. The CAP reform (Reg. EC 1782/03), marks the implementation of the new CAP reform (Reform Fischler, 2003) and introduces this new historical context on previous reforms on funding, environmental protection, animal welfare , public health and providing for the identification and registration of animals reared.

CAP reform

The new reform of the CAP is structured on two main pillars which provide the "market support" (1st pillar) and aid for the "rural development" (2nd pillar). The first, covering income support provides the payment of a "premium" behind the recruitment of specific commitments by agriculture and substantially enhances good agricultural management. The second, representing the incentive for development and competitiveness, offers investment opportunities that ensure integrated development of rural areas, environmental protection, sustainable use of land, the skills of employees. Strengthening the second pillar (rural development), together with "decoupling", "cross compliance" and "modulation" constitute essential elements of the new Common Agricultural Policy.

Rural Development Program

The new programming for Rural Development (RDP 2007-2013) is designed to achieve three main objectives: improving the competitiveness of agriculture and forestry through support for restructuring, development and innovation (Priority 1), improving the environment and countryside (Priority 2), improving the quality of life in rural areas and encouraging diversification of the rural economy (Priority 3), building local capacity for employment and diversification (Priority 4), ensuring consistency in programming (Priority 5), complementarity between Community instrument (Priority 6). Priority 2 provides investment in knowledge of natural resources with a view to being more effective in the protection and promotion of environment, for the protection and development of environmental friendly agro-forestry in addition to the protection of the countryside."

Cross compliance (1st pillar of CAP) is implemented at the national level through the Ministerial Decrees and applied locally by the Regional Council Resolutions. Cross compliance is defined by two sets of rules that farmers need to respect to receive direct payments.

The first group represented by the so-called Statutory Management Requirements (SMRs) provides that payments be based on respect of "18 Acts", resulting from regulations and directives covering the fields of the environment, public, plant and animal health, animal welfare.

The second group, represented by the Good Agricultural and Environmental Conditions (GAEC), stipulates method of management of agricultural land and soil aimed at preserving natural resources with particular reference to soil.

The CAP reform process emphasising strengthening of the integration of environmental objectives with economic and social factors, lead polluter pays principle (PPP, see also Directive 2004/35/EC on Environmental Liability). In this regard, the Fischler Reform pays particular attention to business consultancy (Audit Company) and assigns a central role to regional services that must ensure that knowledge support for the proper land management and respect SMR and GAEC commitments.

Knowledge of natural resources and its evolution processes, sustainable management of rural areas, development of monitoring activities and dissemination of information (reporting) is extremely important.

The mentioned Directives and Regulations in application of EU agricultural policies strengthen the strategies and actions undertaken by the Marche Region for the development of typical and quality agriculture and application of production techniques that increase the environment protection. Despite the considerable progress made in this direction, production of high quality products linked to territory and specific technical disciplinary for production still occupies a limited percentage of UAA. The application of the cross compliance rules, introduced in 2005 with the Fischler Reform, was able to highlight that in the Marche region the process of industrialisation and extensification of agriculture is less relevant compared to the national level.

This result may reflect the cultural legacy of sharecropping (mezzadria) and the small farms structure. This structure is rich in cultural and social traditions of the family's farmer attributing great value to the land property that must be preserved for future generations that should be given the same socio-economic chances of today.

Another factor that certainly has mitigated the negative effects brought by "agricultural industrialisation" is the geomorphological and environmental conditions, like the microclimate, of Marche region, which require the maintenance of proper hydrological conditions, a division of the fields compatible with the slope and exposure, the adoption of appropriate agricultural techniques, the use of specific machines depending on the morphology of the hills.

The specific territory of the Marche could be skilfully exploited by an even more precise application of the rules of cross compliance. The development of agricultural techniques related to such legislation would lead indirectly to demonstrate how the "commodities" could be considered as typical product of quality. The cultivation of wheat for the production of pasta, wheat for bread making, milk for dairy products are increasingly linked to the territory of the original production (Marini, 2004).

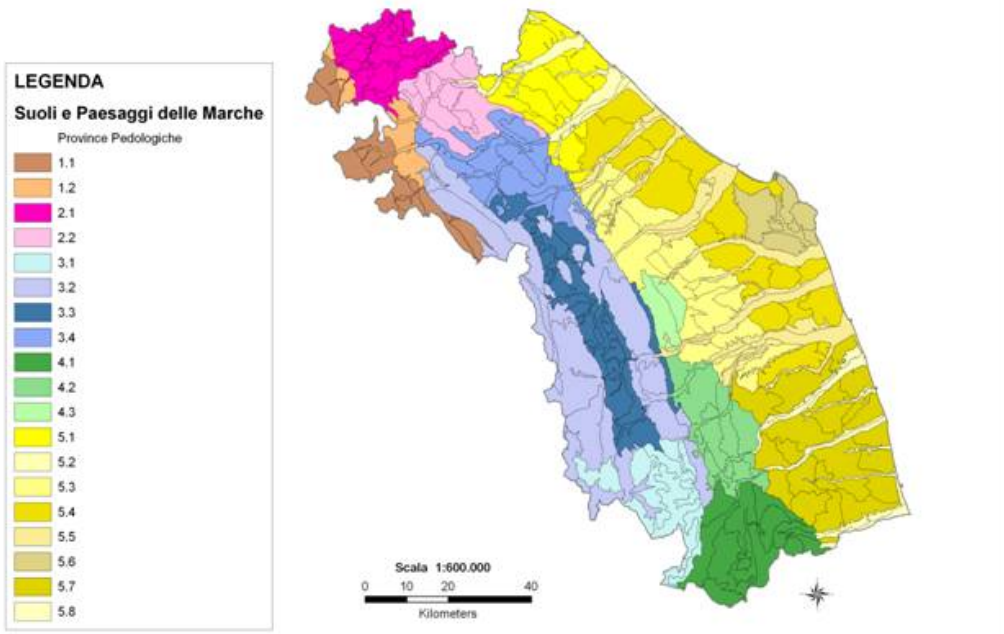
4.2.2 Homogeneous areas in relation to the development of Management Systems adapted to the conditions in the Marche region

The study and knowledge of the physical environment constitutes the essential conditions for sustainable use of local resources and farms.

The definition of management systems is closely tied to what the French authors define with the term "Terroir". The meaning of "Terroir" is the integration of environmental characteristics of an area with a particular crop. From the link between environment and crops it is possible to obtain products with high quality and specificity for a single "terroir". The current methodology for determining these relationships, with differentiation and delineation of the territories, is based on a thorough knowledge of the parameters that characterize the environment, like soil, climate and microclimate, in which cultivation is carried out. The above factors, combined with the specific needs of crops and cultivation techniques, ensure the achievement of high production qualities.

Soil is a natural body derived from a long process of genesis that led to the development and characteristics in relation to environmental factors that act differently in every point on the surface. The knowledge of soils essentially is the knowledge of various factors that contribute to soil formation and evolution. Climate, lithology, geomorphology, hydrology, vegetation, fauna and human activity are generally considered the main soil formation (pedogenetic) factors. The study of the formation processes of soils has an interdisciplinary approach (climatology, geology, physics, chemistry, botany, agronomy, etc.) that explains the differences between soils according to the morphological, chemical, physical and biological differences. In mapping soil has been recognized the close link between types of soils, the soil formation factors and landscape characteristics (geomorphology, vegetation, geolithology, parent material, etc.).

Figure 4.3: Soil and landscape map of Marche region (1:250,000)

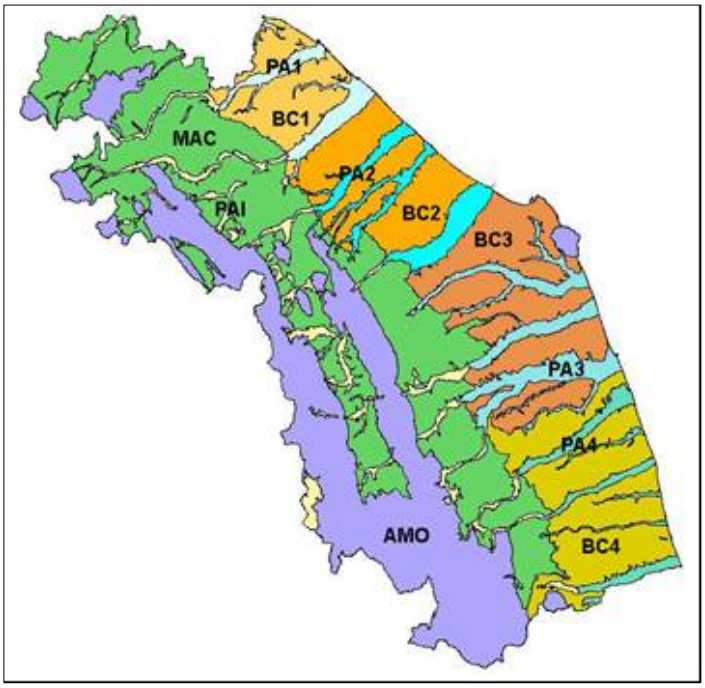


Activities such as agro-forestry and pasture are acquiring new purpose and function, which exceed the simply productive aspects. More attention is paid to "how to produce" compared to that "what is produced." The management of farmland and forestry and their production processes must also be adapted for the purpose of environmental protection and for the protection and enhancement of the rural landscape: it falls under the “activities that produce landscape." The use and management of the land must meet the requirements of production needs, protection and enhancement of the landscape. With the support of data available in the Soil Information System (SIS), managed by the Regional Service Soils-ASSAM, according to "landscape map unit" and the most representative soil type inside the Homogeneous Areas (HA) are identified. The HA have influenced the development of Management Systems adopted nowadays.

4.2.3 Homogeneous areas

There are 11 homogeneous areas in the Marche, with a view to defining and address the land management adapted to specific characters of different regional landscapes. Geomorphology and elevation are the criteria that allow the definition of relationship between landscape and distribution of Management System. The boundaries of HA are the limits of landscapes.

Figure 4.4: Distribution of Homogeneous Area of Marche region



Code in the map	Relation with Homogeneous area
PA1	PA_FM
BC1	BC_FM
PA 2	PA_CE
BC2	BC_CE
PA3	PA_MCe
BC3	BC_MCe
PA4	PA_TT
BC4	BC_TT
MAC	MAC
PAI	PAI
AMO	AM

Table 4.13: Homogeneous areas of the Marche

	Homogenous area	**Area Km^2**	**abbreviation**	**% surface/ total surface**
1	High Mountains	2,350.56	AM	24.16
2	Medium High Hills	2,817.25	MAC	28.96
3	Pianure Interne	419.44	PAI	4.31
4	Low Hills between Foglia and Metauro	426.56	BC_FM	4.39
5	Coastal Alluvial Plains between Foglia and Metauro	181.42	PA_FM	1.87
6	Low Hills between Cesano and Esino	675.46	BC_CE	6.94
7	Internal Alluvial Plains between Cesano and Esino	279.67	PA_CE	2.88
8	Low Hills between Musone and Chienti	984.19	BC_MCe	10.12
9	Coastal Alluvial Plains between Musone and Chienti	406.32	PA_MCe	4.18
10	Low Hills between Tenna and Tronto	983.16	BC_TT	10.11
11	Internal Alluvial Plains between Tenna and Tronto	203.14	PA_TT	2.09
	Total	*9,727.17*		100

4.2.4 Definition of Management Systems

As mentioned before, the "Management Systems" represent a concept for the multi-annual analysis of sustainable management of a territory. The identification of Management Systems typical for the Marche region does not take into account the individual crops with their production techniques but the crops and their sequence in time, the crop rotation concept. For every type of crop rotation technical practices are associated. The identification of a MANAGEMENT SYSTEM is derived from an analysis conducted in a perspective of "SYSTEM" in order to highlight the possible interactions between different components of the environment and techniques and ensure the balance between production, conservation and improvement of natural resources.

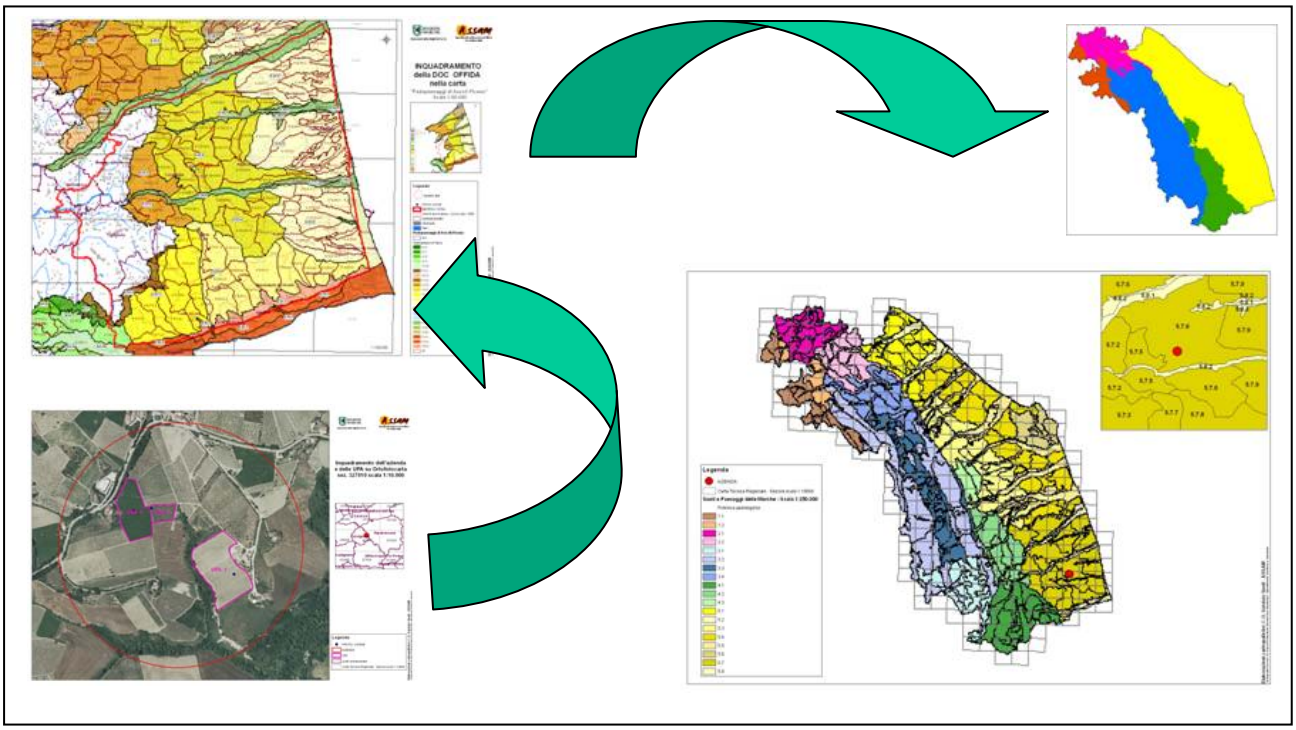
The factors considered for identifying the various management systems can be summarized in two groups:

- measurable aspects relating to the biophysical condition,
- hardly measurable aspects related to socio economic condition.

Soil, climate, growing season, technical factors and crop rotation are the factors associated with the biophysical environment. Among these factors crop rotation, tillage, chemical weeding control and fertilisation (organic and chemical) are undoubtedly more important. Evaluations, needed to integrate the various Management Systems, referred to a specific site and the specific environment where the Management System is applied. The knowledge of soils and their distribution, even at farm level, is crucial for the establishment of more accurate strategies for soil management that must maintain the best balance between production and conservation. Sustainable agriculture means in essence managing the soil resources, "maintaining unchanged potential fertility and productivity in balance with the ecosystem". A soil may be suitable for a crop and not be for another, some use can be harmful to the genesis of the soil another can keep the original fertility unchanged. As a general principle it is possible to assume that the more human activities do not disturb the natural processes of development of a "land" and are according to its suitability, the higher are the possibility to preserve and improve the quality and functions of a specific area.

The term "Terre" (Land) is a wider concept than the soil. We can say that a "land" is a soil in a given position with a certain morphological and climatic situation. "Land" does not refer only to the ground but to the main features of the site: geology, geomorphology, climate, hydrology, vegetation and wildlife including insects and micro fauna (Giordano, 2001). Through the same concepts, at farm level is possible to identify "Land" as "Land Management Unit" (LMU) identifying parcels with the same type of soil, the same crop rotation. Parcels or portions of plots that belong to the same LMU have the same type of land use, a comparable level of fertility related to management, similar physical-chemical or chemical (texture, permeability, pH, etc.), drainage (groundwater, drainage network), position (geomorphology, slope). A LMU is, therefore, a "homogeneous unit management at farm scale". Significant differences in one of the characters mentioned above should suggest identifying different LMUs in the same farm. The LMU represents the smallest elements of analysis. It will be exactly at this level that the implementation of policies and their effectiveness or ineffectiveness is evident. Even in the LMU evaluation conservation practices are a fundamental element. The analysis and evaluations have been conducted with a continuum upscale and downscale as shown in next figure. The results have been then aggregated and highlighted at the level of Management Systems and Homogeneous Areas.

Figure 4.5: Example of upscaling LMU to Management System and Homogeneous Area



Biophysical Factors

The biophysical factors are directly related to obtaining production. It is possible to measure all inputs needed to implement the cultivation system, the final products obtained (food, raw materials, etc.), the positive or negative impacts on the environment based on the biophysical factors.

In the historical period of "agrarian rurality" these were the factors influencing the choice of Management System. The same factors have been the subject of intense change to achieve the targets set for the agricultural sector in the aftermath of the so-called “industrialisation of the rural areas" (Sotte, 2004) during which the main objective was to reach, through the agricultural sector, the same economic results achieved by the industrial sector. The understanding of Management System, within the Homogeneous Area, is made through the definition of both elements: inputs (agronomic factors and management) and output (productions).

Crop rotation

The Crop rotation is without doubt the most important element for cultivation under the Management Systems. It produces an indirect effect especially on crops and the environment. Crop rotation has different effects on weeds, diseases, soil conditions (natural chemical and biological), organic matter content, stability of the structure, recycling of nutrients and nitrogen fixation with legumes. These effects do not depend only on the characteristics of crop but also by adopted cultivation techniques: irrigation, tillage, chemical and organic fertilisation, chemical and mechanic weeds control, diseases (Toderi et al., 2002).

A crop rotation contains the following key elements:

- Provides sufficient crop nutrients and minimises their losses;
- Provides nitrogen (N) through leguminous crops during the fertility-building phase of the rotation;
- The careful use of crops to maintain ground cover, helping to reduce soil erosion and nutrient losses;

- Deep and shallow rooting crops in a rotation can help to create soil structure and utilise minerals and nutrients, which are not available to shallower rooting plants;
- Aims to minimise and help control weed, pest and disease problems;
- Maintains the soil organic composition and structure.

Abandonment of cereal-livestock system management, and thus less need for fodder, has replaced fodder in crop rotation with cereal crops and spring crops (e.g. wheat-sugar beet or corn). Subsequently, the conditioning of the market and agricultural policies have driven the choice of crop rotation increasingly "free"; the choice of crops is defined annually on the basis of many economic considerations as well as agronomic (Rossi et al., 1995). Technological development increased availability of technical instruments (fertilizers, herbicides, pesticides, mechanisation, improvement of plant species and varieties, etc.) but gave less importance to the concept of soil improving or soil depleting crops.

Today, to avoid adverse effects on economic performance of agriculture and environment the assessments for crops is no longer based on the concept of improving or depleting crops but on specific characteristics of each crop: crops with deep root surface or crops with expanded root are alternate to other with more moderate roots, crops nitrogen fixation are alternate with other crops with high needs of nitrogen, etc.

The choice of crops is often conditioned by the feasibility of tillage, particularly in Marche region with soil with high percentage of clay. The adoption of simplified crop rotation can lead to soil degradation processes (loss of structure, compaction, erosion, etc.) due to wrong tillage system induced by incorrect crop rotation, excessive traffic of machines on land not in right wet condition, irrational irrigations, etc.

On the basis of these considerations it is evident that crop rotation plays a central role in the development and application of sustainable agriculture. Crop rotations are the essential precondition for adopting techniques for the conservation and improvement of soil, for the preservation of natural resources and to obtain positive results in terms of environment sustainability.

Soil management and tillage system

Another important pillar of the Management System is soil management in relation to the tillage system adopted. Tillage systems have little direct effect on crops (tillage with crops: weeding) and a much more significant indirect effect on soil quality referring to the development of weeds on the development of disease attacks has been proven.

Actually there is a profound process of discussion about the tillage system in relation to the environmental sustainability and production. Proper implementation of tillage systems by farmers allows them to achieve significant results in terms of energy savings, yield benefits from agronomic practices, positive effects on soil genesis promoting conservation and improvement of soil quality (structure, organic matter and nutrients, protection of biodiversity, hydrological conditions, etc.).

Agricultural activity has always been associated with ploughing as linked to a conversion of forest land to agricultural land. The main ploughing practiced in Marche region is at an average of 40-50 cm depth that nowadays is not fully justified to the productive responses of the crops that, in many case, show no big differences in terms of yields with different plough depth. The absence of forage in many crop rotations and the reduction of organic fertilizers inputs from livestock manure have further highlighted the negative effects associated with deep ploughing: profound reversing of soil horizons with loss of soil structure, loss of organic matter due to increased mineralisation, impoverishment of soil biodiversity, deterioration of the soil hydrological conditions, compaction, increase of soil erodibility mainly due to increased run-off, high energy costs for ploughing due to the increased need of engine power, etc. On the other hand, the abandonment of this technique raises other difficulties when it is needed to reverse the top soil horizon when:

- burying crop residues infested with fungal parasites to avoid damage to the crop;
- burying abundant crop residue and organic fertilizers to facilitate the organic matter mineralisation;
- control of weeds;
- restoration of soil structure compromised by the use of machines;
- restore the uniformity of surface and/or the slopes of the plots.

In all these cases, the sufficient depth to obtain the identified agronomic objectives does not exceed 30 cm.

In Marche region an active process of transition from the traditional ploughing system to other forms of conservation tillage system that are more environmental and economic sustainable is happening. Many machines are available on the market in order to apply the conservation tillage:

- "double layer" tillage, that is quite widespread in Marche region;
- reduced tillage (depth <25 -30 cm);
- minimum tillage (depth <10-15 cm);
- no tillage (direct seeding).

The development of these new techniques has not had a rapid development because beyond the possibilities offered by technological innovations (high-power tractors, direct seeding) it is not so easy to reconcile the tradition and cultural characteristics of farmers with the environmental conditions (climate, soils, agronomy).

As for the Management System evaluation an integrated assessment is necessary for the tillage system that will take into account all the conditions that influence the choice of tillage system (environment, agronomy, farm structure, etc.). The final objective is not to identify a single tillage practice but a set of practices which include several operations to be performed in a flexible and systematic way according to the environmental and socio-economic conditions and that maximize sustainability.

Due to the nature of high percentage clay soils and the geomorphological structure of the hilly areas, any tillage system, including simplified, is not applicable without an efficient management of hydraulic conditions of field especially when taken into consideration the effects of climate change that show an increase in rainfall intensity and a slight decline in the average annual rainfall.

With the implementation of water regime management systems excess water throughout winter and in spring can be removed quickly, allowing a more rapid warming of the surface horizons in spring. The temperature in untilled soils tends to be lower. This is especially significant for spring crops. The seed has more difficulties to germinate and is more subject to the bird attacks.

The water regime management system ensures a suitable environment for plant development (balanced relationship between liquid, gaseous and solids phase of soil) preventing the occurrence of the following soil degradation processes:

- water erosion;
- landslides and mudslides
- loss of organic matter;
- contamination of soil and groundwater.

Fertilisation

The fertilisation strategy is represented by the techniques aimed at promoting nutrition of plants through an increase of soil nutrient level and by improving soil quality and increase the radical absorption capacity. In the past the adoption of traditional management systems, characterized by a balance between cereals and fodder for livestock farming, allowed to maintain a good balance between contributions and removal of nutrients and a good percentage of organic matter content with the use of manure.

The abandonment of the cereal-livestock system has gradually increased the need to maintain the balance between removed and input of nutrients, forcing the use of mineral fertilizers instead of manure. The exact amount of fertilizer to be used, the time and manner of distribution needs to be carefully determined. Errors in this area lead to risks of excessive availability of nutrients in the soil that if not absorbed by soil can leach toward the deeper horizons soil causing chemical contamination of soil and groundwater.

The Marche region, pursuant to Directive EEC 676/91, identified Vulnerable Nitrate Zones (VNZ) in the valleys, areas where the special nature of soils and the hydro geological condition facilitate the leaching of nitrogen, and imposed specific cultivation rules to limit the risk of contamination (Program of Action, Cross, 2005, 2006, 2007, 2008). Solutions for appropriate mineral fertiliser use are:

- improve the knowledge on natural level of nutrient in soils,
- use the fertilizer according the need of the crops and avoid excesses of fertilisation,
- maximizing the effectiveness of fertilizers through appropriate techniques (and choice of modes of distribution).

Much more difficult is the restoration of organic matter due to unavailability of manure and fodder crops with a high intake of organic material.

In this regard the possible solutions are:

- Insert crops in the crops rotation that produce greater amounts of crop residues;
- maintain the soil covered by the crop residues as long as possible;
- incorporate the crop residues into soils;
- Perform conservation tillage (reduced, minimum and no tillage).

Control weeds and pests

Weeds and disease attack reduce agricultural production.

During the period of “industrial agriculture” reduction of crop rotations, the spread of monoculture, use of chemical fertilizers and the decline of application of organic fertilizers lead to an increase of the weed and disease occurrence. In order to maintain the agriculture production level the farmers increased the use of herbicide and pesticide with an increase in production costs and negative effects on the environment and water. Moreover this process increased also the resistance of weed and disease to the chemical products. This process has been reversed through technology development.

In this context technology has made considerable progress in terms of:

- molecules increasingly effective even at very low doses;
- high biodegradability of products once released into the environment;
- increase of more specific formulations;
- development of increasingly effective techniques;
- availability of more efficient machines for treatments with pesticides and herbicides.

In Marche some services are put in place in order to give technical assistance to farmers. In cooperation with associations of plant protection technicians, technical professional association of producers and freelancers on the basis of meteorological variables detected, the Regional Agro-meteorological Service produces a weekly bulletin with the aim of supporting the farmers with detailed information on phenological phase of crops, state of plants and plant health, mode and time of execution of treatments that has to be made.

The Regional Plant health Service also monitors the risks of attack by pests, provides training for operators who handle and distribute products, guidance on introducing new formulations and new strategies to combat weeds and diseases.

Weed and diseases control can be achieved through "integrated farming systems." The different physical, chemical and biological conditions of soils could be influenced through the preparation of the seed bed and influences the development of weeds. The chemical

fertilisation, especially nitrogen, influences the relationship between crops and weeds. A similar evaluation can be made between development and disease, crop rotation, tillage system, pesticide and herbicide treatments and sustainability of the adopted techniques.

Socio Economic Factors

It is much more difficult to assess the socio economic factors. Such factors have influenced the choices of farmers considerably since the period of the "rural industrialisation".

Nowadays, in the so-called “rural post-industrialisation "socio economic factors are enriched more and more with new elements. Among these elements technological innovation, the development of local culture, market policies, agricultural and rural development policies and environmental policies are most important.

The socio economic factors as a whole lead to identify the "desires" of farmers and society as a whole concerning the economic benefits, improved living conditions through the preservation of natural resources and protection of the environment in general. To be able to explain the adoption, development and the meaning of Management Systems in the Marche region is necessary to make an integrated assessment of the biophysical and socio-economic factors (Toderi, 2003).

4.2.5 The Management Systems of the Marche after the Fischler Reform (2003)

Agriculture in the Marche is small scale and spread throughout the region. Due to the high dynamics of land use determined by market condition changes and influenced by policies it is very difficult to know the Management Systems adopted and their distribution in Marche region.

The statistical data of National Institute of Statistics (Istat) summarizing the regional economic and agricultural sector can not be used for the identification of Management Systems because these have been updated to the year 2000 and reported according to the common boundary and are not suitable to represent the particular geomorphological conformation of Marche region.

In order to verify the effect on management following the Fischler Reform the AGEA database has been used on the crops referring to 2006/2007 applied by farmers and that have benefited the contributions of CAP 2007.

The definition and delineation of Management Systems of the Marche has been made on the basis and assessment of factors described in the previous paragraphs:

- cultivated crops and crop rotation;
- technical rules applied in an integrated system of farm management;
- the balance between the production needs and environmental sustainability;
- the spatial distribution of Management Systems at the regional level and by homogeneous areas.

Based on the presence of Management Systems within Homogeneous Areas an integrated assessment on environmental sustainability will be provided in the next chapter with particular reference to soil conservation. The integrated assessment will be conducted on the basis of the following factors:

- technical aspects regarding the applicability of conservative practices,
- effects on environment and risks of soil degradation,
- policies and other situations that may affect the development of sustainable agriculture in the Homogeneous Areas and related Management Systems within it.

Based on assessments suggestions for sustainable agriculture and soil conservation have been incorporated.

5 Assessment of the environmental sustainability of management systems in the Marche

To assess the potential of a specific area and develop strategies, it is necessary to carry out an *integrated assessment,* balancing natural resources management with landscape added value and sustainable human activity. This includes the evaluation of soil conservation practices in the local context since these cannot be evaluated in isolation.

The first step in this assessment is the integration of all characteristics in the concept of "land". We can state that *a "land" is composed of a soil with a specific morphology and in a certain climate*. The land unit refers to soil, but includes all principal characteristics of an area: geology, morphology, climate, hydrology, vegetation and fauna, including insects and micro fauna.

The suitability of a crop depends on local environmental conditions. The application of soil conservation practices follows the same trend. In some conditions some management practices are considered to increase soil degradation while in other conditions they prevent damage. As a general principle, the more appropriate the specific use of the soil resource is; the greater the conservation guarantees are. An integrated assessment of land suitability for a specific land use provides the Marche region with valuable technical support, useful for decision-making bodies and for agricultural businesses which, through a targeted use of *land* and appropriate soil management, will be able to achieve environmental sustainability[7] and obtain improved economic results.

The assessments carried out within SoCo Project are based on the analysis and the integrated comparison among the specific characteristics of Marche region, implemented "Management Systems" and the economical and social needs of the population.

The considered geographical land units are:

- High Mountains (HM);
- Medium High Hills (MHH);
- Low Hills (LH_**)
- Internal Alluvial Plains (AP)
- Coastal Alluvial Plains (AP_**)

The following codes refer to management systems considered in the assessment:

Table 5.1: Codes of the management system in the Marche region

SC1	Crop rotation (no fodder);	SC8	SRF (Short Rotation Forestry)
SC2	Fodder and Forage Crops;	SC9	Wood Plantations
SC3	Pasture	SC10	Forest
SC4	Outdoor vegetable crops	SC11	Olive groves
SC5	Fruit orchards	SC12	Set Aside
SC6	Kiwi	SC13	Truffle Grounds
SC7	Grapevines	SC14	Other Management systems

[7] Sustainability: World Commission on Environment and Development from the United Nations defines sustainable as "development meeting the needs of the current generation without impairing the possibilities for the following generations to meet their needs" (WCED, 1987- Bruntland Report).

The following aspects have been taken into account in the integrated assessment:

a) *Technical and operating factors in relation to the feasibility of conservation practices:*
- soil cover;
- multi cropping;
- fertilisation;
- tillage;
- number of tracks.

b) *effects on environment and soil degradation risks;*

c) socio-economic aspects and costs/effectiveness assessment;

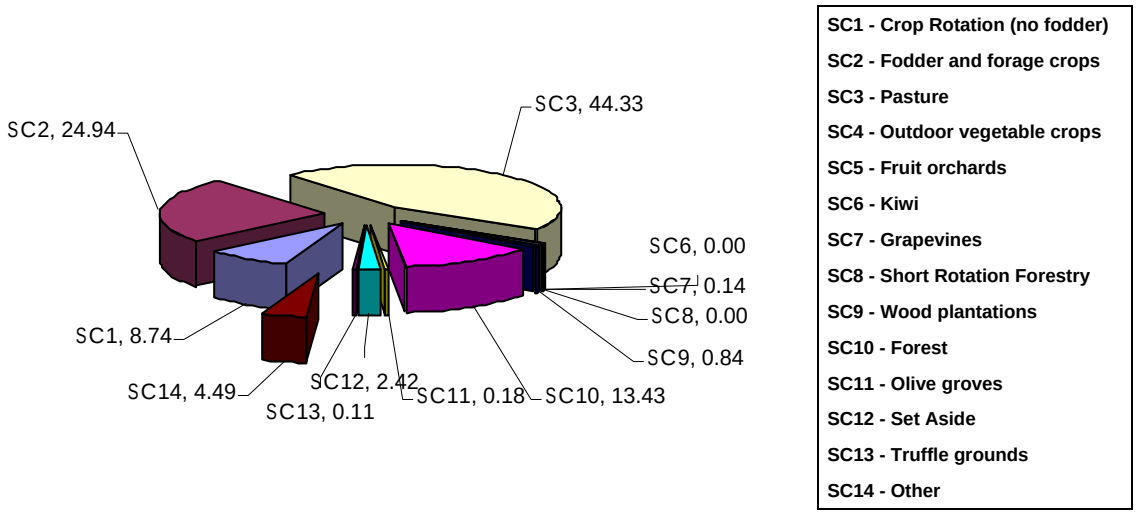
d) regulations and other situations which can affect the development of sustainable agriculture.

The last part of this paragraph provides some suggestions and proposals for the development of sustainable agriculture also aimed at improving the application of the rural development policies.

