INFORMATION ON LULUCF ACTIONS UNDER ARTICLE 10(2) OF DECISION 529/2013/EU

ITALY

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Authors

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Summary

1. Executive Summary

Based on an agreement by the Council and the European Parliament, the Decision n. 529/2013/EU sets out accounting rules applicable to greenhouse gas emissions and removals from the LULUCF sector, with the aim of a future inclusion of the LULUCF sector in the Union's emission reduction commitment. The Decision 529/2013/EU also requires Member States to draw up and transmit to the Commission information on their current and future LULUCF actions to limit or reduce emissions and maintain or increase removals resulting from the activities referred to in Article 3.1, 3.2 and 3.3 of abovementioned Decision (*Afforestation, Reforestation and Deforestation* (ARD), *Forest Management* (FM), *Cropland Management* (CM), *Grazing Land Management* (GM), *Wetland Drainage and Rewetting* (WDR), and *Revegetation* (RV)).

Italy has decided to transmit the information on LULUCF actions under Article 10(2) of Decision 529/2013/EU as a separate document, following art. 10.1 of the abovementioned Decision.

An expert panel was set up under the coordination of Ministry of Environment and in cooperation with the Ministry of Agriculture, Food and Forest Policies, including relevant national experts and the main stakeholders, at the national and regional levels. The panel is aimed to streamline data, information and policies among the UNFCCC/KP framework, the Decision n. 529/2013/EU and CAP Regulations and to promote the best practices and synergies with other policies and measures relating to forest and agriculture.

The area of managed lands included in the current report is the same reported in the UNFCCC reporting and consistent with the Kyoto Protocol (KP) reporting, as land subject to KP activities have been identified as a subcategory of one of these six IPCC main categories. In Italy all land use categories and related activities (*cropland, grazing land, forest*) are to be considered managed. National forest definition under the Kyoto Protocol has been fully implemented also in the LULUCF sector of the UNFCCC inventory, in order to maintain coherence and congruity between the two forest-related reporting.

A disaggregation of cropland and grassland categories has been carried out and included in the current report, taking into account several management practices: *organic farming, sustainable agriculture, conservation practices, set-aside, ordinary agriculture, ordinary grazing land, managed grazing land, improved grazing land*.

Emissions and removals related to the period 1990-2012 have been reported, coherently with the data submitted to UNFCCC and related Kyoto Protocol, considering the mandatory carbon pools.

In order to develop a national methodology able to take into account the detailed information on implemented management practices in the estimation process of carbon stock changes related to the soils pool, an analysis of management practices in cropland and grassland categories is currently ongoing.

The data and the information on projections reported in UNFCCC and UE context have been provided. In particular the for the activity *Forest Management*, the assessment of the *Forest Management Reference Level* (FMRL) is included, being the FMRL the averages of the projected forest management (FM) data series for the period 2013-2020, taking account of policies implemented before mid-2009, with emissions/removals from *harvested wood product* (HWP).

Projections for the reporting activities *Cropland Management* and *Grazing land Management* have been not implemented, yet; therefore the projections for cropland and grassland categories officially reported under Article 3(2) of the Monitoring Mechanism Decision (Commission Decision 280/2004/EC), related to 2020 and 2030, have been included in the current report.

To outline the scenarios (2014-2020) for future trends, according to national strategic plans, the enhancement of agricultural areas and containment of land consumption and the full implementation of CAP (first and second pillar) at national and regional levels have been considered.

The three scenarios are considering the following elements:

- *with measures* scenario: the maintenance of existing policies has been considered until 2020;
- *with additional measures scenario:* the introduction of new practices (e.g. "*greening*") of the first pillar of the CAP, and a strengthening of the practices of the rural development are assumed;
- *without measures* scenario*:* refers to the total absence of policies.

A quantitative assessment of the impact of the three different scenarios on the activity data related to cropland and grassland categories has been provided.
The mitigation potential has been analysed, taking into account the biophysical-technical potential (with a focus on soils carbon pool), economic potential, market potential, on the basis of several national studies and researches. The quantitative assessment of the F_{LU}, F_{MG}, F_I factors have been carried out, for three Italian climatic regions, disaggregated for the identified management system (*annual crop, organic annual crop, annual crop - sustainable practices, annual crop – greening, annual crop - no tillage, set aside, perennial crop, organic perennial crop, perennial crop - sustainable practices*). On these bases, the SOCs at the equilibrium for each management practice and geographic zone have been pointed out.
The principal measures implemented in the cropland and grazing land management have been outlined, according the following production systems*: ordinary agriculture, sustainable agriculture, agriculture with conservation practices, organic farming, set-aside, greening, ordinary grazing land, managed grazing land, improved grazing land*.
The existing and the planned policies have been reported; for each policy, the objective and the related key land area have been described. The implementation status and body has been detailed, policy by policy, and a description of the policy impact, in term of CO_2.
The timetable for the implemented and planned measures in the period 2013-2020 is provided.

2. Enhanced communication and stakeholder consultation

2.1 Communication between ministries / government departments

A national expert panel was set up under the coordination of Ministry of Environment and in cooperation with the Ministry of Agriculture, Food and Forestry Policies. The aforementioned panel involves the relevant national experts and the main stakeholders, at the national and regional levels. The key issue of the panel is to achieve a streamlining among the UNFCCC/KP framework, LULUCF Decision and CAP Regulations and promoting the best practices and synergies with other policies and measures relating to forest and agriculture.
Much information relating to LULUCF actions is already part of different frameworks and reporting (i.e. Forest Management Reference Level submission, National Communication under UNFCCC, reporting under Article 3(2) of the Monitoring Mechanism Decision, Rural Development Programmes, Ministerial Conference on the Protection of Forests in Europe (MCPFE) reporting, Agricultural policy strategy, National Renewable Energy Action Plan, etc.).
In a meeting held on 5 June 2014, the Ministry of Agriculture, Food and Forest Policies presented to agricultural regional administrations a draft of a report on emissions accounting of cropland and grassland management (art. 10 of EU 529/2013/ Decision) with a view to better sensitize them to the relevant issues.
Following on this, a questionnaire was sent out to Regions seeking to ascertain technical and financial information for new strategic climate measures to be implemented in the regional RDP 2014-2020.
However it is worth noting that the information on LULUCF to be transmitted within this decision is strictly linked to the still ongoing processes under the CAP 2014-2020, which is the basis of policies and measures that will be implemented in the agroforestry sector within the EU in the near future. Within the second pillar, MMSS have to submit within July 2014 their rural development programs (article 16 of the EU regulation n 1303/2013), while within the first pillar the submissions for the implementation choices (including greening) are to be presented within next August 2014 (EU regulation 1307/2013). After the submission of the RDP a revision process from the commission will start, thus the Programs cannot be considered as final before the end of the next autumn. Therefore the information contained in this report are based on a first draft of policies and measures within the LULUCF sector since the CAP process is in the course of its completion.

2.2 Synergies and re-use of existing information

The expert panel is aimed at collecting the information already included in reporting activities and to outline a synthesis to be used in preparing the submission of information on LULUCF actions pursuant to Article 10(1).

2.3 Consultation with stakeholders

In 2009 the Ministry of Agriculture Food and Forest Policies, in conjunction with National Rural Network, held a national workshop involving public and academic officials to evaluate the role of agriculture and forestry sectors in post-Kyoto climate change adaptation and mitigation.
A position paper was published, which, taking into account the importance of the agriculture sector on emission balance, showed the strategies of the Italian rural development and agro-food chain for climate policies. The aim was to enhance not only the contribution of agriculture to emission reduction, but also to play an active role in economic development.
Soon after, the Ministry began working on a “White paper on climate change” which was published in 2011. This document presented the national framework for opportunities and challenges for rural development on mitigation and adaption to climate change, taking into account various possible climatic scenarios.

Around eighty experts contributed to this document, highlighting detailed proposed actions which the Italian agriculture and forestry sector could adopt, not only in LULUCF, but also in the animal husbandry, agro-food and energy sectors.
During 2012 and 2013 the involvement of stakeholders continued as evidenced by the publication of further relevant magazine articles, as well as on line, at www.pianetapsr.it.
In addition to this, a technical report concerning the baseline indicators n.24 and n.25 (renewable energy and agricultural and forestry biomass) for the monitoring and evaluation of the regional RDP 2007-2013 was published.
On the international level, ISMEA (Italian Institute for agricultural and agro-food market) represented the Italian Rural network at a workshop entitled "Climate Change mitigation and adaptation in RDP's", organized by the European Evaluation Network, held in Cyprus on 10-11 February 2014.
On 13 March 2014, more than 170 stakeholders from NRN partners, government institutions, universities and research organizations attended a workshop in Rome organized by Rete Rurale - the Italian NRN - regarding the contribution of the 2014-2020 RDP to the efficient use of resources and the transition to a low-carbon economy in the food industry[3].
Delegates heard presentations on climate indicators and the strategic framework for support from Ministry of Agricultural, Food and Forestry Policies representatives. These were followed by sessions covering practical ways to monitor and reduce emissions at both regional and farm levels.
On the 22nd April 2014 the Partnership Agreement (document that defines the strategies and priorities of the Member State) has been notified to the European Commission. The Agreement, as indicated in the Commission Regulation (EU) No. 1303/2013, was the result of an intensive consultation with a specific focus on the drafting of the Objective no. 4 ("support the transition towards a low-carbon economy in all sectors") and no. 5 ("Promote adaptation to climate change, the prevention and risk management").

[3] http://enrd.ec.europa.eu/publications-and-media/enrd-magazine/it/enrd-magazine_it.cfm

3. Overview of national circumstances

3.1 Areas of managed land

The area of managed lands included in the current report is the same reported in the UNFCCC reporting and consistent with the Kyoto Protocol (KP) reporting, as land subject to KP activities have been identified as a subcategory of one of these six IPCC main categories. In Italy all land use categories (cropland, grazing land, and forest) are to be considered managed under the UNFCCC reporting.

Land uses and land use changes have been assessed, on the basis of the IUTI[4] data, related to 1990, 2000 and 2008. For 2012, land use and land use changes data were assessed through the survey, carried out in the framework of the III NFI, on a IUTI's subgrid (i.e. 301,300 points, covering the entire country). Time series related to the areas to be included into the different IPCC categories have been assembled using IUTI data, and the data assessed by the national forest inventories (1985, 2005, 2012). Verification and validation activities have been undertaken and the resulting time series have been discussed with the institutions involved in the data providing (i.e. National Forest Service, Ministry of Agricultural, Food and Forestry Policies (MIPAAF), Forest Monitoring and Planning Research Unit (Agricultural Research Council-MPF)).

Further details on the land representation are reported in National Inventory Report -NIR (ISPRA, 2014).

3.1.1 *Forest land*

National forest definition[5] under the Kyoto Protocol has been fully implemented also in the LULUCF[6] sector of the UNFCCC inventory, in order to maintain coherence and congruity between the two forest-related reporting. The forest definition has been set up, and included in the determination of Italy's assigned amount under Article 7, paragraph 4, of the Kyoto Protocol, and the election of the art. 3.3 and 3.4 activities, by a national expert panel[7] set up under the coordination of Ministry of Environment and in cooperation with the MIPAAF).

Forest Land is therefore defined as a land containing trees and fulfilling the national forest definition's thresholds. Forest land also includes systems with vegetation that currently fall below, but are expected to exceed, the threshold of the forest land category; it may be temporarily unstocked.

Forest roads, cleared tracts, firebreaks and other open areas within the forest as well as protected forest areas are included in forest. All forests fulfilling the definition of forest, as given above, are considered as managed and are under forest management. The total Italian forest area is eligible under forest management activity, since the entire Italian forest area has to be considered managed forest lands.

Forest land area, for the period 1990-2012, is shown in Figure 1, disaggregated into forest land remaining forest land and land converting to forest land subcategories.

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[4] Detailed information on IUTI is reported in Annex 10 of National Inventory Report 2014, ISPRA 198/2014, http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ita-2014-nir-15apr.zip

[5] National forest definition is the same applied by the Food and Agriculture Organization of the United Nations for its Global Forest Resource assessment (FAO FRA 2000). This definition is consistent with definition given in Decision 16/CMP.1. Forest is a land with following threshold values for tree crown cover, land area and tree height:

a. *a minimum area of land of 0.5 hectares;*
b. *tree crown cover of 10 per cent;*
c. *minimum tree height of 5 meters.*

[6] LULUCF sector include the following categories: *Forest land, Cropland, Grassland, Wetlands, Settlements, Other Land.*

[7] The panel involves, on a voluntary basis, the relevant national experts, including the forest inventory experts (http://www.sian.it/inventarioforestale/jsp/home_en.jsp), members of the FAO-FRA Italian panel (http://www.fao.org/docrep/013/al537E/al537E.pdf) and other national researchers.

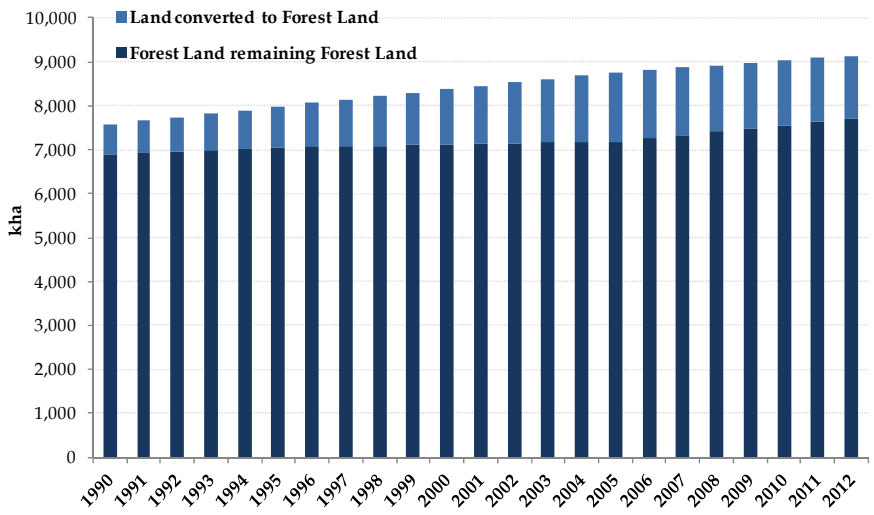


Figure 1: Forest land area for the period 1990-2012 [kha]

In table 1, the area of land subject to the KP art. 3.3 activities (Afforestation/Reforestation – AR and Deforestation – D) and article 3.4 activity (forest management –FM) is reported for the first KP commitment period (2008-2012).

kha	2008	2009	2010	2011	2012
art. 3.4 - FM	7,486	7,483	7,479	7,475	7,471
art. 3.3 - AR	1,437	1,495	1,553	1,612	1,670
art. 3.3 - D	26	29	33	37	40

Table 1: Area of lands subject to KP art. 3.3 and art. 3.4 activities

3.1.2 *Agricultural land: cropland and grassland*

Cropland is defined as a land that with cropping systems, including trees that fall below the forest definition's thresholds.

Cropland area, for the period 1990-2012, is reported in Figure 2, disaggregated into cropland remaining cropland and land converting to cropland subcategories.

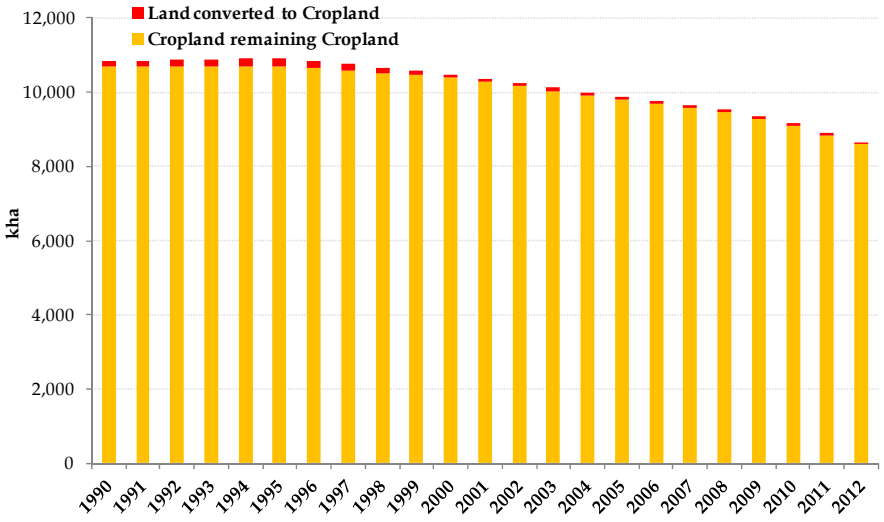


Figure 2: Cropland area for the period 1990-2012 [kha]

Grassland is defined as is a land with pasture or rangelands, as well as any other land (e.g. wild grassland, shrublands, recreational areas, etc.) with vegetation that does not match the forest definition's thresholds and that is not included in other land use categories.
In Figure 3, grassland area, for the period 1990-2012, is reported, disaggregated into grassland remaining grassland and land converting to grassland subcategories.

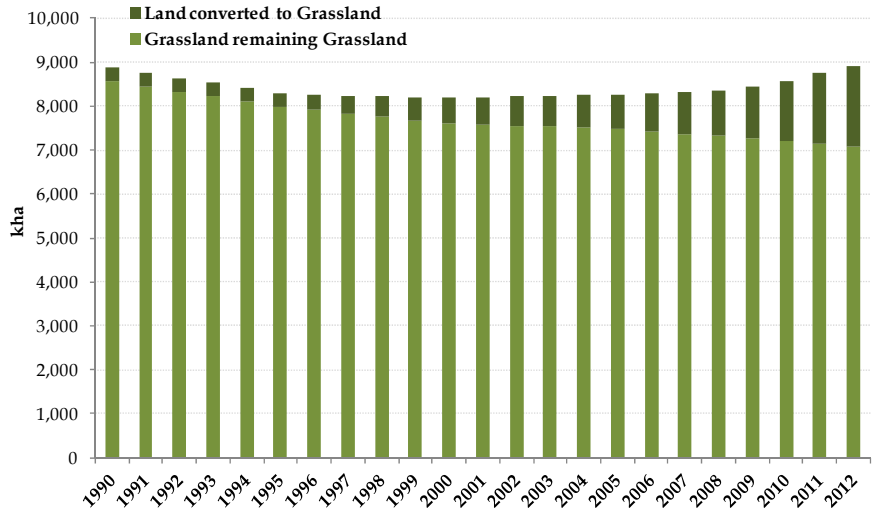


Figure 3: Grassland area for the period 1990-2012 [kha]

In Table 2, the land uses and land use changes areas for the period 1990-2012 have been reported; following the UNFCCC requirements and the consequent IPCC implementation, the national total area, including those areas not subject to any KP activity as well as the area of lands classified as unmanaged lands under the UNFCCC, is shown, for completeness of reporting and consistency of time series.

kha	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
5. LULUCF	30,134	30,134	30,134	30,134	30,134	30,134	30,134	30,134	30,134	30,134	30,134	30,134	30,134	30,134	30,134
A. Forest Land	7,590	7,980	8,369	8,447	8,525	8,603	8,681	8,759	8,814	8,868	8,923	8,978	9,032	9,087	9,142
1. Forest Land remaining Forest Land	6,901	7,056	7,117	7,131	7,144	7,158	7,172	7,183	7,258	7,333	7,408	7,483	7,558	7,633	7,707
2. Land converted to Forest Land	689	923	1,252	1,317	1,381	1,445	1,509	1,577	1,556	1,536	1,516	1,495	1,475	1,454	1,434
B. Cropland	10,841	10,924	10,487	10,365	10,244	10,122	10,000	9,879	9,769	9,660	9,551	9,355	9,159	8,903	8,648
1. Cropland remaining Cropland	10,704	10,704	10,403	10,281	10,160	10,038	9,916	9,795	9,686	9,577	9,467	9,271	9,075	8,836	8,598
2. Land converted to Cropland	136	220	84	84	84	84	84	84	84	84	84	84	84	67	50
C. Grassland	8,891	8,278	8,186	8,202	8,218	8,233	8,249	8,265	8,292	8,318	8,345	8,459	8,573	8,746	8,919
1. Grassland remaining Grassland	8,566	7,985	7,592	7,572	7,552	7,531	7,511	7,488	7,430	7,371	7,313	7,255	7,196	7,138	7,080
2. Land converted to Grassland	325	292	594	630	666	702	738	777	862	947	1,032	1,204	1,377	1,608	1,839
D. Wetlands	510	512	515	515	516	516	517	517	518	518	519	519	519	519	519
1. Wetlands remaining Wetlands	510	510	510	510	510	510	510	510	510	510	510	510	510	511	511
2. Land converted to Wetlands	0	2	5	5	6	6	7	7	8	8	9	9	9	8	8
E. Settlements	1,644	1,782	1,920	1,948	1,975	2,003	2,030	2,058	2,086	2,113	2,141	2,169	2,196	2,224	2,251
1. Settlements remaining Settlements	1,423	1,451	1,478	1,484	1,489	1,495	1,500	1,506	1,534	1,561	1,589	1,616	1,644	1,672	1,699
2. Land converted to Settlements	221	331	442	464	486	508	530	552	552	552	552	552	552	552	552
F. Other Land	658	657	656	656	656	656	656	656	655	655	655	655	655	655	655
1. Other Land remaining Other Land	658	657	656	656	656	656	656	656	655	655	655	655	655	655	655
2. Land converted to Other Land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2: Land uses and land use changes areas for the period 1990-2012 [kha]

3.2 Planned improvements[8]

To estimate the carbon stock changes in the agricultural activities of the LULUCF sector, as required in the article 10 par. 2 of Decision 529/2013, it's necessary to analyze the impact of some measures and production systems within the cropland and grassland categories. To this purpose several production systems have been considered: *organic farming, sustainable agriculture, conservation practices, set-aside, ordinary agriculture*[9]*, ordinary grazing land, managed grazing land, improved grazing land*. Within these production systems only agronomic aspects were considered, aimed at preserving the soil, maintaining or increasing the organic matter, such as grassing, crop rotation, cover crops, as well as the minimum or zero tillage. These agronomic practices are illustrated in the table 3.

Production systems	Practices	PAC legislation
organic farming	*Management of waste crop* *Organic manure* *Extended crop rotation* *Selection of better crop varieties* *Cover crops*	Reg. (EEC) n. 2078/92 Reg. (EC) n. 834/2007 and Reg. (EC) n. 889/2008 RDPs 2000-2006: Reg. (EC) n. 1257/99 RDPs 2007-2013: Reg. (EC) n. 1698/2005 and Reg. (EC) n. 74/2009
sustainable agriculture	*Crop rotation* *Grassing* *Specific erosion prevention* *Cover crops* *Minimum tillage*	National decree on sustainable agriculture n. 2722/2008 RDPs 2000-2006: Reg. (EC) n. 1257/99 RDPs 2007-2013: Reg. (EC) n. 1698/2005 and Reg. (EC) n. 74/2009
agriculture with conservative practices	*Zero tillage* *Organic manure* *Grassing c* *Cover crops* *Minimum tillage* *Crop rotation*	RDPs 2007-2013: Reg. (EC) n. 1698/2005 and Reg. (EC) n. 74/2009
managed grazing land	*Renewal and/or thickening of crops*	National decree on cross compliance implementation n. 30125/2009 and subsequent revisions
improved grazing land	*Renewal and/or thickening of crops* *Connection to zoothecnics*	RDPs 2000-2006: Reg. (EC) n. 1257/1999 RDPs 2007 - 2013: Reg. (EC) n. 1698/2005 and Reg. (EC) n. 74/2009 Reg. (EC) n. 834/2007 and Reg. (EC) n. 889/2008 Reg. (EC) n. 1804/2007
set aside	*Natural grassing* *At least one mowing*	Reg. (EEC) N. 1765/1992 National decree on cross compliance implementation n. 30125/2009 and subsequent revisions

Table 3: Agricultural management practices considered

[8] Data used in this report, and/or used to make quantitative estimates, is taken from official source Mipaaf (SIAN), and related to the implementation of national and regional measures first and second pillar of the CAP, and national statistics are based on quantitative and qualitative information available at the time of processing. This implies that they are to be considered provisional and subject, in subsequent editions, or any review, even retrospectives, if there is the need to incorporate additional data and information, adjustments and updates statistical and administrative corrections or additions.

[9] In this report, "ordinary agriculture" is understood as a kind of agriculture that doesn't evidence any kind of soil carbon stock technical maintenance.

The period 1990 - 2000 is characterized by the increasing integration of environmental issue. With CAP reform of 1992, the specific measures to encourage environmentally friendly farming are introduced[10]. These measures include organic agriculture which increases considerably in the coming decade to represent 9% of cropland in 2000. With CAP reform of 1992 set aside[11] took the form of a compulsory measure, which introduced the obligation for farmers to set aside a predetermined percentage of their arable land (or to cultivate it with non food crops) as a condition to apply for compensatory payments. The provisions on the set aside measure were modified in several occasions until the CAP reform of 1999[12].
From 2000 to 2012 there was a consolidation of the agri-enviromental measures. With 1999 CAP reform (Agenda 2000) integration of environmental requirements was achieved via two major pieces of legislation. One, 'horizontal regulation', requires account to be taken of environmental aims in the implementation of first pillar measures (cross-compliance with 2003 CAP reform); the second, the rural development regulation, consolidates earlier agri-environmental measures and adds to them, thereby covering the second pillar of the CAP[13]. These Agri-environmental measures offer opportunities for favouring the build-up of soil organic matter, the enhancement of soil biodiversity, and the reduction of soil erosion, contamination and compaction.
The trend from 2001 to 2012 of the sustainable agriculture, and organic farming areas shows a decrease until 2005 (due to the switch from the Regulation (EC) No. 2078/92 to the Regulation (EC) No. 1257/99 related to the period 2000/2006) and then a considerable increase until 2012.
In the following figures 4 and 5, the area of cropland and grassland categories are showed, including data on the considered management practices.

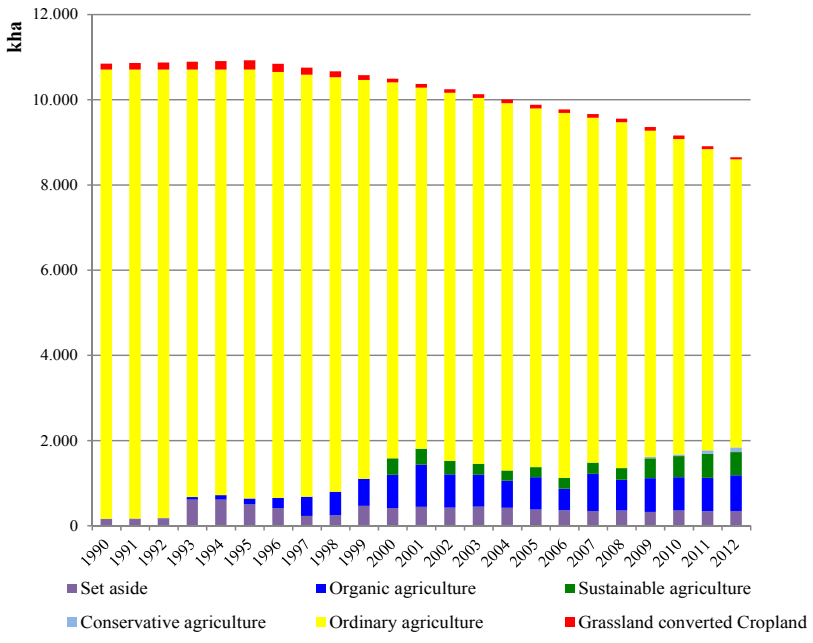


Figure 4: Cropland area for the period 1990-2012, detailed by management practices [kha]

[10] Council Regulation (EEC) No 2078/92.
[11] The set aside is introduced with the Council Regulation (EEC) No 1765/92.
[12] The main changes concerned the rate of compulsory set aside, the differentiation in rates between compulsory rotational and non-rotational set aside, and the introduction of compensated voluntary set aside Council Regulation (EC) No 231/94.
[13] Council Regulation (EU) No 1257/99.

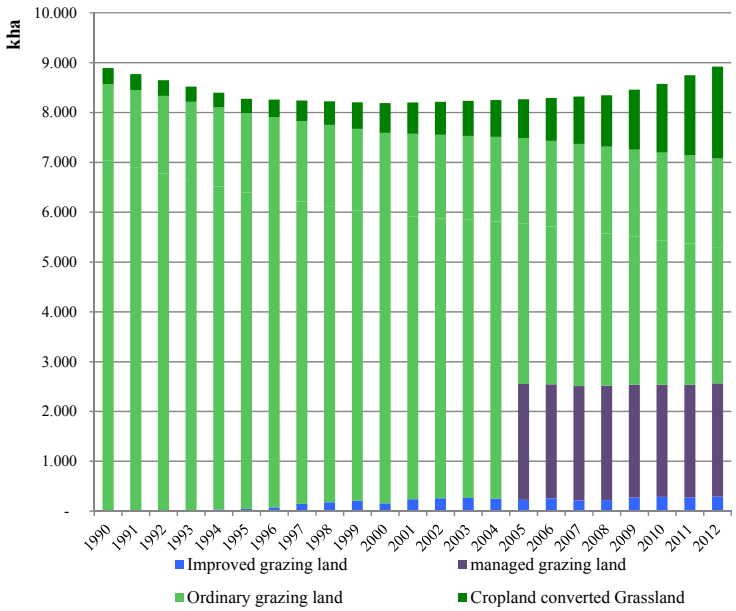


Figure 5: Grassland area for the period 1990-2012, detailed by management practices [kha]

The Cross Compliance includes the protection of permanent grassland in the "good agricultural and environmental conditions" (GAEC), to ensure a minimum level of maintenance and to avoid the decay of habitats through the prohibition to reduce the surface destined to permanent pasture. The rural development programmes include measures to improve grazing land management.

Ordinary grazing land is different from grassland managed according to the cross compliance rules, and from those funded by rural development (improved grazing land), because ordinary grazing land has an extensive management based on minimal interaction with the soil, to avoid the physical and floristic deterioration.

In addition to these measures, the CAP contributes to mitigation and adaptation through funding, into the rural development, payments to areas facing natural or other specific constraints, to Natura 2000 areas and to the forest conservation[14].

The table 4 below describes a preliminary study of the measures / production systems that affect GHG, where measures are present in Italian regional RDP 2007-2013, with reference to organic matter and emissions.

[14] These are the measures of the 2007-2013 programming 211-212-213-215-225, replaced by those Articles 30-31-34 of the Regulation (EU) No. 1305/2013.