5.1 High Mountains (HM)

5.1.1 Implemented management systems and conservation practices

Figure 5.1: Management systems in the High Mountain zones

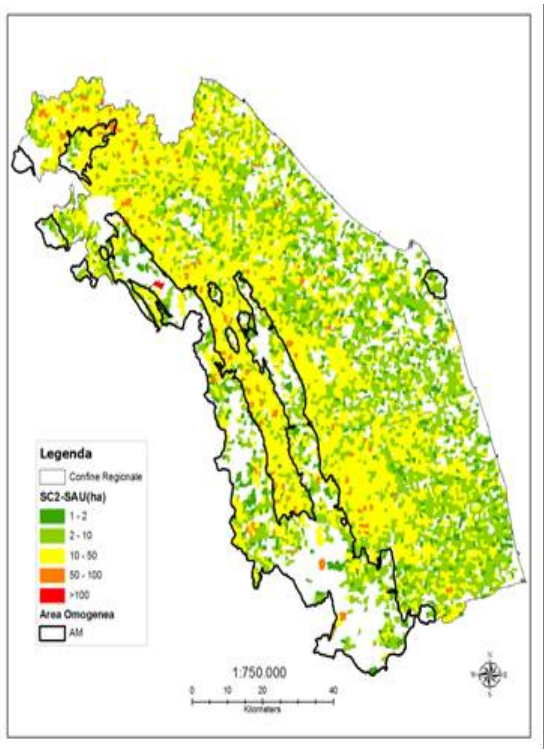


Source: Elaboration of Servizio Suoli Assam on AGEA data

More than half of the surface area is covered by forestry and permanent pasture. The main agricultural activities are food crops and crop rotation with the introduction of forage crops. All agriculture combined occupies over 30 % of Utilised Agricultural Area (SC1 + SC2). According to recent developments, the *set-aside* (SC12) surface may be substituted by crop rotation. Truffle grounds (SC13) though occupying a small area, have a high economic value. The other systems, for example vineyards, olive groves, wood plantations etc., are present on small plots and, even though they are less important from an economic point of view, they play an essential role for the preservation of biodiversity and the protection of the rural landscape.

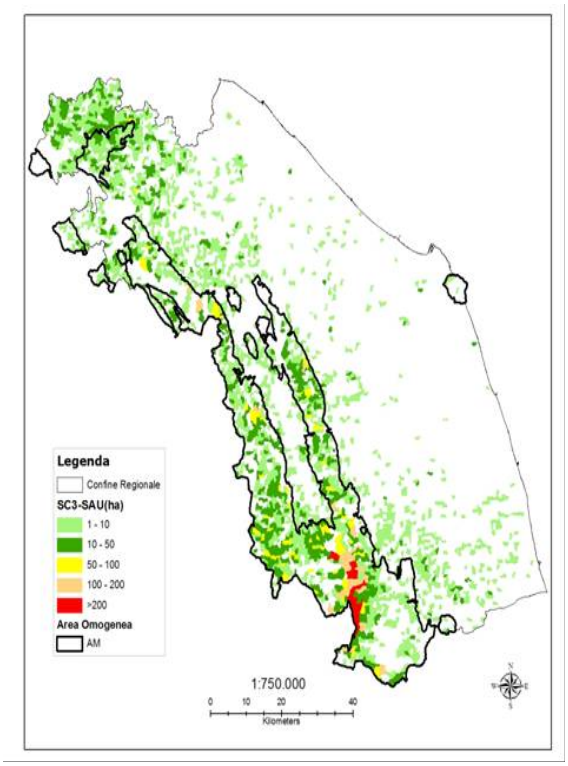
Figure 5.2 shows the spatial distribution of forage crops (SC2) within the *High Mountain* zone (black outline) which are concentrated in the central and northern parts. The figures are expressed in hectares of Utilised Agricultural Area. An isolated mountainous area is represented by the zone Mount Conero, an anomalous promontory in the shelter of the sea.

Figure 5.2: Geographic distribution of management system 2 (SC2-Fodder and forage crops) in the "High Mountain" zone



Source: Elaboration of Servizio Suoli Assam on AGEA data
SAU: Italian acronym for Utilised Agricultural Area

Figure 5.3: Geographic distribution of management system 3 (SC3-Pasture) in the "High Mountain" zone



Source: Elaboration of Servicio Suoli Assam on AGEA data

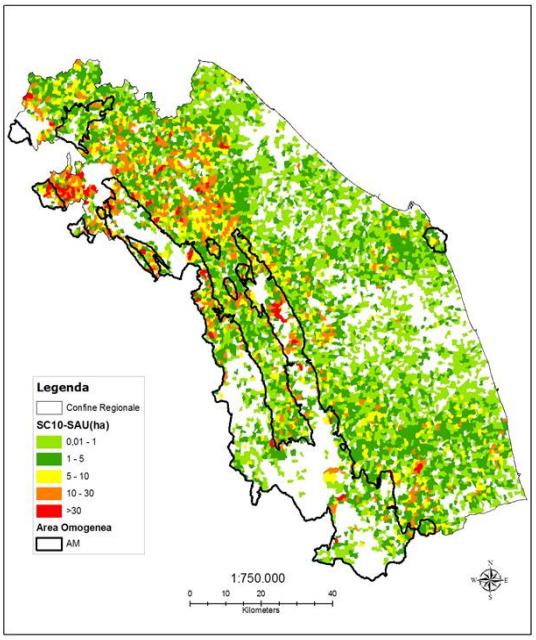
Figure 5.3 shows the equal distribution of the areas dedicated to pastures across the entire High Mountain area.

The presence of forest and pasture gives this zone another nature and landscape value also emphasized by the presence of major Parks and Natural Reserves, Special Protection Areas (SPA) and Sites of Community Importance (SCI)8.

Regarding agroforestry management, it is possible to observe an undoubtedly positive situation towards environmental sustainability. A high ratio of forage crops to crop rotation (SC2/SC1) of 285 % indicates a good presence of livestock breeding and extensive crop rotations with the conservation benefits from soil cover, fertility conservation and low use of herbicides.

[8] ZPS and SIC – Special Protection Areas and Sites of Community Importance in application of CEE Directive 79/409 (Directive Uccelli) and CEE Directive 92/43 (Directive Habitat).

Figure 5.4: Geographic distribution of management system 10 (SC10-Forest) in the "High Mountain" zone



Source: Elaboration of Servizio Suoli Assam on AGEA data

5.1.2 Integrated assessment of conservation practices

Technical and operating aspects in relation to the feasibility of conservation practices

The technical and operating aspects in relation to the feasibility of conservation practices are described below in table 5.2.

Table 5.2: Assessment of conservation practices in the High Mountains zone

Conservation practices	Assessment
Soil cover	Excellent level thanks to the particular environmental and landscape characteristics (presence of forestry and pasture lands) of the area and to the presence of perennial forage cultivations.
Multi cropping	Applied in treelike management systems (olive groves, truffle lands, wood plantations). Within limited areas, seeding associated with barley is carried out during the first year of alfalfa planting.
Fertilisation	The excellent conditions of the years of high livestock development are no longer present. In consideration of current livestock resources, the High Mountain area is surely the area with the highest possibility for organic fertilisation. The cultivation diversification also allows putting into practice the best strategies for the added value of crop residues. Such a situation is complemented by mineral fertilisation, above all nitrogen and phosphorous given the good nutrient condition of the soils.
Tillage	The no-tillage or minimal tillage is suitable in this area given the nature of the soils (coarse texture and shallow) and the morphology of the fields which prevents the use of large size machinery. Conservation tillage benefits also from the better operability conditions derived from crop rotations.
Track reduction	With this type of crop rotation the need for passages is low.

Effects of management on Homogeneous Area and soil degradation problems

In Marche, the main soil degradation risks concern erosion, organic matter loss and compaction.

Given the good level of soil cover in the High Mountain zone, the particle transport is very low and is within the range of natural limits and risk acceptability for erosion.

Figure 5.5: Risk of soil erosion in the "High Mountain" zone (in t $ha^{-1}yr^{-1}$)

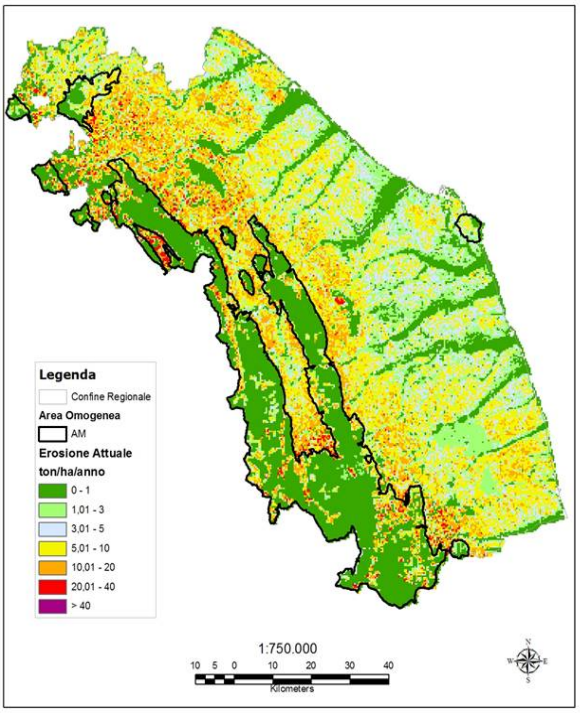
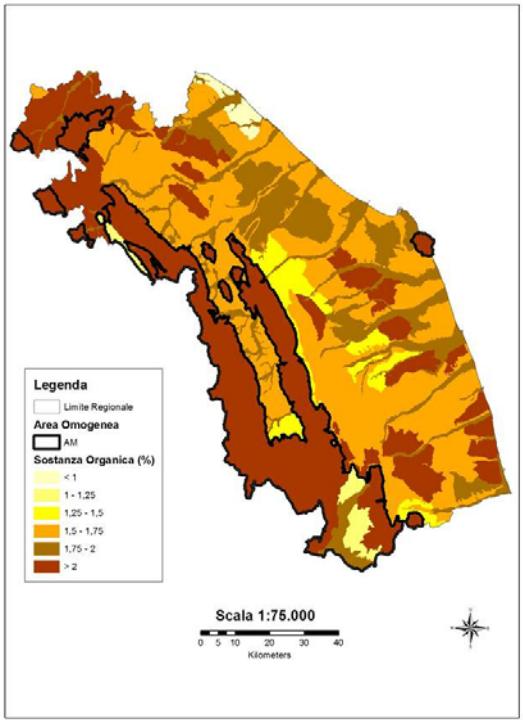


Figure 5.6: Organic matter content in "High Mountain" soils (in percentage)



The organic matter content is among the highest of the region, with many values above 5 %.

Socio-economic aspects and costs/effectiveness ratio

Pressure from agriculture on the natural resources is low in the High Mountain area making it easier to maintain a high environmental value. The realisation of policies on enterprise development is more difficult due to the ageing of the population leading to a progressive reduction in the workforce. This situation has an effect on the essential facilities for the population (social services, education) or accessibility to these due to the distance from the main urban areas.

According to the OECD classification, 66.28 % of the High Mountain area belongs to rural areas of type *D – rural area with development problems*.

Intermediate rural areas with natural limitations (C3) account for 10 % of the High Mountain areas and are the zones with the highest development potential thanks to a slight increase in population due to migration flows and the job prospects offered by the sustainable land management. The presence of job opportunities means social and economic vivacity, allowing a good standard of living.

Table 5.3: Presence of rural areas within the High Mountain areas

Rural areas *(Classification OAM Marche)*	**Description**	**Presence in High Mountain *(HM)* area**
A	Urban settlements	11.34 %
C1	Industrialized intermediate rural areas	1.00 %
C2	Intermediate rural areas with low population density	5.73 %
C3	Intermediate rural areas with natural limitations	10.14 %
D	Rural areas with development problems	66.28 %

Source: elaboration by Servizio Suoli Assam on Istat data

In the High Mountain area, agriculture has a more social and environmental value than economic or productive. Concerning costs/effectiveness ratio of agricultural sustainability, it is possible to state that in these areas the ordinary management of agricultural zones has already reached a good level of sustainability. There is always space for improvement and in this context the priority is given to survival of the small businesses.

5.1.3 Sustainable agriculture: development opportunities

The sustainability of the agricultural sector in the Marche is strongly linked to its diversity attracting a wide range of development opportunities and initiatives. These need to focus on region's shared factors while at the same time valuing the local diversity:

- initiatives, activities and resources directed at three common elements: the land; the enterprises and the commercial sector.
- integration of the interventions on the basis of the needs of enterprises, sectors and society as a whole, balanced with the environmental demands;
- participation of all parties in the decision and operation processes, stimulating an ongoing exchange of experiences, knowledge and information leading the definition of best practice.

In the following table some proposals for the High Mountain area are introduced in relation to the land, the enterprises and the commercial sector.

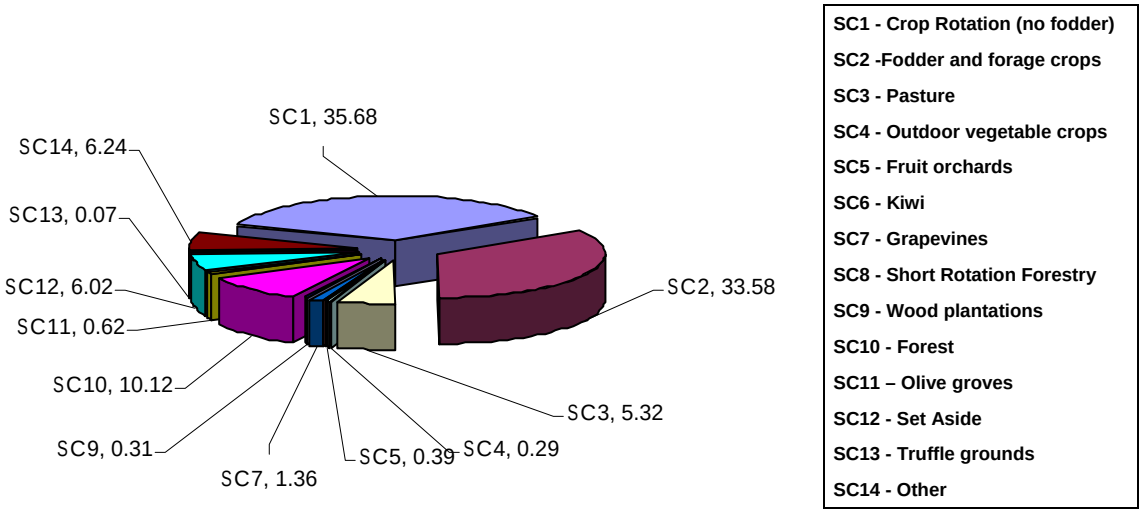
Table 5.4: Proposed initiatives for sustainable development in the High Mountain area

Strategic elements	Proposed initiatives
Land	- conservation and appreciation of natural resources seen as income and job opportunities for people staying in the zone; - conservation and appreciation of the grazing lands for landscape and biodiversity protection; - continuation of services to the population;
Enterprises	- diversification of the production concerning above all cropland; - income integration with the provision of services; - enhancement of the breeding activities; - integration with forestry activities;
Sector	- appreciation of local products; - activation of local market involving local population; - promote cooperation forms linked to specific territorial identities.

5.2 Medium High Hills (MHH)

5.2.1 Implemented management systems and conservation practices

Figure 5.7: Management Systems and presence percentage within the Medium High Hills (MHH) zones



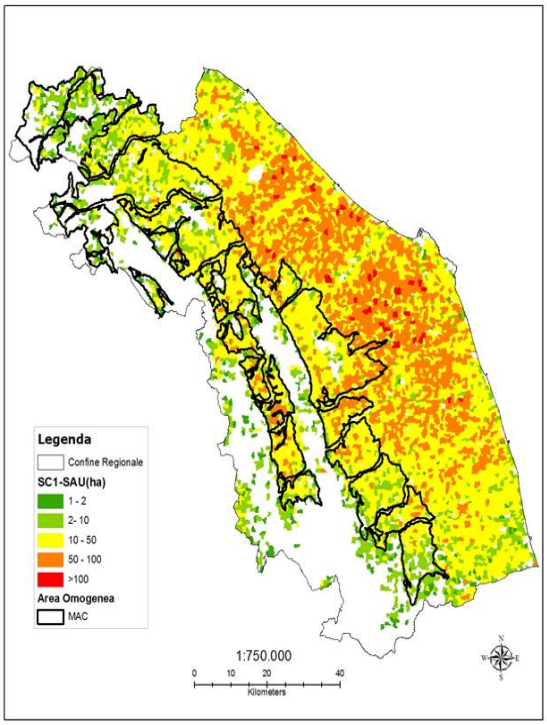
Source: Servizio Suoli Assam elaboration on AGEA data

The management systems in *"Medium High Hills"* area show a drop in grazing zones (SC3 5.32 %) and smaller area dedicated to forestry (SC10 10.12 %) compared to the High Mountains. Turning now to areas with a predominant agricultural management it is possible to observe how the geomorphology and the micro climate have encouraged an expansion of the agricultural cropland over the years although mono culture is rare. In all zones with a high agricultural land use, most systems typical of the Marche are represented in different degrees of importance and significance.

Cropland (SC1) represent an extended surface (35 %) in the *Medium High Hills* zone. Natural resource conservation is most urgent in areas that fall under this land use. On the other hand, an extensive surface has been assigned to forage crops (SC2 33.58 %), representing more than 90 % of crop rotation (SC2/SC1 94.12 %). These figures indicate extensive crop rotations, the sustainability of the fertilisation practices, the presence of breeding, and low chemical inputs over nearly 70 % of the area (SC1+SC2). System SC.1 could undergo innovations and improvements aimed to a still more conservation management making it a critical element. As evidence of the variability of the cultivations, in this area there are vineyards (SC7 1.37 %), DOC Verdicchio of Matelica and Jesi, specialised olive groves (SC11 0.62 %) and wood plantations (SC9 0.31).

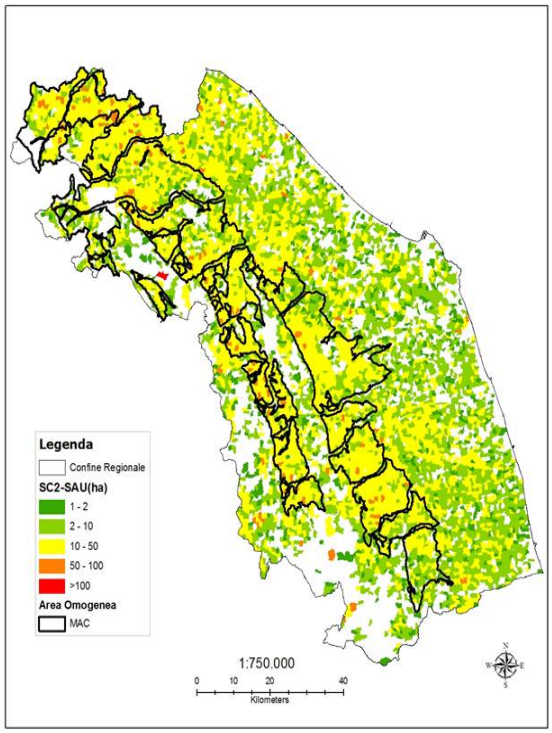
Figure 5.8 and 5.9 represent the distribution of the Crop rotation (SC1) and of the Forage crops (SC2) within the homogeneous Medium High Hills (MHH) area. The distribution is expressed in hectares of presence per cadastral reference unit.

Figure 5.8: Geographic distribution of management system 1 (SC1- Crop rotation) in Medium High Hills zone



Source: Elaboration of Servizio Suoli Assam on AGEA data

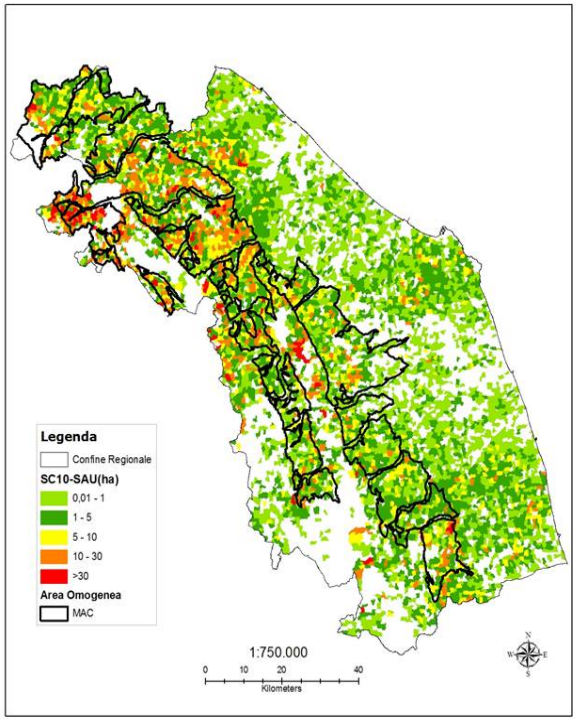
Figure 5.9: Geographic distribution of management system 2 (SC2 – Fodder and Forage crops) in Medium High Hills zone



Source: Elaboration of Servizio Suoli Assam on AGEA data

Comparing figure 5.8 with 5.9 illustrates the low presence of management system 1 (crop rotation) in the Medium High Hills area; on the contrary Fodder and forage crops (SC2) are more present in this zone. Tillage is the most critical assessment element concerning the conservation practices and the environmental sustainability is in the management of cropland given the slope and exposure of these lands. The possibility of broader crop rotations, the introduction of forage crops and the presence of perennial crops (vineyard, olive grove) offer opportunities for the application of practices with low environmental impact.

Figure 5.10: Geographic distribution of management system 10 (SC10 - Forest) within the Medium High Hills



Source: Elaboration of Servizio Suoli Assam on AGEA data

5.2.2 Integrated assessment of the conservation practices

Technical and operating aspects in relation to the feasibility of conservation practices
The technical and operating aspects in relation to the feasibility of conservation practices are described below in table 5.5.

Table 5.5: Assessment of conservation practices in the Medium High Hills zone

Conservation practices	Assessment
Soil cover	The application of this practice involves about 50 % of the areas assigned to crop rotation (SC1). The introduction of cover crops during the winter period creates difficulties in seedbed preparation of spring crops. Such difficulties derive from the nature of the soils, particularly clayey soils, and from the microclimate in these zones. Normally, better conditions are present during the first ten days of December than in March and April. Such situations occur are very diverse in the area and often within the same enterprise because of the variable hydrologic characteristics of the soils.
Association of different cultivations	In this zone, it is possible to apply the association in the treelike Management Systems (olive groves, truffle fields, wood plantation). In the vineyards, inter-row grass strips has not productive function but contains erosion, higher water permeability, lower management costs, better hydrologic conditions of the soil, reduced warming of surface soil horizons. In organic farming, associations with grain legumes are successfully practiced e.g. Vetch (Vicia sativa L.), field bean and also forage grasses coupled to green manure.

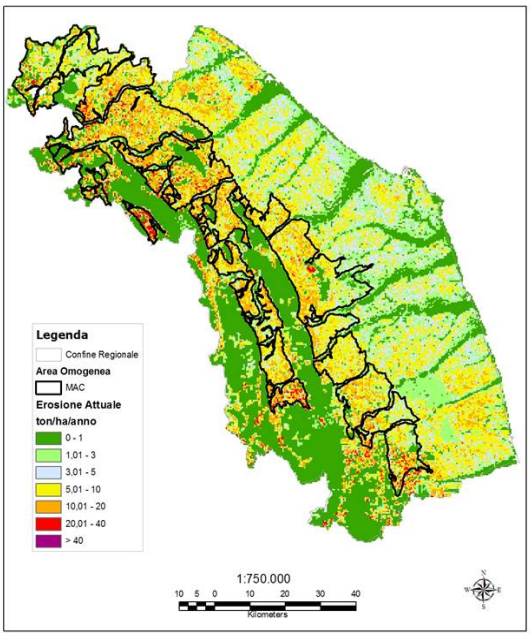
Fertilisation	The Medium High Hills areas, along with the higher areas, still conserve good opportunities to use organic matter from manure given the widespread presence of livestock in these areas (cows, pigs, sheep and goats). With the added value of the crop residues from crop rotations improving the physical, chemical and biological characteristics of the soil the chemical intervention can be considerably reduced.
Tillage	No-tillage in these areas is difficult to apply because of the high clay content of the soils which tend to lose their *glomerular*[9] state very early, making it difficult to implant new crops and above all to absorb rainwater. The presence of steep slopes considerably worsens the situation. However, favourable situations to direct seeding can occur in some sites, in specific conditions of cropping systems and in particular seasonal weather conditions. Reduced tillage (surface ploughing 20-25 cm deep) provides possibilities of application in the preparation of the fields for the autumn and spring cereals. Depending on the adopted rotation and on the structural conditions of the soil after some time, it is possible to intervene with the so-called double tillage (chisel tillage + surface tillage). The reduced tillage or the minimal tillage is necessary even in consideration of the better weed control without using chemical products. In many cases, the difficulties in the application of these technical programmes are the lack of adequate machinery.
Track reduction	In this zone, it is more strategic to use small size and low weight machinery than reducing the number of tracks. The particular slopes of the cultivated land impose precise ways to follow, otherwise causing overturning. The areas useful to the manoeuvre operations are usually limited and do not allow many alternatives in the practical execution of tillage. To avoid compaction phenomena in these areas it is strategic to use small, light and practical machinery, so even if it is necessary to carry out several passages there will not be any compaction problem. The effectiveness and thus the agronomic effects produced by this tillage depend considerably on the moment of execution. This feature makes it difficult to use combined machineries which, besides not meeting the lightweight and manoeuvrability requirements, oblige to execute different agronomic operations in the same moment (minimal tillage, fertilisation, seeding). In this zone, only in very particular cases it is possible to have pedo-climatic conditions suitable for all the operations at the same time. If the tillage is carried out improperly during the first phases of crop development, it can compromise the good outcome of the whole production cycle.

[9] Glomerular: state of structural aggregation taken by the soil particles (clay or silt) thanks to the intervention of organic or mineral colloidal cements leading to the formation of “clots” or “glomerules”. In this state, the macroporosity created among the clots adds to the microporosity inside the clots.

Effects on environment and soil degradation risks

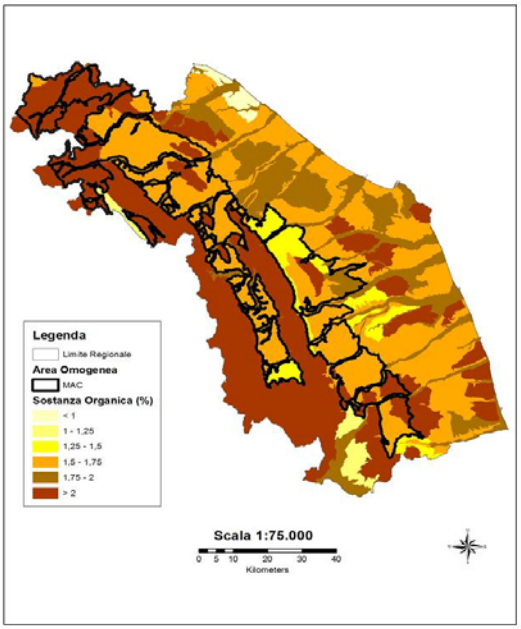
The *Middle and high hill* areas are the areas with the highest risk of soil erosion.

Figure 5.11: Risk of soil erosion in the Medium High Hills



Source: Elaboration of Servizio Suoli Assam on AGEA data

Figure 5.12: Organic matter content within the soils of Medium High Hills



Source: Elaboration of Servizio Suoli Assam on AGEA data

The major factors subjecting the soils of this area to a higher risk are the morphology (altitude, slopes and exposure), the versant length and the soil cover. It is necessary to produce improvements in soil conservation in consideration of climate change. What appears to be extremely delicate is the soil cover control given the influence of the quick and dynamic external factors.

The introduction of *decoupling*[10] with the Fischler reform produced a strong increase in fodder production in this zone. The increase in the cereal price of the 2007/2008 campaign immediately led to an interruption of the perennial cycle of the forage crops in favour of reintroducing durum wheat. The reorganisation of the agricultural management systems is aimed also at the management of these phenomena imposed by market laws: plot resizing, permanent ditches to reduce the slope length, hedge and tree rows.

The figure 5.12 shows the organic matter content level which is notably lower than in the high mountain area. The lands with higher content are concentrated in the zone on the north of this area, and in some specific locations in Piceno and in Musone and Chienti inland.

Socio-economic aspects and cost/effectiveness ratio

More than 70 % of Marche rural areas identified as *Areas with Natural limitations* (C3) fall within the *Medium High Mountain* area. The multi functionality of agriculture represents the marketing tool to guarantee a valid economical and productive development. The risk of marginalisation for the local enterprises due to natural impediments that do not allow adequate access to services for people with mobility difficulties is very high. This situation is exacerbated by inadequate public transportation service and telecommunication network. Furthermore, the Medium High Hills zone includes over 30 % of Marche rural areas classified as *Intermediate rural areas with low residential density (*C2*).* C2 areas are characterised by a

[10] Decoupling: concession of the CAP connected to cultivated surface and not to the type of cultivation carried out.

stable rural society enabling investment for economical and social development. The hilly landscape makes the links and the communications among production and commercialisation areas difficult. The demographic growth sometimes produced inappropriate building development with regards to the landscape and the rural heritage.

Integrated development needs initiatives and interventions able to reconcile the needs of enterprises, the commercial sector and the land. This creates the need of landscape requalification through a greater integration and balance among urbanised and rural areas. The new rural development strategies built up through the reform process of the Common Agricultural Policy (Fischler reform find their full application in this zone. Any non-integrated rural development or agricultural policies risks impairing the future development of these areas. Agriculture will expand its horizon by paying attention to productive and non-productive activities.

The financial resources made available by the RDP 2007-2013 can give these significantly rural territories an excellent development possibility, with the condition that the plan fits the goals from the strategic point of view and permits the transition from sectoral to territorial agriculture. The failure to reach these objectives determines the risk of assigning the resources to the agricultural and agro-feeding sector, relegating the rural territories a marginal role.

The territorial and landscape quality of the Medium High Hills areas is illustrated by the absence of industrial areas. The application of the conservation practices concerns mainly cropland management (tillage), which has to be adapted to the new management strategies. For the cost assessment it is necessary to evaluate the necessary investments for adjusting the hydraulic situation of the fields in question. The main limits to the application of conservation practices are the availability of adequate machinery, the costs/effectiveness ratio being at any rate positive even without evaluating the environmental benefits by considering the significant cost reduction (fuel, labour).

5.2.3 Sustainable agriculture: development opportunities

On the basis of the general consideration reported in the paragraph concerning development opportunities of “high mountain” areas, some specific proposals are introduced here for *Medium High Hills*.

Table 5.6: Proposed initiatives for sustainable development in the Medium High Hills area

Strategic elements	Proposed initiatives
Land	- conservation and value adding of the natural resources regarded as income and job opportunity for people staying in the zone; - agricultural activity not only directed to enterprise needs but as a collective service for territory maintenance and management; - improvement of agricultural hydraulic arrangements introducing hedges and riparian vegetation; - involvement of the agricultural enterprise for the management of the state stream system; - maintenance of services to the population; - Enhancement of the support technical services on a territorial and enterprise scale according to a logic of Regional Rural Network integrated at National and European levels. - verification and assessment of the territorial natural aptitudes for the incentives and the development of new cultivations; - improvement of the transportation services and of the communication networks;
Enterprise	- diversification of the production concerning above all cropland through the introduction of multiyear cycle (forage crops) or permanent (grazing lands) cultivations; - enhancement of the breeding activities through small livestock distributed over the whole area; - investments for the provision of machinery suitable for the execution of conservation practices (reduced and minimal tillage, direct seeding etc.); - application of technical programmes specific for Land Unit and managed Management System; - rediscovery and value adding of historic productions typical of the area and abandoned; - adhesion to area projects and agreements to stimulate typical productions; - traceability of the agricultural activity through the adoption of production specifications; - income integration with the provision of services;
Sector	- enterprise or territorial investments for land units for processing and consumer direct sales; - value adding of local products; - activation of local market committing the local population; - promote cooperation forms linked to specific territorial identities; - realisation of facilities for producer-consumer direct sales *(farmer's market).*

5.3 Low Hills (LH)

The Low Hills represent the most extended and important area for the regional agricultural production. Being the most important zone for the economic and productive aspects, it is also the zone where the agriculture intensification phenomena during the industrialisation phase have been more evident. Agricultural intensification is followed by natural resource degradation risks and by greater environmental impacts. The specific understanding of the individual processes in relation to the different crop practices is linked to a specific characterisation on an enterprise landscape unit.

In the study case, four homogeneous subzones have been identified on a regional scale. The common factors are linked in particular to the prevalent presence of the crop rotation (SC1), always higher than 50 %, with some peaks over 70 %. There is a small presence of forage crops, however accounting for percentages useful to ease rotations. Perennial crops as vineyards and olive groves are present in the whole area with zones of higher concentration. The cultivations in these areas are carried out in dry conditions, and irrigation is only exceptionally possible to help during greater water emergency years fed by small hill storages.

In this zone, the most favourable morphologic characteristics to cultivation (land unit size and slope, soil inherent fertility, microclimatic conditions), crop intensification and mechanisation led to the simplifying of *agricultural hydraulic situation*[11] through the reduction of small scarps, hedges, riparian vegetation, drains and permanent canals. Even though this situation has been limited by local specific factors (land geomorphologic characteristics, farm fragmentation, historical culture of entrepreneurs), it increased the risks of soil erosion and of activation of gravitational phenomena landslides.