Measure		Valle d'Aosta	Piemonte	Lombardia	F.V.G.	P.A. Trento	P.A Bolzano	Veneto	E.R.	Liguria	Toscana	Marche	Umbria	Lazio	Abruzzo	Basilicata	Molise	Campania	Calabria	Puglia	Sicilia	Sardegna
Organic agriculture																						
Sustainable agriculture	Integrated agriculture																					
	Soil management																					
	Soil cover																					
	Conversion of cropland to grassland																					
Conservative agriculture																						
Improved grazing land	Extensive crops																					

Table 4: RDP measures with impact on organic matter and GHG emission
(Fonte: rielab. da "Ricognizione degli studi e delle ricerche riguardanti il potenziale di mitigazione di talune pratiche colturali e delle lavorazioni" MIPAAF – ISMEA 2013)

Grassland areas supported by incentive scheme from rural development and the cropland area subject to cross-compliance standard on crop rotation are currently in the process of verification and validation, and will be used in following stages of the investigation process.

3.3 Key C pools and C sources in land based sectors

A key category analysis of the LULUCF categories has been carried out in the Italian national greenhouse gas inventory context, according to the Approach 1 and Approach 2 described in the 2006 IPCC Guidelines (IPCC, 2006). According to the IPCC guidelines, a key category is defined as an emission category that has a significant influence on a country's GHG inventory in terms of the absolute level and trend in emissions and removals, or both. Key categories are those which, when summed together in descending order of magnitude, add up to over 95% of the total emissions or 90% of total uncertainty.

The outcome of the key category analysis for 2012, according to level and/or trend assessment (*IPCC Approach 1 and Approach 2*), is listed in Table 5. CO_2 emissions and removals from forest land remaining forest land, land converted to forest land, cropland remaining cropland, grassland remaining grassland, land converted to grassland and land converted to settlements have been identified as key categories, both in level and in trend assessment. Concerning CH_4 or N_2O emissions, no categories have resulted as a key source.

	gas	*categories*	2012
5.A.1	CO_2	Forest land remaining forest land	key (L, T)
5.A.2	CO_2	Land converted to forest land	key (L, T)
5.B.1	CO_2	Cropland remaining cropland	key (L, T)
5.C.1	CO_2	Grassland remaining Grassland	key (L, T)
5.C.2	CO_2	Land converted to Grassland	key (L, T)
5.E.2	CO_2	Land converted to Settlements	key (L, T)
5.D	CO_2	Wetlands	Non-key
5.E.1	CO_2	Settlements remaining Settlements	Non-key
5(V).A1	CH_4	Forest land remaining forest land	Non-key
5(V).A1	N_2O	Forest land remaining forest land	Non-key
5.B.2	CO_2	Land converted to cropland	Non key
5.B.2	N_2O	Land converted to cropland	Non-key

Table 5: Key categories identification in the LULUCF sector

Key category analysis for KP-LULUCF[15] was performed according to section 5.4 of the IPCC GPG for LULUCF (IPCC, 2003).

CO_2 emissions and removals from *Afforestation/Reforestation and Deforestation* activities (art. 3.3) and from *Forest management* (art. 3.4) have been assessed as key categories. Their figures have been compared with the key categories identified for the latest reported year (2012) based on the level of emissions including LULUCF. The respective associated UNFCCC subcategories are *Land converting to forest land*, which has been identified as key category, at level and trend assessment, *Land converted to settlements* and *Land converted to grassland*, which has been identified as key category at level and trend assessment, and *Forest land remaining Forest land*, which is a key category at level and trend assessment.

3.4 Main crop systems and grasslands that have links to key C pools and C sources

3.4.1 *Cropland*

Cropland includes all annual and perennial crops as well as temporary fallow land (i.e., land set at rest for one or several years before being cultivated again). Annual crops may include cereals, oils seeds, vegetables, root crops and forages. Arable land which is normally used for cultivation of annual crops but which is

[15] KP-LULUCF includes the mandatory activities under art. 3.3 (*Afforestation, Reforestation and Deforestation*) and the elected activity under art. 3.4 (*Forest Management*)

temporarily used for forage crops or grazing as part of an annual crop-pasture rotation is included under cropland. Temporary set aside of annually cropland (e.g. conservation reserves) is included in cropland category. Perennial crops include trees and shrubs, in combination with herbaceous crops (e.g. agroforestry) or as orchards, olive groves and vineyards.
Different management practices, including crop type and rotation, tillage, drainage, residue management and organic amendments, are implemented on cropland areas, depending on crop, soil and climate variables.
Carbon stock changes for living biomass and soils carbon pools are estimated and reported in UNFCCC context.

3.4.2 *Grassland*

Grassland includes grazing lands, forage crops, permanent pastures, and lands once used for agriculture purposes, but in fact set-aside since 1970. Grasslands generally have vegetation dominated by perennial grasses, with grazing as the predominant land use, and are distinguished from "forest" by having a tree canopy cover of less than the threshold used in the forest definition.
Carbon stocks in permanent grassland are influenced by human activities and natural disturbances, including harvesting of woody biomass, rangeland degradation, grazing, fires, pasture management, etc.
Carbon stock changes for living biomass, dead organic matter and soils carbon pools are estimated and reported in UNFCCC context.

4. Past emissions and removals

The IPCC default land use transition period of 20 years has been used to estimate carbon stock changes in mineral soils related to land use changes; the annual changes in carbon stocks in mineral soils have been reported for 20 years subsequent the conversion.

4.1 Forest

All the data concerning the growing stock and the related carbon are assessed by the For-est model (Federici et. al., 2008), estimating the evolution in time of the Italian forest carbon pools, according to the IPCC Good Practice Guidance for LULUCF (IPCC, 2003) classification and definition: *living biomass*, both *aboveground* and *belowground*, *dead organic matter*, including *dead wood* and *litter*, and *soils* as soil organic matter. Italy has decided not to account for the soil carbon stock changes from forest land remaining forest land and from activities under Article 3.4, providing transparent and verifiable information to demonstrate that soils pool is not a source in Italy, as required by par. 21 of the annex to decision 16/CMP.1. Additional information on the methodological aspects may be found in National Inventory Report -NIR (ISPRA, 2014).

Emissions and removals related to the category Forest land, for the period 1990-2012, are reported in Figure 6, disaggregated into the required carbon pools: *living biomass, dead organic matter* and *soils*.

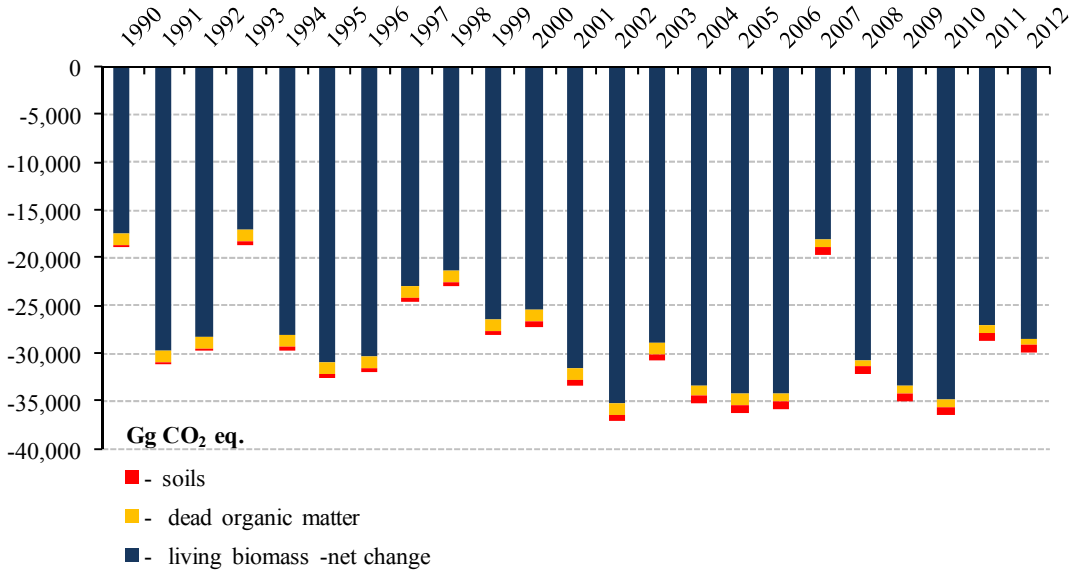


Figure 6: Emissions and removals for the category forest land [GgCO$_2$ eq.]

In table 6, GHG emissions and removals related to the lands subject to the KP art. 3.3 activities (*Afforestation/Reforestation* – AR and *Deforestation* – D) and article 3.4 activity (*forest management* –FM) for the first KP commitment period (2008-2012) are reported.

	2008	2009	2010	2011	2012
A. Article 3.3 activities	**-4,421**	**-5,148**	**-5,757**	**-4,353**	**-4,630**
A.1. Afforestation and Reforestation	-6,352	-7,088	-7,708	-6,310	-6,594
A.1.1. not harvested	*-6,352*	*-7,088*	*-7,708*	*-6,310*	*-6,594*
A.1.2. harvested	*NA*	*NA*	*NA*	*NA*	*NA*
A.2. Deforestation	1,930	1,940	1,951	1,957	1,965
B. Article 3.4 activities	**-27,191**	**-29,779**	**-30,869**	**-23,564**	**-24,735**
B.1. Forest Management	*-27,191*	*-29,779*	*-30,869*	*-23,564*	*-24,735*

Table 6: GHG emissions/removals from activities under Article 3.3 activities and from Forest Management under Article 3.4

4.2 Cropland

Cropland includes all annual and perennial crops; the change in biomass has been estimated only for perennial crops, since, for annual crops, the increase in biomass stocks in a single year is assumed equal to biomass losses from harvest and mortality in that same year. Activity data for cropland remaining cropland have been subdivided into annual and perennial crops.

4.2.1 *Cropland remaining Cropland*

Concerning woody crops, estimates of carbon stocks changes are applied to aboveground biomass only, according to the GPG (IPCC, 2003). To assess change in carbon in cropland biomass, the IPCC Tier 1 based on highly aggregated area estimates for generic perennial woody crops, has been used. The carbon stock change in living biomass has been estimated on the basis of carbon gains and losses, computed applying a value of biomass C stock at maturity. The default factors of aboveground biomass carbon stock at harvest, harvest/maturity cycle, biomass accumulation rate, biomass carbon loss, for the temperate climatic region, are not very representative of the Mediterranean area, where the most common woody crops are crops like olive groves or vineyards that have different harvest/maturity cycles. Therefore, in the absence of country specific values, and following the suggestion of Joint Research Centre (JRC[16]) experts, in the framework of European Union QA/QC checks of the Member States' inventories for the preparation of EU greenhouse gas inventory, an average value of 10 t C ha^{-1} (carbon stock at maturity), deduced by the values adopted in Spain, has been chosen. A cycle of 20 years has been considered. In Table 7 change in carbon stock in living biomass are reported.

[16] European Commission's Joint Research Centre (JRC) - Institute for Environment and Sustainability (IES): http://ies.jrc.ec.europa.eu/

	Area	Gains (Area <30yrs)		Losses		net change in C stock
year	*kha*	*kha*	*GgC*	*kha*	*GgC*	*GgC*
1990	2,698	70	35	-22	-224	-189
1991	2,701	58	29	0	0	29
1992	2,704	49	25	0	0	25
1993	2,707	40	20	0	0	20
1994	2,710	32	16	0	0	16
1995	2,712	23	11	0	0	11
1996	2,691	14	7	-21	-212	-206
1997	2,670	14	7	-21	-213	-206
1998	2,648	14	7	-21	-213	-206
1999	2,627	14	7	-21	-213	-206
2000	2,606	14	7	-21	-213	-206
2001	2,600	14	7	-6	-57	-50
2002	2,594	14	7	-6	-57	-50
2003	2,589	14	7	-6	-57	-50
2004	2,583	14	7	-6	-57	-50
2005	2,577	14	7	-6	-57	-50
2006	2,578	14	7	0	0	7
2007	2,579	14	7	0	0	7
2008	2,579	15	8	0	0	8
2009	2,577	16	8	-2	-25	-17
2010	2,574	16	8	-2	-25	-17
2011	2,490	16	8	-85	-846	-838
2012	2,405	13	7	-85	-846	-840

Table 7: Change in carbon stock in living biomass – perennial woody crops

According to the IPCC GPG (IPCC, 2003), the change in soil C stocks is the result of a change in practices or management between the two time periods and concentration of soil carbon is only driven by the change in practice or management. It wasn't possible to point out different sets of relative stock change factors [F_{LU} (land use), F_{MG} (management), F_I (input factor)] for the period 1990-2012 under investigation; therefore, as no management changes can be documented, resulting change in carbon stock has been reported as zero.

4.2.2 *Land converted to cropland*

Carbon stock changes related to living biomass pool, for land converted to cropland, for the period 1990-2012, are reported in table 8. Further details on data and parameters used in the estimation process are reported in National Inventory Report -NIR (ISPRA, 2014).

	Conversion Area		**$\Delta C_{converted\ land}$**
	annual change	*20 years change*	
year	*kha*	*kha*	*Gg C*
1990	0	136	0
1991	16.8	153	21.8
1992	16.8	170	21.8
1993	16.8	186	21.8
1994	16.8	203	21.8
1995	16.8	220	21.8
1996	0	193	0
1997	0	166	0
1998	0	138	0
1999	0	111	0
2000	0	84	0
2001	0	84	0
2002	0	84	0
2003	0	84	0
2004	0	84	0
2005	0	84	0
2006	0	84	0
2007	0	84	0
2008	0	84	0
2009	0	84	0
2010	0	84	0
2011	0	67	0
2012	0	50	0

Table 8: Change in carbon stock in living biomass in land converted to cropland

In table 9 carbon stock changes in soils pool, for land converted to cropland, are shown. SOC reference value for cropland has been set to 56.7 tC ha^{-1} on the basis of reviewed references.

	Conversion Area		**Carbon stock**
	annual change	*20 years change*	
year	*kha*	*kha*	*Gg C*
1990	0	136	-145.6
1991	16.8	153	-163.6
1992	16.8	170	-181.5
1993	16.8	186	-199.5
1994	16.8	203	-217.4
1995	16.8	220	-235.3
1996	0	193	-206.2
1997	0	166	-177.1
1998	0	138	-147.9
1999	0	111	-118.8
2000	0	84	-89.7
2001	0	84	-89.7

2002	0	84	-89.7
2003	0	84	-89.7
2004	0	84	-89.7
2005	0	84	-89.7
2006	0	84	-89.7
2007	0	84	-89.7
2008	0	84	-89.7
2009	0	84	-89.7
2010	0	84	-89.7
2011	0	67	-71.8
2012	0	50	-53.8

Table 9: Change in carbon stock in soil in land converted to cropland

4.3 Grassland

Coherently with the forest definition adopted by Italy under Kyoto Protocol, shrublands have been reported into the grassland category, as they don't fulfil the national forest definition.

4.3.1 *Grassland remaining Grassland*

Grassland includes all grazing land and other wood land that do not fulfil the forest definition (as shrublands); the change in biomass has been estimated only for subcategory "other wooded land", since, for grazing land, the increase in biomass stocks in a single year is assumed equal to biomass losses from harvest and mortality in that same year. Activity data for grassland remaining grassland have been subdivided into grazing land and other wooded land.

Grazing land

To assess change in carbon in grassland biomass, the Tier 1 has been used; therefore no change in carbon stocks in the living biomass pool has been assumed; in accordance with the GPG no data regarding the dead organic matter pool have been provided, since not enough information is available.

According to the IPCC GPG (IPCC, 2003), the estimation method is based on changes in soil C stocks over a finite period following changes in management that impact soil C (Equation 3.4.8). Soil C concentration for grassland systems is driven by the change in practice or management, reflecting in different specific climate, soil and management combination, applied for the respective time points. It wasn't possible to point out different sets of relative stock change factors [F_{LU} (land use), F_{MG} (management), F_I (input factor)] for the period 1990-2012 under investigation; therefore, as no management changes can be documented, resulting change in carbon stock has been reported as zero.

Other wooded land

Regarding shrublands, growing stock and the related carbon are assessed by the For-est model, estimating the evolution in time of the different pools and applied at regional scale (NUTS2). A detailed description of the model and the parameters used in the estimation process are reported in National Inventory Report -NIR (ISPRA, 2014).

	Area	**Living biomass**			**Dead organic matter**	**Soil organic matter**
		Increase	*Decrease*	*Net Change*		
	kha	*Gg C*				
1990	1,555	2,466	-2,584	-118.25	32.19	0
1991	1,571	2,503	-2,355	148.13	32.19	0

	Area	Living biomass			Dead organic matter	Soil organic matter
		Increase	*Decrease*	*Net Change*		
	kha			*Gg C*		
1992	1,586	2,543	-2,486	57.35	32.19	0
1993	1,602	2,593	-2,851	-258.42	32.19	0
1994	1,618	2,630	-2,506	124.55	32.19	0
1995	1,634	2,660	-2,294	366.49	32.19	0
1996	1,650	2,691	-2,327	363.67	32.19	0
1997	1,666	2,726	-2,513	213.00	32.19	0
1998	1,682	2,764	-2,686	78.31	32.19	0
1999	1,698	2,795	-2,453	342.24	32.19	0
2000	1,713	2,830	-2,619	210.50	32.19	0
2001	1,729	2,860	-2,504	356.61	32.19	0
2002	1,745	2,889	-2,461	427.71	32.19	0
2003	1,761	2,919	-2,557	361.40	32.19	0
2004	1,777	2,947	-2,507	439.61	32.19	0
2005	1,793	2,974	-2,510	464.00	32.19	0
2006	1,804	3,000	-2,502	498.28	26.50	0
2007	1,816	3,030	-3,057	-26.92	26.50	0
2008	1,827	3,046	-2,586	459.81	26.50	0
2009	1,839	3,064	-2,660	403.54	26.50	0
2010	1,850	3,079	-2,622	457.10	26.50	0
2011	1,862	3,100	-2,851	249.34	26.50	0
2012	1,873	3,118	-2,713	404.94	26.50	0

Table 10: Change in carbon stock in living biomass, dead organic matter and soil organic matter in other wooded land

4.3.2 *Land converted to Grassland*

Concerning soil carbon pool, Italy uses the IPCC default land use transition period of 20 years, to estimate carbon stock changes in mineral soils related to land converted to grassland. As a result of conversion to grassland, it is assumed that the dominant vegetation is removed entirely, after which some type of grass is planted or otherwise established; alternatively grassland can result from the abandonment of the preceding land use, and the area is taken over by grassland. The IPCC Tier 1 has been followed, assuming that carbon stocks in biomass immediately after the conversion are equal to 0 t C ha^{-1}.

	Conversion Area		C_{before}	ΔC_{growth}	ΔC
	annual change	*20 years change*			
year	*kha*	*kha*	*t C ha^{-1}*	*t C ha^{-1}*	*Gg C*
1990	0	325	5	3.05	0
1991	0	318	5	3.05	0
1992	0	312	5	3.05	0
1993	0	305	5	3.05	0
1994	0	299	5	3.05	0
1995	0	292	5	3.05	0
1996	60	353	5	3.05	-118
1997	60	413	5	3.05	-118
1998	60	473	5	3.05	-118
1999	60	534	5	3.05	-118
2000	60	594	5	3.05	-118
2001	94	630	5	3.05	-184
2002	94	666	5	3.05	-184
2003	94	702	5	3.05	-184
2004	94	738	5	3.05	-184
2005	97	777	5	3.05	-190

2006	85	862	5	3.05	-166
2007	85	947	5	3.05	-166
2008	85	1,032	5	3.05	-166
2009	172	1,204	5	3.05	-336
2010	172	1,377	5	3.05	-336
2011	231	1,608	5	3.05	-451
2012	231	1,839	5	3.05	-451

Table 11: Change in carbon stock in living biomass in land converted to grassland

In table 12 carbon stock changes in soils pool, for land converted to grassland, are shown. SOC reference value for grassland has been revised and set to 78.9 tC ha^{-1} on the basis of reviewed references.

	Conversion Area		**Carbon stock**
year	*annual change*	*20 years change*	
	kha	*kha*	*Gg C*
1990	0	325	348
1991	0	318	341
1992	0	312	334
1993	0	305	327
1994	0	299	320
1995	0	292	313
1996	60	353	377
1997	60	413	442
1998	60	473	506
1999	60	534	571
2000	60	594	635
2001	94	630	674
2002	94	666	712
2003	94	702	751
2004	94	738	789
2005	97	777	831
2006	85	862	922
2007	85	947	1,013
2008	85	1,032	1,104
2009	172	1,204	1,288
2010	172	1,377	1,473
2011	231	1,608	1,720
2012	231	1,839	1,720

Table 12: Change in carbon stock in soils in land converted to grassland

Greenhouse gas removals and emissions in the categories of the LULUCF sector in 2012 are shown in following table 13.

In table 14, information on accounting for the KP-LULUCF activities based on the reporting for the year 2008, 2009, 2010, 2011 and 2012 are given.

GHG Gas Source and Sink Categories	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
CO_2	**-5,443**	**-24,215**	**-18,020**	**-29,989**	**-30,577**	**-7,719**	**-26,397**	**-28,385**	**-31,567**	**-19,794**	**-19,864**
A. Forest Land	-18,943	-32,660	-27,233	-36,281	-35,954	-19,706	-32,314	-35,156	-36,536	-28,785	-30,062
B. Cropland	2,175	1,659	2,017	1,443	1,231	1,271	1,240	1,330	1,319	4,275	4,228
C. Grassland	4,329	-1,214	306	-2,833	-3,543	3,024	-3,021	-2,310	-4,113	-3,053	-3,053
D. Wetlands	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO
E. Settlements	6,996	8,001	6,890	7,682	7,690	7,692	7,698	7,750	7,763	7,768	7,774
F. Other Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CH_4	**1487.99**	**343.47**	**841.68**	**337.78**	**271.85**	**1612.42**	**424.25**	**517.09**	**313.18**	**485.61**	**1,046**
A. Forest Land	877.43	182.30	484.38	183.32	138.46	904.83	170.26	199.33	102.91	184.25	534.41
B. Cropland	4.85	1.40	2.82	1.31	1.18	5.56	1.81	1.95	1.04	2.20	4.14
C. Grassland	605.70	159.77	354.48	153.16	132.21	702.02	252.18	315.80	209.22	299.16	507.59
D. Wetlands	0	0	0	0	0	0	0	0	0	0	0
E. Settlements	0	0	0	0	0	0	0	0	0	0	0
F. Other Land	0	0	0	0	0	0	0	0	0	0	0
G. Other	0	0	0	0	0	0	0	0	0	0	0
N_2O	**346.46**	**171.15**	**204.43**	**108.92**	**98.94**	**368.89**	**155.04**	**184.76**	**134.44**	**169.80**	**262**
A. Forest Land	4.07	0.85	2.25	0.85	0.64	4.20	0.79	0.92	0.48	0.85	2.48
B. Cropland	61.37	96.18	37.72	37.02	36.96	38.99	37.25	37.32	36.89	30.15	23.77
C. Grassland	281.01	74.13	164.46	71.06	61.34	325.70	117.00	146.52	97.07	138.79	235.49
D. Wetlands	0	0	0	0	0	0	0	0	0	0	0
E. Settlements	0	0	0	0	0	0	0	0	0	0	0
F. Other Land	0	0	0	0	0	0	0	0	0	0	0
G. Other	0	0	0	0	0	0	0	0	0	0	0
LULUCF (*Gg CO_2 equivalent*)	**-3,609**	**-23,700**	**-16,974**	**-29,543**	**-30,206**	**-5,738**	**-25,817**	**-27,683**	**-31,119**	**-19,139**	**-18,556**

Table 13: Greenhouse gas emissions from the LULUCF sector in the period 1990-2012

Greenhouse gas source and sink activities	Net emissions/removals						Accounting Parameters	Accounting Quantity
	2008	2009	2010	2011	2012	Total		
A. Article 3.3 activities								
A.1. Afforestation and Reforestation								-34,052.83
A.1.1. Units of land not harvested since the beginning of the commitment period	-6,352	-7,088	-7,708	-6,310	-6,594	-34,053		-34,052.83
A.1.2. Units of land harvested since the beginning of the commitment period								
A.2. Deforestation	1,930	1,940	1,951	1,957	1,965	9,743		9,742.90
B. Article 3.4 activities								
B.1. Forest Management	-27,191	-29,779	-30,869	-23,564	-24,735	-136,139		-50,967
3.3 offset							0	0
FM cap							50,967	-50,967

Table 14: Information table on accounting for activities under art. 3.3 and 3.4 of the Kyoto Protocol, for 2008, 2009, 2010, 2011 and 2012

4.4 Planned improvements

The analysis of management practices in cropland and grassland categories is currently ongoing with the aim to develop a national methodology able to take into account the detailed information on implemented management practices in the estimation process of carbon stock changes related to the soils pool. The main challenge is the assessment of activity data and ancillary information related to 1990; a collection of any available data related to the period 1971-1990 is currently in progress as well as the delineation of dynamic system for the detection of changes in management practices in the cropland and grassland areas.

An expert group has been constituted by ISMEA to collect activity data, information and parameters to be used in the estimation process of carbon stock changes related to CM and GM activities, for the mandatory pools (aboveground, belowground, deadwood, litter and soils pools), on the basis of stratification identified in the par. 3.2.

5. Projections

The driving forces for projections estimations are activity data linked to the LULUCF sector; in particular, activity data related to the category *forest land* (and related activity *Forest Management*) and to the categories *cropland* and *grassland* constitute the key variables to project emissions by sources and removals by sinks for the related category/activity.

5.1 Information on projections reported in UNFCCC and UE context

Forest management

For the second Commitment Period (2013-2020), Italy has submitted information on Forest Management Reference Level (FMRL), as required by the Decision 2/CMP.6.

The FMRL is the averages of the projected forest management (FM) data series for the period 2013-2020, taking account of policies implemented before mid-2009, with emissions/removals from *harvested wood product* (HWP) using the first order decay functions (A), and assuming instant oxidation (B).

When constructing the FMRL, for Italy, the following elements were taken into account:

a. removals or emissions from forest management as shown in GHG inventories and relevant historical data:
   The historical data used for the calculation of the FMRL come from Italy's 2011 national inventory report submission. GHG emissions and removals from FM are provided from 1990 to 2008 for living biomass (above- and below-ground), dead organic matter and GHG emission sources (i.e. forest wildfires). The FMRL includes above- and below-ground biomass and dead organic matter, which is consistent with pools reported in the GHG inventory.
b. age-class structure:
   the used age structure is based on the latest national forest inventory (INFC 2005), which shows that most even-aged forests in Italy are within the 21–80 year age classes, with the majority being between 21–40 years
c. forest management activities already undertaken:
   indirectly taken into account through the use of the latest available forest time series data (from national forest inventory and other country statistics), and the estimation of the evolution of harvest demand by 2020 based on macroeconomic drivers and policies and legislative provisions adopted by April 2009. These policies are those included in the baseline scenario of the EU model PRIMES, which is the starting point of the projections for the FMRL. Policies adopted after 2009 are factored out.
d. projected forest management activities under business as usual:
   through the estimation of the evolution of harvest demand by 2020 based on macroeconomic drivers and the application of policies implemented by April 2009 and legislative provisions adopted by April 2009.
e. continuity with the treatment of forest management in the first commitment period:
   Italy has elected forest management among the additional activities of art. 3.4 under the Kyoto Protocol for the first CP, and FM is a mandatory reporting requirement for the second CP.

Pools and gases included in the reference level

Aboveground and belowground biomass, dead organic matter and HWP are included in the FMRL. Non-CO_2 GHGs from forest wildfires are also included in the submission. Italy has decided not to account for the soil carbon stock changes from activities under Article 3.4, providing transparent and verifiable information to demonstrate that soils pool is not a source in Italy, as required by par. 21 of the annex to decision 16/CMP.1.

Italy is one of the member States of the EU for which the JRC of the European Commission developed projections in collaboration with two EU modelling groups:

- G4M, from the International Institute for Applied Systems Analysis (IIASA)

- EFISCEN (*European Forest Information Scenario Model*) from the European Forest Institute (EFI)

The projection provided annual estimates of emissions and removals for forest management up to 2020 for the above- and below-ground biomass carbon pools.
The G4M model relies on spatial data, provided by Italy. The main forest and forest management parameters (e.g. age-class structure, increment and historical harvest) were taken from NFIs.
EFISCEN uses as data input the forest area data from NFIs scaled to match the forest area reported in the national inventory report (the forest land remaining forest land area, from which the deforested area is deducted, and the forest management area) and provides projections on basic forest inventory data (stem wood volume, increment, age-class structure, as well as carbon in forest biomass and soil.
To estimate the FMRL, the emissions and removals estimated by the models for the time series 2000 to 2020 were calibrated/adjusted using historical data from the Party for the period 2000–2008. In this post-calibration, a constant offset is added to models' results for 2000–2020 to match the average historical data provided by each country for the period 2000–2008 in order to ensure consistency with national historical data in terms of the absolute level of emissions and removals and coverage of pools and gases.
Future harvest demand under a 'business as usual' scenario was derived from macroeconomic drivers (e.g. gross domestic product, population) and policies enacted in Italy. This information is used as data input to the GLOBIOM (Global Biomass Optimization Model) model, which projects demand for timber. Italy's projected harvesting rate (for both timber and fuel wood) is 16,879,000 m^3 by the year 2020.
Only biomass pools and emissions from biomass burning have been projected assuming a constant net change, for the period 2009–2020, equivalent to the historical average change reported for the period 2000–2008.
Policies and measures that were implemented before mid-2009 have been considered in Italy's FMRL.

Continuation of current forest management with regard to timber is assumed.
All energy policies implemented at the EU and national levels are taken by the PRIMES model as input values for estimating wood fuel demand driven by these policies, combined with the expected global market effects (for the GLOBIOM model). The future demand for wood for material use (i.e. timber not bioenergy) is projected by GLOBIOM as compared to a base year (2000) based on GDP and population growth, which drive demand for timber. Outputs of PRIMES and GLOBIOM are further used as input to estimate emissions related to HWP pool. Although forest management policies are not used by models as input parameters, the impact of these policies is integrated in the projection process through increment and harvesting rates, and changes in age-class structure. Wood energy demand is derived from an analysis of country-specific policies implemented by April 2009. The increase of harvesting rates for wood for energy will result in more intensive forest management, moving toward the lower rotation lengths of the ranges provided.

The FMRL has been subjected to a technical assessment (TA), carried out by UNFCCC expert, and the FMRL value has been inscribed in the Appendix to Decision 2/CMP.7.
The FMRL for Italy is equal to -22,166Mt CO2 eq. per year applying a first-order decay function for harvested wood products (HWP) and to –21,182 Mt CO2 eq. per year assuming instantaneous oxidation of HWP.