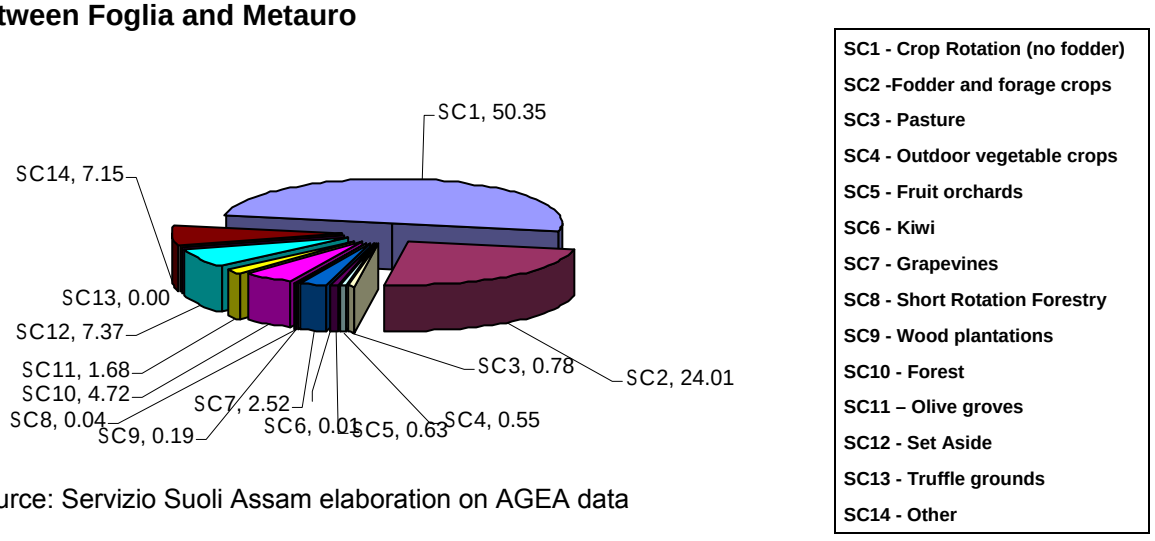
The recovery of the agricultural arrangements, the introduction of new management strategies and the value adding of water resources (application of "*dry crop*" techniques) are on the basis of the rationalisation of all the Management Systems adopted in this zone, also in relation to the now certain climatic changes.

5.3.1 Implemented management systems and conservation practices

For a better comprehension of crop management, the Low Hill area can be divided into four subzones. In the following, the respective composition of the Management Systems and the geographic distribution is shown.

Low Hill area between Foglia and Metauro (BC_FM)

Figure 5.13: Management Systems and presence percentage of Low Hill zones between Foglia and Metauro



Source: Servizio Suoli Assam elaboration on AGEA data

[11] Meaning of agricultural hydraulic arrangements

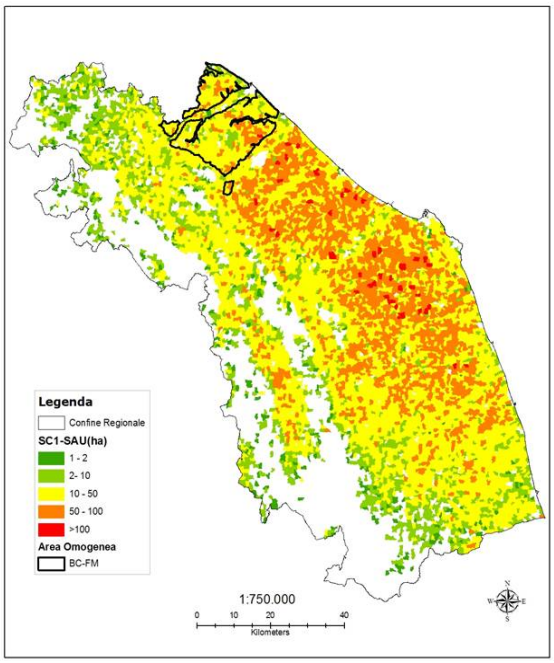
The territory between Foglia and Metauro is characterised by a forage crops/cropland ratio (SC2/SC1) of 47.69 %. Normally, a high percentage of forage crops indicates the presence of breeding, while in this case the greater part of the forage production is reserved for industrial processing for the extraction of proteins for fodder. However, all the advantages connected to the possibility of introducing perennial forage crops in the productive system remain. It is worth considering that, starting from 2008, the surfaces recalled from production (7.37 %) will resume the rotation, integrating the surfaces assigned to SC1 and SC2.

A noteworthy feature of this zone is the presence of viticulture (SC7), accounting for 2.52 %.

Ultimately, it is worth noticing the low presence of horticultural crops (SC4) in the rotations (0.63 %).

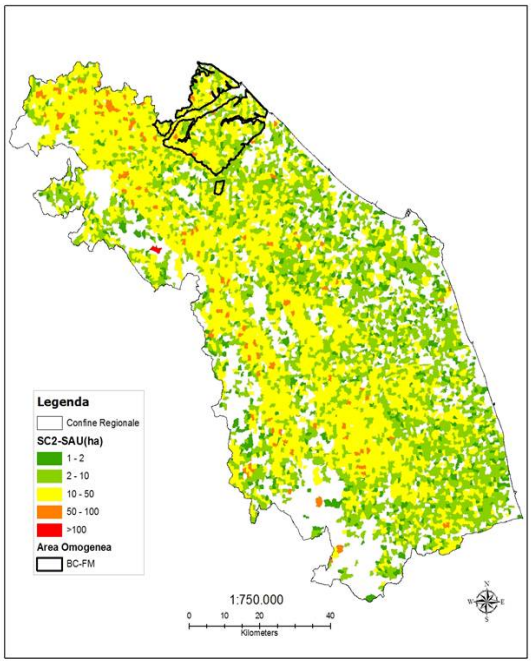
Concerning the farm management systems in the southern part there is a higher frequency of system 1 (SC1), favoured by soils with better disposition and fertility.

Figure 5.14: Geographic distribution of management system 1 (SC1) in the Low Hill area between Foglia and Metauro



Source: Elaboration of Servizio Suoli Assam on AGEA data

Figure 5.15: Geographic distribution of management system 2 (SC2) in the Low Hill area between Foglia and Metauro

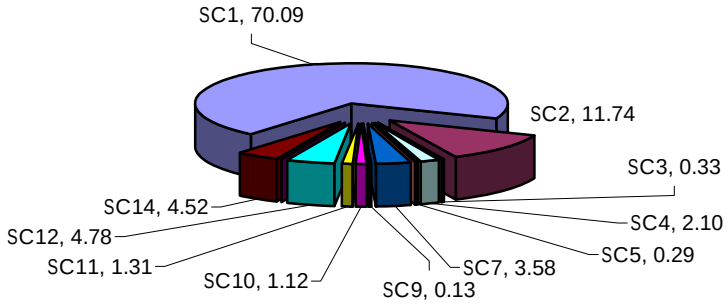


Source: Elaboration of Servizio Suoli Assam on AGEA data

The forage crops (SC2) are distributed more uniformly, tending to a higher concentration within the zones bordering the Emilia Romagna region.

Low Hill area between Cesano and Esino (BC_CE)

Figure 5.16: Management Systems in Low Hill zones between Cesano and Esino (BC-CE)

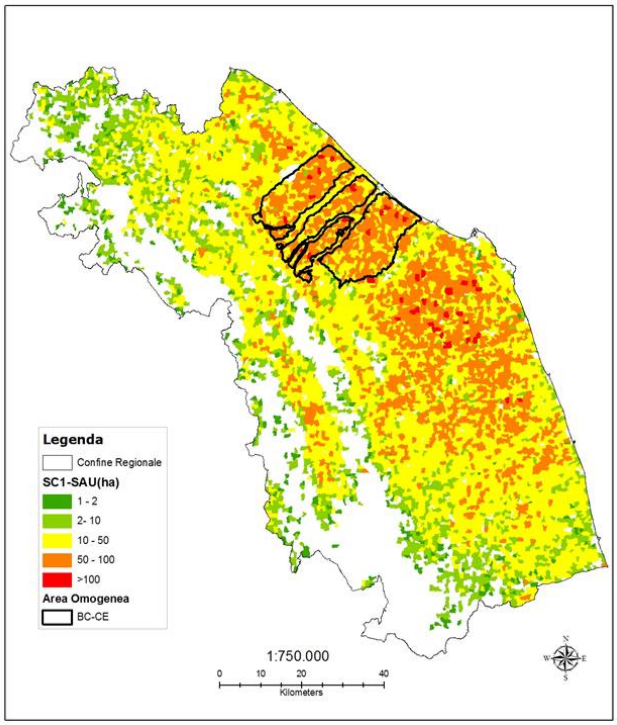


- SC1 - Crop Rotation (no fodder)
- SC2 -Fodder and forage crops
- SC3 - Pasture
- SC4 - Outdoor vegetable crops
- SC5 - Fruit orchards
- SC6 - Kiwi
- SC7 - Grapevines
- SC8 - Short Rotation Forestry
- SC9 - Wood plantations
- SC10 - Forest
- SC11 – Olive groves
- SC12 - Set Aside
- SC13 - Truffle grounds
- SC14 - Other

Source: Servizio Suoli Assam elaboration on AGEA data

In Cesano and Esino zone the crop rotation (SC1) are notably extended, accounting for over 70 %. The increase of cropland is opposed to a lower presence of forestry (SC10 1.12 %) and a strong reduction of forage crops (SC2 11.74 %). The ratio between forage crops and cropland (SC2/SC1) is of 16.75 %, about a half with respect to the near Foglia and Metauro area.

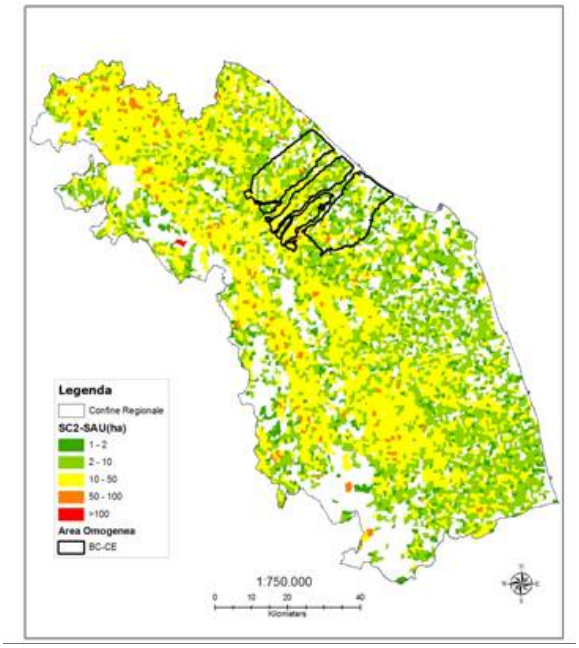
Figure 5.17: Geographic distribution of management system 1 (SC1) in the Low Hill area between Cesano and Esino



There is a significant presence of horticultural crops (SC4 2.10 %) in the rotations. In this area, the ratio between horticultural crops and cropland (SC4/SC1), indicating the presence of vegetable crops in the rotation, is of 2.99, while in Foglia and Metauro it accounts for about a half (1.10). In the southern part, in the Esino basin, the presence of viticulture (SC7 3.58 %) has a particular importance. In the following, the space distribution of crop rotation (SC1), forage crops (SC2) and vineyards (SC7) is presented.

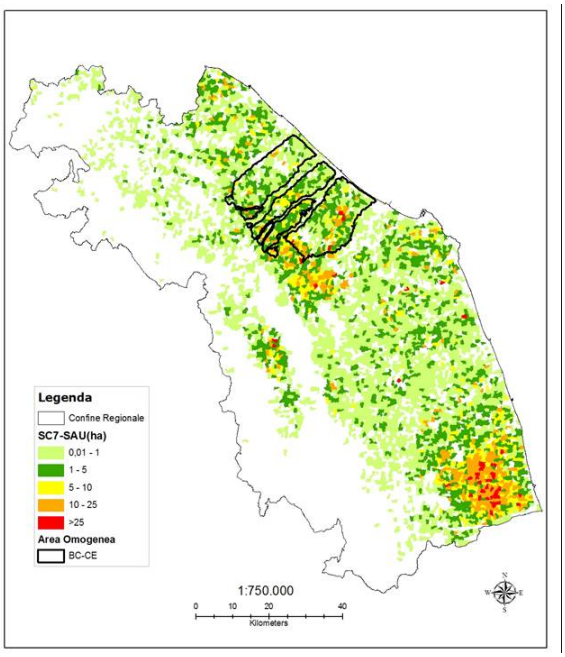
Source: elaboration by Servizio Suoli ASSAM on AGEA data

Figure 5.18: Geographic distribution of management system 2 (SC2) in the Low Hill area between Cesano and Esino"



Source: Elaboration of Servizio Suoli Assam on AGEA data

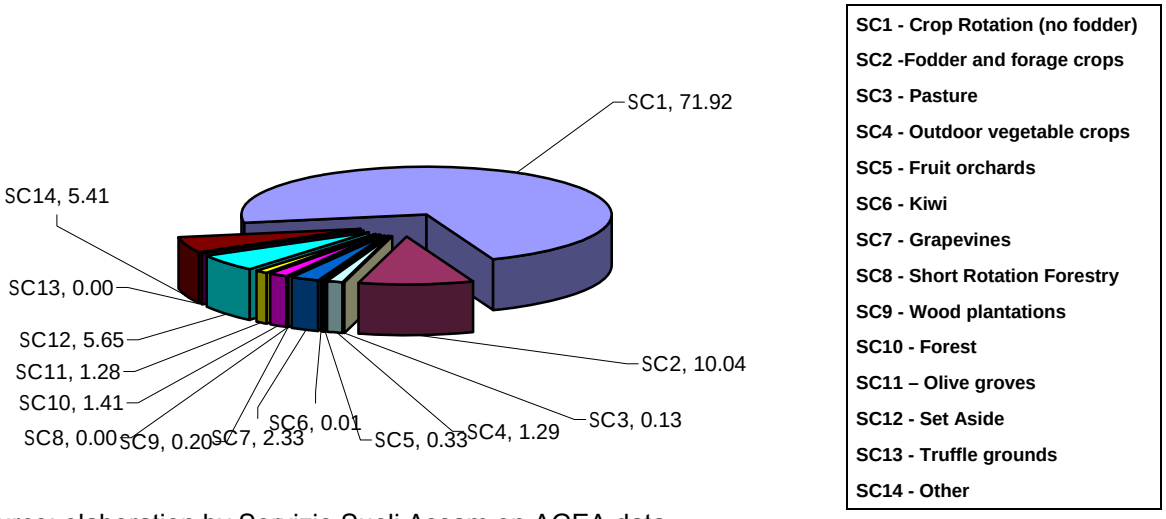
Figure 5.19: Geographic distribution of management system7 (SC7) in the Low Hill area between Cesano and Esino"



Source: Elaboration of Servizio Suoli Assam on AGEA data

Low Hill between Musone and Chienti (BC_MCe)

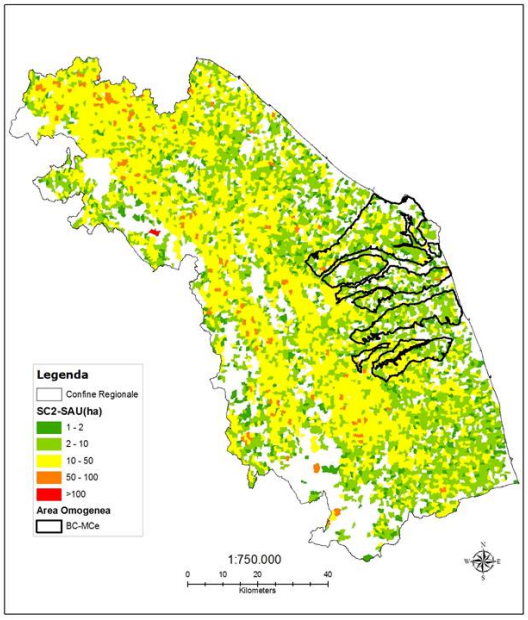
Figure 5.20: Management Systems and presence percentage in the LH zone between Musone and Chienti



Source: elaboration by Servizio Suoli Assam on AGEA data

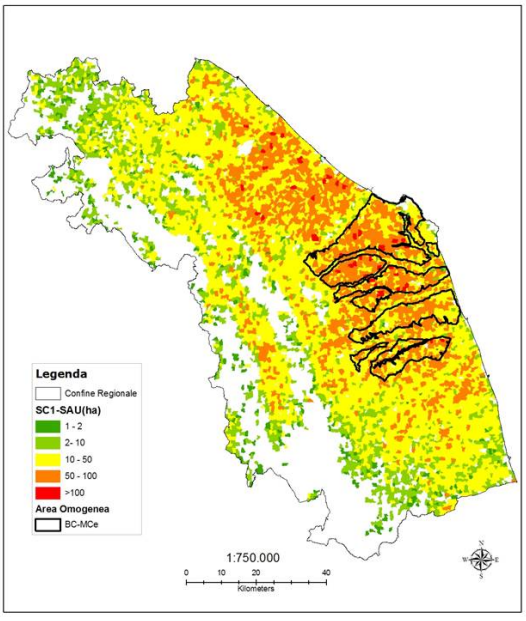
The zone between *Musone* and *Chienti* shows a greater presence of crop rotation (SC1 71.92 %), to the detriment of forage crops, accounting only for 10 % (SC2). A good percentage of outdoor vegetable crops is confirmed (vegetable crops/cropland SC4/SC1 ratio of 1.98). There is an important presence of viticulture (SC7 2.33 %), not in terms of extension but because of the quality level achieved by the enterprises of this zone. Part of the DOCG areas *"Rosso Conero"* and DOC *"Verdicchio di Jesi"* are within this zone.

Figure 5.21: Geographic distribution of management system 1 (SC1) in the Low Hill area between Foglia and Metauro



Source: Elaboration of Servizio Suoli Assam on AGEA data

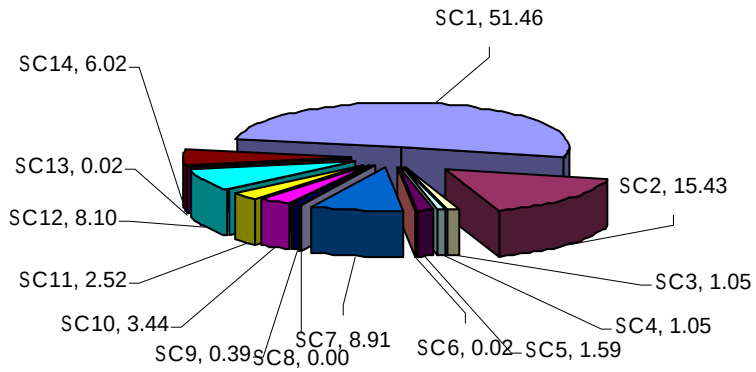
Figure 5.22: Geographic distribution of management system 2 (SC2) in the Low Hill area between Foglia and Metauro



Source: Elaboration of Servizio Suoli Assam on AGEA data

Low Hill area between Tenna and Tronto (BC_TT)

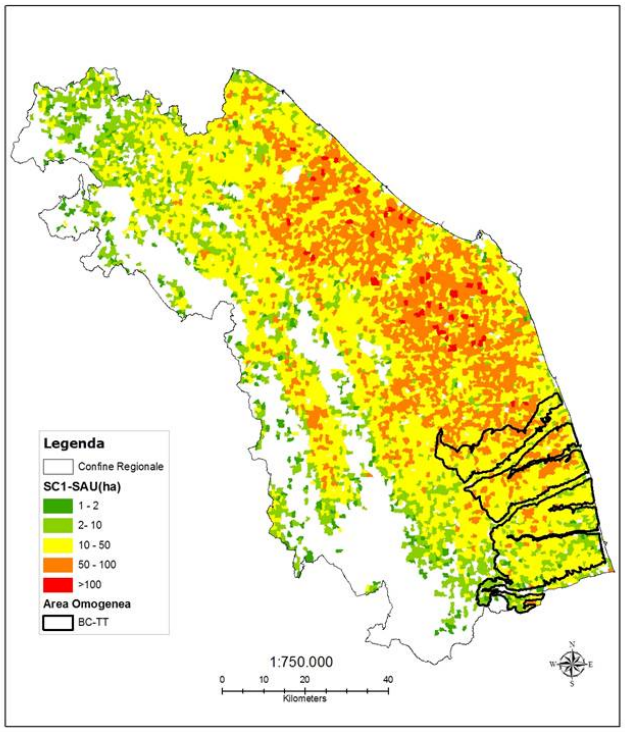
Figure 5.23: Management Systems and presence percentage of Low Hill area between Tenna and Tronto



Source: elaboration by Servizio Suoli Assam on AGEA data

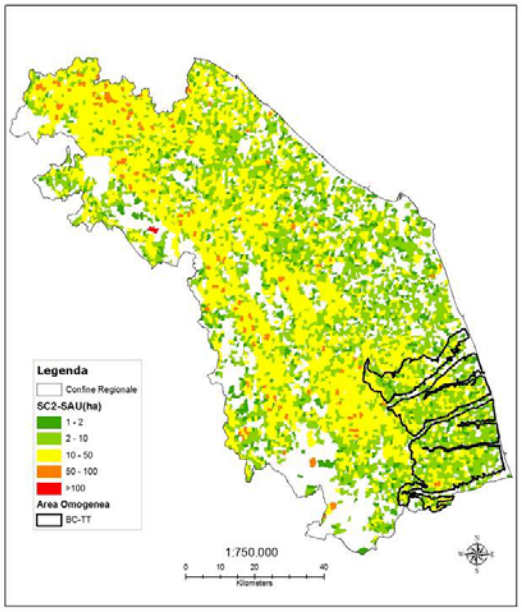
Similarly to the Low Hill zone between Foglia and Metauro, also in this area there is a more balanced ratio between crop rotation (SC1 51.46 %) and forage crops (SC2 15.43 %) with a SC2/SC1 ratio of 30. The distinctive element is undoubtedly provided by the presence of vineyards (SC7 8.91 %). The whole zone falls, in fact, within the DOC production area “Affida” and “Rosso Piceno”. The crop rotation is concentrated above all in the northern part of the area (Tenna), while in the southern part (Aso - Tronto) there is a more concentrated presence of vineyards and forage crops.

Figure 5.24: Geographic distribution of management system 1 (SC1) in the Low Hill area between Tenna and Tronto



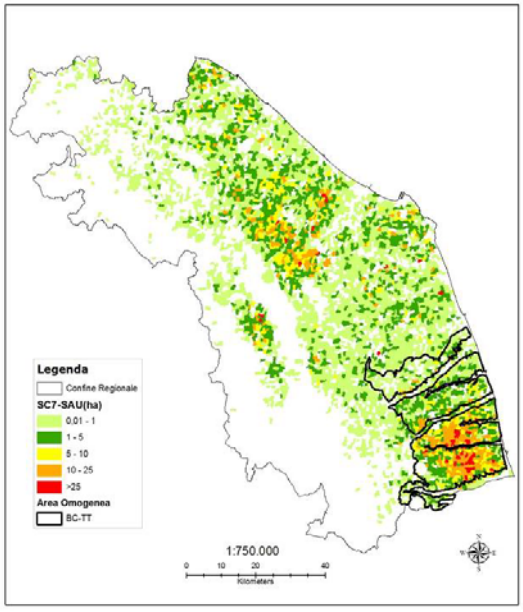
Source: elaboration by Servizio Suoli Assam on AGEA data

Figure 5.25: Geographic distribution of management system 2 (SC2) in the Low Hill area between Tenna and Tronto



Source: Elaboration of Servizio Suoli Assam on AGEA data

Figure 5.26: Geographic distribution of management system 7 (SC7) in the Low Hill area between Tenna and Tronto



Source: Elaboration of Servizio Suoli Assam on AGEA data

5.3.2 Integrated assessment of the soil conservation practices

Technical and operating aspects in relation to the feasibility of conservation practices

Table 5.7: Assessment of conservation practices in the Low Hill zone

Conservation measures	Assessment
Soil cover	The application difficulties of this practice concern a wider surface in the *middle hill*, sometimes over 70 % of the surface destined to crop rotation (SC1). The introduction of cover crops during the winter period creates also in these zones some difficulties in the seeding bed preparation of spring crops. Normally, the cultivated field dispositions are more favourable with respect to the more internal areas but, at the same time, the particularly rich in clay nature of the soils and the local weather conditions do not allow the cultivation during the winter period. Normally, better feasibility conditions are obtained during the first ten days of December than in March and April because of the soil humidity conditions. Such situations occur in a very diversified way within the area and often within the same enterprise because of the variable hydrologic characteristics of the soils which are linked to Marche hill morphologies (valleys and mountain sides delimited by hydrographical macro- and microbasins).
Association of different cultivations	Also in this zone it is possible to apply the association in the more diffused treelike Management Systems (olive groves, truffle fields, wood plantation) and vineyards. The concentration of treelike cultivations in well defined areas (viticulture in the Cesano-Esino zone and in the zone between Tenna and Tronto; fruit arboriculture in Piceno zone) leads to the application of association

	strategies in a differentiated way for each reference area. The principal aim is linked to the reduction of soil erosion, facilitated in particular by the slopes, the weather conditions but above all by the row and field arrangement with the "*rittochino"* system[12] and by higher soil erodibility. The soils of these areas present on average a higher fertility with medium, medium-clay or medium-loamy texture. The inter-row grassing practice, now of common use, is in continuous evolution towards the best herbaceous association and the best ratio between vegetative development of the main crop, competition for water and nutritive elements by the herbaceous crop and effects on the product quality. This quest for the best grassing is still more evident in the biological managements, having also the purpose of soil fertilisation.
Fertilisation	Because of the strong reduction in zootechnic breeding, in the middle hill it is almost impossible to implement organic fertilisation. It is normally carried out in proximity of breeding without land having the necessity of distributing the zootechnic effluents produced. Such situations are present mainly along Foglia and Metauro, in the zone within Tenna and Tronto and, to a lesser extent, in the rest of the Low Hill zone. Over the course of years, this lack of organic matter led to the continuous research of organic filling not belonging to agriculture (compost, depuration mud, wastes from agro-feeding industry etc.). The few guarantees on the characteristics of the available materials, the strong devotion to the land of the small producers and the policies aimed to the product peculiarity and quality prevented massive use of these substances, giving priority to the agronomic measures and strategies to conserve a good level of organic matter (green manure, sealing into the soil of crop residues, rotations with improving crops etc.).
Tillage	The adoption of conservation tillage in this zone is strictly connected to the presence of suitable *agricultural hydraulic arrangements*. In fact the Low Hill area, because of its better morphologic conditions, is the zone that experienced the greatest damages to the existing arrangements after the crop simplifying and the mechanisation. The lack of suitable arrangements, besides activating the known water erosion phenomena and causing landslides in the worst cases, worsen the absorption of meteoric waters in the soil surface horizons. This situation, in addition to the known climatic changes (increase in intense phenomena against stable average rains), creates difficulties for plant development but above all determines direct effects on the possibility of tillaging the soils. Therefore, in these areas the conservation tillage applicability varies from one enterprise situation to another, as a function of the "*technical programme*" set in time and of the seasonal weather conditions influencing the contingent situation. In the crop rotation the greatest possibilities are in the autumn and winter cereal cultivation because of their rusticity and recovery characteristics in case of operative difficulties. In starter crops, the complete substitution of deep ploughings finds adhesion difficulties due to the problems in the direct seeding and weed control. It is possible to see higher possibilities of success through the substitution of deep ploughing with a measure system (*double tillage* or *reduced*

[12] The rittichino system is a management system applied in areas at risk of landslides. The sowing and tillage direction follows the slope, e.g. from upslope to downslope. Water management is essential to avoid soil erosion and increase water infiltration.

	tillage associated with *minimal tillage*) able to obtain similar agronomic results. In many cases, the highest difficulties in the application of these technical programmes are the lack of adequate machinery.
Track reduction	In the *Low Hill* area, the simplifying of crop operations for a reduction of the tracks is less connected to the overturning problems and to the machinery dimensions thanks to the more gentle slopes of the versants. There remain the difficulties of the right moment of execution, complicated by combined machinery (minimal tillage + fertilisation + seeding). The use of lighter machinery and of separated yards offers the possibility of choosing the optimal moment of execution for the different operations. If we consider the greater execution quickness and the lower energy required to tractors, the advantages can also reside in the lower energetic consumptions. In the ordinary management of middle agricultural enterprises, the separated performance of the operations also allows a better use of workforce and a better distribution of the works during the year. Also in these zones it is worth considering that tillage performed in an incorrect way during the first crop development phases can impair the good outcome of the whole productive cycle.

Effects on environment and soil degradation risks

In the four Low Hill subzones there are erosion risks on average lower than in the internal areas. In this context, the factors influencing soil erosion act in different ways. Against a more gentle morphology (lighter slopes), the simplifying of the agricultural arrangements and the adoption of Management Systems reducing the soil cover during autumn and winter periods represent the main limiting factors.

In the Foglia and Metauro and Piceno (Tenna and Tronto) zones, the presence of microbasins with greater ridge energy determines the higher occurrence of the phenomenon.

Figure 5.27: Risk of soil erosion in the Low Hill zones between "Foglia and Metauro"

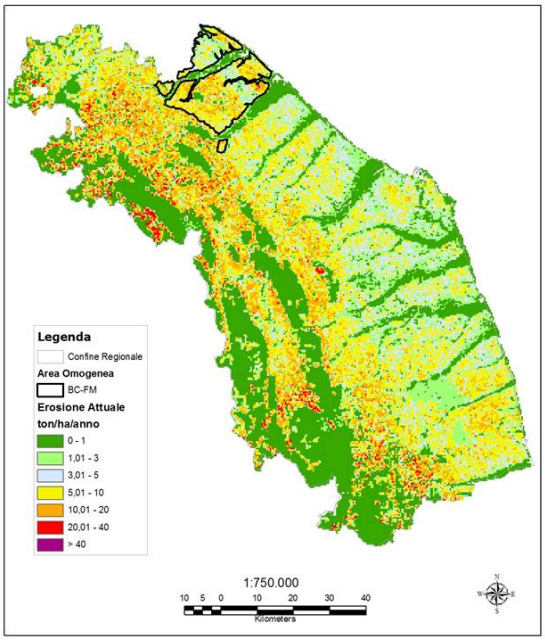
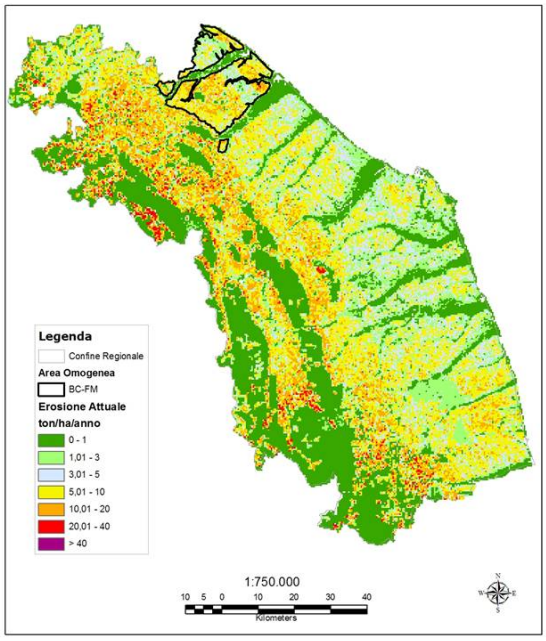


Figure 5.28: Risk of soil erosion in the Low Hill zones between "Tenna and Tronto"



The particular composition of the Management Systems of the Low Hill zone between Foglia and Metauro (BC_FM) and of the Low Hill zone between Tenna and Tronto (BC_TT) explains the better level of conservation of the soil organic matter which can be registered in these areas.

In general, in these domains it is possible to point out a level of better organic matter differentiated for each individual environment in relation to in-time adopted Management Systems and to the original nature of the soil.

Figure 5.29: Organic matter content in the Low Hill soils between Foglia and Metauro

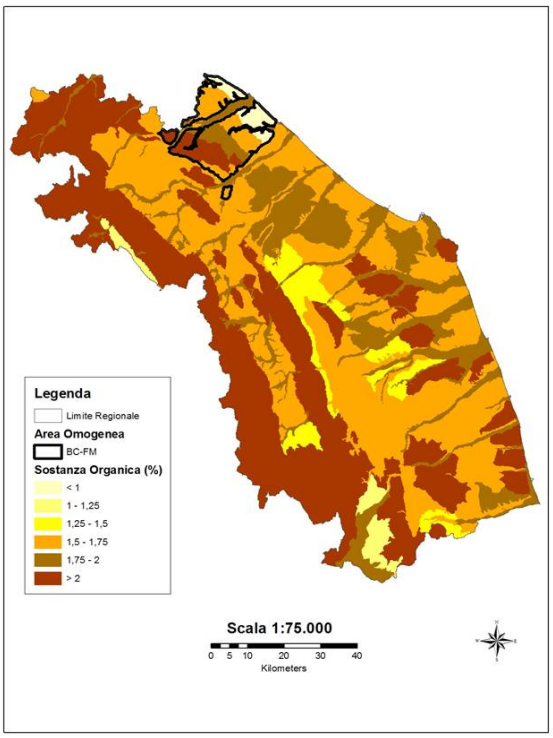
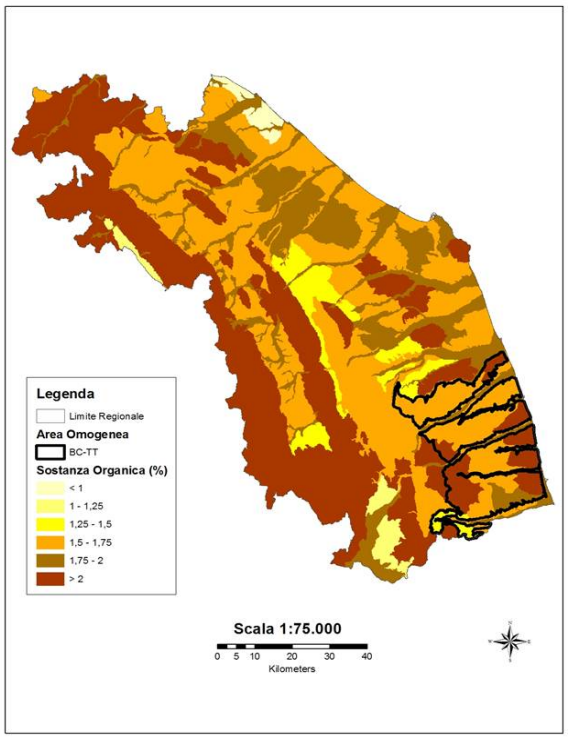


Figure 5.30: Organic matter content in the Low Hill soils between Tenna and Tronto



Socio-economic aspects and costs/effectiveness ratio

Table 5.8 clearly points out how dramatically the characteristics of rurality change in these zones.