In the table 15 projections for cropland and grassland categories have been reported, related to 2020 and 2030. These projections have been carried out on the basis of 1990-2011 trend, subcategory by subcategory,

considering a Business As Usual (BAU) scenario[17] and have been officially reported under Article 3(2) of the Monitoring Mechanism Decision (Commission Decision 280/2004/EC).

Gg CO2 equivalent	2011	2015	2020	2025	2030
Cropland	**-11,560**	**-10,641**	**-8,650**	**-7,362**	**-6,073**
Cropland remaining Cropland	*-11,561*	*-10,440*	*-9,020*	*-7,732*	*-6,443*
Land converted to Cropland	*2*	*-201*	*370*	*370*	*370*
Grassland	**-7,938**	**-8,772**	**-4,358**	**-4,360**	**-4,363**
Grassland remaining Grassland	*-272*	*-2,639*	*-1,654*	*-1,654*	*-1,654*
Land converted to Grassland	*-7,665*	*-6,141*	*-2,709*	*-2,709*	*-2,709*

Table 15: Projections for cropland and grassland categories

5.2 Planned improvements

To outline the scenarios (2014-2020) for future trends (*'with measures'*, '*with additional measures'*, '*without measures*'), according to national strategic plans, the following policies have been considered:

- enhancement of agricultural areas and containment of land consumption;
- implementation of CAP (first and second pillar) at national and regional levels.

The three scenarios are detailed in the relevant paragraphs. In the first one (*with measures* scenario)the maintenance of existing policies has been considered until 2020; in the second one (with *additional measures scenario*), the introduction of new practices (e.g. "*greening*") of the first pillar of the CAP, and a strengthening of the practices of the rural development are assumed. The last scenario (*without measures*) refers to the total absence of policies.

'With measures' scenario

According to the "Whereas" 22 of Regulation (UE) No 1305/2013 on Rural Development, Member States should maintain the level of efforts made during the 2007-2013 programming period.

Therefore, in this scenario, the future mix of agronomic and financial measures remains constant on the same total of hectares provided to national and regional levels in the programming period 2007-2013.

Regarding the use of land, in line with historical trends, but also considering the proposed legislation at the national level on the containment of land consumption, a reduction of 2% in ten years of cropland areas and an increase of the grassland area[18] of the same percentage, have been assumed.

[17] The BAU scenario has to be considered equivalent to the 'with measures' scenario, taking into account policies and measures already planned and implemented at national level

[18] Based on the analysis of the time series (see Chapter 4) the average annual value varies between 0.1% and 0.4% so an estimated annual average of 0,2% has been assumed.

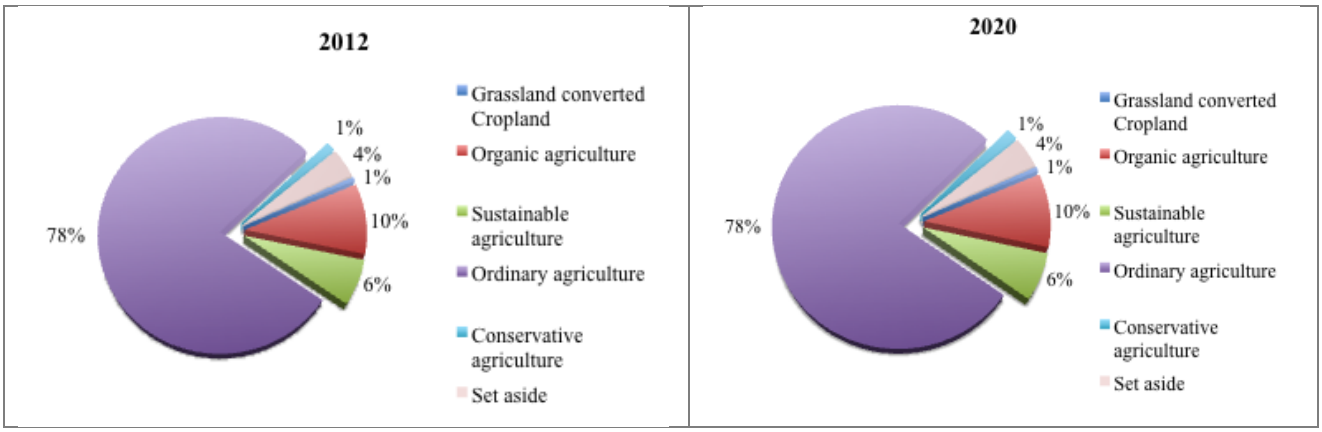


Figure 7: With measures scenario: cropland area

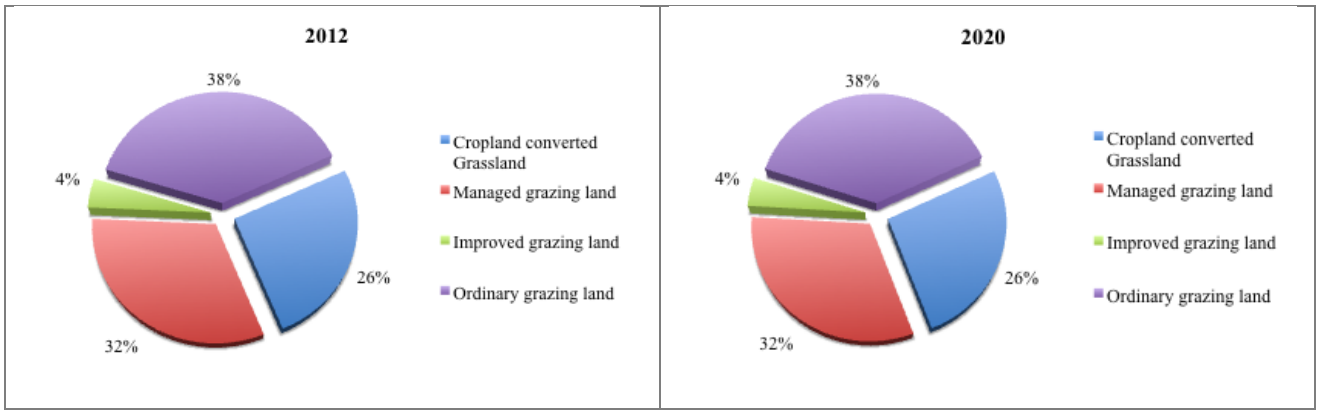


Figure 8: With measures scenario: grassland area

'With additional measures' scenario

Three hypotheses have been considered for this scenario:

- the introduction of "Greening" in 2015 as stated in the Regulation (EU) No. 1307/2013 on direct payments;
- an increase of 20% in 2020 (compared to 2012) of the areas where conservative agricultural practices (organic, sustainable, set aside, etc.) in the context of RDP, are applied;
- the combined effect of the two previous measures (Greening and the enhancement of the area with conservative agricultural practices).

As indicated in the first scenario ("with measures") a reduction of the total area of cropland and an increase of the total grassland is considered.

As required by articles 43-47 Regulation (EU) 1307/2013, the greening provides the following practices:

- crop diversification;
- preservation of permanent grassland;
- introduction or maintenance of an area of ecological interest (Ecological Focus Area) on the agricultural area (or equivalent practices).

For more details on greening please refer to Chapter 7.

For the shaping of the scenario, about "crop diversification" the total areas considered for the application of the Greening comes from all conventional farms with minimum areas of 10 hectares of arable land as required by the regulation.

The Ecological Focus Areas have been assimilated to the areas where the set-aside is applied, considering the similar characteristics of the practices.

Finally, the "preservation of permanent grassland" has been assimilated to the "Grazing land management" consistently with other practices (cross-compliance).
Regarding the strengthening of measures and the increase of the total area where conservative agricultural practices are applied, the Regulation (UE) No. 1305/2013 asserts that Member States should be required to spend a minimum of 30% of the total contribution from the EAFRD (European Agricultural Fund for Rural Development) to each rural development program on climate change mitigation and adaptation, as well as environmental issues. Such spending should be made through agri-environment-climate and organic farming payments and payments to areas facing natural or other specific constraints, through payments for forestry, payments for Natura 2000 areas and climate and environment-related investment support.
The total economic amount for those measures represents 27% of the total planned by EAFRD[19].
Therefore to achieve at least 30% of the total contribution, an increase of 20% (taking into account only measures that impact on soil carbon fluxes) of the agricultural areas involved has been considered until 2020[20].
Further scenarios, still under study depending on new RDPs 2014-2020, will focus on agronomic practices aimed at preserving the soil, such as conservative agriculture.

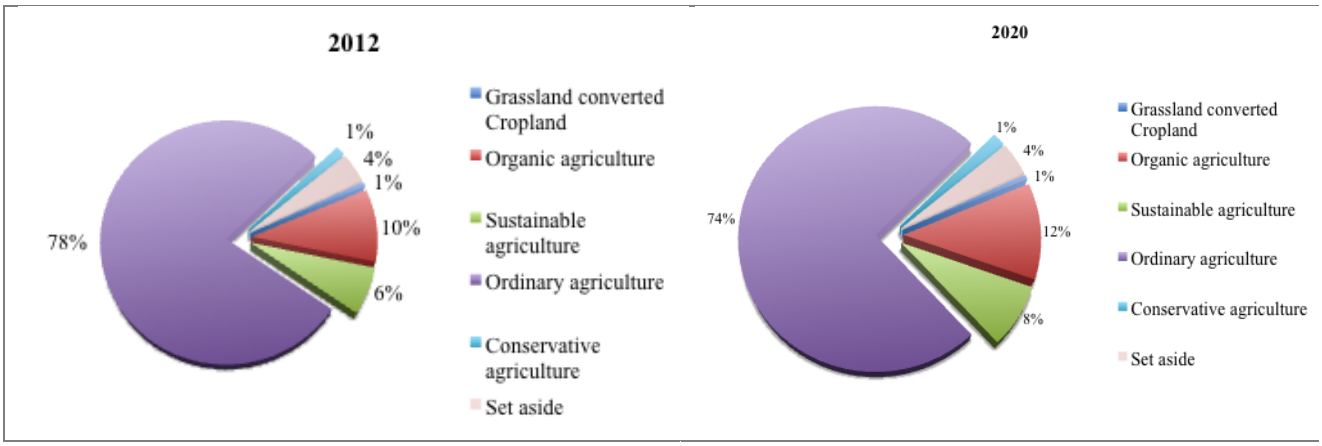


Figure 9: With additional measures scenario: cropland area with an increase of 20% of RDP measures

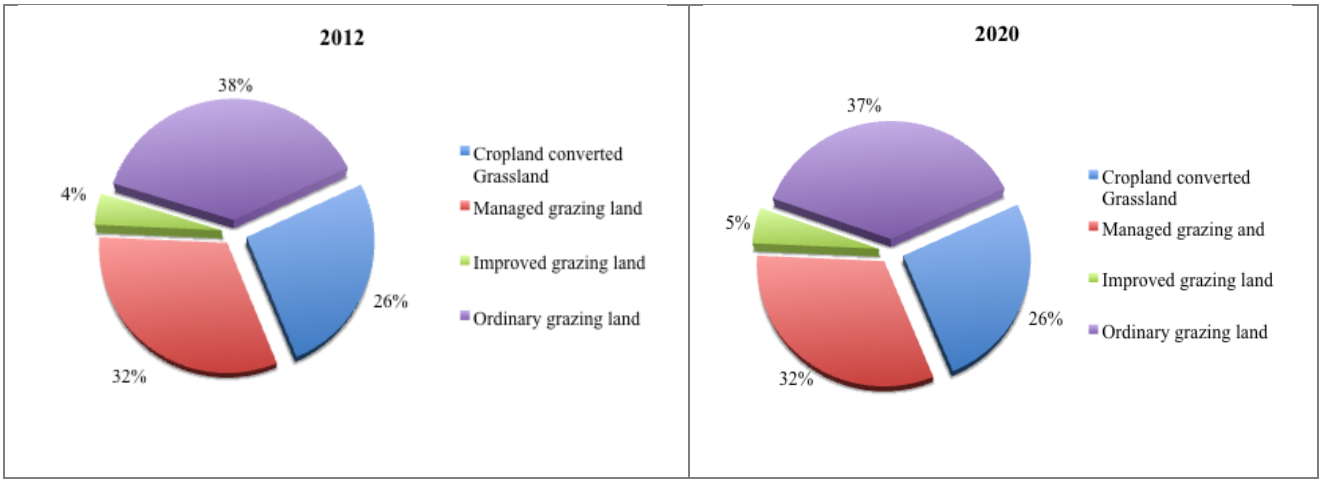


Figure 10: With additional measures scenario: grassland area with an increase of 20% of RDP measures

[19] http://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/13506.
[20] The average payment per hectare is considered unchanged.

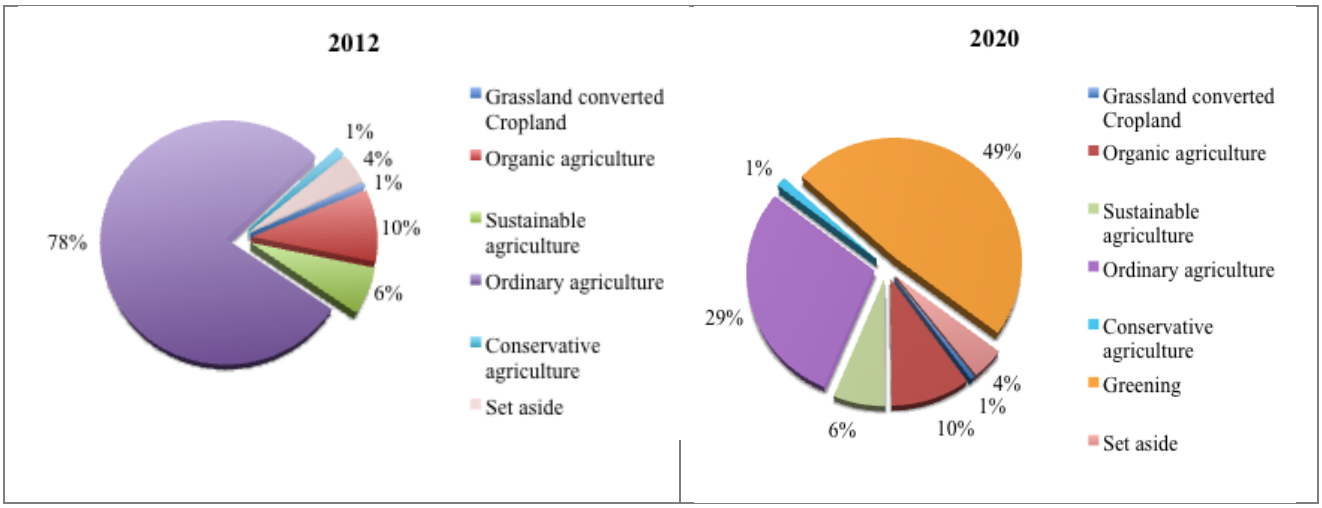


Figure 11: With additional measures scenario: cropland area with the introduction of greening in 2015

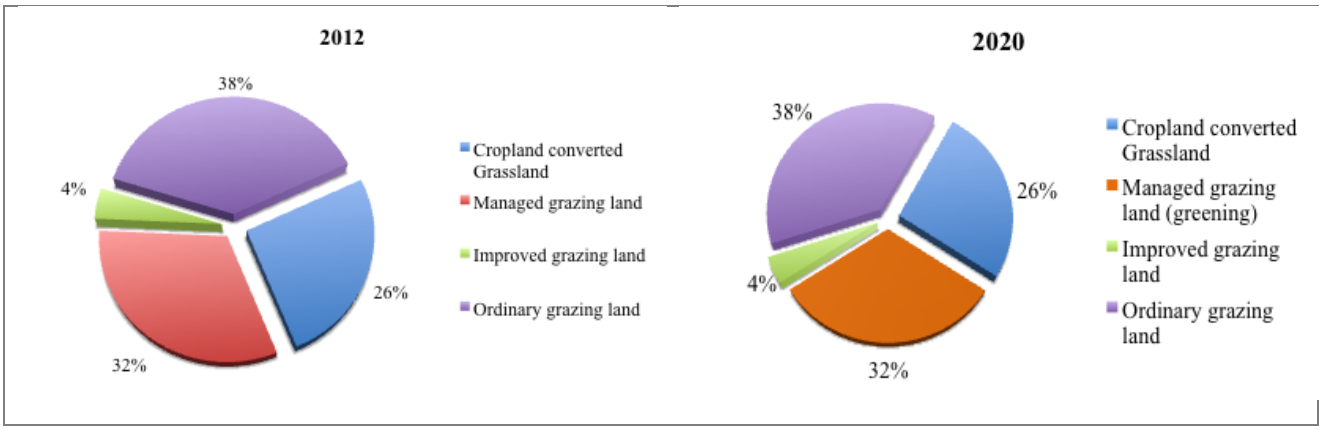


Figure 12: With additional measures scenario: grassland area with the introduction of greening in 2015

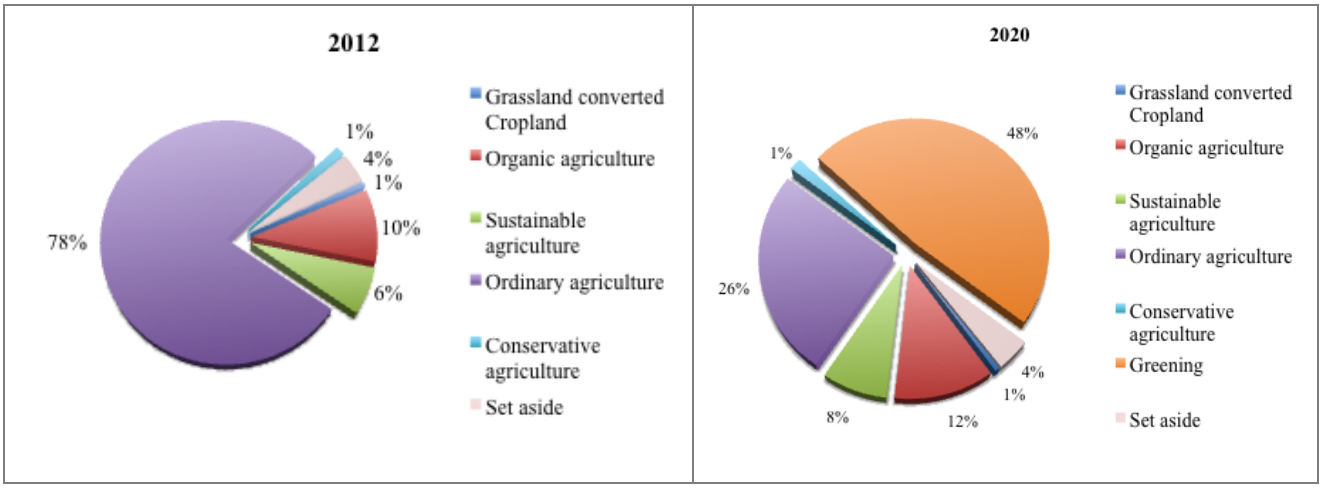


Figure 13: With additional measures scenario: cropland area with the introduction of greening in 2015 and an increase of RDP measures

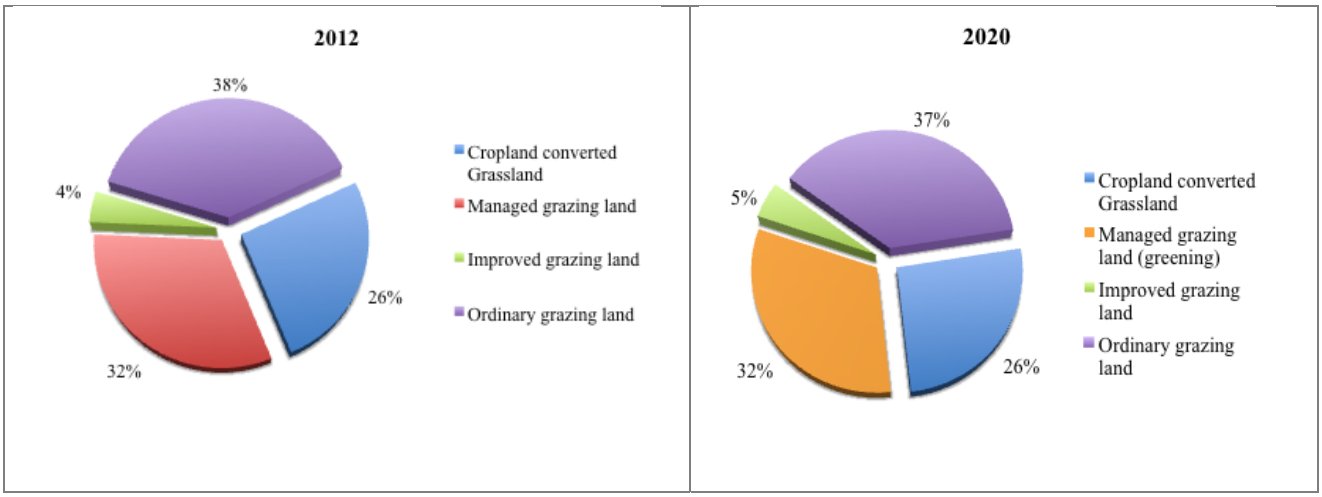


Figure 14: With additional measures scenario: grassland area with the introduction of greening in 2015 and an increase of RDP measures

'Without measures' scenario

The total absence of conservative policies and measures is considered in the last scenario. Ordinary farming is applied to the total agricultural areas. "Ordinary farming" refers to a form of agriculture completely traditional and conventional, unproved of any form of "care" of the soil carbon stock. However, more technical and agronomic details about "Ordinary farming" can be found in Chapter 7.

6. Identification of mitigation potential

Three different types of the mitigation potential are described in the following part of the report:
- biophysical-technical potential,
- economic potential,
- market potential.

6.1 Biophysical-technical potential

In the following paragraphs, some issues on the main hotspot related to soils pool are detailed, on the basis of recent researches on the biophysical potential of mitigation. The analysis of these case studies may be helpful to introduce the next part concerning the quantitative description of the factors needed for the calculation of the soil organic matter.

6.1.1 *Case studies*

Within climate change mitigation techniques, a specific role is assumed by agronomic practices that produce soil organic carbon (SOC) stock increasing (IPCC, 2007).
Most part of agricultural practices generate an increase of soil organic matter and a decrease of the level of the mineralization; on the other hand, for this reason extreme tillage or other practices characterized by total absence of attention to the level of SOM can be considered climate change practices.

Agronomic measures	C-CO_2 (Mg ha^{-1} a^{-1})	N_2O direct	N_2O indirect	CH_4
Productivity increase	-	+/-	+/-	
Crop rotations	+/-	+/-	+/-	
Green manure crops	+/-	+/-	+	
Reduction of growing time	+/-	-	+	
Conversion to permanent crops	+	+	+/-	
Permanent crops grassing	+	+/-	+/-	
Organic agriculture	++	+	+	
Minimum tillage	+/-	+/-	+/-	
Sod seeding	+	+/-	+/-	
Reduction of residues removal	+/-	-	-	
Set aside	++	+/-	+/-	+
Voluntary kept-uncoltivated land	++	+	+	-

Table 16: Biophysical mitigation potential of national cropland – (rielab. da Libro Bianco – Sfide ed opportunità dello sviluppo rurale per la mitigazione e l'adattamento ai cambiamenti climatici, 2012)

In this context the cross compliance regime within the CAP provides specific intervention within objective 2 "Maintaining of organic matter", in respect of the national study "Effectiveness of the GAEC standard of cross compliance crop rotations in maintaining organic matter levels in soils", was carried out by Agricultural Research Council's researchers (Borrelli et al. 2011).
A study analysed the effect of crop rotation on SOC in Italy (North, Centre and South). Results showed that crop rotation is effective if the productivity of the system and the C inputs are high.

No-tillage, N fertilization and cover crops have been studied in a long term experiment in Central Italy. The study showed that it is easier to conserve or increase SOC by adopting no-tillage, while conventional tillage requires higher N fertilization rates and introduction of highly productive cover crops (table 17).

Different soil tillage techniques were studied in a long-term experiment in Sicily (Italy). No-tillage and conventional tillage were most effective in SOC sequestration, whereas with dual-layer tillage no C was sequestered.

Factors and treatment	Soil organic carbon (g kg $^{-1}$)*					
	0-10 cm			10-30 cm		
	1993	1998	2008	1993	1998	2008
Tillage system						
CT	11.0	10.1 b	10.8 b	10.8	10.6	10.6
NT	11.1	13.0 a	15.5 a	9.8	9.7	10.2
N *fertilization*						
N0	11.6	11.3	12.6 b	11.0	9.8	10.3
N1	11.1	11.3	12.5 b	10.2	10.1	9.9
N2	10.7	11.4	13.6 a	10.2	10.5	10.7
N3	10.8	12.0	14.0 a	10.0	10.1	10.6
Cover type						
C	11.2	11.0 b	12.4 c	10.3	10.2	9.9 c
NL	11.3	11.7 ab	13.1 bc	10.5	10.1	10.2 bc
LNL	10.8	11.4 ab	13.5 ab	10.2	10.1	10.6 ab
HNL	10.9	12.0 a	13.7 a	10.2	10.2	10.8 a

N0, N1, N2 and N3 are respectively no nitrogen, low nitrogen, medium nitrogen and high nitrogen fertilization rates.
C no cover crop; NL non-legume cover crop; LNL low nitrogen supply legume cover crop; HNL high nitrogen supply legume cover crop.
CT conventional tillage; NT no-tillage.
* Within each factor, means in the same column followed by the same letters are not significantly different at P<0.05 (LSD test)

Table 17: Mean effects of tillage system, N fertilization and cover type on organic carbon concentration in the 0-10 cm and 10-30 cm soil layers in 1993, 1998 and 2008.

The contribution to SOC conservation of agricultural woody crops and permanent grassland highlights from the results of RAAM Project (Relations Agriculture and Environment funded by the Ministry of Agricultutal Food and Forestry Policies), in the sampling points of AGRIT in Veneto and Friuli Venezia Giulia regions (northern Italy).
A case study from north-eastern Sardinia (Italy) compared six land uses (Francaviglia et al., 2014). Results have shown higher SOC stocks in less intensive land uses and natural vegetation in comparison with the vineyards, even under climate change conditions (Francaviglia et al 2012).
Grass cover obligation in arable land under set-aside is the most effective cross compliance's innovation in reducing risk erosion, since the yearly tillage of soil is not allowed with related impact on the mitigation potential.
An evaluation study on set-aside was carried out at the EU-25 level. The effects on soil erosion were found to be largely influenced by the presence and type of green cover.
In a study conducted in Apulia region (Borrelli et al., 2011), seven different durum wheat based systems were compared. Results showed a SOC decrease (0.32-0.86 t ha-1 year-1), a steady state condition, and high SOC losses with irrigation.
A modelling approach (TIER3) was used in Apulia in the project CIS, funded by the Ministry of Agriculture. Results showed that the rotations with irrigated tomato have the highest SOC loss (-20÷-5 t ha-1 year-1), while more complex rotations have a steady state or a SOC gain (Di Bene at al., 2014).
From an historical point of view, grass cover obligation of arable land kept non-cultivated (mandatory set-aside until 2008, becoming a voluntary measure) represents the most effective cross compliance's innovation in reducing risk erosion, with related impact on the mitigation potential.
The GAEC (Good Agricultural and Environmental Conditions) standard Management of set aside is applied to arable lands subjected to set aside and kept non cultivated throughout the year. The standard is also

applied to other set aside areas eligible for direct payments. For the implementation of this Standard, the farmer must assure the presence of natural or artificial green cover on the surface throughout the year and adopt consistent agronomic practices such as mowing, or other equivalent, in order to maintain the normal state of soil fertility, protect wildlife, and prevent the formation of a potential inoculum of fires, especially during drought and prevent the spread of weeds. Up to the CAP Health Check the legislation on the set aside required the farmer to plough the soil by mid-May.
In the Mediterranean environment most erosion is caused by critical rainfall events. In bare soil conditions, soil erosion for set aside was high and similar to that observed in intensive cropping systems. On the contrary, erosion was very low when erosive rainfall occurred with the soil surface sufficiently covered by natural vegetation.
Since 2005 (being the first year of real application of cross compliance by farmers), erosion on set aside under cross compliance might have reduced soil erosion by approximately 98% respect to intensive agriculture and below 3 Mg ha–1 year–1 on areas where the GAEC standard has been applied.
In conclusion, from the results of case studies it can be said for certain that the new form of set aside introduced by cross compliance, which forbids the yearly tillage of soil, has a very positive effect in reducing erosion, almost to its complete annulment.
An evaluation study on set-aside was carried out at the European level between May 2007 and April 2008 by Aretè srl and the University of Bologna[21]. It covered the EU-25 in the period between marketing years 2000/01 and 2006/07. An in-depth description of the arable crops sector and of the implementation of the measure in the Member States was provided.
Generally speaking, various positive effects on different environmental aspects can be associated to set aside - and especially to fallow set aside - in comparison with the effects associated with the main conventional agricultural systems in the same conditions. Water consumption, nitrogen losses, biodiversity, GHG emissions and energy consumption were found to be the aspects most positively impacted.
In particular the effects on soil erosion were found to be largely influenced by the presence and type of green cover.