The typology D (*Rural areas with development problems*) and the typology C3 (*Intermediate rural with natural limitations*) are completely absent, with the exception of the Low Hill zone between Tenna and Tronto (BC_TT). The rural areas C2 (*Intermediate rural with low resident density*), accounting for over 30 % of their extension in the *Medium High Hills* areas, are concentrated above all in these areas with a surface exceeding 50 %. The greatest extension is observed in Piceno area, with a presence 19.57 % and in the Cesano and Esino zone (12.67 %).

The *Medium High Hills* areas (C2) are characterised by a stable rural society on which it is possible to base development policies and strategies integrated with the highest balance between environmental sustainability and socio-economical needs. The requirements reside in the territory and landscape requalification for a better integration among urban and agricultural areas.

C1 areas (*Industrialised intermediate rural*) are characterised by a high occupational level, higher than the national average and than the average of the other regions of Central Italy.

Over 80 % of the total surface is occupied by agricultural activities. The population concentration in the shelter of the industrial areas determines a progressive loss in more fertile and organised agricultural lands for urbanised or facility assigned areas.

The expansion of urban areas along with the drop in economical importance of the agricultural sector marks a lower and lower relevance given to the maintenance and the management of the peri urban and agricultural areas. Such circumstances lead to the exigency of a landscape and territory requalification for a better integration among urban and agricultural areas.

The development potential of these areas resides in the direct sale of the products through the creation of local market exploiting the market potential offered by the near urban centres. Here the necessity arises to characterise the agricultural products for their identification and value adding within the local markets (quality certification).

The greatest expression of the C1 areas is in the central Low Hill of Marche (BC_CE e BC_MCE), 12.46 % and 30.48 % respectively. It is less present at northern and southern extremes of the region (BC_FM e BC_TT), respectively 9.96 % and 9.22 %. The urban centre development (A) is concentrated above all in the Low Hill area between Musone and Chienti (33.27 % - BC_MCE) and along Foglia and Metauro (18.06 % - BC_FM).

Table 5.8: Rural areas of Marche included within Low Hill area

"LOW HILL" homogeneous areas	MARCHE RURAL AREAS				
	A	**C1**	**C2**	**C3**	**D**
BC-FM	18.06 %	9.96 %	5.49 %	0.00 %	0.00 %
BC-CE	0.00 %	12.46 %	12.67 %	0.00 %	1.31 %
BC-MCe	33.27 %	30.48 %	8.53 %	3.71 %	0.00 %
BC-TT	12.42 %	9.22 %	19.57 %	7.64 %	0.00 %

Source: elaboration by Servizio Suoli, Assam on Istat data

Illiteracy has almost disappeared in the most urbanised zones, and it is anyway barely present also in the other areas. The sharpest difference is the different number of graduation and diploma holders, which is lower in the rural areas, in particular in C2 and C3. Probably, this is not so much an indication of school service access difficulty, but of the attraction exerted by the urban centres on the more trained population classes, thanks to a higher presence of service sector activities.

Considering the evolution of the job market, requiring people with a higher and higher school level, the low presence of graduates seems to be an obstruction to specialized professional skill development both in the self-employed and the subordinate work sectors. The towns with the lowest number of graduates are localised mainly along the Appennino ridge, and a small group is present in the hilly belt between the provinces Ancona and Pesaro. It is worth noticing how the highest presence of graduate is not limited only to the sole urban centres, but it extends towards some university centres (Urbino and Camerino), comprising a wide belt of the surroundings.

Concerning the costs/effectiveness ratio of the conservation measures in the Low Hill areas, with the current organisational possibilities they still turn out not to be positive in relation to the production losses (on average reductions of 15-20 %), that in the greater part of the cases do not set off the reduction of the technical means costs. These evaluations, carried out on short cycles, can take different meanings through the quantification of the benefits in terms of long term resource conservation and soil quality improvement and through the improvement of the rationally integrated techniques within a specific enterprise management system.

5.3.3 Suggestions and development prospects towards a sustainable agriculture

On the basis of the considerations of general character reported in the paragraph concerning the development prospects of the “high mountain” areas, we present in the following specific proposals for the “Middle Hill” lands.

Table 5.9: Proposed initiatives for sustainable development in the Low Hill area

Strategic elements	Suggestions and proposals
Territory	- agricultural activity not only directed to enterprise needs but as a collective service for territory maintenance and management valorising the widespread presence of the rural population on the territory; - improvement of agricultural hydraulic arrangements introducing hedges and riparian vegetation, scarp consolidation and underground drainage works; - requalification of the territory minor hydrographical network through the active involvement of agricultural enterprises; - requalification of the rural landscape through a better integration and balance among urban and agricultural areas; - maintenance of services to the population; - enhancement of the support technical services on a territorial and enterprise scale according to a logic of Regional Rural Network integrated at National and European levels. - verification and assessment of the territory natural aptitudes for the incentivisation and the development of new cultivations; - integrated controls and assessments for a reasonable building development; - improvement of the transportation services and of the communication networks;
Enterprises	- diversification of the production concerning above all cropland through the introduction of multiyear cycle cultivations (forage crops, vineyards, etc.), treelike or agrienergetic (SRF) crops; - investments for the provision of machinery suitable for the execution of conservation practices (reduced and minimal tillage, direct seeding, etc.); - development of dry crop techniques; - application of technical programmes specific for Land Unit and managed Management System; - avoid deep tillage and soil horizon stirring through the double tillage techniques; - crop residue value adding for supplying organic matter to the soil; - rediscovery and value adding of historic productions typical of the area and abandoned; - expand the zootechnic activities in balance with the enterprises organisation structures (utilised agricultural surface, adopted Management Systems, use of effluents in soil organic fertilisation); - adhesion to area projects and agreements to stimulate typical productions; - traceability of the agricultural activity through the adoption of production specifications; - income integration with the provision of services.

Sector	- enterprise or territorial investments for land units for processing and direct consumer sales (cellars, inter-municipal abattoirs, *farmer's market*); - value adding of local products through the involvement of the resident population; - stimulate cooperation forms for the participation in the commercial sector competitive on the international market (cereal, fresh milk, wine, pork, etc.).

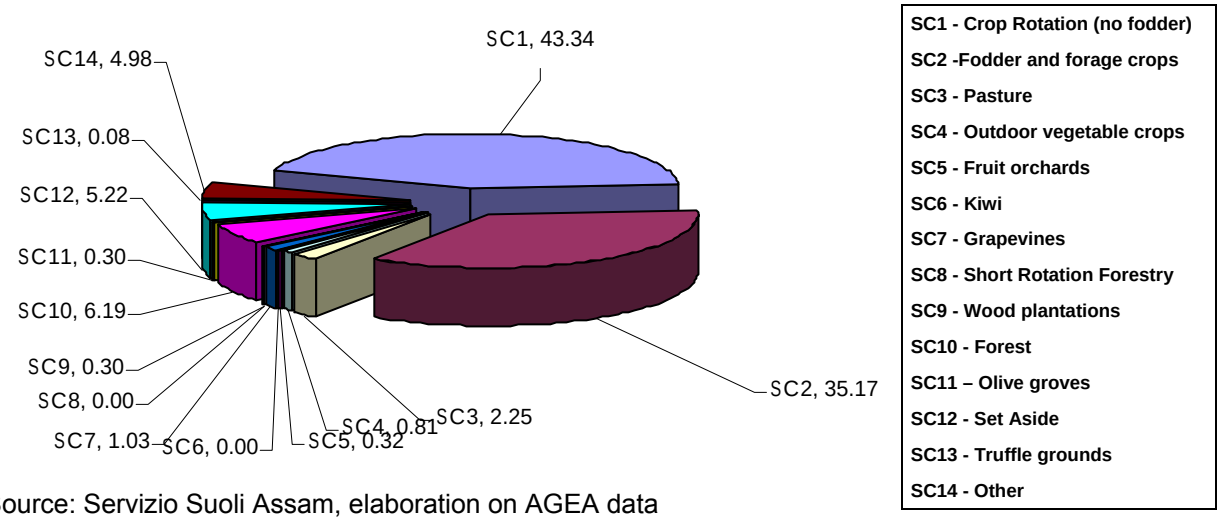
5.4 Internal Alluvial Plain (AP)

The flat disposition is the common characteristic of these areas, providing them the name "plain". In reality, they should be classified as valley floors developed in the shelter of the principal rivers at the foot of the hill versants.

The Management System composition is more similar to the Medium High Hills areas thanks to the coastal plain zones. The cultivations are carried out in dry conditions, except rare cases of hill pool or river irrigation as an aid in case of particularly dry years.

5.4.1 Implemented management systems and conservation practices

Figure 5.31: Management Systems and presence percentage of internal alluvial plain



Source: Servizio Suoli Assam, elaboration on AGEA data

The ratio between forage crops and crop rotation of 81.17 (SC2/SC1) is significant. Such a ratio, which is positive thanks to the presence of lucerne within the rotations, indicates the presence of breeding and holds a portion of 35.7 % of the utilised agricultural surface. The presence of pasture lands (2.25 % (SC3)) is noticeable for the integration of the biologic diversity and landscape characteristics. Forestry covers a surface of 6.19 % (SC10).

Figure 5.32: Geographic distribution of management system 1 (SC1) within the internal alluvial plain

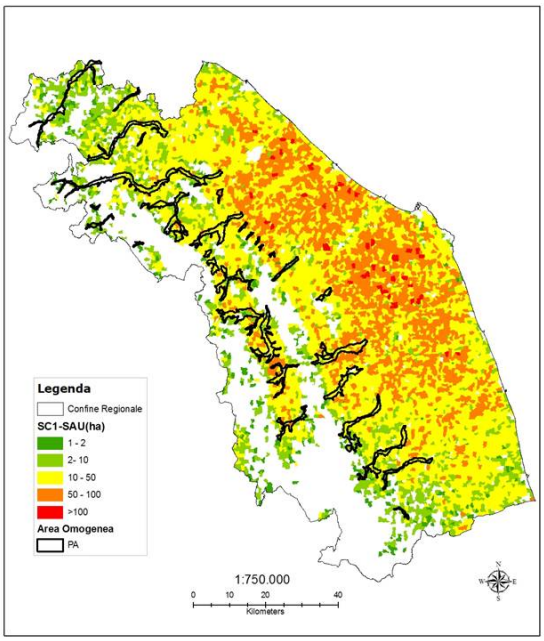


Figure 5.33: Geographic distribution of management system 2(SC2) within the internal alluvial plain

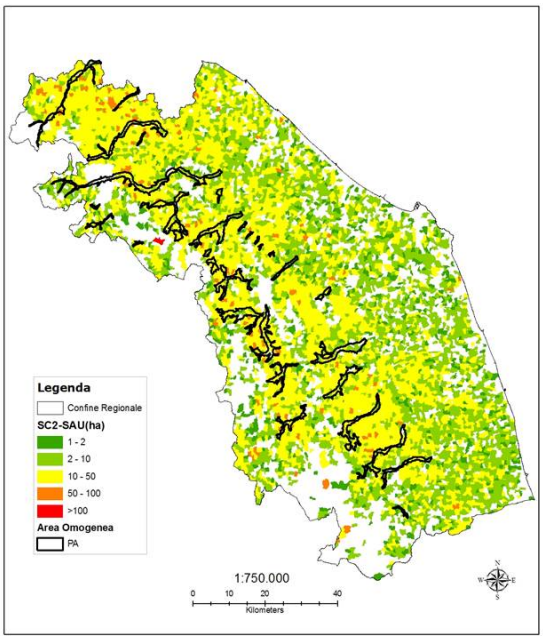
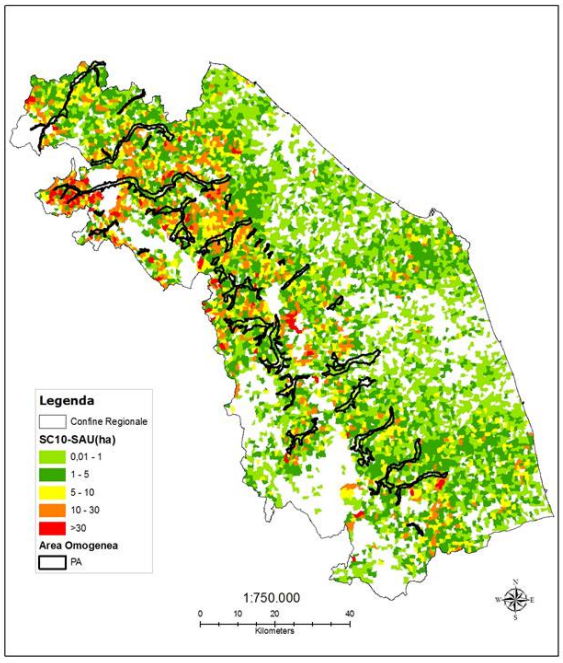


Figure 5.34: Geographic distribution of management system 10 (SC10) within the internal alluvial plain



5.4.2 Integrated assessment of the soil conservation practices

Technical and operating aspects in relation to the feasibility of conservation practices

Table 5.10: Assessment of conservation practices in the internal alluvial plain

Conservation measures	Assessment
Soil cover	The particular plain morphology of these areas and the presence of crop rotations with a good presence of forage crops (SC2 35 %) do not generate particular application needs of this measure. Normally, the disposition of the fields does not create problems of erosion. Furthermore, the presence of permanent canals and natural scarps with a significant presence of *riparian vegetation*[13] conditioned the conservation of the *hydraulic agricultural arrangements* facilitating today the conduction of agriculture with a good level environmental sustainability.
Association of different cultivations	Given the scarce presence of treelike crops, the association of different cultivations is of low interest in this zone.
Fertilisation	Normally, the presence of fresh soils and the diffusion of Management Systems with a wide use of forage crops maintained good levels of average organic matter content of the principal mineral elements in time. Thus, despite the breeding decrease in this zone there are no particular problems of fertilisation, which is practiced valorising the current availability of animal manure and rationalizing the mineral fertilizer supply.
Tillage	The non tillage in these areas is of easier application considering the physical nature of the soil, characterised by a more even composition in sand, silt and clay. Besides determining specific water characteristics useful for the best plant development, the nature of these soils facilitates the tillage of the soils in relation to the different conditions of humidity arising during the year. As pointed out in the other zones, issues remain related to the correct preparation of the seed bed, the weed control and control of parasitic diseases favoured by the presence of undecomposed crop residues in the soil. The experiences carried out by the farmers during recent years lead to the adoption of differentiated solutions depending on the zone, the adopted enterprise management system, the weather of the year and the fortuitous field situations when performing the tillage. The justification of the adopted operations passes through the assessment of the adopted *measure system* and of the aimed and obtained agronomic purposes, instead of evaluating the individual operations. In the majority of the cases, the technical innovations are mainly applied by enterprises of greater size and/or with better organisation; in other cases by contracts with industry, more often provided with mechanic equipment.

[13] Riparian vegetation

Track reduction	In these zones, the easier improvement of the machinery, the greater size of the fields and the lower slopes facilitate the use of machinery combined with the consequent reduction of the tracks. However, the soil water regimen imposes the performing of the principal tillage for the preparation of the seed bed during the summer period and in "*tempera*"[14] conditions. In case of direct seeding, it is necessary to associate a minimal tillage to favour the seed cover and above all to protect the new seedlings from the weeds competition and from the attack by diseases brought by the previous crop residues.

Effects on environment and soil degradation risks

The factors influencing soil erosion in this area are strictly connected to its territory context, recognized as the *Medium High Hills* zone. Given the lighter slopes, the flowing water earth particles transportation is rather limited. Otherwise, there are more frequent opposed effects of material accumulation on surface soil horizons, which actually modify the horizons and the chemical, physical and biological quality characteristics. In the event of more intense meteoric occurrences, the increase in erosion of surrounding hill versants often leads to discharging earthy materials out of the cultivated plots, creating significant damage to roads, buildings and other facilities located in the territory.

Figure 5.35: Risk of soil erosion in the internal alluvial plains

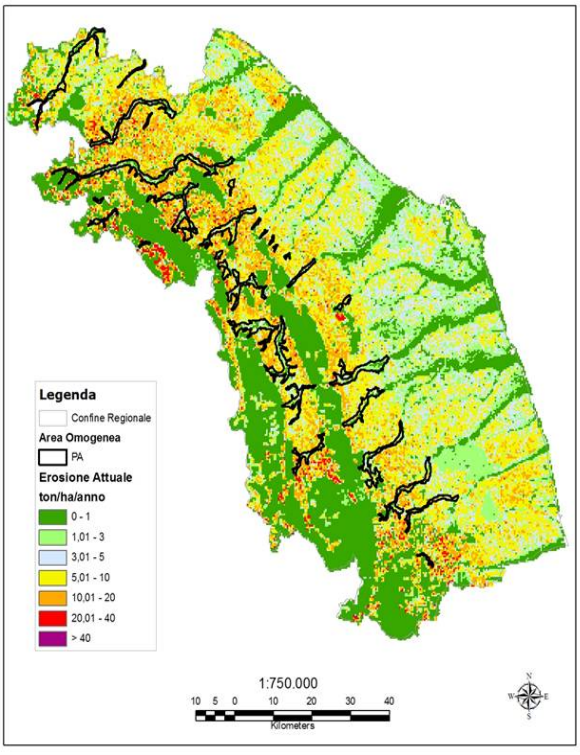
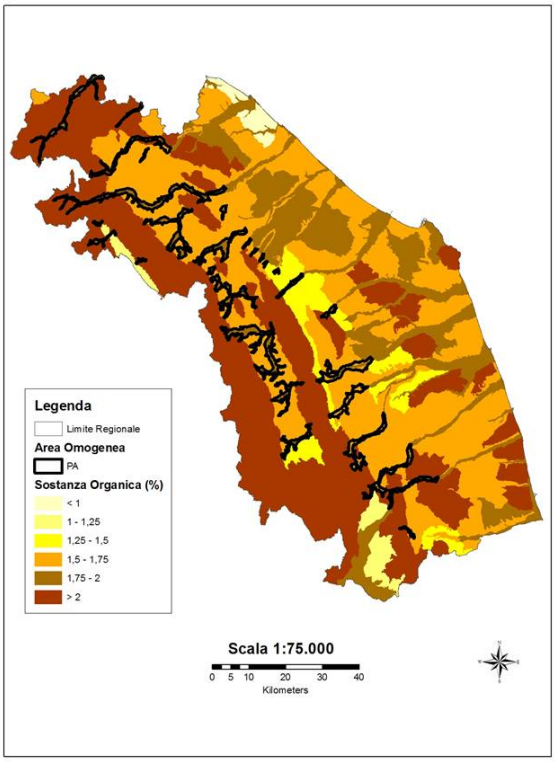


Figure 5.36: Organic matter content in the internal alluvial plain soils



The organic matter content, particularly differentiated within the micro basin extending from the north to the south of the region, kept middle high levels with respect to more intensively cultivated territories. However, the decrease in the supply of animal manure organic matters has strongly lowered the concentration averages.

[14] Tempera: particular hydrologic condition of the soil characterised by a water content minimizing the cohesion and the plasticity: thus, it is a condition increasing the effectiveness of the disaggregation tool action.The balance between water, solids (mineral) phases of soils and air allow tillage without damage.

Socio-economic aspects and costs/effectiveness ratio

The geographic position of the internal alluvial plains, integrated within the Medium High Hills belt, devised in time socioeconomic development models identified for the internal areas of the region.

The data reported in the table 5.11, analogously with the observations in the *Medium High Hills areas,* point out how the internal plains (AP) are characterised by the presence of type D rural areas (*Rural areas with development problems*); C3 *(Intermediate rural with natural limitations) and* C2 *(Intermediate rural with low resident density)*.

Table 5.11: Marche rural areas included within the internal alluvial plain (AP)

Homogeneous "internal alluvial plain" Area	MARCHE RURAL AREAS				
	A	C1	C2	C3	D
AP	0.01 %	0.00 %	4.45 %	5.88 %	4.95 %

Source: elaboration by Servizio Suoli, Assam on Istat data

The development possibilities of these zones, as of the other typically rural areas of Marche, are linked to the possibility of integration: the enterprise needs; the necessities of the other parties of the sector including final consumers; the belonging territory and the rural society needs.

From this point of view, the role of the economical and social partnership and consequently the necessity of realising an effective “National and European Network for Rural Development”, not only allows the participation in the decisional and operative processes by all the involved parties but also and above all the exchange of experiences, the knowledge and information sharing, as well as the best practice circulation.

The so intended integrated development, to guarantee also a sustainable development able to value-add the territories and to meet society needs, will have to be based on the ingrained knowledge of the natural characteristics of the local lands and the enterprises interacting with them.

5.4.3 Suggestions and development prospects towards a sustainable agriculture

On the basis of the general considerations reported in the paragraph concerning the “high mountain” area development prospects, we introduce in the following some specific proposals for the Internal Alluvial Plains.

Table 5.12: Proposed initiatives for sustainable development in the internal alluvial plains

Strategic elements	Suggestions and proposals
Territory	- conservation and value adding of the natural resources regarded as income and job opportunities for people staying in the zone; - agricultural activity not only directed to enterprise needs but as a collective service for territory maintenance and management; - involvement of the agricultural enterprises in the management of the main rivers; - maintenance of services to the population; - enhancement of technical support services on a territorial and enterprise scale according to a logic of Regional Rural Network integrated at National and European levels. - verification and assessment of the territory natural aptitudes for the incentivisation and the development of new cultivations;
Enterprises	- diversification of the production concerning above all cropland through the introduction of multiyear cycle cultivations (forage, treelike, bio energy crops etc.); - enhancement of the breeding activities in balance with the organisation structure of the enterprises (UAA, adopted Management Systems, use of effluents in the soil organic fertilisation, etc.); - investments for the provision of machinery suitable for the execution of conservation practices (reduced and minimal tillage, direct seeding etc.); - application of technical programmes specific for Land Unit and managed Management System; - rediscovery and value adding of historic productions typical of the area and abandoned; - adhesion to area projects and agreements to stimulate typical productions; - traceability of the agricultural activity through the adoption of production specifications; - income integration with the provision of services;
Sector	- enterprise or territorial investments for land units for processing and consumer direct sales; - value adding of local products; - activation of local market committing the local population; - promote cooperation forms linked to specific territorial identities; - realisation of facilities for producer-consumer direct sales *(farmer's market).*

5.5 Coastal alluvial Plain

5.5.1 Implemented management systems and conservation practices

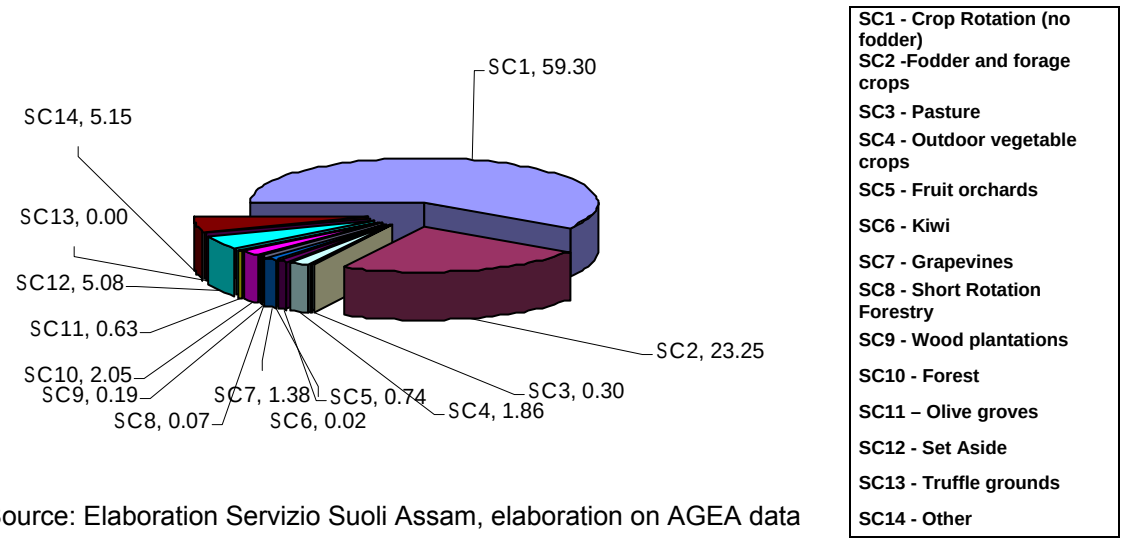
Common factors of these areas are high productivity, good fertility soils, irrigated intensive agricultural management systems. These are also the areas with the highest risk of soil loss because of the growing presence of industrial activities along the rivers or in the shelter of the Adriatic coast. Considering the hydro geological nature of the substrate, the majority of these zones fall within the Nitrate Vulnerable Zones (NVZ), identified on the application of the UE Directive no. 676/91. According to the Fischler Reform, since 2005 the agricultural enterprises of these zones have to apply a specific “Action Programme” aimed at avoiding contamination of the aquifers.

The vegetable crop presence in the crop rotations is an indication of the intensity level of typical cultivation in the four plain areas. The highest presence is registered in the zones between Musone and Chienti (11.71 %) and in the areas between Tenna and Tronto (12.2 %). The presence of forage crops, which indicates on the contrary longer rotations, thus more sustainable for the soil and the environment, is greater in the zone between Foglia and Metauro (39.2 %). In Cesano and Esino, the SC2/SC1 ratio is of 20 %.

Table 5.13: Forage and vegetable crops on crop rotation and for homogeneous areas

Homogeneous areas	SC2/SC1	SC4/SC1
AP-CE	20.68 %	9.43 %
AP-FM	39.20 %	3.13 %
AP-MCe	12.07 %	11.71 %
AP-TT	17.30 %	12.20 %

Coastal Alluvial Plain between Foglia and Metauro (AP_FM)
Figure 5.37: Management Systems and presence percentage of High Mountain

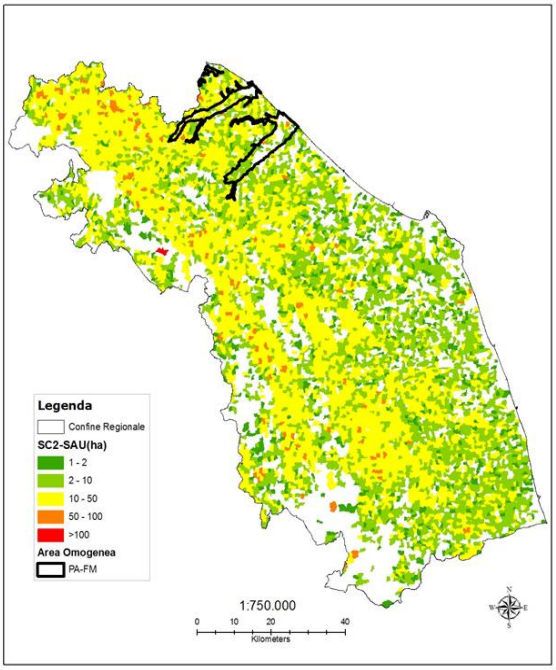


Source: Elaboration Servizio Suoli Assam, elaboration on AGEA data

In the Foglio and Metauro area, as well as in the hill versants, the coastal valleys maintain a good presence in forage crops (SC3 23.35 %). Vineyards (SC7) and vegetable crops (SC4 1.86 %) have a small presence but, as previously stated, these management differentiations have a particular relevance from the environmental and landscape point of view.

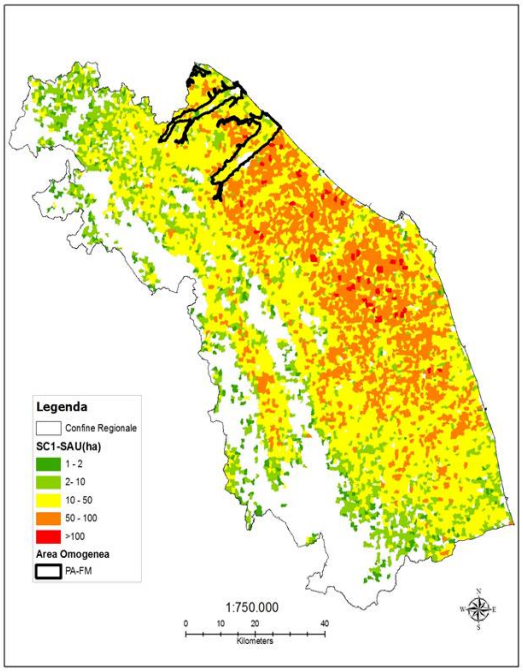
Presented in the following figures is the space distribution of the most represented Management Systems: crop rotation (SC1) and forage crops (SC2). In the development prospects of this zone, the crop rotation surfaces will undergo a further increase due to the recropping of the surfaces currently recalled from production (SC12 5.8 %).

Figure 5.38: Geographic distribution of management system 1 (SC1) in the Coastal Alluvial Plain between Foglia and Metauro



Source: elaboration Serizio Suoli Assam on AGEA data

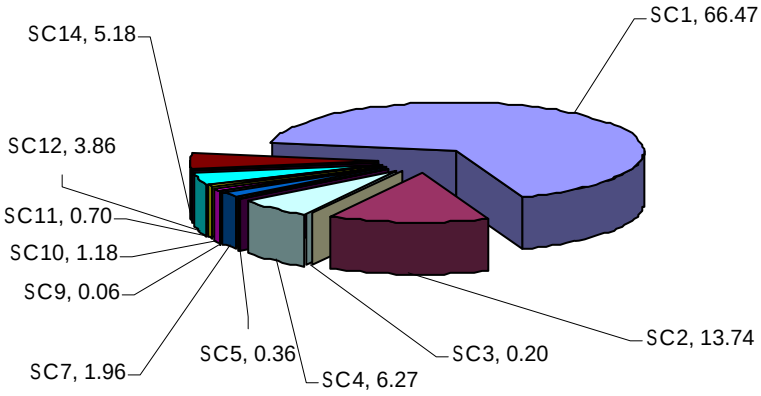
Figure 5.39: Geographic distribution of management system 2 (SC2) in the Coastal Alluvial Plain between Foglia and Metauro



Source: Elaboration of Servizio Suoli Assam on AGEA data

Alluvial Plain between Cesano and Esino (AP_CE)

Figure 5.40: Management Systems and presence percentage in the Alluvial Plain between Casino and Esino



SC1 - Crop Rotation (no fodder)
SC2 -Fodder and forage crops
SC3 - Pasture
SC4 - Outdoor vegetable crops
SC5 - Fruit orchards
SC6 - Kiwi
SC7 - Grapevines
SC8 - Short Rotation Forestry
SC9 - Wood plantations
SC10 - Forest
SC11 – Olive groves
SC12 - Set Aside
SC13 - Truffle grounds
SC14 - Other

Source: Servizio Suoli Assam elaboration on AGEA data

More than 80 % of the whole area (SC1+SC2+SC4) is used for herbaceous cropland. Besides being the most widespread system, system 1 (SC1 66.7 %) is also the most connected to the principal agro-environmental problems due to the cultivation intensity and to the inherent vulnerability of the area in relation to the aquifer contamination by nitrates, used for fertilisation.

Management System 1 (SC1) provides the introduction of annual cycle cultivations, mainly autumn-winter cereals (hard wheat accounting for over 40 %), and of autumn-spring starter crops, mainly represented by sunflower and corn.

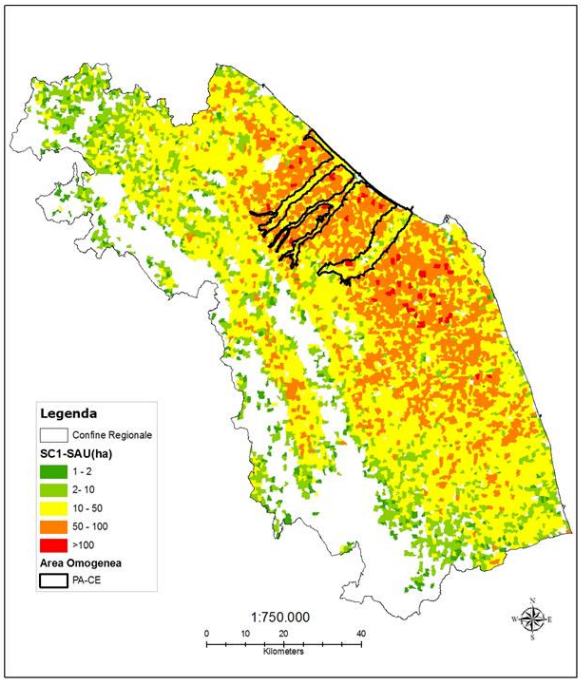
In this case, the degradation risks are in:

- the continued and repeated annual tillage with repercussions on the soil structural characteristics, on the organic matter content and on the biologic quality maintenance;
- the intensive use of chemical fertilizers and the use of pest control products.

The presence of the forage crops and vegetable crops (SC4 6.27 %) systems indicates enterprises using forage crops as starter or perennial crops to lengthen the rotations and the vegetable crops as starter or catch crops of spring-summer or summer-winter cycle in their cultivation management plan. Even though the variety of cultivations and crop techniques introduced in the enterprise management plans determines several and relevant degradation risks, it offers valuable enterprise opportunities with good production results and more tolls to guarantee the environmental sustainability. Indeed, the rotation of different crops offers the possibility of having the soil always covered by cultivations. In the absence of organic contribution, there is a higher availability of crop residues, and normally the cereal following the vegetable catch crop (often represented by grain legumes able to fix atmospheric nitrogen) does not need nitrogenous fertilisations given the soil base condition.

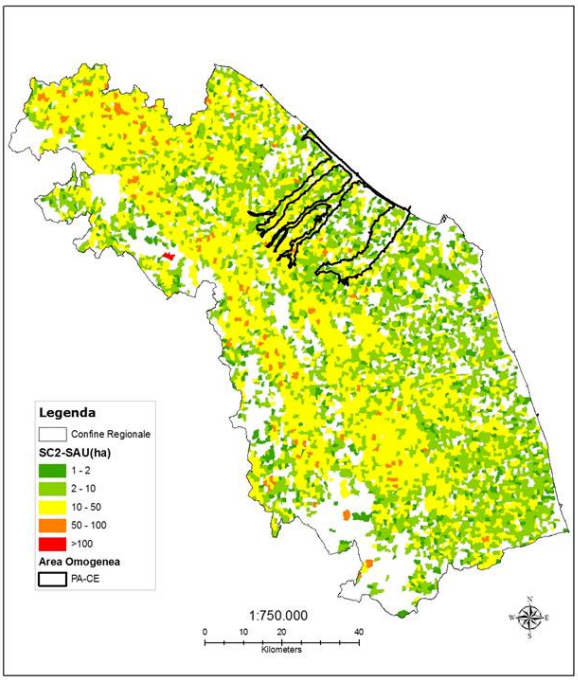
The geographic distribution of the more widespread Management Systems SC1 and SC2 are illustrated in figure 5.41 and 5.42.