6.1.2 *A quantitative description of the mitigation potential*

Soil C sequestration is a complex process that is influenced by many factors, such as organic C inputs from crop residue, climatic and soil conditions, and the original C levels, as well as all possible interactions with specific soil and crop management. To assess the SOC stock per hectare at the equilibrium related to each management system mentioned in chapter 7 below, the methods described in the IPCC GL 2006 (Volume 4, chapter 2.3.3) was applied, where SOC stocks are derived by multiplying reference default SOC related to undisturbed soils (SOC_{ref}) by stock change factors that are linked to the land use, management and inputs applied in each land use category and sub category. The quantification of the stock change factors linked to the land use system (F_{LU}), management regime (F_{MG}) and input of organic matter (F_I) was carried out through expert judgment on the basis of the knowledge gained from specific experiments in Italy.
Due to different types of soil and climatic conditions across South, Center and Northern Italy, the soil carbon has different feedback than the same agricultural practices. In order to reflect these peculiarities, different factors have been proposed for the three climatic regions (Barbera et al., 2011; Mazzoncini et al 2012; Lugato e Berti, 2008).
F_{LU} is stock change factor for land-use systems or sub system for a particular land use, which in case of Cropland intends to describe the effect on the SOC of the continuous cultivation under current practices for

[21] Cfr. Evaluation of set-aside measure 2000 to 2006 – final report (May 2008).

each management activity identified. Under Italian conditions the herbaceous and perennial woody crops may range from 0.69-0.80 to 1 respectively.
Regarding cropland, F_{LU} values of 0.73 to 0.75 and 0.77 have been considered respectively for Northern, Central and Southern Italy considering the intensive techniques most commonly used in the areas characterized by an elevated production potential. The values of F_{LU} were considered constant over time, even though it might be interesting to verify the possibility of including a factor that considers the loss of SOC over 20 years, with the same agronomic management, the same production systems and the same level of productivity.
The F_{MG} factor, related to the soil management and to the agriculture techniques (higher values for conservative techniques; minor values for techniques with the highest impact), has been differentiated in years, in kind of crops and, of course, in the adopted agriculture practices for several kinds of species in a specific geographic range.
Since the early 90s, tillage techniques have changed moving towards a minor depth of execution than in precedent years. For this reason, for arable land, adopted factor is 1.02 in 1990-2000 and 1.03 in 2001-2020, without considering the geographical area. The values for the minimum agriculture practices indicated by IPCC (IPCC, 2003) vary from 1.02 to 1.08, thus applies aforementioned factor to sustainable agriculture has been considered possible.
The same criteria have been used to define the values of F_{MG} for wheat and durum wheat and for other kind of cereals. For example, F_{MG} for wheat production is 1.02 and 1.03 respectively for the 1990-2000 and 2001-2020; specific index values for other produced cereals are being studied as probably they are slightly higher since characterized by more superficial soil working than the tillage adopted for the wheat.
The same approach has been used about perennial woody crops where a single factor (1.00) has been used.
The factor F_I is mainly linked to the capacity of the system considered to generate and maintain biomass (low = 0.92 to 0.95; medium = 1; high without manure = 1.04 to 1.11, and finally this value is higher for techniques and systems that increase the carbon input). Regarding conventional agriculture systems, to allocate this factor, the criteria used have been limited to the peculiarities of the annual crops, with particular reference to their ability to produce agricultural crop residues that are conserved, as biomass, in the agri-ecosystem. For these reasons, the value of F_I chosen is 0.92 in 1990-2000 and 0.95 in 2001-2020 in conventional agriculture; perennial woody crops are characterized by $F_I = 1.00$.
The assessment abovementioned "factors" was carried out in the framework of the range proposed by the IPCC and on the basis of agronomic consolidated considerations that can be applied to conventional systems. National and international results from scientific literature were used (Alberti et al, 2011; Guo and Giffort, 2002) for the selection of emission factors of other kind of systems considered in this analysis (conservative agriculture, integrated biological systems and the land abandonment).
The factors related to the land managed with conservative techniques (annual crops - no tillage) were deduced by the experiences of national and international agronomic research:
F_{LU} = 0.73, 0.75, 0,77 respectively for the Northern, Central and Southern Italy;
F_{MG} = 1.4 for no-tillage all over Italy;
F_I = 1.04, 1.02, 1.00 for Northern, Central and Southern Italy assuming a lower contribution of crop residues with decreasing latitude.
The stock change factors for the "sustainable agriculture" have been defined considering the increased use of more conservative techniques of tillage compared to the "organic" (F_{MG} = 1.08); at the same time a lower contribution of carbon to the system (related to the lower productivity of some crops managed according to this system of production) has been considered: F_I = 1.05.
The organic agricultural system factors used are:
F_{LU} = 0.73, 0.75, 0.77, respectively, for North, Central and Southern Italy; throughout the national territory:
F_{MG} = 1.02 all over Italy as it is impossible to apply conservation tillage factors as those systems are yet characterized by a moderate tillage depth;

F_I = 1.11 whereas in the organic systems burying of crop residues is a normal practice.
Even in this case, the correspondence of the aforementioned factors to the climatic conditions of Italy has been assessed on the results of agricultural scientific literature available (Mazzoncini et al., 2010; Barbera et al, 2011).

Type of crops and management system	F_{LU}			F_{Mg}			F_I		
	North	*Center*	*South*	*North*	*Center*	*South*	*North*	*Center*	*South*
Annual crop	0.73	0.75	0.77	1.02	1.02	1.02	0.92	0.92	0.92
Annual crop-Organic	0.73	0.75	0.77	1.02	1.02	1.02	1.11	1.11	1.11
Annual crop-sustainable practices	0.73	0.75	0.77	1.08	1.08	1.08	1.05	1.05	1.05
Set aside	0.73	0.75	0.77	1	1	1	1	1	1
Perennial tree crop	0.73	0.75	0.77	1	1	1	1	1	1
Perennial tree crop –Organic	0.73	0.75	0.77	1.4	1.3	1.2	1.11	1.11	1.11
Perennial tree crop - sustainable practices	0.73	0.75	0.77	1	1	1	1.05	1.05	1.05

Table 17: Stock change factors for the period 1990-2000

Type of crops and management system	F_{LU}			F_{Mg}			F_I		
	North	*Center*	*South*	*North*	*Center*	*South*	*North*	*Center*	*South*
Annual crop	0.73	0.75	0.77	1.03	1.03	1.03	0.95	0.95	0.95
Annual crop-Organic	0.73	0.75	0.77	1.02	1.02	1.02	1.11	1.11	1.11
Annual crop-sustainable practices	0.73	0.75	0.77	1.08	1.08	1.08	1.05	1.05	1.05
Annual crop –Greening	0.73	0.75	0.77	1.03	1.03	1.03	1.05	1.05	1.10
Set aside	0.73	0.75	0.77	1.1	1.1	1.1	1	1	1
Perennial tree crop	0.73	0.75	0.77	1.00	1.00	1.00	1.00	1.00	1.00
Perennial tree crop – Organic	0.73	0.75	0.77	1.40	1.30	1.20	1.11	1.11	1.11
Perennial tree crop - sustainable practices	0.73	0.75	0.77	1.00	1.00	1.00	1.05	1.05	1.05
Annual crop -No tillage	0.73	0.75	0.77	1.4	1.4	1.4	1.04	1.02	1

Table 18: Stock change factors for the period 2000-2020

The SOC_{ref} classification of the agriculture and pasture soils is based on the default reference soil organic carbon stocks for mineral soils (tC/ha in 0-30 cm) provided in table 2.3 of IPCC 2006 (Vol. 4). The identification of country specific SOC_{ref} is estimated using the combination of the information provided by the following map layers:

- IPCC climate zones (JRC) -
- Corine Land cover 2006 (agriculture and pastures land uses) - http://sia.eionet.europa.eu/CLC2006

- Soil map of Italy- (reclassified according to the main groups of soil types as in table 2.3) -Costantini E.A.C., L'Abate G., Barbetti R., Fantappiè M., Lorenzetti R., Magini S. (2013) Carta dei suoli d'Italia, scala 1:1.000.000 - http://www.soilmaps.it/
- Map of Italy with administrative boundaries.

From the combination of the information contained in the maps above, it was possible to classify the Italian agricultural soils in the IPCC soil classes (table 2.2, AFOLU Vol. 4 IPCC 2006), and their related climate zones in the three identified macro-regions (Northern, Center and Southern Italy), with a resulting SOCref for these three groupings of 70 Mg C ha^{-1} in Northen Italy, 57 Mg C ha^{-1} in Central Italy and 43 Mg C ha^{-1} in Southern Italy.
The product of the SOC_{ref} described above by the stock change factors resulted in SOC stock per hectare at the equilibrium related to each management system and period of time (20 years) as reported in the table below.

Crop type and management practice	Geographic zone	1990-2000	2001-2020
Perennial woody crops – Organic			
	North	79	79
	Centre	62	62
	South	44	44
Perennial woody crops – sustainable practices			
	North	54	54
	Centre	45	45
	South	35	35
Perennial woody crops – ordinary practices			
	North	51	51
	Centre	43	43
	South	33	33
Annual crop – Organic			
	North	58	58
	Centre	48	48
	South	37	37
Annual crop-sustainable practices			
	North	58	58
	Centre	48	48
	South	38	38
Annual Crops-no tillage			
	North	-	74
	Centre	-	61
	South	-	46
Annual crop-greening			
	North	-	55
	Centre	-	45
	South	-	34

Crop type and management practice	Geographic zone	1990-2000	2001-2020
Set aside	**Italia**		
	North	51	**56**
	Centre	43	**47**
	South	33	**36**
Annual crop – ordinary agriculture			
	North	48	**50**
	Centre	40	**42**
	South	31	**32**

Table 19: SOCs at the equilibrium. In bold those that change between the time periods [Mg C ha^{-1}]

The resulting values are in the range of what has been reported by Chiti et al (2011) as mean value of the whole cropland category in Italy 52.1±17.4 Mg C ha^{-1}, for the Arable land (48.6 ± 17 Mg C ha^{-1}), while for woody crops the reported SOC ranges from 41.9 ± 16 Mg C ha^{-1} (vineyards) to 51.5 ± 20 Mg C ha^{-1} (olive groves).

6.2 Economic potential

The estimation of carbon stock changes linked to the agriculture productions nowadays is a very common approach to calculate the carbon footprint for agri-food products. But in most part of the methodologies, soil carbon stock changes are not evaluated. In Italy there are several projects that consider not only the carbon stock changes linked to the production process but also the carbon changes related to the management of the soil (kind of culture, organic or chemical inputs, etc.) Managing this kind of fluxes presents an opportunity to have a more accurate and complete approach to the carbon footprint estimation for several reasons. First of all, considering the soil using national data (and not international generic data) can help both political decision-makers and farmers to orient all the decisions towards the more efficient strategy for the local agriculture ecosystems to exploit the mitigation potential.

Moreover, soil, if managed in an adequate way, can often be a good carbon sink, and can help to reduce the communicated carbon footprint of carbon labels. In fact, carbon labels for the agri-food sectors are a new strategy of industrialized countries to reduce climate change-relevant gas emissions in agriculture. However, not every label includes the measurement of all emissions, as soil emissions, and it may be disadvantages to, and even exclude exporting farmers from several countries.

This is the approach that has been followed by the National Rural Net developing the methodology IAGRICO$_2$ (for the estimation of the carbon footprint of agri-food products) where both carbon stock changes related to soil of agriculture and forestry land are considered in the total estimation. An important national case has been presented by the Region Emilia Romagna, where an application of carbon footprint has been used for the evaluation of the RDP Agro-environmental Measures. Those carbon footprint estimations considered not only the production processes (energetic consumptions, fuel consumptions, chemicals input, etc.) but also the role of the soil as carbon sink.

Several Italian Regions, in the RDP contest, developed specific measures and actions (e.g. Veneto 214/b) to preserve and increase the content of organic matter in the soil. In the evaluation of RDP programs both the Regions of Lombardia and Veneto developed specific indicators to evaluate the effectiveness of some specific measures (such as 214, and some related actions as the "Organic productions) in terms of quantity of the organic matter in the soil.

But there are some barriers to the development of organic agriculture. In fact the supply of organic products grown in Italy, such as cereals, potatoes, rice, extra-virgin olive oil, pulses, lemons, etc, does not meet the domestic demand. Processors and traders therefore buy on the international market (Callieris et al., 2010).

Many conventional farmers in Italy are still reluctant to proceed with organic conversion due to economic uncertainty and the bureaucracy that the change entails. Many organic farmers produce to access payments, but do not sell their products with organic certification. Organic payments do not take into account the cost of certification, which is covered under a different measure. This results in an additional bureaucratic burden for beneficiaries.

Most regions prioritise the expansion of organic farming in order to increase the positive environmental impact of the action, in compliance with the RDP objectives. However, only a few regions provide incentives to their producers to sell on the organic market. Some regions apply penalties to producers who do not sell their products as organic, and others use a payment system that prioritises farmers who sell goods with the organic logo, or who have on-farm points of sale. On the other hand, other regions prefer not to compel recipients of to make organic payments to market their products, in order to avoid problems for beneficiaries who are unable to provide such evidence. Measure 214 includes other schemes intended to achieve environmental objectives such as increased biodiversity and improved soil quality.

The new CAP 2014-2020 will strengthen the central role of organic agriculture in the fight against climate change, the protection of the environment and the preservation of biodiversity.

In Pillar 1, direct payments, those who are already farming organically will automatically qualify for a Greening payment as they are seen to be *ipso facto* "greening compliant" since they are already undertaking agricultural practices that address climate change and environmental objectives. Greening requirements such as the diversification of annual crops or maintaining permanent grassland, vineyard, olive groves and fruit orchards, are already undertaken by organic farmers which go beyond the scope of the new greening component (De Filippis and Sandali, 2013).

About the economic potential of the future measures for the mitigation, a national study, realized by INEA, "Cost Effectiveness of CAP Greening Measures" gives an ex-ante evaluation in Italy about the application of the Greening measures.

The new policy tool for farms that aims to create a new market for ecosystem services provided by agriculture has been analyzed. The potential regional supply curve of ecosystem services has been quantified, using as a proxy the amount of carbon that could be sequestered with permanent grassland. A minimum data approach has been applied to integrate the spatial heterogeneity of the agro-systems with economic parameter collected through FADN (Farm Accountancy Data Network - Rete di Informazione Contabile Agricola) in a case study area (Veneto, Italy). The simulation allows comparing three policy tools (agri-environment payment, regulatory standard and tradable permit). Results suggest that tradable permits (floor and trade) could be more efficient than policy based on direct payments or mandatory standards, although the largest provision of ecosystem service (carbon sequestered) has been achieved with mandatory mechanism.

6.3 Market potential

These instruments, linked with the economic, could be divided in two categories: those useful as mitigation incentive and those useful to mitigation obligations. This kind of tool could be implemented at international, national or local levels, with public or private "emission reduction" policies targeted.
A simple framework of incentives and socio-political obligation for mitigation in Italy is reported in table 21.

Incentives	Obligations
Voluntary agreements: considerable alternative to direct regulation or taxes, even if the most widespread in forestry sector (660 agreements until 2009[22]	Direct regulation: National Decree on cross compliance implementation n. 30125/2009 and subsequent revisions
Information campaign: 2010 National Rural Network press campaign, within RD National Strategic Programme, on agriculture as a source for climate change mitigation	Taxes, duties and rates: National Law n. 448/1998 art. 8 "Carbon tax" (energy sector)
Government payments for eco-compatible practices and ecosystem services: 21 regional RDPs financing for example sustainable agriculture practices	New market creation: emissions market, "green certificate" exchanges

Table 21: framework of incentives and socio-political obligation for mitigation (Rielab. da "Libro Bianco – Sfide ed opportunità dello sviluppo rurale per la mitigazione e l'adattamento ai cambiamenti climatici, 2012)

[22] Cfr. Gli accordi volontari per la compensazione della CO2 – Quaderno 2 INEA (2009).

7. List of measures

The principal measures for the management of cropland and grazing land, for the evaluation of soil organic carbon (SOC), should be allocated to the following production systems:

1. Ordinary agriculture
2. Sustainable agriculture
3. Agriculture with conservation practices
4. Organic agriculture
5. Set-aside
6. Greening
7. Ordinary Grazing land
8. Managed Grazing land
9. Improved Grazing land

	Reduction of GHG emissions from key C sources in key crop or grazing land systems, drained wetlands, forests and degraded land	*Avoidance of new GHG emissions from key C pools in key crop and grazing land systems, wetlands, forests, and avoiding land degradation*	*Maintaining or enhancing carbon sequestration levels in key C pools in key crop and grazing land systems and forests, above all but not exclusively in organic soils (peat lands)*
Sustainable agriculture	***	**	***
Organic agriculture	***	**	***
Agriculture with conservation practices	***	**	***
Set-aside	**	**	*
Greening	**	**	**
Managed Grazing land	*	**	*
Improved Grazing land	***	**	**

Table 22: Qualitative evaluation of the efficiency of agricultural practices in maintaining soil carbon stock

7.1 Ordinary agriculture

Ordinary agriculture is evaluated on the wide-ranging usual practices and techniques in the Italian context in the different macro region. The practices are: ploughing, soil working implements, ridging up to annual crop and scarification soil, ploughing and soil working to limit the competition to another annual species. Consequently, the evaluation of ordinary agriculture is influenced by ploughing, soil-working implements, reduced supply of organic matter to the soil (crop residues, green manure crops, organic manuring).