Figure 5.41: Geographic distribution of management system 1 (SC1) in the Coastal Alluvial Plain between Cesano and Esino



Source: elaboration Serizio Suoli Assam on AGEA data

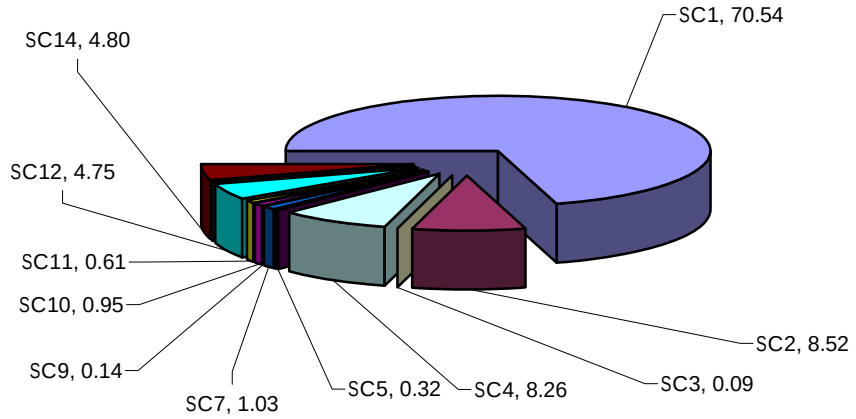
Figure 5.42: Geographic distribution of management system 2 (SC2) in the Coastal Alluvial Plain between Cesano and Esino



Source: elaboration Serizio Suoli Assam on AGEA data

Alluvial Plain between Musone and Chienti (AP_MCe)

Figure 5.43: Management Systems and presence percentage of High Mountain



SC1 - Crop Rotation (no fodder)
SC2 -Fodder and forage crops
SC3 - Pasture
SC4 - Outdoor vegetable crops
SC5 - Fruit orchards
SC6 - Kiwi
SC7 - Grapevines
SC8 - Short Rotation Forestry
SC9 - Wood plantations
SC10 - Forest
SC11 – Olive groves
SC12 - Set Aside
SC13 - Truffle grounds
SC14 - Other

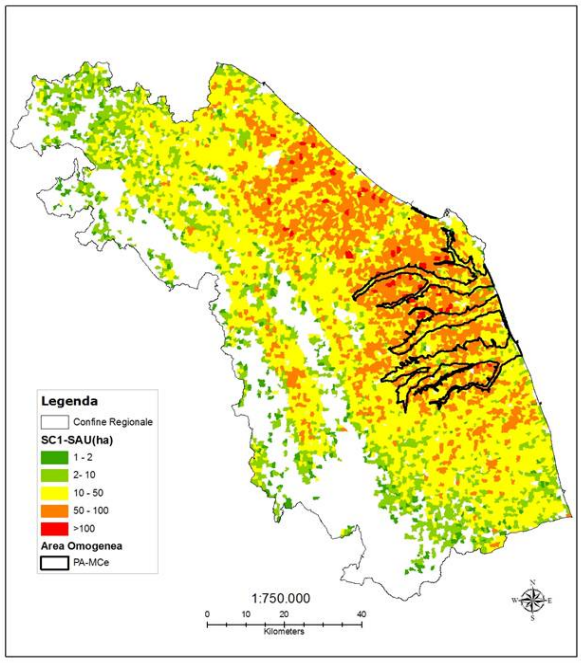
Source: Elaboration Servizio Suoli Assam on AGEA data

In the territories within the valleys between Musone and Chienti, the same considerations made for the zone of Cesano and Esino are valid, and they are expressed in a more evident way by the composition of the Management System operated.

The SC1 is still more widespread (70.54 %), the forage crops have a lower presence (SC2 8.52 %) and the vegetable crops are still more used (SC4 8.26 %). There is a significant ratio between vegetable crops and crop rotation (SC4/SC1), 11.7 %, indicating the presence of vegetables and catch crops in the rotations.

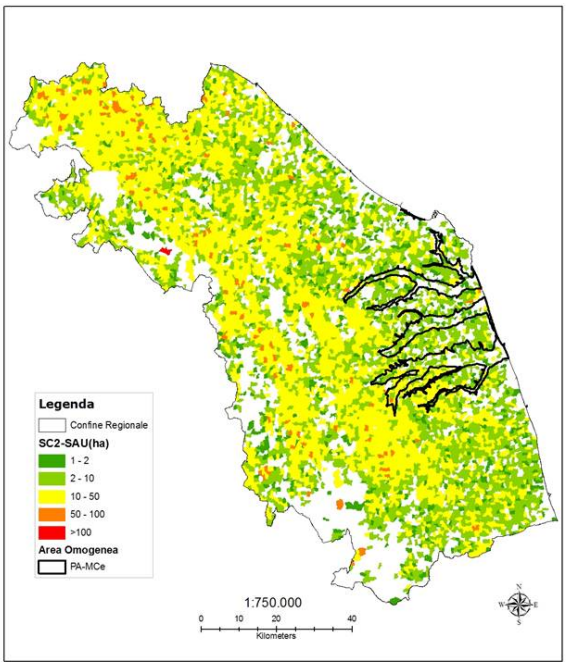
Figure 5.44 and 5.45 represent the space distribution of SC1 SC2 and of the outdoor vegetables (SC4).

Figure 5.44: Geographic distribution of management system 1 (SC1) in the Coastal Alluvial Plain between Musone and Chienti



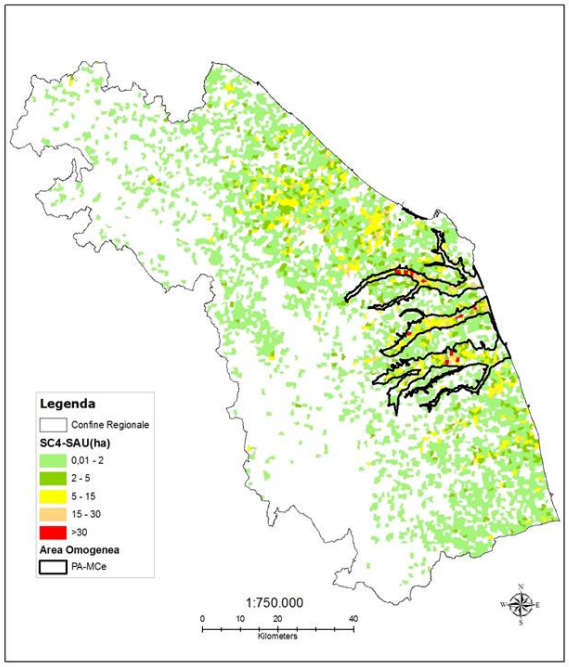
Source: elaboration Serizio Suoli Assam on AGEA data

Figure 5.45: Geographic distribution of management system 2 (SC2) in the Coastal Alluvial Plain between Musone and Chienti



Source: elaboration Serizio Suoli Assam on AGEA data

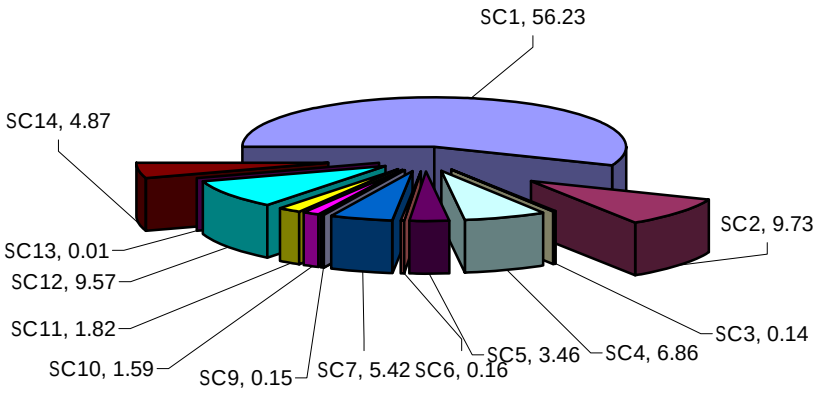
Figure 5.46: Geographic distribution of management system 4 (SC4) in the Coastal Alluvial Plain between Musone and Chienti



Source: Elaboration Servizio Suoli Assam on AGEA data

Alluvial Plain between Tenna and Tronto (AP_TT)

Figure 5.47: Management Systems and presence percentage of High Mountain

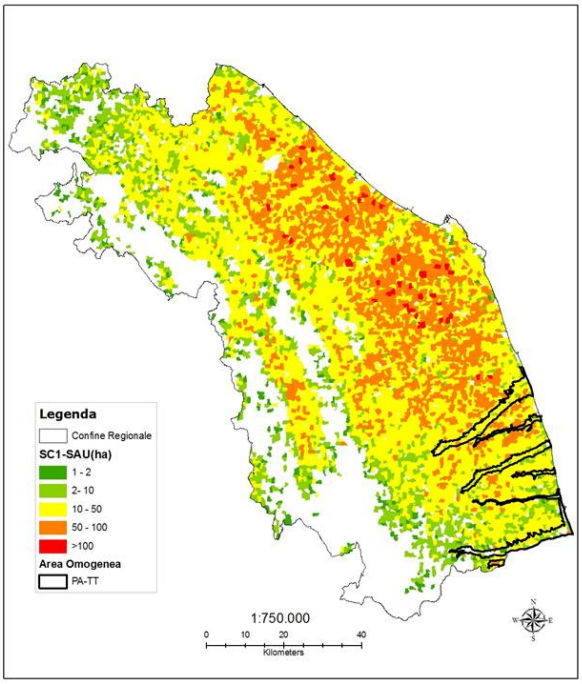


SC1 - Crop Rotation (no fodder)
SC2 -Fodder and forage crops
SC3 - Pasture
SC4 - Outdoor vegetable crops
SC5 - Fruit orchards
SC6 - Kiwi
SC7 - Grapevines
SC8 - Short Rotation Forestry
SC9 - Wood plantations
SC10 - Forest
SC11 – Olive groves
SC12 - Set Aside
SC13 - Truffle grounds
SC14 - Other

Source: Elaboration Servizio Suoli Assam on AGEA data

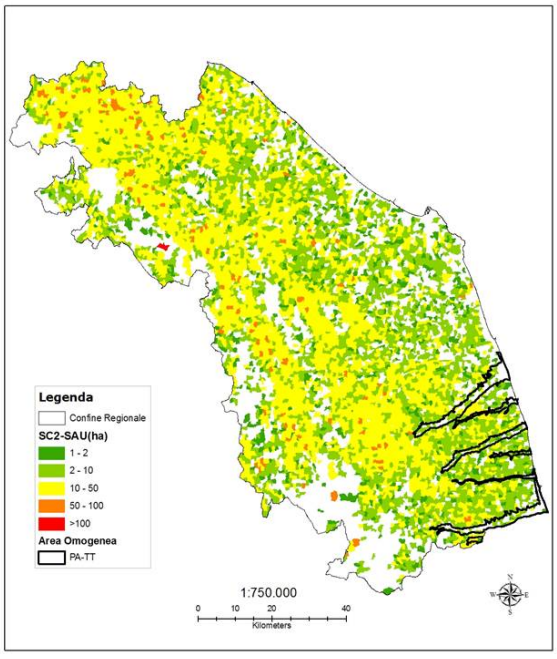
The valleys of Tenna and Tronto are clearly distinguished from the other plain zones not only because of their particular environmental features but also because of the Management Systems operated in the agricultural enterprises. There is a significant differentiation among the Management Systems provided by the presence of forage crops (9.73 % - SC2), vegetable crops (6.86 % - SC4), vineyards (5.42 % - SC7), fruit trees (3.46 % - SC5) and of course by the crop rotation (56.23 % - SC1). It is worth noting the importance of the garden activities (4.87 % - SC14). An interesting aspect in these valleys is the reintroduction in the cultivation of the set-aside areas, representing in this case 9.57 % (SC12).

Figure 5.48: Geographic distribution of management system 1 (SC1) in the Coastal Alluvial Plain between Tenna and Tronto



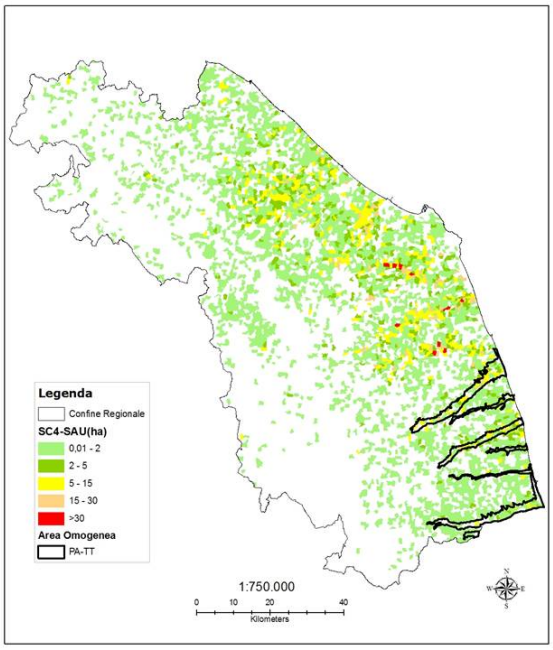
Source: Elaboration Servizio Suoli Assam on AGEA data

Figure 5.49: Geographic distribution of management system 2 (SC2) in the Coastal Alluvial Plain between Tenna and Tronto



Source: elaboration Serizio Suoli Assam on AGEA data

Figure 5.50: Geographic distribution of management system 4 (SC4) in the Coastal Alluvial Plain between Tenna and Tronto



Source: elaboration Serizio Suoli Assam on AGEA data

5.5.2 Integrated assessment of the soil conservation practices

Technical and operating aspects in relation to the feasibility of conservation practices

Table 5.14: Assessment of conservation practices in the coastal alluvial plains

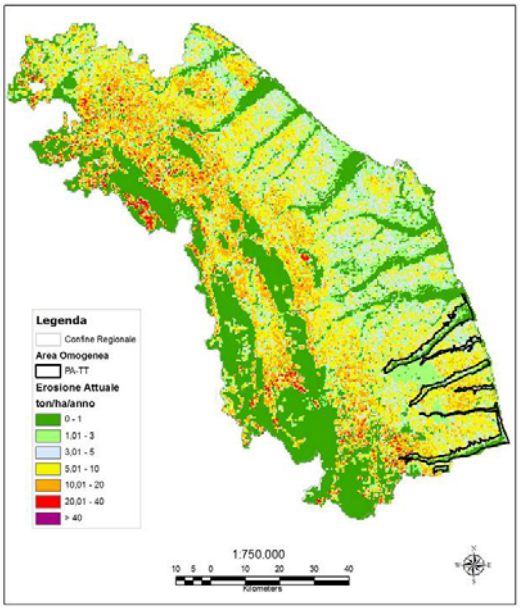
Conservation measures	Assessment
Soil cover	The soil cover in the coastal plain is widely guaranteed by two identifying characteristic elements. Presence of forage crops and other uses of the soil above all in the area of Foglia and Metauro and in the zone south of the region between Tenna and Tronto. In the rest of coastal plain, even though on one hand the introduction of vegetable crops creates many concerns connected to the cultivation intensity, on the other hand it guarantees a greater soil cover.
Association of different cultivations	The association of different cultivations has little interest in this zone. In consideration of the irrigation possibilities, in these areas the double cultivation during the same agricultural year is possible. Cereal + vegetable crop at the second harvest; starter vegetable crop + sunflower or corn at the second harvest.
Fertilisation	The organic fertilisation is only limited to breeding farms, mainly concentrated north of the region and in Ascoli Piceno province (Tenna-Tronto area). The introduction of grain legumes in the rotations permits limiting the nitrogenous fertilisation of the vegetable crops as well as of the subsequent cereal. The excessive use of nitrogen during past years determined within the greater part of the main rivers nitrate concentration levels exceeding the norm. In these zones, which have been identified as Nitrate Vulnerable Zones, the application of the *conditionality* rules registered a noticeable improvement of the surface water qualities.
Tillage	The non tillage in these areas is of easier application in consideration of the physical nature of the soils, characterised by medium to loose texture (higher presence of silt and sand), the plain disposition, the field size and the irrigation possibility. The nature of the plain soils facilitates the tillage of the lands in relation to the different humidity conditions arising during the year. As pointed out in the other zones, issues remain related to the correct preparation of the seed bed, the weed control and control of diseases favoured by the presence of undecomposed crop residues in the soil. The experiences of the farmers during recent years lead to the adoption of differentiated solutions depending on the zone, the adopted enterprise management system, the weather of the year and the field fortuitous situations when performing the tillage. The justification of the adopted operations passes through the assessment of the adopted *measure system* and of the aimed and obtained agronomic purposes, instead of evaluating the individual operations.

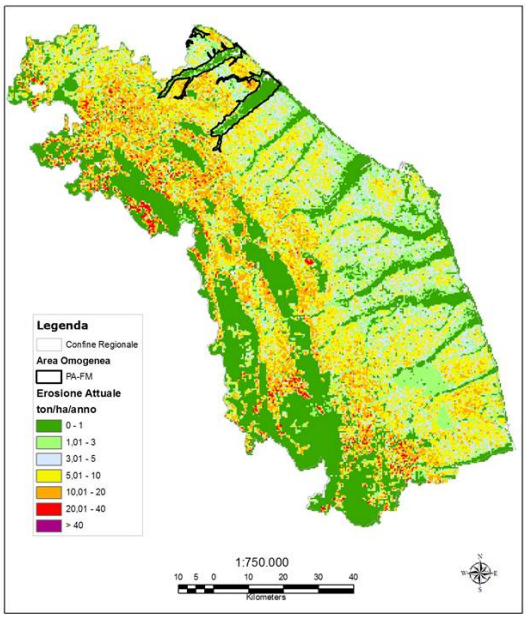
	The use of dryers coupled to the seeding on firm soils proves to be efficient during the first years of intervention. Its continuous and repeated use throughout several years can lead to a gradual loss of the treatment effectiveness due to the development of more resistant species with perennial root systems able to reach deeper and deeper soil horizons. In the majority of the cases, the technical innovations are mainly applied by enterprises of greater size and/or with a better organisation; in other cases through contracts with enterprises, more often provided with mechanic equipments.
Track reduction	In these zones, the easier improvement of the machinery, the greater size of the fields and the lower slopes facilitate the use of machinery combined with the consequent reduction of the tracks. In case of direct seeding, it is necessary to associate a minimal tillage to favour the seed cover and above all to protect the new seedlings from the weed competition and from the attack by diseases brought by the previous crop residues. Given the nature of the soils, less vulnerable to compaction, the reduction of the tracks is connected above all to the reduction of the execution times of the crop operations and to the reduction of the operation costs.

Effects on environment and soil degradation risks

The coastal plain areas are characterised by the fact of having a lower erosion risk. In consideration of the more and more frequent occurrence of exceptional meteoric events, along the main rivers there are some small size areas at risk of overflow.

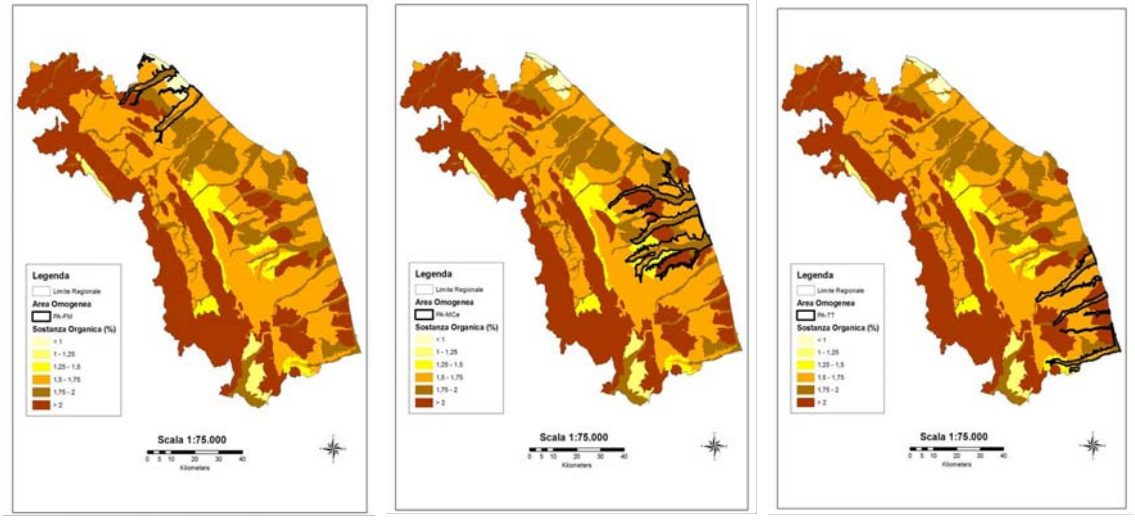
Figure 5.51 and Figure 5.52: Risk of soil erosion in the "Coastal Alluvial Plain" zones (TT: Tenna and Tronto; FM: Foglia and Metauro)





As with the Low Hill areas, in area the different composition of the adopted Management Systems directly affects the evolution of the soil organic matter. Even though generally low or very low counts are registered, in the northern area (Foglia and Metauro) and in the southern zone, between Tenna and Tronto, it is possible to find Land Units with good organic matter content.

Figure 5.53: Organic matter content in the "Coastal Alluvial Plain" soils



a) FM: Foglia-Metauro b) MCe: Musone-Chienti c) TT: Tenna-Tronto

Socio-economic aspects and costs/effectiveness ratio

The coastal alluvial plains are characterised by socio-economic contexts similar to the ones typical of the Low Hill areas. In fact, according to the values reported in the table, a prevalence of type C1 rural areas appears (*industrialized intermediate rural areas*).

Table 5.15: Marche rural areas included within the Coastal Alluvial Plains

Coastal Alluvial Plain homogeneous areas	MARCHE RURAL AREAS				
	A	**C1**	**C2**	**C3**	**D**
AP-FM	7.22 %	5.62 %	1.57 %	0.00 %	0.00 %
AP-CE	0.00 %	10.88 %	3.11 %	0.00 %	0.40 %
AP-MCe	6.94 %	15.00 %	4.01 %	0.78 %	0.00 %
AP-TT	3.95 %	5.39 %	3.32 %	0.14 %	0.00 %

Source: elaboration by Servizio Suoli Assam on Istat data

5.5.3 Suggestions and development prospects towards a sustainable agriculture

On the basis of general character considerations reported in the paragraph concerning the development prospects of the "high mountain" areas, we introduce in the following some specific proposals for the "Coastal Plain" lands.

Table 5.16: Proposed initiatives for sustainable development in the coastal plains

Strategic elements	Suggestions and proposals
Territory	- agricultural activity not only directed to enterprise needs but as a collective service for territory maintenance and management valorising the widespread presence of the rural population on the territory; - requalification of the territory minor hydrographical network; active involvement of agricultural enterprises in the management of the main rivers; - requalification of the rural landscape through a better integration and balance among urban and agricultural areas; - strategic environmental assessments for the planned expansion of the urban areas in balance with the rural territory; - rationalisation in the use of water resources; - realisation of measures for the control of the environmental pressure due to higher touristic flows; - maintenance of services to the population; - enhancement of the support technical services on a territorial and enterprise scale according to a logic of Regional Rural Network integrated at National and European levels; - verification and assessment of the territory natural aptitudes for incentives and the development of new cultivations;
Enterprises	- diversification of the production concerning above all cropland through the introduction of improving crops (as a function of the demand for energetic inputs, cycle length, cover effects, drought resistance, CO2 cycle etc.); - adoption of Management Systems which guarantee a greater soil cover; - investments for the provision of machinery suitable for the execution of conservation practices (reduced and minimal tillage, direct seeding etc.); - investments for the rationalisation of the irrigation techniques (new irrigation systems, systems to monitor the hydrologic conditions of the soil and the weather variables influencing the water cycle); - development of dry crop techniques; - application of technical programmes specific for Land Unit and managed Management System; - avoid deep organisation tillage and soil horizon stirring through the double tillage techniques; - crop residue value adding for supplying organic matter to the soil; - rediscovery and value adding of historic productions typical of the area and abandoned; - expand the livestock activities in balance with the enterprises organisation structures (utilised agricultural surface, adopted Management Systems, use of effluents in soil organic fertilisation); - adhesion to area projects and agreements to stimulate typical productions; - traceability of the agricultural activity through the adoption of production specifications;
Sector	- enterprise or territorial investments for land units for processing and consumer direct sales (*cellars, farmer's market, transformation and storage of fruit and vegetable products etc.);* - integrated development of industrial poles for the agro-feeding

	transformation with the production territories; - value adding of local products through the involvement of the resident population; - incentivize cooperation forms for the participation in commercial sector competitive on the international market (cereals, fresh milk, bovine and pork, vegetables and fruits);

5.5.4 Conclusions and suggestions for new rural development policies

The transition from an agriculture mainly aimed at production to an agriculture supported by a strong territorial policy requires an integrated strategy aimed at achieving the best balance between land, farms and industry.

Rural development is in a crucial phase that can determine the success for the next seven years and beyond. The choices to be made are important and should be innovative and not put off. The alternative is between the old and new; badly focused or strategic measures; between the old logic focusing on agricultural productivity and the new concepts that take into account the territory and the environment; between the bureaucracy and simplification and between a strong partnership between policy makers and farmers conscious of their role and a mere consultation.

The road to build functional policies addressing the needs of the farms, industry and the territory is still long: now it is time to make the right choice to give a future to the rural areas of the Marche.

5.6 Assessment of soil related Policies applied in Marche region

In the following paragraph will give the information and evaluation of the policies applied in Marche region.

5.6.1 Cross compliance application (1st pillar of CAP Fischler reform)

Good Agricultural and Environmental Condition – GAEC – BCAA

The GAEC have been applied since 2005 according to the Regional Council Decree of the Marche (DGR) n. 320 of 2 March 2005. A revision and adaptation of GAEC for the Marche region was introduced with DGR Marche n. 159 20 February 2006, DGR Marche n. 151 on 26 February 2007, DGR Marche n. 1453 on 3 December 2007.

The National Legislation, implemented at the regional level, for the GAEC foreseen the application of the following measures:

- Measure 1.1: surface water management in slope land;
- Measure 2.1: management of stubble and crop residues;
- Measure 3.1: maintained efficiency of the network for draining surface water runoff;
- Measure 4.1: protection of permanent pasture;
- Measure 4.2: management of set-aside surfaces;
- Measure 4.3: maintenance of olive groves;
- Measure 4.4: maintenance of the characteristic features of the landscape.

Measures 1.1, 2.1 and 3.1 focus on erosion reduction and control. These measures are widely applied even if the efficiency evaluation is difficult due a lack of information on effective influence of the measures on soil erosion processes. It also emphasizes the dynamism of the factors involved in the process of soil erosion (e.g. frequency and intensity of weather meteorites). Certainly the farmers have devoted much attention to the hydraulic-agricultural management with a great improvement of the system of surface waters.

The other rules relating to GAEC belong to more normal agricultural practices, and sometimes in line with the traditions, and the implementation and application is easier for the farmers.

Statutory Management Requirements, SMRs

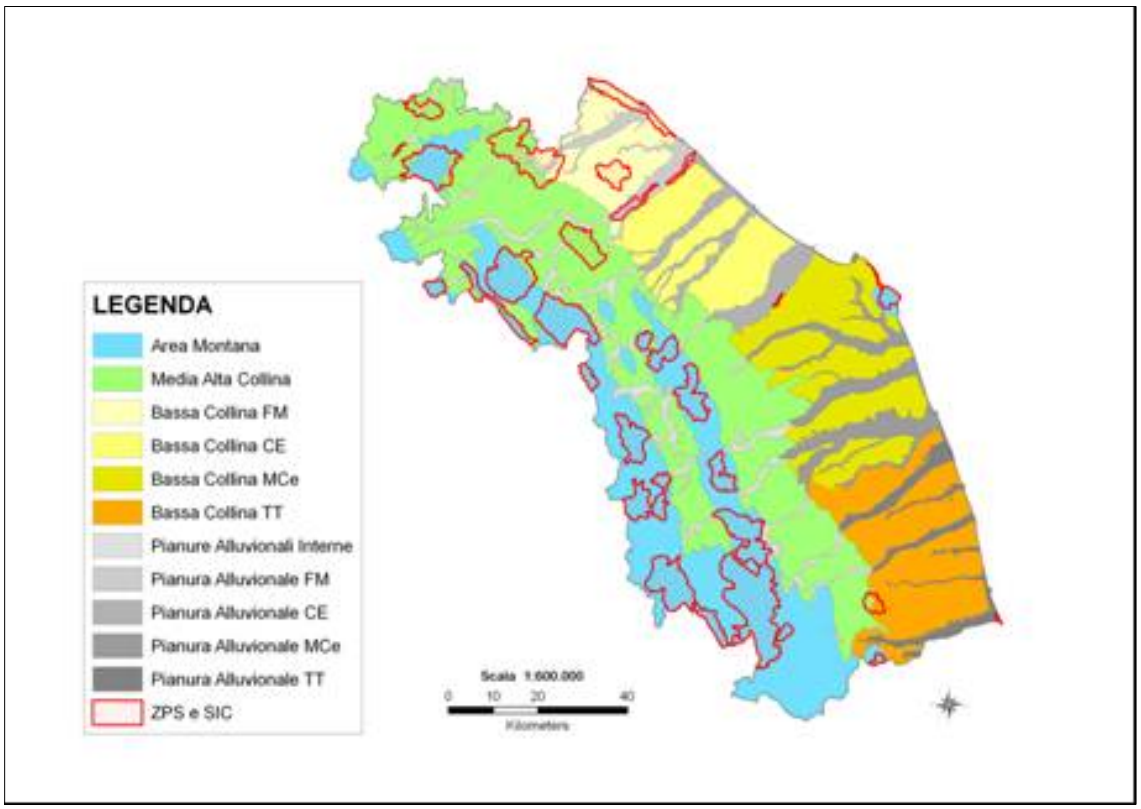
For management requirements (SMR) in force since 2005, commitments are differentiated by:

- location of the farm in relation to the delineation of sensitive areas from an environmental point of view;
- use of certain dangerous substances and sludge,
- presence of livestock.

The purpose of the rule is to help preserve biodiversity through the adoption of measures and to ensure the conservation of natural habitats of flora and wildlife. The reference Directives are Directive EEC 79/409 (Bird Directive) and Directive EEC 92/43 (Habitat Directive).

Currently the Natura 2000 network consists of the Special Protection Areas (SPAs) and other Sites of Community Importance proposed (SCIs) to the European Commission by Member States.

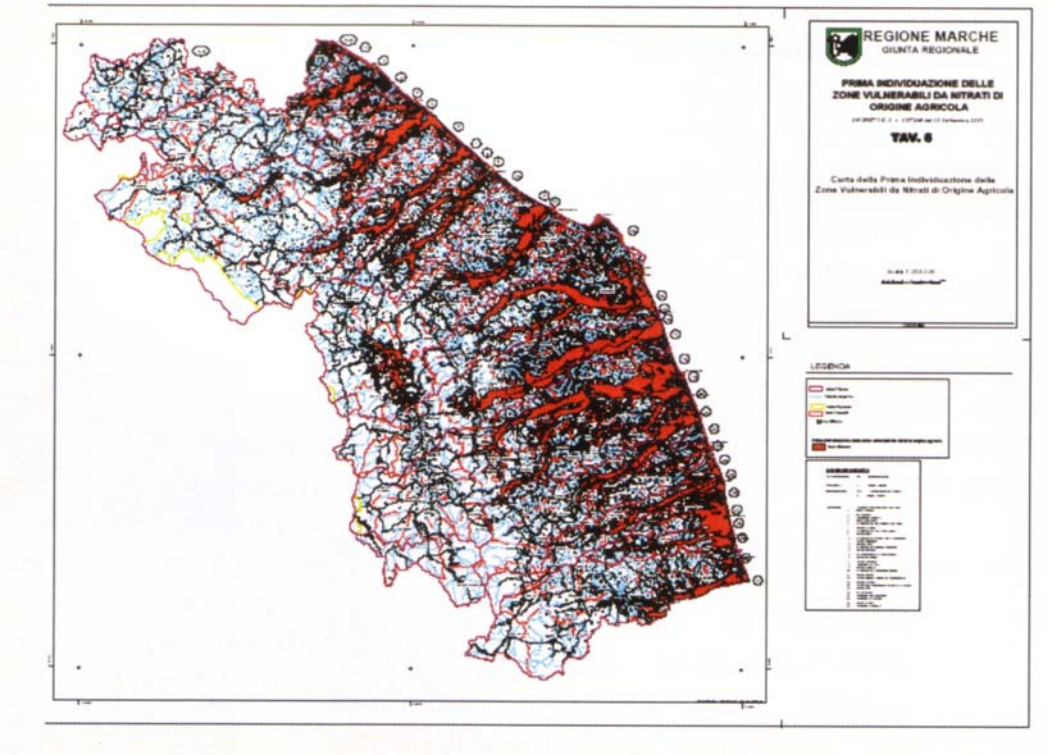
Figure 5.54: SCIs distribution in the Marche region



Nitrate Vulnerable Zones

The definition of Nitrate Vulnerable Zones in Marche region covered most areas of coastal flood plain (Figure 5.55). In these areas the Action Programme for Nitrate Vulnerable Zones has identified specific rules for cultivation which involved a radical change of fertilisation technique.

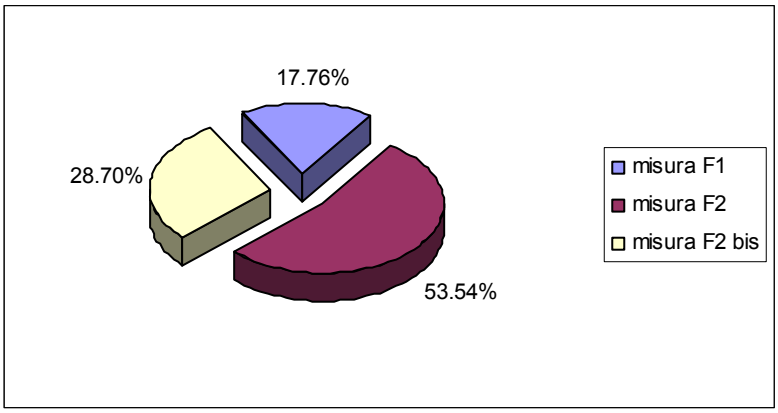
Figure 5.55: Nitrate Vulnerable Zones in Marche region



5.6.2 Agri-environmental measures of Rural Development Plan 2000-2006 (2nd pillar of CAP)

The Rural Development Plan of the Marche region has been acted on Rural Development through the so called Measures F of II Axis "Protection and valorisation of the landscape and of Environmental resources". The application of F measures has been carried out on about 430,000 hectares distributed according the different measures as reported in the following chart.

Figure 5.56: Application of F measures of RDP



Source: elaborazione S.Suoli ASSAM su dati Regione Marche

The "F" agro-environmental measures are referring to:

- *Submeasure F1): actions finalized to the management of agriculture according to low environmental impact techniques and protective of the environment;*
- *Sottomisura F2 eF2 B): actions finalized to the management of agriculture according to organic farming techniques and protective of the environment.*

The measure F1 forces the candidate farms for receiving the funds of RDP to adopt on the entire farm surface the techniques with low impact as follows:

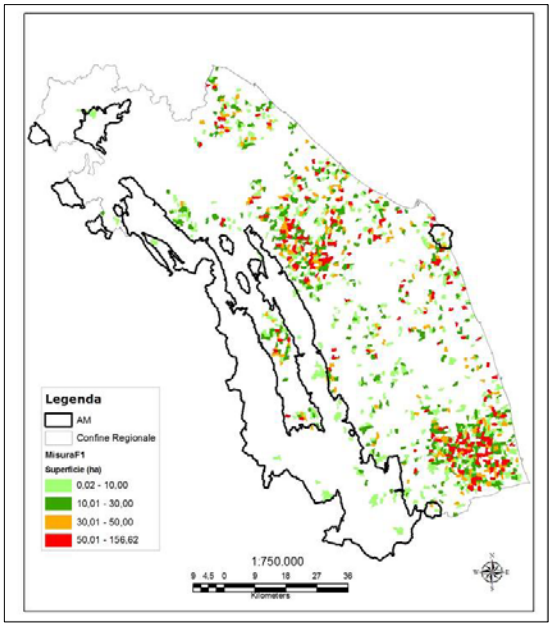
a) the use of a Fertilisation Plan define on the basis of the physical and chemical characteristics of soils and on the applied crops,
b) the use of integrated pest control piego di un piano di difesa delle colture impostato sul metodo della lotta guidata o integrata;
c) a crop rotation plan for 5 years and the respect of the surface water management as foreseen by GAEC,
d) mantaining the cover crops during the winter time.

Other optional techniques can be adopted: e.g. erosion control with barriers, hedges, rows of trees.

The measure F2 and F2bis is mainly focused on the organic farming techniques as set by Reg.CEE 2092/91.

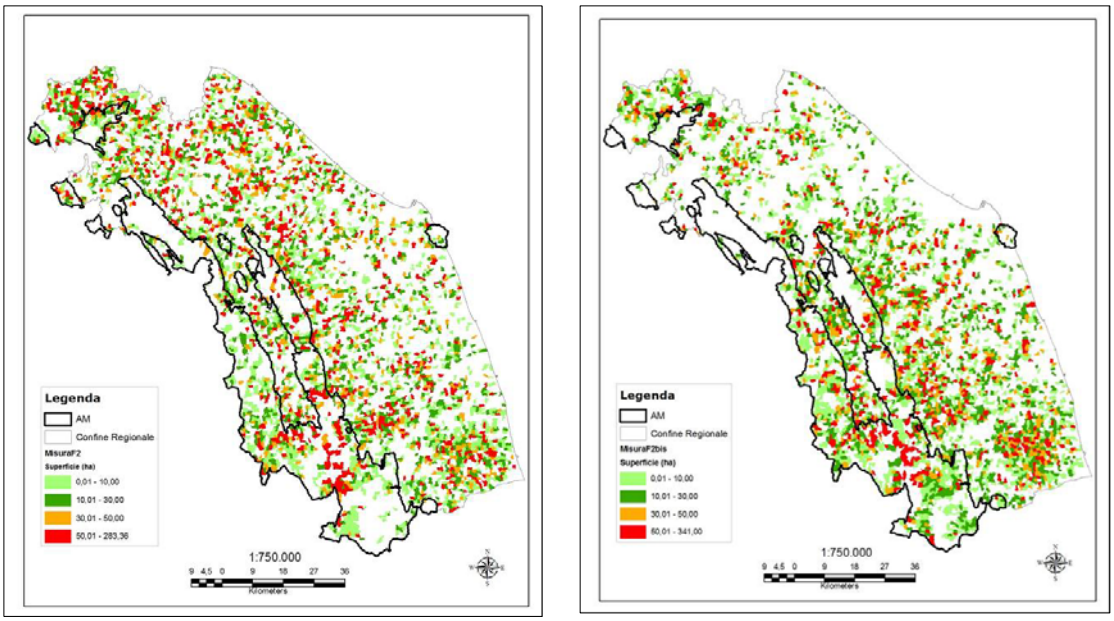
The figures show the distribution of area involved from the agro-environmental measures. Measure F1 has been applied mainly in the areas of Low Hill and in coastal flood plains. The largest concentration is evident in areas ranging from Cesano, Esino and Piceno between the Tronto and Tenna. To a limited extent also covered areas of medium high hill landscape. The two major area of concentration for the application of F1 measures are referable to a producer association and highlight the important role of the technical assistance in the application of the RDP measures.

Figure 5.57: Regional distribution of applied F1 measure



The F2 and F2bis measure have been applied in different areas. A greater concentration of farms that have implemented these measures is present in north and interior areas of the region and in the south between the Tenna and Tronto.

Figure 5.58: Regional distribution of applied F2 and F2 bis measures



By analyzing the distribution of F1 and F2 measures of RDP 2000-2006 in relation to major soil degradation processes of the Marche region can be underlie as such measures may acquire a different meaning in relation to the reference homogeneous areas where are applied.

The following chart shows the distribution (% of area of homogeneous area) of soil erosion risk classes according different homogeneous area.

Figure 5.59: Surface (hectares) of application of F1 measure

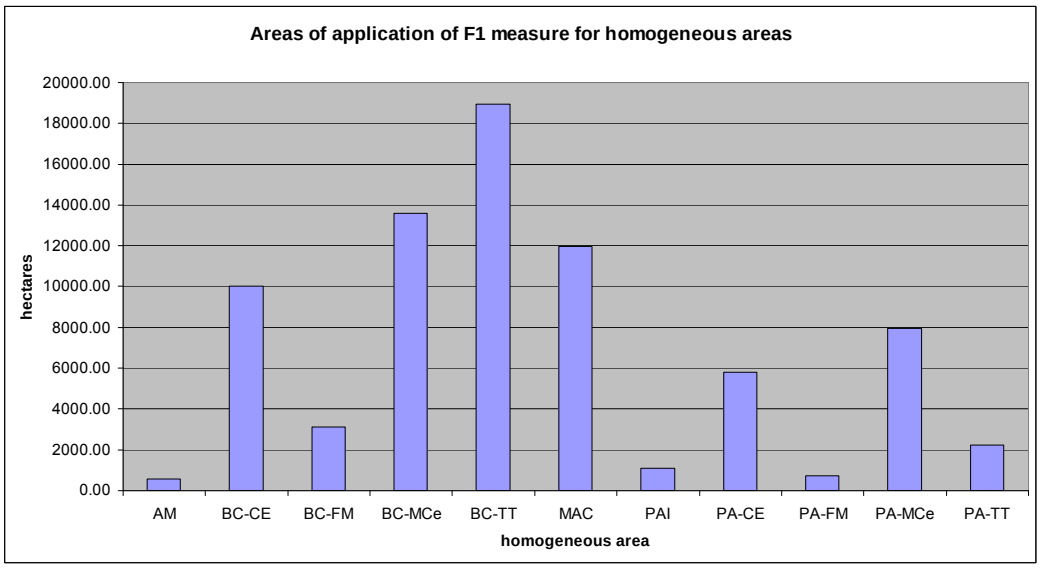
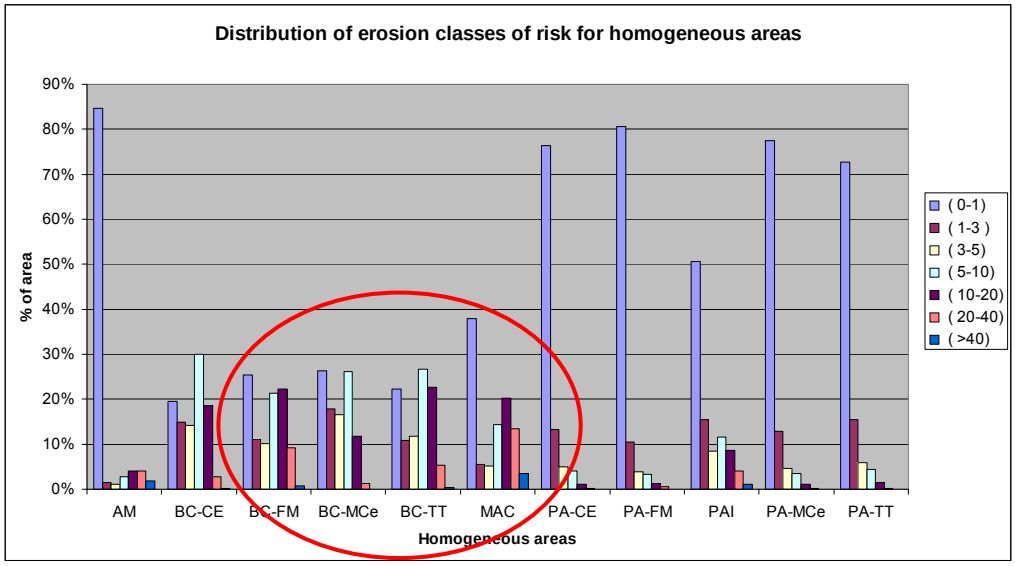


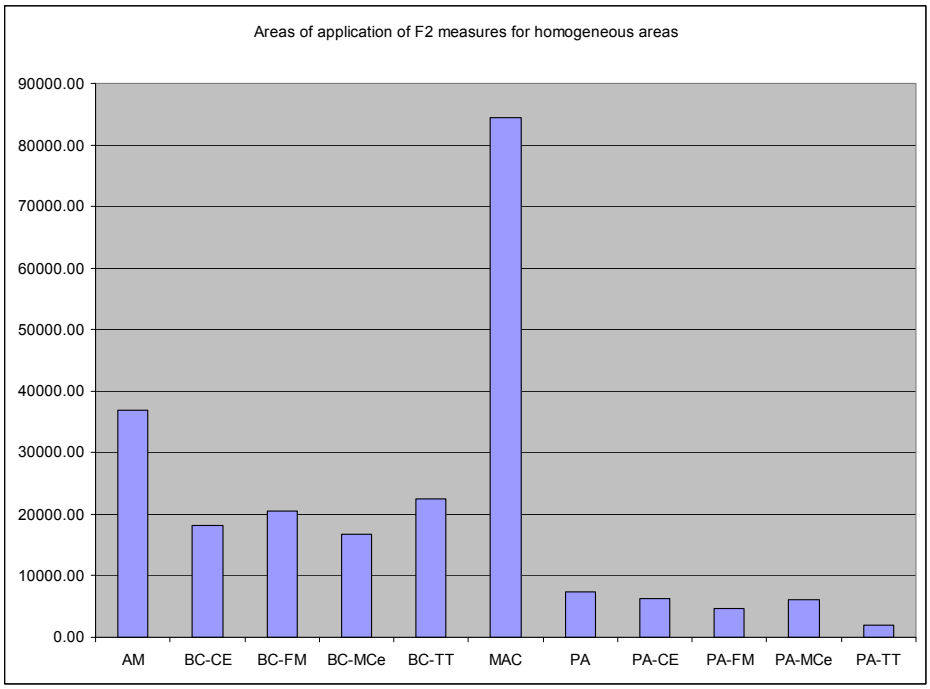
Figure 5.60: Distribution (% of area) of soil erosion risk classes for homogenous area



As shown by the Figure 5.59, the F1 measure had its greatest application, in terms of area involved in homogeneous area of low hill (BC-EC-MCE BC, BC-TT). These homogeneous areas have the highest risk of soil erosion (areas circled in red in Figure 5.60). Since the measure F1, focusing on techniques of integrated production, provided, among others; grassing of the vineyards we can say that this measure was applied in areas where there is actually the process of soil erosion. Figure 5.55 on the distribution of Measure F1, highlights how it has affected mainly the areas with greater presence of viticulture.

The following chart shows the distribution, in % of area, of applied F2 measure.

Figure 5.61: Hectares interested by the application of F2 and F2 bis Measures



Measure F2, on organic farming, has a broader connotation than the Measure F1 and an increased focus on environmental sustainability. This finding seems clear from the figure on the regional distribution of Measure F2 showing the involvement of most of utilized agricultural area and many, if not all, management system.

Has to be noticed that the largest percentage of the surface on which has been applied the Measure F2 falls in medium-Upper hill (MAC) and partly in High Mountain. This is clearly attributable to socio-economic and cultural aspects. In such areas the traditional agriculture is already applied with techniques with low impacts and the organic farming not represents such a big change. In terms of processes of land degradation, the introduction of organic farming, certainly shows the positive impacts on soil erosion and on the decrease in organic matter and, more generally, for maintaining functional quality of the soil.

By analyzing the weight of reciprocal measures F1 and F2 it is clear how F1 interest only 17 % of the total area of application of agro-environmental measures related to II pillar of CAP. These data show how the action of the Marche Region has not focused on specific practices addressed primarily to the protection of the soil, but on agricultural management models which are better suited to maximize environmental sustainability.

Ultimately the implementation of 1st and 2nd Pillar of the CAP, with GAEC, SMRs, RDP, represent a regulatory framework and integrated actions that lead to the development of conservative management systems linked with the territorial reality. The soil conservation may be subject to the same measures, such as GAEC, or be part of a result derivable from models of integrated management.

As shown by carried out analysis the applied measures are related to the environments where there are actually processes of land degradation but the assessment of their effects in the short, medium and long term still remains very difficult due to lack of data from a monitoring network on soils and in relation to the adopted management system.

However, the applied methodology and the analysis carried out, has highlighted the need to link policies, measures and environments in which they are applied. The depth knowledge of homogeneous areas, landscapes, soil and management systems is the prerequisite for the evaluation of effectiveness of policies and their applicability.

In support of the carried out analysis on the effectiveness of the 1st and 2nd pillar of CAP, always with reference to the protection of the soil, there are also the results from interviews with farmers. These results are show in the Annex.

5.6.3 Rules for production of Protected Designation of Origin (PDO), Protected Geographical Indication (PGI), Traditional Speciality Guaranteed (TSG)

Quality products in the Marche Region are:

- *n. 7 Protected Designation of Origin (PDO):*
  Casciotta di Urbino; Prosciutto di Carpegna; Olio extravergine di oliva di Cartoceto; Oliva Ascolana del Piceno; Salamini italiani alla cacciatora; Formaggio di Fossa; Gran Suino Padano;
- *n. 4 Protected Geographical Indication (PGI):*
  Vitellone bianco dell'Appennino centrale; Lenticchia di Castelluccio di Norcia; Mortadella di Bologna; Ciauscolo;
- *n. 1 Traditional Speciality Guaranteed (TSG):*
  Mozzarella.

In the wine sector:

- *n. 2 Protected Designation of Origin (PDO):*
  Vernaccia di Serrapetrona; Còner o;
- *n. 15 Appellation of Origin:*
  Bianchello del Metauro; Colli Maceratesi; Colli Pesaresi; Esino; Falerio o Falerio dei Colli Ascolani; Lacrima di Morro d'Alba o Lacrima di Morro; Affida; Rosso Còner o; Rosso Piceno; Verdicchio dei Castelli di Jesi; Verdicchio di Matelica; Serrapetrona; I Terreni di Sanseverino; Pergola; San Ginesio.

In the Rural Development Program 2007-2013, in addition to assistance for crops and livestock (Measure 2.1.4) and for participation in certification costs (Measure 1.3.2), is expected to intervene, with the support of associations Producers (Measure 1.3.3), in promoting consumer education and food for organic production and quality. For consulting services to farms, with a view to improving competitiveness and environmental management of land (Measure 1.1.4) subsidies are provided to the farmer, even during the conversion period.

In the disciplinary production planned for individual areas of production the GAEC are incorporated and represent the reference baseline. In addiction to the GAEC further measures aimed at ensuring a sustainable farm management are foreseen. Moreover, the presence on the territory of organisations linked to the typical geographical production have led to greater dynamism of the sector with the implementation of research and development activities which are now part of the technical assistance to agriculture.

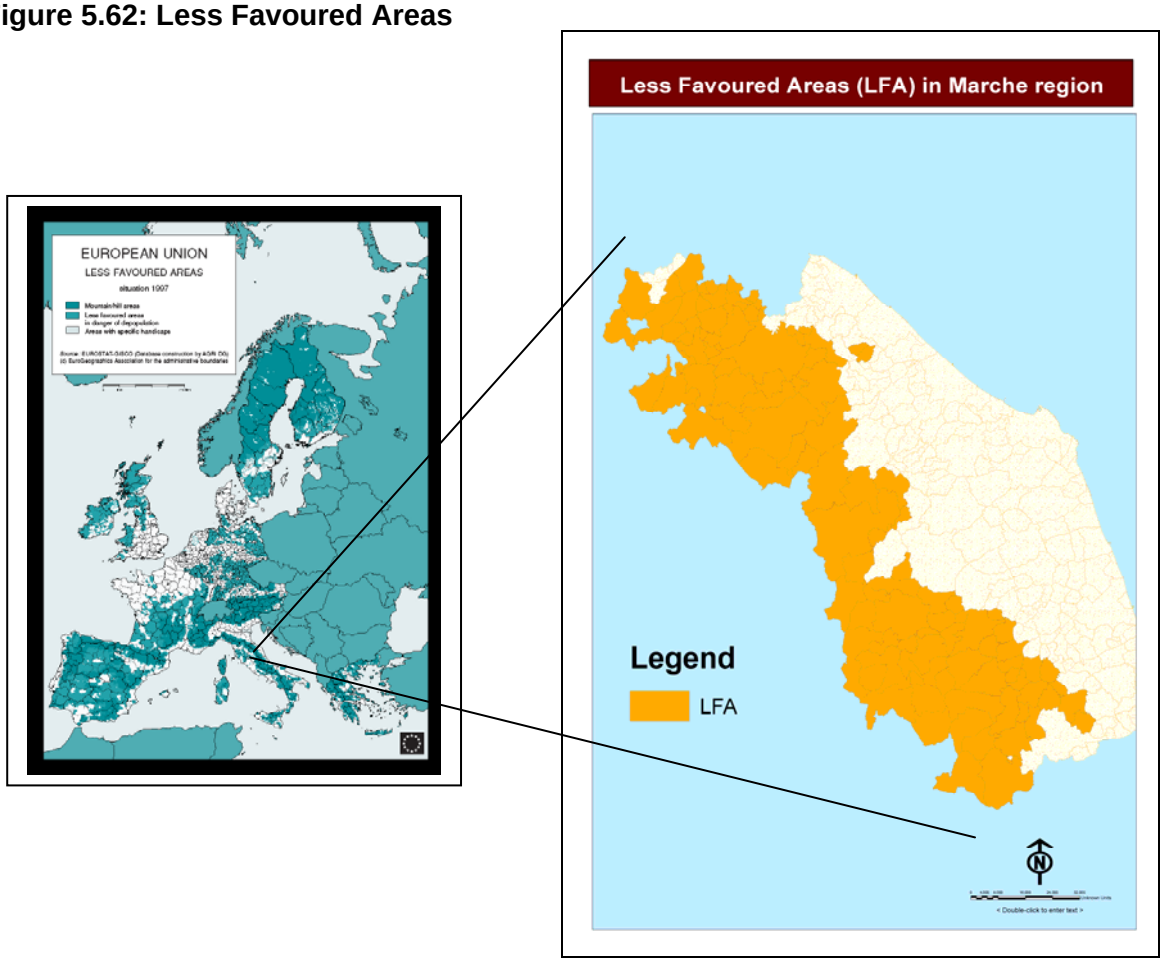
5.6.4 Less Favoured Areas (LFA)

The aid to farmers in Less Favoured Areas (LFA) is a longstanding measure of the Common Agricultural Policy. In place since 1975, it provides a broad-scale mechanism for maintaining the countryside in marginal areas.

Following the Reg. CE n° 1698/2005 the Rural Development Plan of Marche region foreseen an increasing of payment, according to the Annex of the Regulation and on the basis of Axis 2 measures, for farmers that are in the LFA.

Figure 5.62 clearly shows that the LFAs are actually identified on the basis of the administrative borders and mainly on the basis of classification of territory as mountain. The concept behind the LFA is that the “Payments should compensate for farmers’ additional costs and income forgone related to the handicap for agricultural production in the area concerned” (Art. 37 Reg. CE 1698/2005). The LFA scheme will remain into force until January 2010. The review of LFA schema is already launched and the main issue will be the delimitation of areas with natural handicaps other than mountain areas.

Figure 5.62: Less Favoured Areas



5.7 Successful and unsuccessful practices in relation to the Management System

As repeatedly noted and as explained in the previous paragraphs, there are no universally applicable practices that give good results in terms of soil protection. Each practice has to be evaluated according to the environment of applicability and of the Management System (see Chapter 4.2). The success or failure of a practice is closely linked to the environment of the application. However, some success stories in implementing certain practices can be highlighted by the case study Marche. One of the soil conservation practices that is mostly applied in Marche region is cover crops. Cover crops are applied mainly to reduce the soil erosion process. It is necessary to make distinctions on the basis of the Management System adopted:

- perennial crops with cover crop between the crop row,
- cover crops in arable land.

The first one is very common in the Marche region especially for vines (Management System Grapevines – SC7). The effectiveness of this practice is very good and the objective to reduce soil erosion is fully achieved. Indeed the maximum risk of soil erosion in the Marche region is during the spring/summer period due to heavy storm and rainfall and the benefit of cover crops in perennial crops is strictly linked to this period.

Different results are obtained for the cover crops in arable land. The Measure F2 of the RDP 2000-2006 for Marche (see Chapter 5.6.2), foresees cover crops during autumn/winter as practice entitled for compensation. On the contrary to the previous situation, during winter soil erosion processes are limited. In addiction, due to the soil properties, very clayey, it is very difficult, if not impossible, to prepare the seedbed in spring because of high soil moisture

levels. Where cover crops in arable land are applied, the soil structure is damaged by subsequent ploughing, and there are strong signs of compaction.

In terms of tillage systems in the Marche region, there is a tendency for cereals, to switch from conventional tillage to conservation tillage systems (reduced tillage). This tendency is mainly driven by economic consideration. It is also to highlight that conservation tillage is applied only for cereals. Farmers applied reduced tillage while no-tillage is not so diffused. Reduced tillage is not applied for spring crops in crop rotation that are mainly represented by sugar beet, maize, sorghum, soybean, etc. Reduced tillage is mainly performed with discs and tines. Another tillage system is represented by “double-tillage”. This particular tillage system is a “non-inversion tillage”. The technique is performed with a tool combining tines and plough. The tines are 40-50 cm and the ploughing is made on the first 20 cm. With this particular tillage system there is no inversion and no mixing of different soil horizons.

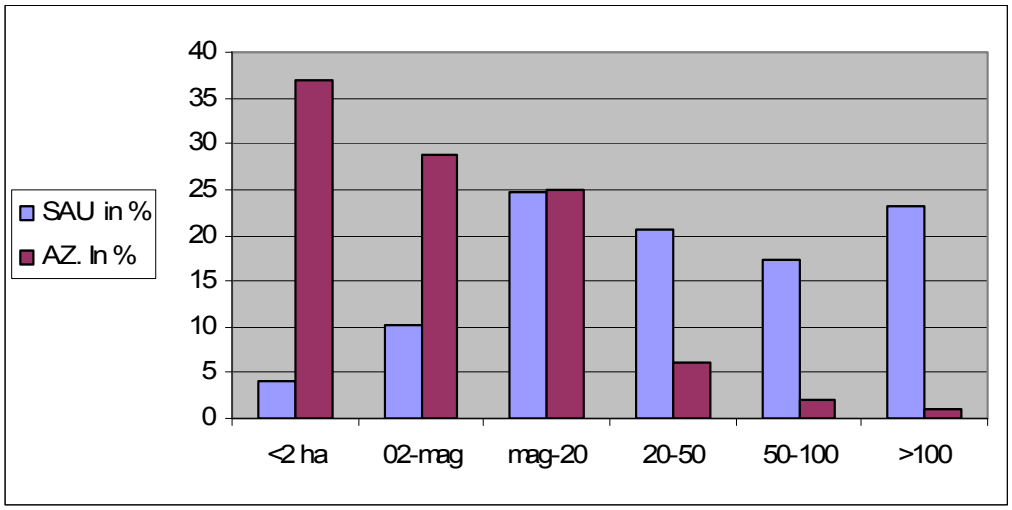
6 Soil and all the actors of the food system

6.1 The actors in the agricultural production

6.1.1 Agricultural companies and their associations

As briefly reported in chapter 4.1.2, the agricultural companies of the Marche region (n. 55.582) are small, more than 90 % of them cover an area of 20 hectares (n. 50.370).

Figure 6.1: Number of agricultural companies in relation with the agricultural area



Source: Elaboration Servizio Suoli, Assam, on Istat data (2003)

Figure 6.1 shows that small companies use less than 40 % of the agricultural area used and indicates the importance of big companies in the control of the cultivated areas. There are more properties (84.2 %). The rent is 4.8 % and other mixed forms 11 %. In the last decade there has been a big change from property owning to rent or other more flexible forms. In 1990 property owning represented 90.2 % of the companies. In relation to the area (Table 6.1) property management is 58.5 % of the cultivated area.

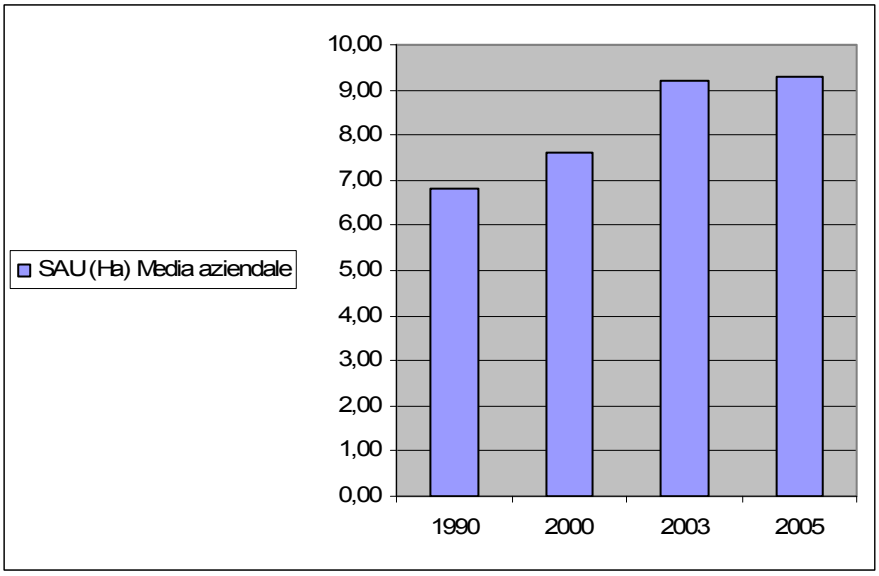
Table 6.1: Owning typologies for companies and cultivated surface

	companies		SAU	
title	Number	%	ha	%
Property	55,087	84.2	296,467.9	58.5
rent	3,121	4.8	53,642.0	10.6
Partly property, partly rent	7,178	11.0	157,070.5	31.0
TOTAL	65,426	100.0	507,180.6	100.0

Source: Agricolture census 2000

Company dimensions vary, the current average is 9 hectares.

Figure 6.2: Average farm size



Source: Agricultural census 2000

Most companies are privately owned (more than 90 %); there are only few collective and capital companies (Table 6.3).

Table 6.2: Legal status of the companies

Legal status	2002	2003	2004	2005
		Percentage values		
Capital company	0.3	0.4	0.4	0.5
Collective company	6.6	6.7	6.9	7.0
Individual company	92.4	92.2	91.9	91.8
Other forms	0.7	0.7	0.8	0.8
Total	100.0	100.0	100.0	100.0

Source: Infocamere

An important factor for the identification of the companies' competence in the forest agricultural sector is human resources. In the Marche region the average age of owners is 61, while the national average is 59. All about businessman features and their skills for product and process innovations and the political legislations can be found in chapter 4.6.

There is a new Regional Law, n. 5, 2003, concerning "laws to help the development of cooperation". Through this law the region wants to increase the development and the strength of cooperation by innovation support, occupation increase, valorisation of the disadvantage areas.

Last census shows cooperative companies in the Marche region are 133, 2.3 % of the nation. Agricultural cooperative companies are the most (43 %), then we have those which deal with process and transformation of food (29 %), the forestry ones (17 %) and finally those concerning fishing (12 %).

The cooperative companies in the Marche region are highly specialized in the agricultural cultivation, in the animals feeding, and products such as meat, fish and forestry products.

In the provincial area the most cooperative companies are in the province of Ancona, then Ascoli Piceno, Pesaro Urbino e Macerata.

Working together is a helpful tool to fight the structural limits of the companies in this region and therefore it helps the development of competitiveness, the necessary level to be in the market. The development of such companies are strongly influenced by the laws and regulations, both national and European, regarding common market organisations (OCM). The various kinds of associations are described in the following paragraph.

An increasing phenomenon is the managing of the land by "other people" who tend to stipulate cultivation contracts with the management of the entire cultivation cycle for one or more consecutive years. Therefore these people get control over the company and run all the processes and operations.

This new category of agricultural businessman is usually more open to innovations, they can easily make the right investments for innovative machines, they can use more easily the modern communications tools (Internet, email, mobile, etc.).

6.1.2 Factors influencing the farmers choices

a) Market and economic results

Conservative processes bring a variation of culture costs, they reduce the cost of working but they have more expenses regarding the treatments for the control of the weeds. The decrease of the average productivity per hectare weighs on proceeds. The use of a minimum working force or other simplification techniques requires many machines. The need for such equipment obliges companies to buy directly the new machines, adjust the existing ones or use third parties companies. In any case the choice requires a careful valuation of the costs that often represent the main cause of the scarce diffusion of conservative business.

No doubt the economic valuations, regarding technical means, work, product marketing, productions and proceeds have an important influence on the choices of the companies.

b) Common market organisation

Common market organisations (CMO) influence a lot the management systems. Here there is a list of reference laws divided by type of production:

- environment features of the Marche region lands which oblige the adoption of specific systems of forest agricultural management;
- availability of technical means (machines, equipment);
- availability of labour.

There are laws for companies (protection plan of waters, management, account, etc.), and application of European laws with incentives (condition, PSR, FESR, FSE, etc.).

6.2 Institutes and policy makers involved in the land planning and the use of policies

Organisations and public bodies

The structure of the administrative functions regarding agriculture is described by the regional law 27 July 1998, n. 24 (Regulation for the exercise of the administrative functions concerning sectors such as the agro-industrial, forest, hunting and fishing in the region)

National level

The main actors are the Ministry of Agricultural and Forest policies, the Ministry of Environment and Land and Sea Protection. AGEA, the Agency for Agriculture Allocation is the institute in charge of payments and control.

Region

The section 4 of the same law gives power to the Region for administrative functions regarding (i) competition for the elaboration and realisation of the European and national policies, (ii) specific programmes of intervention and (iii) applied research, trial and regional demonstration.

Specific for the Region are:

- the regional interest activities, described by the regional sector plan;
- the definition of the addresses and the approval of the forest arrangement plans, woods protection from fire;
- the realisation of the interventions for the regulation of the markets not specific of the State, definition and distribution of the reference quantities in relation to the production regulations policies;
- promotion and improvement of the regional agro-industrial and forest productions and the interventions for the promotion and the orientation of the food consumptions;
- the system of milk dues;
- legal recognition, supervision and control of the agricultural producers associations, protection associations;
- interventions for the promotion and support of the cooperation activities concerning research, trial, technological transfer and technical assistance;
- regional list of goods for civic uses;
- nature protection interventions, including the foundation of parks and natural reserves and the protection of moist areas;
- zootechnic improvement and the diagnostic service of the animal transmissible diseases and zoonosis;
- defence against plant diseases;
- organisations of the active and passive defence of productions from atmospheric adversity and calamity, delimitation of the damaged areas and the specification of their provision on the national solidarity fund;
- control over the registers keeping and genealogical books and realisation of its functional controls;
- promotion of the product quality and of the processes in the agricultural, forest and agro-industrial productions; quality control of the forest and agricultural products and the substances used;
- keeping of professional registers of regional interest;
- relations with credit institutes for assisted credit interventions and financial operations;
- calendar of truffle harvest ;
- regional farms;
- supervision of the control organisations concerning biological agriculture.

Sections 5, 6 and 7 of the regional law then define the administrative functions of Communes, Communes in mountain areas and the Provinces.

Communities
Councils have administrative functions concerning:

- acknowledgement and certification of professional qualifications in agriculture;
- authorisation for the exercise of agro-industrial business, rural tourism and connected agricultural activities;
- exercise of farm activity and the trade of plants, parts of plants and seeds;
- cheaper milk and home made products for school students;
- officinal plant crop;
- management of the controls for food education;
- tax relief for farm owners;
- indivisibility obligation to rustic properties bought with public funding;
- declaration of registration and property transfer of agricultural machines;
- authorisation and supervision of the olive plant cut, and powers for the protection of the Marche region vegetation;
- authorisation for the exercise of the industrial zootechnic activity.

Communities in mountain areas
Councils in mountain areas have administrative functions concerning:

- harvest, production, working and marketing of mushrooms and truffle, except for the truffle crop calendar;
- cut of woods in areas with hydrogeological obligation;
- use of agricultural, forest and pastoral goods of the Region;
- civic uses, except the regional list.

Provinces
Provinces have administrative functions concerning:

- provincial coordination of the regional agricultural informative statistic system and statistic survey provided by the regional and national statistic plan;
- powers given to the Region by the national legislation about agricultural contracts;
- harvest, production, working and marketing of mushrooms and truffles for the area not included in the mountain communes;
- formation and professional qualification of the agricultural and forest operators;
- cultivation of cross-fertilisation plants;
- controls over working activities according to current European and national regulations;
- purchase, use and selling of plant protection products and food defences;
- interventions and indemnity to cultivations and the zootechnic heritage damaged by wild animals;
- delimitation of areas and valuation of the damages caused by calamity, etc., so to recognize the exceptionality of the event;
- authorisation for the cultivation of firm grounds or grazing meadows;
- authorisation for cheaper fuel and keeping of the users list of agricultural engines and their assistance;
- courses for tasters of the agro-industrial productions.

Sector 9 bis of the regional law n. 24/1998 provides that provinces have to plan agricultural and rural policies.

6.3 Organisational structure of the regional council

The organisation of the regional council has, according to the regional law n. 20/2001, a general Secretary, 12 Services and a Department for security integrated policies and for civil protection. There is also the Cabinet of the President.

The regional administrative functions concerning agriculture are carried out, according to the decision of the regional Council n. 72/2007, by the agriculture, forest and fishing Service.

In this Service, according to the decision of the regional Council n. 160/2007, there are the following function executive positions:

a) Competitiveness and development of the agricultural company:
   Competitiveness and development of the agricultural company, with powers in: the improvement of competitiveness, tax relief and cheaper fuel in agriculture; common market organisations (OCM); marketing of agricultural and zootechnic products, agro-industrial organisations, genetically modified organisms, food education; cooperation, producers organisation, biological agriculture, food quality, certification, traceability of productions, professional qualifications, agricultural credit: financial engineering and loans renegotiation; rescue of agricultural companies with financial problems, supervision on the certification organisations; renewable energy sources in agriculture; services of agricultural development, applied research and agricultural, zootechnic and forest trial, including the collaboration with Assam; phytologic sanitary protections;

b) Diversification of rural activities and decentralized structure of Macerata:
   For farm holidays and rural tourism; multifunction of the agricultural companies: diversification in non agricultural activities, improvement of the quality of life in rural areas; realisation and management of local development LEADER actions; are essential services for the economy and the rural population; agricultural contracts;

c) Forests and irrigation:
   Responsibility towards: forest state property, woods, forests, meadows and pastures, forest police, productive and protective forestation; drainage and irrigation, prevention and fight against woods fires; solidarity fund; mushrooms and truffles; rural development in mountain areas, civic uses, rural area and rural building;

d) Fishing and zootechny:
   Authority on: sea fishing and hydroponics; planning and management of the European fund for fishing; sea state property concessions for fishing and hydroponics; zootechny, research and zootechnic trial; zootechnic services APA and ARA; indemnity for damages caused by animals; animal reproduction, genetic improvement and genealogical books;

e) Hunting and sports fishing and decentralized structure of Ancona, with
   Authority on: hunting and sports fishing; policies of the sector, decentralized structure of Ancona;

f) Decentralized structure of Ascoli Piceno", with
   Authority on: decentralized structure of Ascoli Piceno; programmatic cohesion of the policies of the agriculture sector; collaboration to the institution of the regional paying organisation; standardisation of announcements and of the procedure of realisation of the rural development plan.

Other regional structures have connected authorities with those given to the agriculture, forest and fishing Service. These are the Environment and landscape Service, the department for integrated security policies and for civil protection, Culture Service, tourism and trade and the Internationalisation Service, abroad promotion, development cooperation and Marche region people in the world.

6.4 Leader+ Area

The Communities involved in the Leader plan are 158, 64.2 % of the regional total. These are mainly in the province of Pesaro Urbino (79 %), while in the province of Ancona only 40 % of the communes are part of the Leader area.

6.4.1 Features of local action groups

The Leader program is carried out by the "LAG" (Local Action Groups), which have formulated their own LDP (Local Development Plan).

These groups are public and private, representing the actors of the area, which are those that live and operate in the areas of realisation of the plan.

In the Marche region the selected GALs for the realisation of the Leader plan are 5 and each of them works in an area which include from 17 to 43 communes.

The smallest one is GAL Flaminia-Cesano, located in the south of the province of Pesaro, while the biggest, always in terms of number of communes, is GAL Piceno.

In terms of the population living in the GAL areas, the most populated area is GAL Colli Esini, while, the least one is the area of GAL Flaminia-Cesano, which however has a more limited extension than that of the other GALs.

In terms of surface, indeed GAL Flaminia-Cesano has an area of about 560 km^2, while the other four GALs exceed 1,000 km^2, and two of them exceed 1,800 km^2.

Table 6.3: Characteristics of communities participating in Local Action Groups

Tabella 6.7 - Caratteristiche dei comuni dei Gal

	Comuni	Popolazione al 31.12.2005	Superficie in km^2	Densità abitativa al 31.12.2005
Gal Montefeltro Leader	36	100.955	1.801,33	56,0
Gal Flaminia-Cesano	17	48.408	560,71	86,3
Gal Colli Esini-San Vicino	24	113.052	1.190,88	94,9
Gal Sibilla	38	99.253	1.858,20	53,4
Gal Piceno	43	72.353	1.320,72	54,8
Totale	**158**	**434.021**	**6.731,84**	**64,5**

* Il comune di Fabriano è inserito nell'area del Gal Colli Esini - San Vicino soltanto parzialmente, tuttavia i dati qui analizzati riguardano l'intero territorio comunale

Fonte: PSL e Demo Istat

The GAL Colli Esini has the biggest concentration of population, indeed there are almost 95 inhabitants per km^2, while in the area of GAL Sibilla we have the lowest demographic density, with 53 inhabitants per km^2.

6.4.2 Making aware and involvement activities of the socioeconomic actors

The making aware and involvement activities of the social actors have been carried out by GALs both in the planning phase and in the realisation. The subjects particularly involved are the local bodies (provinces, communes and mountain communes), park foundations, category associations and professional organisations of the productive sectors. Above all activities concerned the organisation of meetings to highlight the needs of the areas and find the main issue for the PSL. Then, in the realisation phase, the objectives of GALs were:

- maintain contact with local populations;
- involve the potential subjects interested to the initiatives to guarantee a more homogenous and widespread development;
- increase and improve the local population's sense of identity;
- change plans and actions according to new local needs.

Obviously meetings were not the only tools used; indeed there have been used also new communication means like emails, internet, websites, newsletters, press conferences and GAL information desks.

6.5 Conclusions

The acceptance of national and European regulations sometimes can be not conformed with the area involved. This issue is particularly evident in Italy where the climate and the environment change so fast. For this reason sometimes the European laws are too generic.

As long as local and regional levels are concerned, therefore there is a lack of reference. Moreover, often, the executive development of the addresses on a regional scale comes with a lack of support data and of territorial knowledge. This brings to a loss of effects on a national level of synergic actions made on a local level. The recent proposal to change the regulations of CAP, the so called Health Check, introduces the concept of a more regionalisation looking for a better link between interventions and the territory.

Moreover, for soil protection there are no specific laws and those about this issue show as main limit the difficult integration in a general set of laws and in the following application. An attempt in that direction is represented by cross compliance which sees the integration of SMRs and GAEC standards in the CAP.

On one hand it's difficult to identify just one political level for the creation of soil conservation policies but, on the other hand, it's necessary to define strategies, contexts and roles of the various institutional levels. It's also clear that the level of realisation of the law can only be the regional one. To do so, on one hand the Region has to create an adequate basic knowledge and a technical support to create knowledge, and on the other hand, verify the on-going efficacy of the policies application.

7 Policies for soil conservation

7.1 Existing policies and their classification

On a European, national and regional context there isn't a set of laws designed for soil protection. Soil protection is a collateral effect of many policies (Directive Nitrati, Directive Fanghi, Directive about waters, etc.). With the CAP reform (Reg. CE 1782/2003) and the introduction of cross compliance, soil protection gets a central role. Three out of the four paragraphs in the Annex IV on good agricultural and environmental conditions described in Paragraph 5 of the Reg. CE 1782/2003 concern soil. Moreover the three requirements for BCAA have a clear idea of the risks of deterioration identified in the Soil Strategy (COM (2006) 231): soil erosion, the decrease of organic substance and the loss of structure with direct involvements on compacting and on other important functions of soil.

Table 7.1: Classification of policy measures in the Marche region

MANDATORY MEASURES

Type of Policy Mechanism/ Mode of governance	Practical classification Nature of the Policy Objective			Policy relationship to agriculture	Geographical level	Analytical classification – Channels of Impact Primary (1) and Secondary (2) impacts. Y = Yes, N = No		
	Soil conservation is the **primary objective** of a policy measure	Soil conservation is the **secondary objective** of a policy measure	Soil conservation is a **By-product**	Agricultural (AG) or non Agricultural (NAG) focused policy	European (E), national (N), regional ® or local (L) measure, and policy reference	Developing new/altering existing rules (institutions)	Developing and/or altering governance structures/ implementation approaches	Directly impacting on farmer behaviour/ decision making/ factor allocation and management practices
Command and Control	GAEC standards (Soil erosion, soil organic matter)		Cross Compliance SMR (18 Directives)	AG	Reg. CE 1782/2003 (E)	Y – Setting the GAEC end SMR		Y
			Nitrate Vulnerable Zones	NAG	E-Nitrates Directive (91/676/EC) & art. 36 (a) (iv), 39 of Reg.1698/2005; and art. 27 and annex II of Reg. 1974/2006	Y- Setting up of new rules to require identification and implementation of NVZs		Y – restricts the use (not bans) of fertiliser in certain areas
			PAI – Hydrogeological Plan	NAG	L.R. n. 13/1999 ®	N	N	Y
			Water Framework Directive	NAG	Directive CE 2000/60 (E)	Y	Y	Y
			Environmental measures on water protection	NAG	Dlgs 152/2006 (N)	Y	Y	Y

Table 7.2: Classification of policy measures in the Marche region (continued)

NON MANDATORY MEASURES

Type of Policy Mechanism/ Mode of governance	Practical classification – Nature of the Policy Objective			Policy relationship to agriculture	Geographical level	Analytical classification – Channels of Impact. Primary (1) and Secondary (2) impacts. Y = Yes, N = No		
	Soil conservation is the **primary objective** of a policy measure	Soil conservation is the **secondary objective** of a policy measure	Soil conservation is a **By-product**	Agricultural (AG) or non Agricultural (NAG) focused policy	European (E), national (N), regional ® or local (L) measure, and policy reference	Developing new/altering existing rules (institutions)	Developing and/or altering governance structures/ implementation approaches	Directly impacting on farmer behaviour/ decision making/ factor allocation and management practices
Incentive based measures/economic instruments			Rural Development Plan (2000-2006) and 2007-2013)	AG	Reg. CE 1698/2005 (E) National Strategic Plan (N) Rural Development Plan (R)	N	N	Y
			Organic Agriculture	AG	E- Regulation 2092/91 on Organic Farming	Y	Y	Y
Moral Suasion Initiatives ie it has a normative dimension that farmers should protect soils			LEADER approach and LAG (Local Action Groups)	AG	Reg. CE 1698/2005 (E)	Y	Y	Y
Information and capacity building measures, i.e. guidance, advisory measures and farmer support initiatives			Rural development services and technical assistance	AG	Regional law 37/2007	Y	Y	Y
			Specialized regional service on agriculture	AG	Regional law n. 9 del 14 gennaio 1997,	Y	Y	Y

7.2 Description, analysis, and evaluation of policy measures

7.2.1 Fiche 1: Good agricultural and Environmental Condition, Cross Compliance

Part A – Summary of Measure	
Formal title of measure and date of implementation	Cross Compliance GAEC Standards, implemented on 1 January 2005. As provided for by Council Regulation 1782/2003 (OJ L 270, 21 October 2003), Article 5, 'Good agricultural and environmental condition'.15 The GAEC have been applied since 2005 according to the Regional Council Decree of the Marche (DGR) n.320 of 2 March 2005. A revision and adaptation of GAEC for the Marche region was introduced with DGR Marche n. 159 20 February 2006, DGR Marche n. 151 26 February 2007, DGR Marche n. 1453 3 December 2007.
Short description of the measure	Cross compliance standards comprise two sets: One set of standards is collectively referred to as 'Statutory Management Requirements' (SMRs). These are derived from 19 "Acts" of EU legislation in the areas of the environment, public health and animal health and welfare. Of these from the Sewage Sludge Directive and the Nitrates Directive are of indirect relevance to soil conservation. The other set of standards, provided by Annex IV of the same Regulation, set the framework for Good Agricultural and Environmental Condition (GAEC). This framework directs Member States to introduce standards to address soil erosion, soil structure, soil organic matter and minimum level of maintenance of habitats. The GAEC standards are of direct relevance to soil conservation and are the focus of this fiche. The National Legislation, implemented at the regional level, for the GAEC foreseen the application of the following measures: Measure 1.1: surface water management in sloping land Measure 2.1: management of stubble and crop residues; Measure 3.1: maintained efficiency of the drainage network for surface water runoff Measure 4.1: Protection of permanent pasture; Measure 4.2: management of set-aside, Measure 4.3: maintenance of olive groves; Measure 4.4: maintenance of the characteristic features of the landscape Cross compliance SMRs and GAEC standards apply to agricultural land on the holding in the context of Single Payment Schema.
Type of policy measure	Cross Compliance is a regulatory policy measure, focused specifically at the agricultural sector. Standards are implemented at the country level or at regional level (i.e. France or Italian regions), and apply to all beneficiaries of the SPS.
Objective of policy measure and relevance	Annex IV of the Regulation sets out the framework for defining minimum requirements for GAEC. Three 'issues' and six 'standards' are set out for soils. In addition, four 'standards' which could potentially have implications for soil management (e.g. through management of green cover) are set out in relation to minimum level of maintenance of habitats.

[15] As part of the CAP Health Check the Commission has published legislative proposals (COM(2008) 306/4) which, if adopted, would replace Council Regulation 1782/2003 with a Regulation 'establishing common rules for direct support schemes for farmers under the common agricultural policy and establishing certain support schemes for farmers'. As the legislative proposals currently stand, the new Regulation would make a number of amendments to GAEC (now Article 6 and Annex III).

	Issue Standard Soil erosion: protect soil through appropriate measures • minimum soil cover, • minimum land management reflecting site specific conditions, • retain terraces. Soil organic matter: • maintain soil organic matter levels through appropriate practices, • standards for crop rotation where applicable, • arable stubble management. Soil structure: • maintain soil structure through appropriate measures, • appropriate machinery use. Minimum level of maintenance: • ensure a minimum level of maintenance and avoid the deterioration of habitats, • minimum livestock stocking rates or/and appropriate regimes, • protection of permanent pasture, • retention of landscape features, • avoiding the encroachment of unwanted vegetation on agricultural land. Measures 1.1, 2.1 and 3.1 focus on erosion reduction and control. The Reg. 1782/2003 is adopted in Italy through a Ministerial Decree (D.M. 5/08/2004) that fixes the rules for application of Reg. CE. According to the D.M. each Italian region adopted a Regional Council Decree to implement the CAP.
	How relevant are the objectives of the measure to the soil degradation threats in your region? □ □ □ □ X Not very Very
Indirect effects	Good soil management is essential to maintaining agricultural productivity and thus in the interest of all farmers. Of the SMRs, those from the Sewage Sludge Directive and the Nitrates Directive are of indirect relevance to soil conservation. Standards for crop rotation and arable stubble management may also provide benefits to plants, farmland birds, and other mammals and invertebrates found in arable systems.
Linkages to other policy measures	GAEC standards form the baseline level of sustainable land management. Agri-environment schemes, as provided for by Regulation 1698/2005, must include more demanding standards and not duplicate GAEC standards.
Funding	There is no additional funding available to farmers and land managers for complying with GAEC. The level of payment received under the Single Payment is not connected in any way to the costs involved in meeting GAEC. They are baseline standards that mostly consist of legal requirements and hence there is no justification for providing additional funding to beneficiaries of the SPS. The cost of providing information to farmers and enforcement and control is borne by the SPS delivery Agency for Agriculture Allocation (AGEA – Agenzia per le Erogazioni in Agricoltura).

Summary of assessment and conclusions	GAEC provide a suitable framework for introducing soil conservation measures and provide Member States with a degree of flexibility in order to implement nationally or regionally adapted measures. The GAEC standards in Italy are defined in line with the Annex IV of Reg. CE 1782/2003. The implementation at farm level improves both awareness and management practices in relation to soil management. Overall, the cross compliance GAEC standards in Italy represent the baseline for soil management. The main soil degradation processes are taken into account in the Annex IV or Reg. (CE) 1782/2003 and have been included in the D.M. 5/08/2004 and following D.M. of 18 October 2007 on application of cross compliance in Italy. And the should ensure a minimum level of suitable soil management takes place, given the potential for intensification of agricultural practices to occur in response to market conditions and in the context of decoupled direct payments. In practice, a lot will depend on the quality of SPRs undertaken at farm level and the extent to which implementation of appropriate management practices occur, where necessary.
Recommen-dation	The measure should be maintained but improved. Monitoring system is required for an evaluation of cross compliance measures is Through the monitoring system it will be possible to define the cost-effectiveness of the measures put in place.
Part B – Detail on the Measures Design, Implementation, Enforcement and Impacts	
Policy design	In Italy, the Ministry for Agriculture and Forestry Policies, MIPAF, consulted a range of experts from relevant government and non-government organisations, including farming agencies To define and set the most suitable GAEC.
Policy im-plementation I: Implementation at administrative level	The Agency for Agriculture Allocation (AGEA) is responsible for controls and applying payment reductions in its role as the Paying Agency. The control is made as percentage on the farms that have to be applying the GAEC. MIPAF has been involved in setting up the system of cross compliance controls and payment reductions along with the AGEA. The AGEA is the Competent Control Authority for all GAEC standards.
Policy im-plementation II: Method of de-livery to farmers	MIPAF has produced a range of written literature explaining farmers' obligations under cross compliance. A "manual on cross compliance" was produced and distributed to a wide range of stakeholders. A big effort was put in place, through the farmers association, to disseminate the information related to the application of cross compliance and Single payment Scheme.
Targeting	The farmers applying the GAEC have been more aware about the soil degradation problems and the practices fixed by GAEC are becoming standard and widespread practices.
	To what extent does the implementing body have flexibility in the targeting of the policy measure so that it is adapted to local conditions? X □ □ □ □ Low High
What Drives Uptake?	The key driver for compliance with GAEC and SMR standards is the potential reduction to the Single Payment if non-compliance is identified as part of an on-the-spot control.

	X □ □ □ □ Obligation Financial incentive Information & support Exhortation Other
Technical measures	The National Legislation, implemented at the regional level, for the GAEC foreseen the application of the following measures: • Measure 1.1: surface water management in sloping land • Measure 2.1: management of stubble and crop residues; • Measure 3.1: maintained efficiency of the drainage network for surface water run-off • Measure 4.1: Protection of permanent pasture; • Measure 4.2: management of set-aside, • Measure 4.3: maintenance of olive groves; • Measure 4.4: maintenance of the characteristic features of the landscape
Enforcement and control	On-the-spot controls for all cross compliance standards are conducted by AGEA. At least one per cent of farm businesses submitting claims under the Single Payment Scheme are inspected each year. During the inspection the AGEA is checked to see if it has been completed, if it identifies problems and measures to address them, if the identified measures have been implemented, if the annual review has been completed and if there is compliance with any specific guidance. Compliance with the other soil standards is checked through a full physical inspection of all agricultural land parcels. The last reference for the checks, calculating the eligible aids, communications appraisal of outcomes is the Circular of AGEA (Circolare n. 22 del 1 luglio 2008 Domanda Unica 2007, Controlli, calcolo degli aiuti ammissibili, comunicazione esiti dell'istruttoria.)
Monitoring and evaluation	The environmental impacts arising since the 2003 reform of the CAP, including those attributable to cross compliance are not being. Monitoring data for soils is currently considered inadequate. There doesn't exist a soil monitoring network neither at National nor at regional level.
Outcomes of policy measure	The evaluation on the cross compliance is absolutely positive in terms of farmer's awareness on soil degradation problems and soil management issues. Due to the relatively short time of implementation of the GAEC and lack of soil monitoring system it is quite difficult define the results in terms of effectiveness and cost efficiency of the measures.
Analysis of drivers of policy measures' outcomes	The outcomes have been achieved through the combination of the introduction of new requirements on farmers and a new governance structure that acts to inform farmers of the requirements and to penalise them in the event of non-compliance.
Part C – Evaluation of the Policy Measure	
Effectiveness of policy measure (in relation to the extent to which objectives are achieved, and cost-effectiveness)	As already stated before is quite difficult, if not impossible, to define the effectiveness of the cross compliance without a soil monitoring network or at least a pilot areas network where derived the useful data for determine the effects of policies. Even the control of the AGEA gives not so clear idea about the effectiveness of the measures, e.g. after an intense erosion event the farmer can restore the arrangement of the field as was originally and the AGEA surveyor has not the possibility to verify the occurrence of an heavy erosion process.

Constraints of the policy measure	Deficiency of empirical monitoring data.
Reasons for the success of the policy measure (where appropriate)	

7.2.2 Fiche 2: Nitrate Directive

Part A – Summary of Measure	
Formal title of measure and date of implementation	On the basis of Directive 91/676/CEE the National Legislative Decree (Decreto Legislativo, n. 152 of 11 May 1999) has been established. On the basis of Legislative Decree the Marche region provided to define the Nitrate Vulnerable Zones and the Action Program. (Decree of Regional Council n° 1448 of 3 December 2007)
Short description of the measure	The legislation provides the framework for Action plans for Nitrate Vulnerable Zones (NVZ) which requires farmers to prevent water pollution when managing manure and soil. Concerning soil management the main interest is erosion prevention but this is not the key aim of the measure.
Type of measure	Command and control
Objective of policy measure and relevance	To reduce pollution of water by nitrates originating from agriculture
	How relevant are the objectives of the measure to the soil degradation threats in your region? □ X □ □ □ Not very Very
Indirect effects	Protection of water quality when erosion prevention measures are implemented.
Linkages to other policy measures	Regional rules for Cross compliance, Agri-environmental scheme.
Funding	No funding is foreseen. The farmers have to respect the measures of the Action Program.
Summary of assessment and conclusions	Soil protection is not the main aim of the Nitrate Directive and it is targeted at NVZs only. Anyway, the measures has positive impact in reducing soil pollution related to the heavy metal (mainly Copper and Zinc) contained in the slurry.
Recommen-dation	A strictly control on the respect of the Action Program by the farmers is desirable.
Part B – Detail on the Measures Design, Implementation, Enforcement and Impacts	
Policy design	The measure stems from political transposition of European Directive by the national level which in turn was enacted in Regional level.
Policy imple-mentation I: Implementation at administrative level	The policy is implemented at the regional level and controlled by regional services.

Policy implementation II: Method of delivery to farmers	The Nitrate Directive was implemented with a massive information campaign targeted at farmers by using seminars in regions, leaflets, internet and other means.
Targeting	The measure is highly targeted, because it reflects the local conditions in the site-specific management.
	To what extent does the implementing body have flexibility in the targeting of the policy measure so that it is adapted to local conditions? □ □ X □ □ Low High
What Drives Uptake?	Uptake is driven by fear of penalties. Now the first action program is implemented and sanctions were not used so far.
	X □ □ □ □ Obligation Financial incentive Information & support Exhortation Other
Technical measures	The technical measures are defined in the Action program.
Enforcement and control	The compliance to the Action program in NVZs is controlled by regional services like Agency for food and Agricultural Services (ASSAM) and Environmental protection Agency (ARPAM) for the water pollution by nitrate.
Monitoring and evaluation	There's not so long time series of data to have a reliable evaluation on the application of Action Program. The monitoring is mainly carried out on the level of nitrate in the water.
Outcomes of policy measure	The Action program for the NVZs represents a step forward in the management of slurry, fertilizers and soil and water pollution.
Analysis of drivers of policy measures' outcomes	The main driver of the outcomes is the fear of penalties.
Part C – Evaluation of the Policy Measure	
Effectiveness of policy measure (in relation to the extent to which objectives are achieved, and cost-effectiveness)	A longer time series of data are needed in order to assess the effectiveness of the measures. The major results is that the farmers are aware about the right management of fertilizers and slurry and they have to apply, according to the Action Plan, the Good Agricultural Practices and they have to compile the Registry for treatments and fertilisation foreseen by the regional measures of cross compliance. These conditions should result in a net improvement in the risk of contamination of soils and waters by nitrate and heavy metals.
Constraints to achieving full potential of the policy measure	Monitoring system for water and soils and controls.
Reasons for the success of the policy measure (where appropriate)	Farmers are rather well informed, and relevant organisations and farmers cooperate quite well.

7.2.3 Fiche 3: RDP 2000-2006 of Marche region – Axis II "Protection and valorisation of the landscape and of Environmental resources" (organic farming/integrated farming)

Part A – Summary of Measure	
Formal title of measure and date of implementation	Rural development Plan 2000-2006 of Marche region The Rural Development Plan of the Marche region has been acted on rural development through the Measures F of Axis II "Protection and valorisation of the landscape and of environmental resources". Regulation 2092/91 on Organic (Biological) agriculture
Short description of the measure	The agro-environmental measures under Axis II refer to: Submeasure F1): actions finalized to the management of agriculture according to low environmental impact techniques and environmental protection. In order to receive funds for measure F1 farms need to adopt low the following impact techniques: a) the use of a Fertilisation Plan defined on the basis of the physical and chemical characteristics of soils and on the applied crops, b) the use of integrated pest control for crop protection c) a crop rotation plan for 5 years and respect of surface water management as foreseen by GAEC, d) maintenance of cover crops during the winter time. Other optional techniques can be adopted: e.g. erosion control with barriers, hedges, rows of trees. Submeasure F2 e F2bis: actions finalized to the management of agriculture according to organic farming techniques and environmental protection The measures F2 and F2bis are focused on the organic farming techniques as set by Reg.CEE 2092/91.
Type of policy measure	Incentive based
Objective of policy measure and relevance	Organic agriculture supports farmers to avoid the use of certain chemical substances (fertilisers or pesticides) that contribute to soil nitrate and contamination from other residual substances. Waters (inland) are also protected. Integrated farming aims to limit the use of chemical substances and adjusts the use of these according to local conditions.
	How relevant are the objectives of the measure to the soil degradation threats in your region? □ □ √ □ □ Not very Very
Indirect effects	Organic agriculture also sets up a range of Good Farming Practices that assist efforts to combat soil erosion, enhance organic matter and avoid compaction from the use of heavy machinery.
Linkages to other policy measures	Direct linkages to cross compliance policy and other agri-environmental programmes (organic animal raising, production extensification, production in nitrate vulnerable zones, etc.)
Funding	For the period 2000-2006 totally 230 million Euro have been allocated on the Axis II of RDP 2000-2006.

Summary of assessment and conclusions	The value of the measure for soil protection is significant. The application of techniques based on Organic and Integrated farming means for the farmers comply with all GAECs for cross compliance and, on top, they make efforts for the enrichment of soils in organic matter and avoidance of soil and water contamination. The introduction of organic and integrated farming, certainly shows the positive impacts on soil erosion and on the decrease in organic matter and, more generally, for maintaining functional quality of the soil. However, one should note the extremely low uptake of the measure among the farming population. In this context the area used for organic farming increased from 3,426 ha in 1993 to 32,423 ha in 1999. Organic farming still remains a minority over the total of the agricultural sector and it represents 15-25 % of GDP derived from agriculture and 10-15 % of UAA. Uptake of Organic Farming in the Marche has been highest in the Middle Upper Hill area, where farming is traditionally low-impact and the regulation for organic farming does not represent a big change.
Recommen-dation	
Part B – Detail on the Measures Design, Implementation, Enforcement and Impacts	
Policy design	The process to define the RDP is quite long and complex: on the basis of EU Strategic Guidelines a National Strategic Plan is defined. On the basis of National Strategic Plan the Rural Development Plan for Marche region was set up. At regional level the RDP is defined by Regional Agricultural Department (Assessorato Agricoltura) with consultation of stakeholders, farmers association, province, communes, etc. The final act is approved and issued by Regional Council.
Policy imple-menttation I: Implementation at administrative level	The implementing body is mainly the Regional Agricultural Department. A Management Committee is set up. In the Management Committee are represented the National (Ministry for food and Agricultural policies, Ministry of Economy), Regional Authorities, a representative of provinces and Communes, a representative of AGEA). The subsidy includes expenses for implementation of organic/integrated farming and the application of techniques with low environmental impact.
Policy imple-mentation II: Method of delivery to farmers	The farmers have to declare the plots of their farm holding that are under the organic/integrated farming. All other procedures (consultation, inspection and certification) rest with the independent body chosen by the farmer.
Targeting	No targeting. All farmers in Marche region.
	To what extent does the implementing body have flexibility in the targeting of the policy measure so that it is adapted to local conditions? □ □ √ □ □ Low High
What Drives Uptake?	Organic and integrated farming is subsidised. However, its uptake is driven by the fact that it provides an alternative to conventional markets.
	□ √ □ □ □ Obligation Financial incentive Information & support Exhortation Other
Technical measures	The technical are linked with techniques with low environmental impact, e.g. cover crop, grassing between the row of tree crops, maintaining hedges, etc.

Enforcement and control	The regional authorities verify compliance with the commitments taken by farmers.
Monitoring and evaluation	Through requests for funding of farmers is it possible to assess the extent of hectares for the applied measures, the amounts disbursed and the area in which the measures were applied. An ex ante and ex post evaluation on the RDP and measures are made by the Region.
Outcomes of policy measure	
Analysis of drivers of policy measures' outcomes	The outcomes have been achieved through the awareness of the need for farmers to reduce the impact. The farmer's awareness was achieved through specific programs of information and engaging in technical support from the regional departments and associations of producers.
Part C – Evaluation of the Policy Measure	
Effectiveness of policy measure (in relation to the extent to which objectives are achieved, and cost-effectiveness)	The effectiveness of the organic and integrated farming measure is great in terms of soil conservation. Soil erosion and decline of soil organic matter are soil degradation processes that could considerably reduce with organic and integrated farming.
Constraints to achieving full potential of the policy measure	The major constraint to achieving the full potential of the measure is the lack of education and information that has still not achieved the right target.
Reasons for the success of the policy measure (where appropriate)	One of the main reasons for the success of the RDP agro environmental measures on organic and integrated farming is linked with the farmers needs to identify new market opportunities. However is also to highlight the awareness of farmers on the need to adopt techniques more environmental sustainable.

8 Conclusion

The Italian survey of the SoCo project interested a whole region and this has introduced the need of a valuation with a strong link with the territory. This situation is even more delicate in a region like the Marche where there are different environments, microclimate, socioeconomic and agricultural management conditions. For this reason in the Marche region it's not possible to have general laws. It's strategically important the individuation and a following valuation of agricultural management systems. In this region the particular environment conditions, geomorphology and soil, together with social and cultural aspects have mitigated the negative influences due to the agricultural industrialisation process typical of the 60's and 70's. The realisation of environmental policies, CAP first, pushes the Marche region agriculture towards a sustainable model connected with tradition and a quality production.

No doubt the Marche region has processes of soil deterioration which must be taken into consideration to define both policies and eventual technical agronomic solutions. Nevertheless the solutions must be compared with the specific features of the territory.

The de-coupling introduction by the Fischler reform brought to the territory a diversification, from 70 cultivations to more than 250. Moreover the GAEC introduction helped the diversification of the application of soil protection techniques. For example the fight against erosion is carried out mainly by putting in a steady state waters with sluice in sowable lands, while for olive groves, orchards and vineyards there is mainly the turfing of the lane. Therefore the GAEC have shown a good adaptability to the agricultural management systems in the Marche region.

From a Conservation Agriculture point of view the survey has been carried out trying to understand and identify those areas where such operations can be done successfully. The bad case of the cover crops in the Marche region is an example of impossible conservative application. If on one hand with the cover crops we can get a reduction of the erosive phenomenon, the damages caused by the spring cultivations, with high soil moisture, bring to a worst structure loss than the erosive damages.

The Common Market Organisation, that influences a lot the farmers choices, is paradoxically structured in productive lanes (cereal, wine, etc.) not taking into consideration the production area. That paradox is already avoided in the regulation proposal of the Health Check with the introduction of only one Common Market Organisation. In this way it will help the connection between the product and its territorial origin using the most adaptable cultivation techniques for the soil conservation. Nevertheless we don't have to forget the European objectives and the common strategies (participation, development of experience sharing networks and outcomes, GAL, knowledge and information transfer).

To stress the reached objectives of the SoCo project survey we can assert:

- The concept of **"territoriality"** has to be taken into consideration in the definition of the measures and policies of the territory;

- Soil conservation has to be carried out only through a good **knowledge of the soil** itself and the delicate balances that maintain its numerous functions;

- **Conservation agriculture** cannot be considered as a series of different operations (minimum tillage, sod seeding, reduce tillage, cover crops etc.) but it has to be analyzed in relation with the concept of "territoriality" and according to features and qualities of the soil. Only with an integrated approach we can have the application of techniques which can be defined as Conservation Agriculture;

- **Sustainable agriculture** is identified as the achievement of the balance between socioeconomic and environmental factors;

- **Soil conservation practices** should be defined as an integrated system of interventions that take into account:
  - tillage system,
  - nutrient management,
  - pesticide management;

- **Environmental objectives** are a key element of the **Common Agricultural Policy;**

- **First pillar of CAP**, with cross compliance, introduces a strong innovative element for the protection of the environment;

- Numerous objectives of other environmental policies have been already taken into consideration in the **Statutory Management Requirements** (SMRs) established under cross compliance. Particularly important for soil protection are the Nitrate Directive, Sewage Sludge Directive, Habitat Directive;

- With the **second pillar of CAP** the concept of “territoriality” is better respected. CAP reform allows the passage to a policy which better meets local needs with more targeted policy instruments for the area involved;

- Other policies, like **Less Favoured Areas**, could be useful instrument to enhance the soil protection but it is necessary that the policies are defined on a territorial basis and not on few parameters (e.g. elevation) that sometimes are not so significant or are not the main threats for soil degradation;

- **Effectiveness of the policies** and measures used should be determined through a **monitoring network**.

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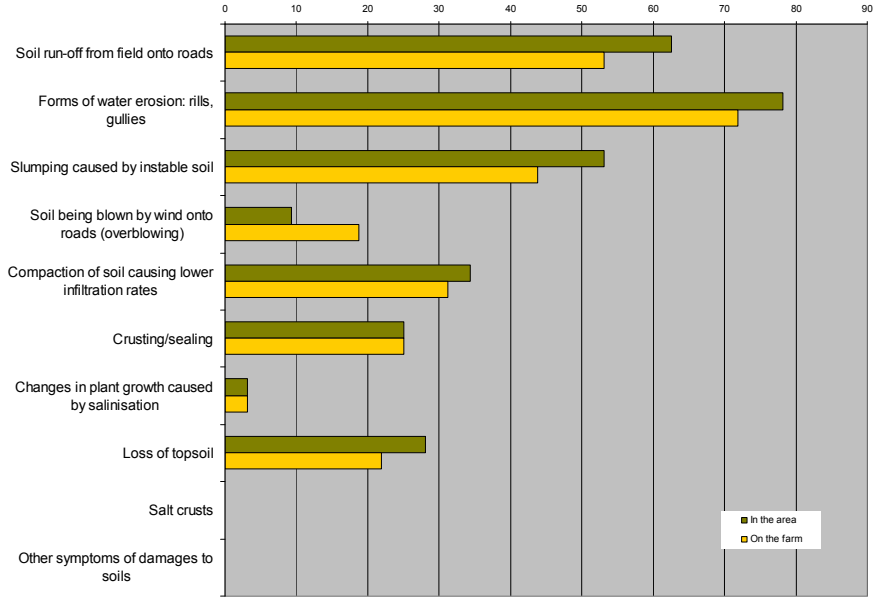
Annexes

Annex: Findings from questionnaires

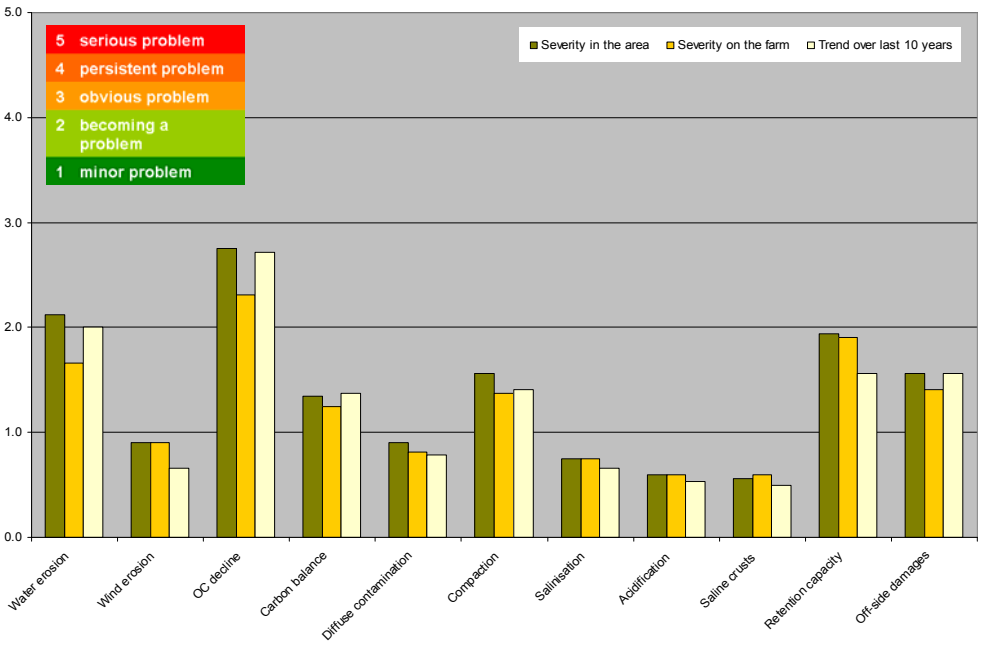
Perception of soil degradation in the case study area: Soil degradation problems

Percentage of farmers that have noticed the following symptoms in the area (green) and on their own farm (yellow).



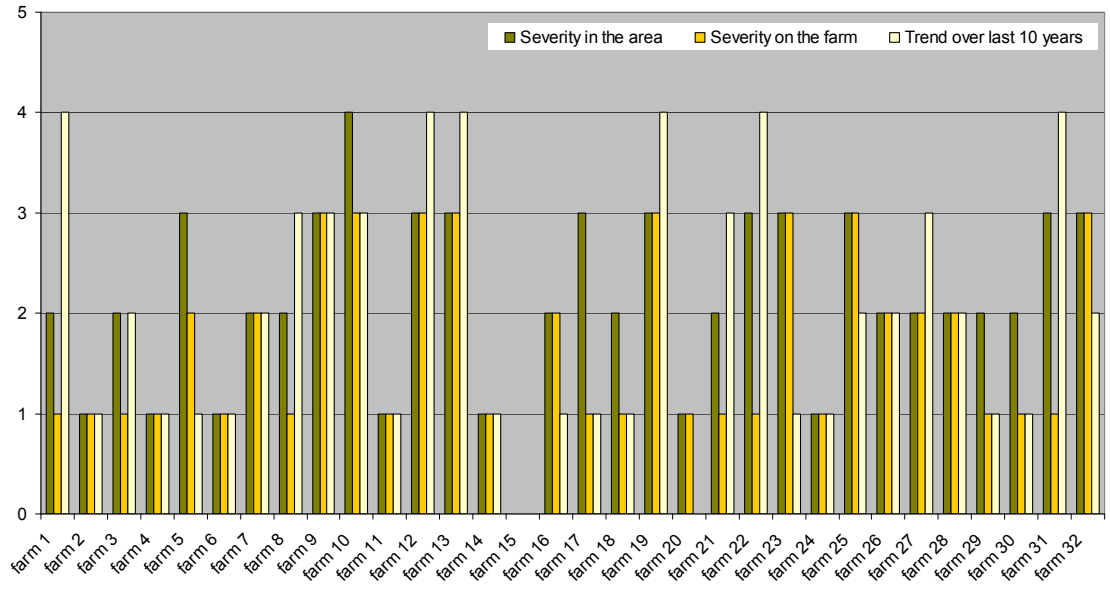
Water erosion, soil run-off and instable soil are seen as the major problems in both the wider area and on the farms. More than 70 % of the farmers say water erosion is a problem in their fields.

Trends in soil degradation and consequences

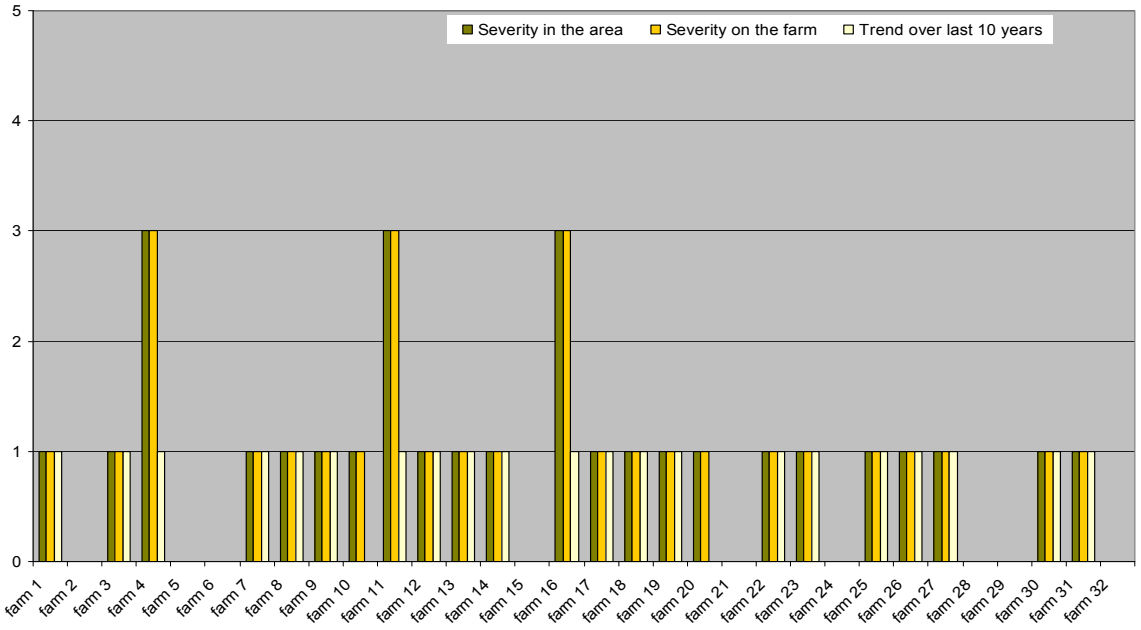


No clear conclusions can be derived from this picture. The graph displays an average perception across an area with different soil types, land use and land management. In certain locations (see next graph) a degradation process can be severe while in other areas the process is absent. Taking the average ignores the extremes, which is exactly where the degradation is in need of attention.

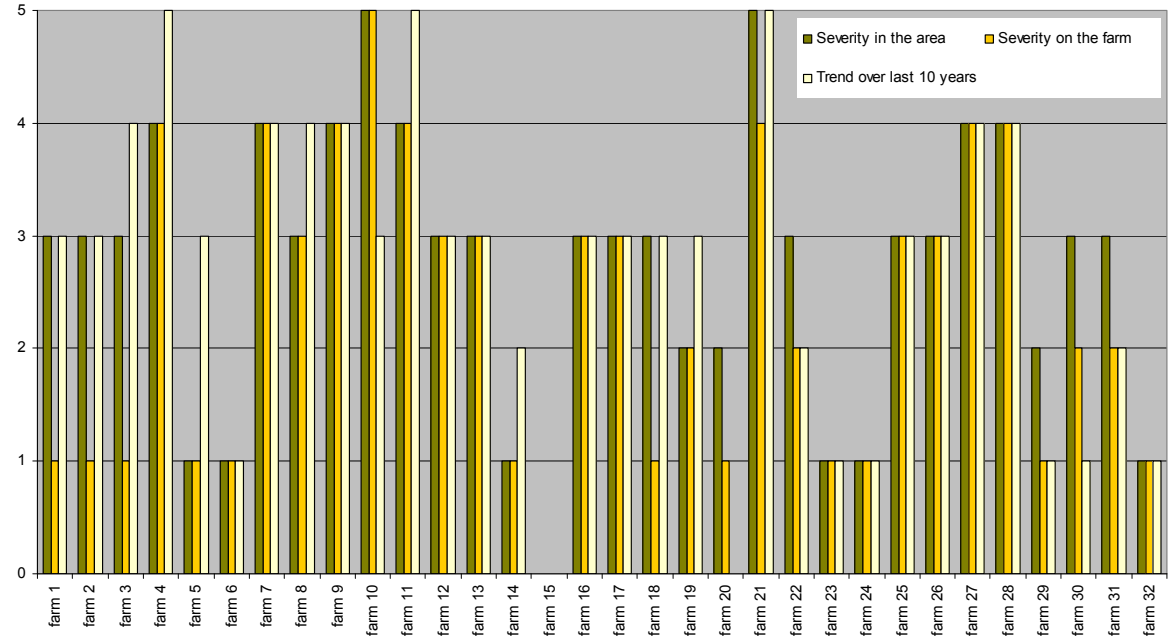
The perception of farmers concerning water erosion



The perception of farmers concerning wind erosion

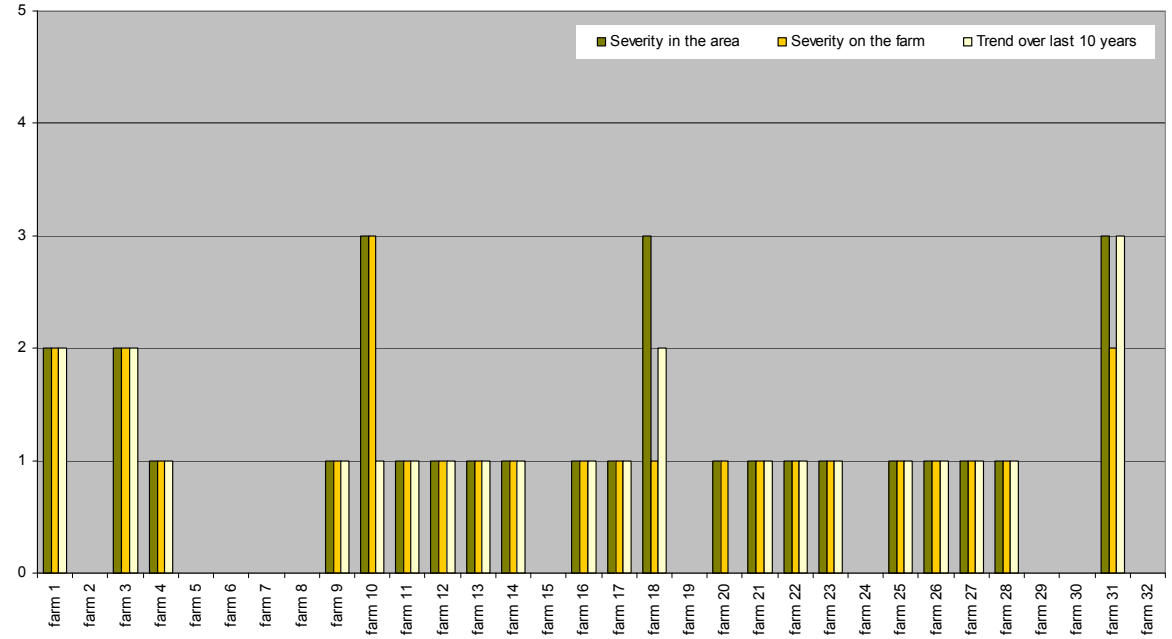


The perception of farmers concerning organic carbon decline



Organic carbon content is declining and this is observed as a serious problem.

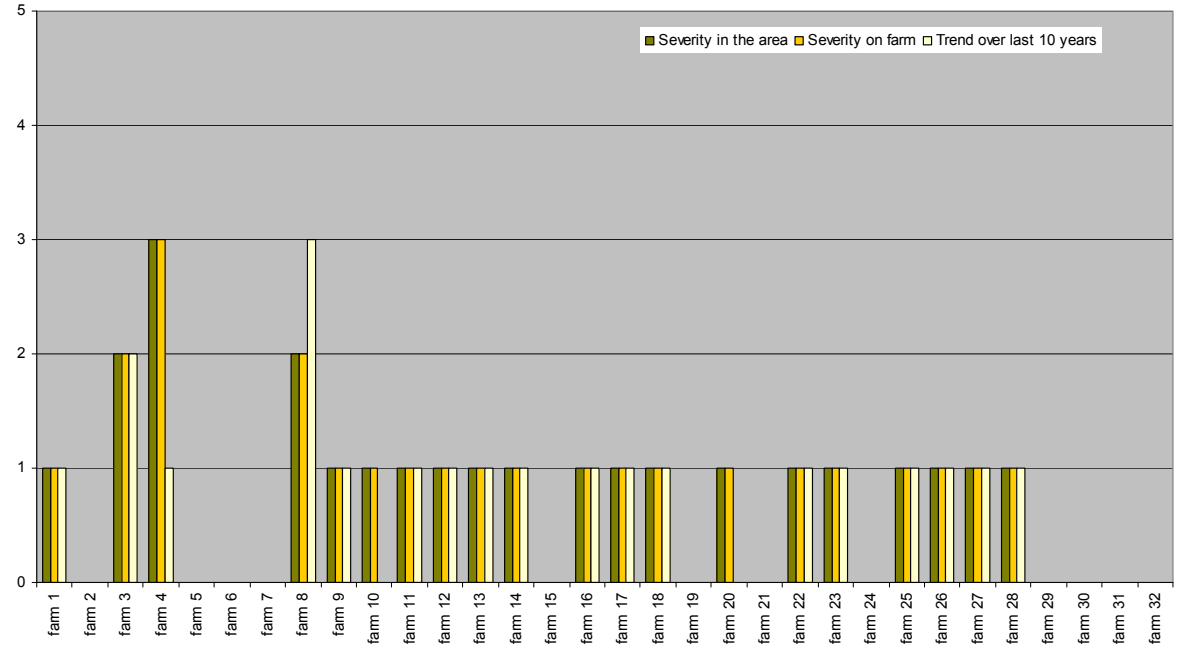
The perception of farmers concerning diffuse contamination



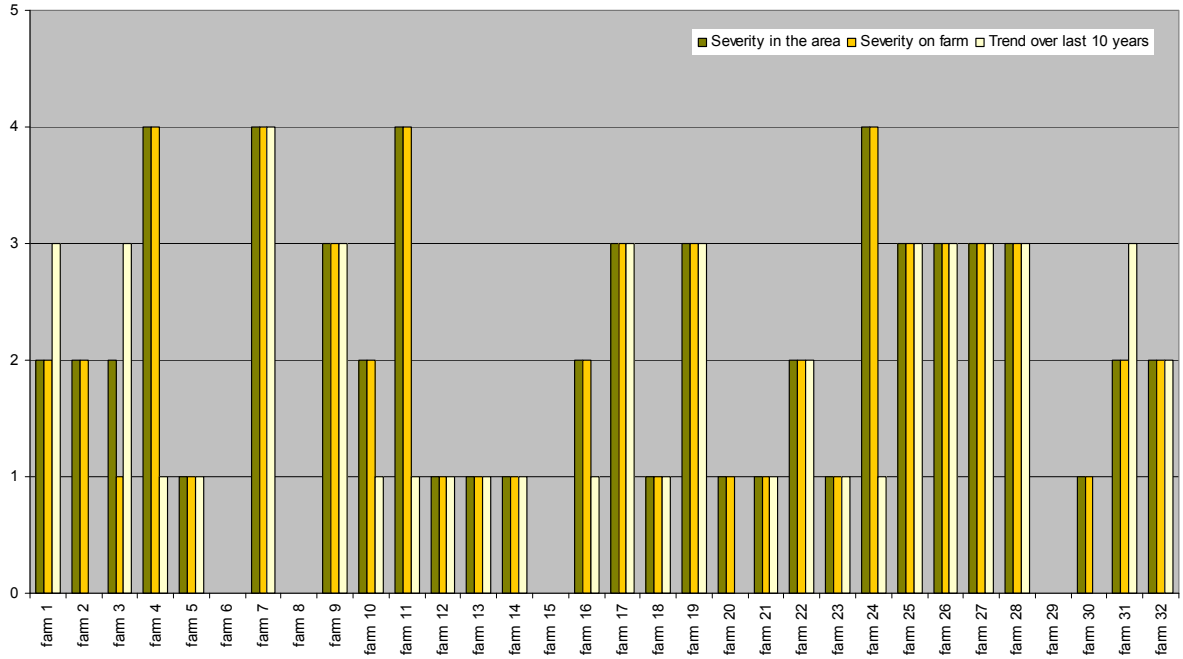
On three locations contamination is perceived as a problem.

Compaction is not widespread in the Marche although in few cases it is seen as a problem by farmers. The same situation is occurring with regards to salinisation.

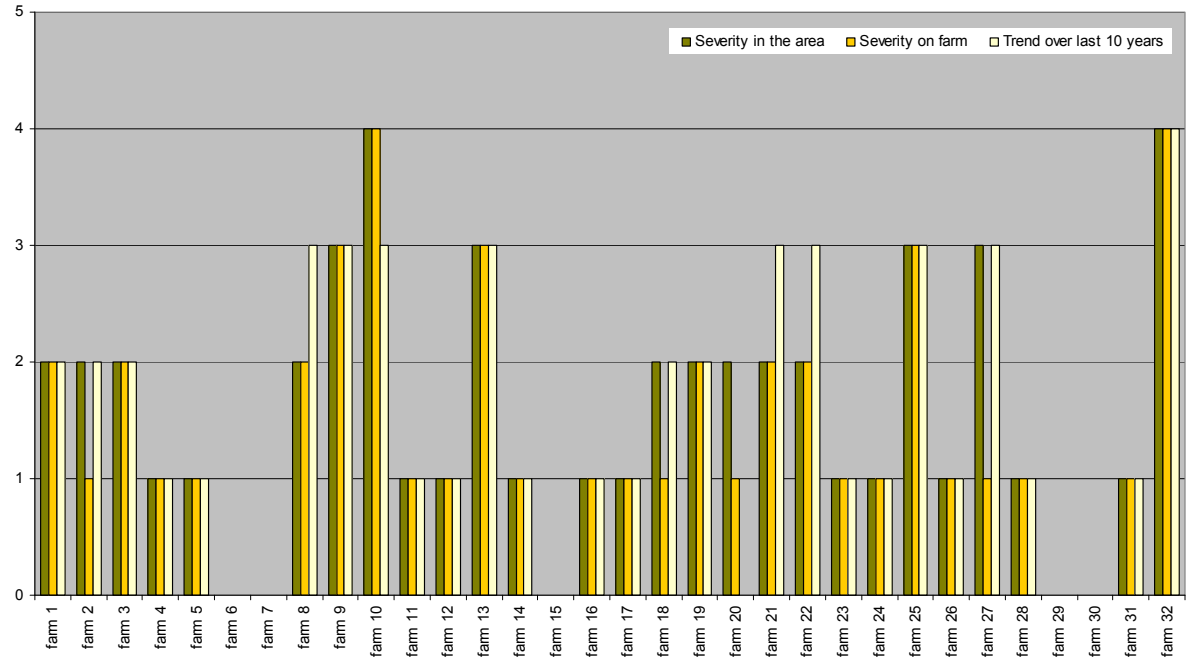
The perception of farmers concerning salinisation



The perception of farmers concerning water retention capacity



The perception of farmers concerning offside damages



Offside damages are present and in some cases are viewed as a persistent problem.

Farming practices and soil conservation practices
Farming practices and their effects on soil

A summary of the measures applied by the 32 participating farmers

Cropping/tillage measures	Farmers (%)	Long-term measures	Farmers (%)
Intercrops	31.3	Change of crop rotation	37.5
Undersown crops	9.4	Strip cropping	0
Grass strips	15.6	Use of organic soil improvers/ exogenous organic matter	50.0
No tillage/ direct drilling	18.8	Liming	12.5
Reduced tillage	75	Drainage management to mitigate salinisation and/or compaction	15.6
Contour tillage	3.1	Use of tramlines	18.8
Restriction of row crops on steep slopes	3.1	Chemical amendments	6.3
Wheel sizes and pressure/restricting excessive heavy machinery use	34.4	Change of field patterns and sizes	6.3
Restrictions on the max. amount of (liquid) manure application	3.1	Retention ponds	15.6
Restrictions of manure application to a certain time period	12.5	Hillside ditches	31.3

Restrictions on the max. amount of N- fertilisation	56.3	Adjusting stocking rates	12.5
Restrictions on the max. amount of P-fertilisation	18.8	Adjusting duration and season of grazing animals	9.4
Other, e.g. non-inverting ploughing, hedges	9.4	Other, e.g. grass cover in olive grove	3.1

Most effective measures for protecting soils

Most effective measures for protecting soils	% of farmers
Drainage ditches	19
Reduced tillage	19
Appropriate tillage	16
Water regime management	13
Organic farming	13
Fertiliser reduction	13
Rotation	9
Cover crops	6
Nitrate directive	6
Reforestation	3
Nitrogen for fallow	3
Conservation tillage	3
Direct seeding	3
none	3

Factors influencing adoption of soil conservation practices

The adoption of soil conservation practices depends on whether farmers perceive the need to apply them. In the questionnaires attention is paid to collect some information on what farmers observe and what barriers and constraints they have to practise soil conservation.

50 % of the farmers have observed that symptoms of soil degradation are linked to particular crops, soil types or management systems. The case study area is diverse; therefore the farmers' explanations are equally diverse.

Links of soil degradation to a variety of reasons according to the 32 participating farmers

Nr of farmers' answers	Soil degradation linked to:
1	Machinery entry causing compaction
1	ploughing direction and ploughing slopes that are too steep for ploughing
1	bare soil (erosion)
1	Compaction and runoff with industrial crops (e.g. beetroot) and horticultural industry (pea, bean, spinach) during the harvest
1	reduction in water infiltration due to direct seeding
2	change of natural situation
2	drainage channels
3	degradation due to cereals/spring crops
3	(lack of) water regime management
3	Sunflowers vulnerable to erosion and mass movements

Farmers' decision making is influenced by mainly two sources; 59 % state their decision making is guided by farmers' associations and 9 % receive their consults from the company that buys their products and where the farmer themselves buy their seed, fertiliser, etc. Furthermore 35 % of the farmers say they take their decisions without anyone influencing them.

Barriers or constraints that prevent farmers from adopting soil conservation practices

Barriers or constraints	%
lack of financial resources and knowledge	53
no barriers or constraints	44
lack of coordination at the level of the area that needs protecting	9

Displaying the consequences of the degradation processes in the area or on the farms as described by the farmers.

Consequences of degradation processes	%
fertility loss	34
drains fill with sediment	13
mass movements and landslides	13
no consequences	28

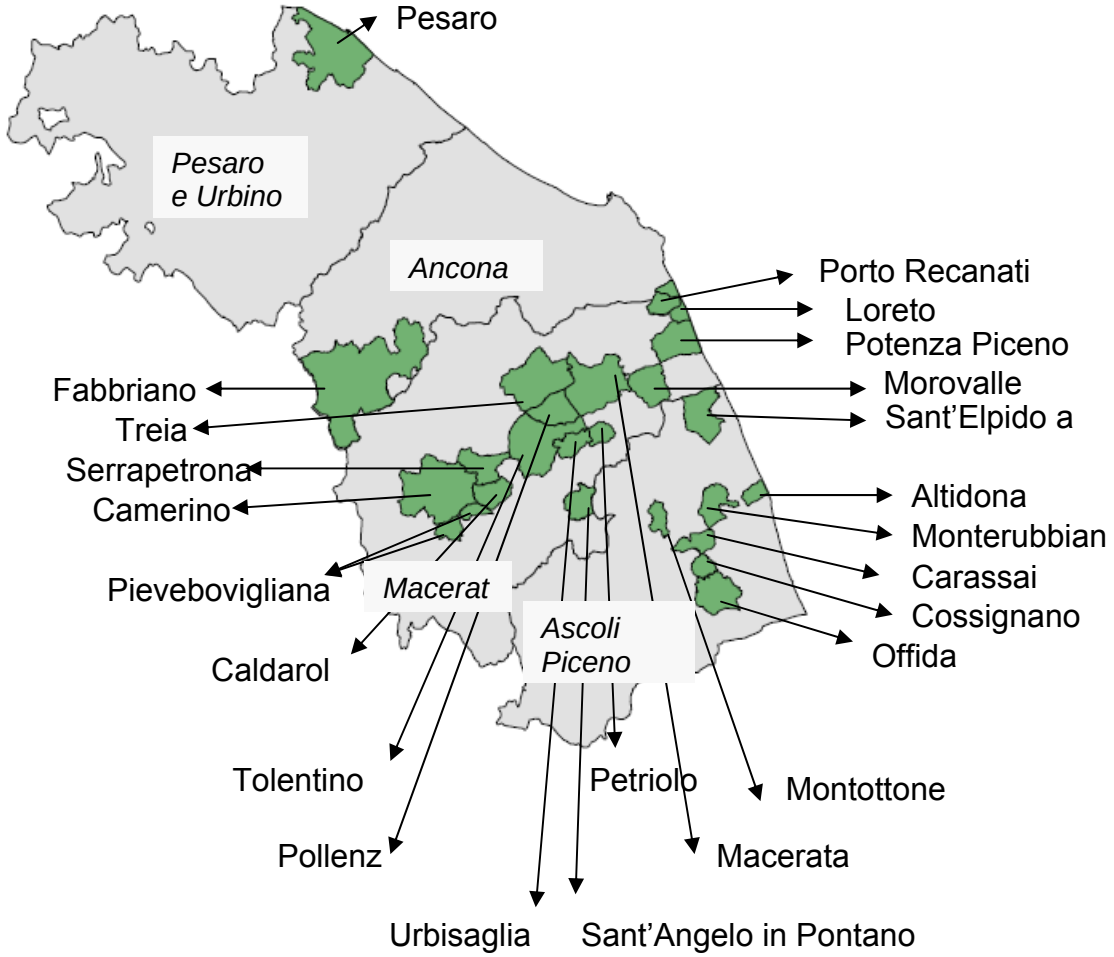
Decrease in fertility, soil loss (observed sediment in drainage channels) and landslides are serious consequences of degradation in the Marche. 53 % of the farmers mention lack of financial resources and knowledge as the main constraints for not adopting soil conservation practices.

Case study Italy

Details of participating farms

Farm	Town	Area (Ha)	Conventional (Ha)	Organic (Ha)	Livestock	Crops
1	Morrovalle	27	16	11		Cereals (e.g. wheat, corn, barley), spinach, peas, lettuce, legumes, vegetables for industrial processing, olive trees.
2	Pievebovigliana	24		24	90 beef cattle	Vineyard, truffles.
3	Morrovalle	40	40		Cattle	Wheat, corn, fodder, horticulture, vegetables for industrial processing, medicinal herbs.
4	Sant'elpidio a mare	26	26			Barley, corn, peas, tomatoes.
5	Camerino	60	60			Cereals (e.g. wheat, corn, barley), fodder.
6	Potenza Picena	100	50	50		Alfalfa, vegetables for industrial processing.
7	Montottone	21	21			Fruit and olive trees.
8	Porto Recanati	20	20			Cereals (e.g. wheat, corn, barley), lettuce.
9	Offida	14	14			Alfalfa, fruit trees.
10	Loreto	1,450	1,450			Wheat, durum wheat, sorghum, corn, barley, peas, beans for industrial processing, pinto beans, basil, medicinal herbs, olive grove, vineyard, sunflowers.
11	Treia	257	257			Durum wheat, barley, corn, peas, sunflowers.
12	Monterubbiano	9.7	9.7			Cereals (e.g. wheat, corn, barley), olive trees, sunflowers.
13	Monterubbiano	10.5	10.5			Cereals (e.g. wheat, corn, barley), olive trees, sunflowers.
14	Tolentino	431.32	431.32			Cereals (e.g. wheat, corn, barley), olive trees.
15	Pollenza	7.5		7.5		Wheat, sunflower, olive trees.
16	Serrapetrona	112	112			Durum wheat, barley, fodder, chickpeas, sunflowers.
17	Altidona	6.6	6.6			Barley, fruit trees, vineyard
18	Petriolo	57	57		90 beef cattle	Durum wheat, barley, corn, lettuce, sorghum, fodder
19	Morrovalle	50	50			Cereals (e.g. wheat, corn, barley), vegetables for industrial processing.
20	S.Angelo in Pontano	100	100		200 sows	Wheat, durum wheat, corn, barley, vegetables for industrial processing, olive trees, vineyard, sunflowers.
21	province Macerata	12	12			Wheat, barley, olive trees, vineyard.
22	Tolentino	80	80			Cereals (e.g. wheat, corn, barley), fodder, peas, fruit trees.
23	Caldarola	13		13		Cereals (e.g. wheat, corn, barley), olive trees.
24	Urbisaglia/Tolentino	73		73		Parsley, basil, alfalfa, wheat, durum wheat, peas, spelt, barley, black beans, olive trees, nut trees.
25	Monterubbiano	34	34			Cereals (e.g. wheat, corn, barley), beetroot, black beans, vineyard.
26	Carassai	25	25			Cereals (e.g. wheat, corn, barley), vineyard.
27	Cossignano	8.6	8.6			Cereals (e.g. wheat, corn, barley).
28	Pesaro	10.59	10.59			Durum wheat, olive and fruit trees, vineyard.
29	Fabriano	51.77	51.77			Wheat, sunflower, olive trees, forest.
30	Pollenza	21.49	21.49			Durum wheat, corn, olive trees, sunflowers.
31	Macerata	300	280			Cereals (e.g. wheat, corn, barley).
32	Macerata	13	13			Cereals (e.g. wheat, corn, barley), fodder, vineyard.
Total			**3,267.57**	**178.5**		

Distribution of the interviewed farmers in the Marche region



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Author(s): Ezio Rusco, Brechje Maréchal, Mauro Tiberi, Cristina Bernacconi, Giovanni Ciabocco, Paolo Ricci, Enrico Spurio

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Abstract

This Technical Note 'Case Study – Italy' is part of a series of case studies within the 'Sustainable Agriculture and Soil Conservation' (SoCo) project. Ten case studies were carried out in Belgium, Bulgaria, the Czech Republic, Denmark, France, Germany, Greece, Italy, Spain and the United Kingdom between spring and summer 2008. The selection of case study areas was designed to capture differences in soil degradation processes, soil types, climatic conditions, farm structures and farming practices, institutional settings and policy priorities. A harmonised methodological approach was pursued in order to gather insights from a range of contrasting conditions over a geographically diverse area. The case studies were carried out by local experts to reflect the specificities of the selected case studies.

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