Due to the lack of databases of practices, ordinary agriculture is standardized on most common practices and therefore this production system results in a low mitigation potential, even though within it coexist different practices that will need to be evaluated.

7.2 Sustainable agriculture

Sustainable agriculture refers to production system using techniques, applies pest and weed control reducing chemical impact and rationalizing soil-working and manure in observance of ecological, economic and toxicological principles.

Soil management and soil working techniques need to be addressed to enhance crops adaptation, weed control, fertilization efficiency, leaching reduction, physical structure of soil, erosion prevention, soil drainage and soil matter.

Whenever deep soil working is needed, these have to be evaluated in connection to soil characteristics and its fertility while considering melioration and corrective practices.

This agriculture method requires specific action, indifferent situations, as follows:

- On hillside and mountain plots with an average slope over 30%, for annual crops minimum tillage, no tillage and scarification soil are allowed while for perennial woody crops cover crops and plant removal are allowed.
- On plots with an average slope between 10% and 30%, in addition to the previously described action, soil working is allowed to the maximum depth of 30 cm, with exception of scarification. For perennial woody crops grow cover crops within the rows is mandatory
- On flatland for perennial woody crops grow cover crops within the rows in autumn-winter period is mandatory.
- Where cover crops are present actions of localized manure are allowed.

It emerges that the diffusion of sustainable agriculture enhances the mitigation potential allowing prevention and limitation of CO_2 losses in the atmosphere from soil, and in the meantime increases the stock of soil organic carbon. Since sustainable agriculture does not allow massive soil working actions, it has positive influence on SOC and therefore increases agronomical fertility.

Actions	Note		Effect	
			Positive	Negative
Rotation	Four/five year	*Step by simplified rotations (including monoculture) to extended rotations.*	SOC enhancement	
Grassing		*Decrease erosion soil and water pollution by fertilization, enhance fertility and water drainage.*	SOC enhancement	
Weed control	Chemical control is mandatory within the row, permitted only in case of soil erosion.			

Table 23: Peculiar aspects of sustainable agriculture

7.3 Agriculture with conservative practices

Conservative agriculture is a production system based on agronomic techniques addressed to reduce degradation process of croplands and to enhance the soil capability to retain water resource. These techniques are based on crop rotation in addition to cover crops or optimized waste crop management. Soil working need to respect soil profile without soil layers inversion. In detail the used practices are minimum tillage and zero tillage. In conclusion conservative agriculture is a set of techniques that evolved in the last twenty years of the past century mainly composed of:

- ✓ zero tillage or sod seeding;
- ✓ minimum tillage;
- ✓ cover crops adoption;
- ✓ organic manure;

- ✓ on field crops residue disposal;
- ✓ crops rotation diversify.

This production system needs advanced technical skills and specific mechanization that allow enhancing mitigation potential due to specificity of actions aimed to the preservation and increase of SOC.

Action	Note	Effect	
		Positive	Negative
Conservative practices	*Match tillage with crop residues*	Reduction of SOC losses	
	Minimum or zero tillage prevent soil erosion and conserve physical structure of soil	Reduction of SOC losses	
Cover crops	*Grassing*	SOC enhancement	

Table 24: Peculiar aspects of conservative agriculture

7.4 Organic agriculture

Organic farming is a production system ruled by Re. (EC) n. 834/2007 and its guidelines, it considers the whole agro-ecosystem, it relies on soil fertility, enhances biodiversity of the environment it operates on. Management of waste crop, organic manure, mandatory crop rotation, selection of better crop varieties and cover crops are the most important among the specific actions to be applied in organic practices finalized to the enhancement of mitigation potential. In particular this production system has to enhance soil structure, avoid deep soil working (<30 cm) that could damage the soil system.

Organic farming is based on eco-compatible management of agricultural activities: reduction or removal of chemical input, structured supply of organic manure, tillage and its timing addressed to fertility preservation, improving nutrient management and residue management.

All these techniques allow enhancing the soil organic carbon, but from their interaction it's possible to obtain result that is higher than the one resulting from the sum of single actions.

On the contrary it has to be noted that the increased mechanization and tillage caused by the limitation of chemical products usage leads to an increased organic carbon loss.

Action	Note	Effect	
		Positive	Negative
Leguminous plant	*Multiannual crops reduce soil working and ploughing*	SOC enhancement	
Manure	*Organic manure*	Enhance physical, chemical and biological fertility of soil	

Table 25: Peculiar aspects of organic agriculture

7.5 Set-aside

On these plots there must be cover crops, spontaneous or sown, all year long, and the obligation of at least one mowing or another similar action per annum; it includes voluntary not grown land.

The regulation considers the prohibition of action on cover crops per 120 days and 150 in Natura 2000 areas.

In detail these set aside areas, production suspended area, are subject to the following regulation:

a) Presence of natural or artificial cover crop, year-round
b) Usage of mowing actions or other similar actions to preserve soil fertility, protect wild fauna, control weed spread and prevent fires, especially in dry conditions.

Mitigation potential is higher in southern Italy than in northern Italy because of the pedoclimatic conditions and the consequent SOC amount of considered areas; nevertheless in both situations positive results in terms of mitigation potential are observed.

Action	Note	Effect	
		Positive	Negative
Cover crops	*Reduce soil erosion*	Reduction of SOC losses	
Biomass management and reduced soil working	*Reduce external input and preserve soil fertility*	Influenced C cycle and SOC.	

Table 26: Peculiar aspects of set aside

7.6 Greening

It's the new agro-environmental policy continuing and improving cross compliance aims.

Farmers eligible to receive founding in the context of basic payment for environment and climate have to respect healthy practices on admissible area, as follows:

1. Annual crop diversification: farms that grow more than 10 hectares of arable land must ensure a certain degree of crop diversification. In detail:
   - Farms with arable land area between 10 and 30 hectares have to grow at least two annual crops. The first crop cannot cover more than 75% of arable land area of the farm;
   - In farms with over 30 hectares of arable land area at least three annual crops have to be grown. Two of the three annual corps cannot cover more than 95% of arable land area of the farm;
2. Permanent meadow preservation: In Natura 2000 and other focus areas, farmers can not convert permanent meadow to cropland and plough soil. In other areas, farmer could eventually be allowed to convert permanent meadow to annual crop.
   However, the total converted area cannot exceed 5%. Whenever exceeding the 5% threshold the Member State must also locate and require individual farmers to convert their plowed or sown land to permanent grassland. The afforestation of permanent grassland, in some cases, is still authorized.
3. Conversion and maintenance of ecological focus area on arable land, or other similar practices: for farms with 15 or more hectares of annual crop area is mandatory that from 1 January 2015, 5% of arable land should be covered with ecological focus area.
   Ecological focus areas are:
   - shelf;
   - landscape features bordering arable land;
   - buffer bordering arable land;
   - buffer bordering forest land;
   - agroforestry systems that receive or received support in accordance with Art. 44 of Regulation (EC) No. 1698/2005 or Art. 24 of the new RDP;
   - new afforestation areas with fast-growing species, which do not use mineral fertilizers or plant protection products;
   - afforestation areas, Art. 31 of Regulation (EC) No. 1257/1999, Art. 43 of Regulation (EC) No. 1698/2005 and Art. 23 of the new RDP;
   - areas with catch crops or nor spontaneous cover crops;
   - areas with leguminous plants.

All these techniques allow to enhance the mitigation potential (Borrelli et al. 2011; Lopez et al. 2010), especially crop rotation in extended areas, and permanent meadow preservation mainly due to their more extensive cultivation. Ecological focus areas also show a tendency to enrich the mitigation potential increasing the complexity of the agricultural system.

Action	Note	Effect	
		Positive	Negative
Rotation crops	*Step by simplified rotations (including monoculture) to extended rotations.*	SOC enhancement	
Permanent crops	*Reduce soil working and enhance physical, chemical and biological fertility of soil*	SOC enhancement	
Buffer	*Reduce soil erosion and enhance soil biodiversity*	SOC enhancement	

Table 27: Peculiar aspects of *Greening*

7.7 Ordinary grazing land

To standardize ordinary grazing land system, the same model used for ordinary agriculture has been applied. In detail, the practices of ordinary grazing land system tend toward the prevention of physical and floristic deterioration.

These areas are characterized by good mitigation potential due to the lower interaction of this production system which is less intensive than arable land areas.

7.8 Managed grazing land

Managed grazing land, as required by the rules on cross compliance within target nr. 4 "Ensure a minimum level of land maintenance and avoid the habitats deterioration", requires the standard nr. 4.1 "Protection of permanent pasture", as follows:

a) reduction of permanent pasture surface in accordance with Article 4 of Regulation (EC) No. 1122/09 and subsequent amendments and additions is banned;
b) conversion of permanent pasture area for other uses is banned within conservation sites, Community focus areas and special protection areas identified by Directives 92/43/EEC and 2009/147/EC, if not differently prescripted by competent authorities;
c) soil working is banned, except for those related to the renewal and/or thickening of the sward and the draining management of the water.

The first two points of this list are not considerable agronomical practices but these actions tend to mitigate the tendency toward concentration and specialization of production in lowland areas, since this lands are characterized by high usage in terms of water, chemicals and energy input and agroecosystem simplification. Another important factor, that positively influences the mitigation potentials, is the containment of weed species and the renewal and/or thickening of the sward.

Action	Note	Effect	
		Positive	Negative
Permanent crops	*Reduce soil working and enhance physical, chemical and biological fertility of soil.*	SOC enhancement	
renewal and/or thickening of crops	*Reduce soil erosion and enhance physical, chemical and biological fertility of soil.*	SOC enhancement	

Table 28: Peculiar aspects of *Managed Grazing land*

7.9 Improved grazing land

The optimization of pasture management is considered a very important action in different Italian regions in order to reduce both the risks caused by intensive production, typical system on lowland areas, and the risks associated with simplification of agro-systems and to improve management of these productions. These highlights are associated with the problems of rural areas with development issues and farming marginalization, where abandonment of land leads to the reduction of agronomic practices that in some case produce negative effects on soil, water, climate and biodiversity. The commitments are also aimed at boosting the role of livestock and limit an excessive load of cattle per hectare for the conservation of pasture-based systems that have a positive influence on the environment and the landscape.
This production system contributes more than any other category within the grazing land to mitigate climate change: using the high capacity of perennial forage crops to store atmospheric carbon and prevent ecosystems simplification

Action	Note	Effect	
		Positive	Negative
Permanent crops	*Reduce soil working and enhance physical, chemical and biological fertility of soil.*	SOC enhancement	
Renewal and/or thickening of crops	*Reduce soil erosion and enhance physical, chemical and biological fertility of soil.*	SOC enhancement	
Connection to zootechnics	*Enhance physical, chemical and biological fertility of soil.*	SOC enhancement	

Table 29: Peculiar aspects of *Improved Grazing land*

In addition to the nine considered measures, the CAP contributes to mitigation and adaptation through continuous funding, as part of rural development: through indemnities in favour of natural or other specific areas, like Natura 2000 areas and the allowances forest[23].

[23]Measures 211-212-213-215-225 of RDP 2007-2013, replaced by those Artt. 30-31-34 Reg. (UE) n. 1305/2013.

Measures	Ordinary Agriculture	Organic Agriculture	Sustainable Agriculture	Agriculture with conservative practice	Set-aside	Greening	Ordinary grazing land	Managed Grazing land	Improved Grazing land
Cropland Management	*Ploughing, soil-working implements, reduced supply of organic matter to the soil*	*Reduction or removal of chemical input, structured supply of organic manure, tillage and its timing addressed to fertility preservation, improving nutrient management and residue management.*	*Enhance crops adaptation, weed control, fertilization efficiency, leaching reduction, physical structure of soil, erosion prevention, soil drainage and soil matter.*	*zero tillage o sod seeding, minimum tillage, cover crops adoption, on field crops residue disposal, crop rotation diversify.*	*Presence of natural or artificial cover crop, year-round. Usage of mowing actions or other similar actions to preserve soil fertility, protect wild fauna, control weed spread and prevent fires, especially in dry conditions.*	*Annual crop diversification: farms that grow more than 10 hectares of arable land must ensure a certain degree of crop diversification. Conversion and maintenance of ecological focus area on arable land.*			
Grazing land management and pasture improvement						*Permanent meadow preservation*	*Tend to prevent physical and floristic deterioration.*	*Reduction of area under permanent pasture. Conversion of permanent pasture area. Soil working is mandatory*	*Boosting the role of livestock and limit an excessive load of cattle per hectare for the conservation of pasture-based systems that have a positive influence on the environment and the landscape.*

Table 30: Correspondence between measures accounted and Annex IV of the Dec. n. 529/2013/UE.

Therefore organic and sustainable agriculture actions are the most important to assess the impact related to the cropland management, grazing land management and improved actions for the grassland management. Moreover, the greening production system and will be applied in the period 2014-2020 on a large scale throughout the country and will have a positive effect.

8. Existing and planned policies and their impacts

Name of policy	Objective	Key sources/ key land areas	Type of instrument	Status	Implementing body	Qualitative impact
Cross-compliance (on force)	To protect the soil through appropriate measures, to maintain the levels of soil organic matter through appropriate practices, to maintain soil structure through appropriate measures, to ensure a minimum level of maintenance of the land and avoid the deterioration of habitats, protecting water against pollution and runoff and manage the use of water resources.	CAP-Pillar I Direct payments: about 8.4 million (since 2009) CAP pillar II - PSR 07-13; measures 211-212-213-214-215-221-224-225 about 5.4 million Ha (since 2009)	Compulsory scheme for access to direct payments and some measures of the RDP	Legislative: DM 30125/2009 and subsequent amendments	Ministry of Agriculture, Food and Forest Policies; Regions and Autonomous Provinces; AGEA and OPR	++
Greening (on force from 01/01/2015)	Observe, on the whole eligible area, the following practices for the environment and climate: crop diversification, maintenance of permanent grassland, introduction or maintenance of an area of ecological interest	CAP Pillar I (2014-2020) About 7 million Ha	Compulsory scheme for access to direct payments	Legislative – Reg. (UE) n. 1307/2013	Ministry of Agriculture, Food and Forest Policies; Regions and Autonomous Provinces; AGEA and OPR	++
RDP - allowances and agri-environmental measures (in force)	Soil management to improve crop adaptation, improve the efficient use of nutrients, keeping soil in good condition preventing erosion, improve fertility naturally, avoid synthetic inputs, promote crop diversification, maintaining and improving the surface of grazing land, maintain habitats in backward areas and subject to specific constraints.	CAP-pillar II - PSR 07-13, measures 211-212-213-214-215-221-224-225: about 5.4 million Ha (2009) PSR 14-20: new measures Art. 28-29-30-31-32 Reg. 1305/2013/UE	Voluntary commitments remunerated on the basis of increased costs and lost profit	RDPs – Reg. 1698/05/CE (and subsequent amendments) Reg. (UE) n.1305/2013	Ministry of Agriculture, Food and Forest Policies; Regions and Autonomous Provinces; AGEA and OPR	+++

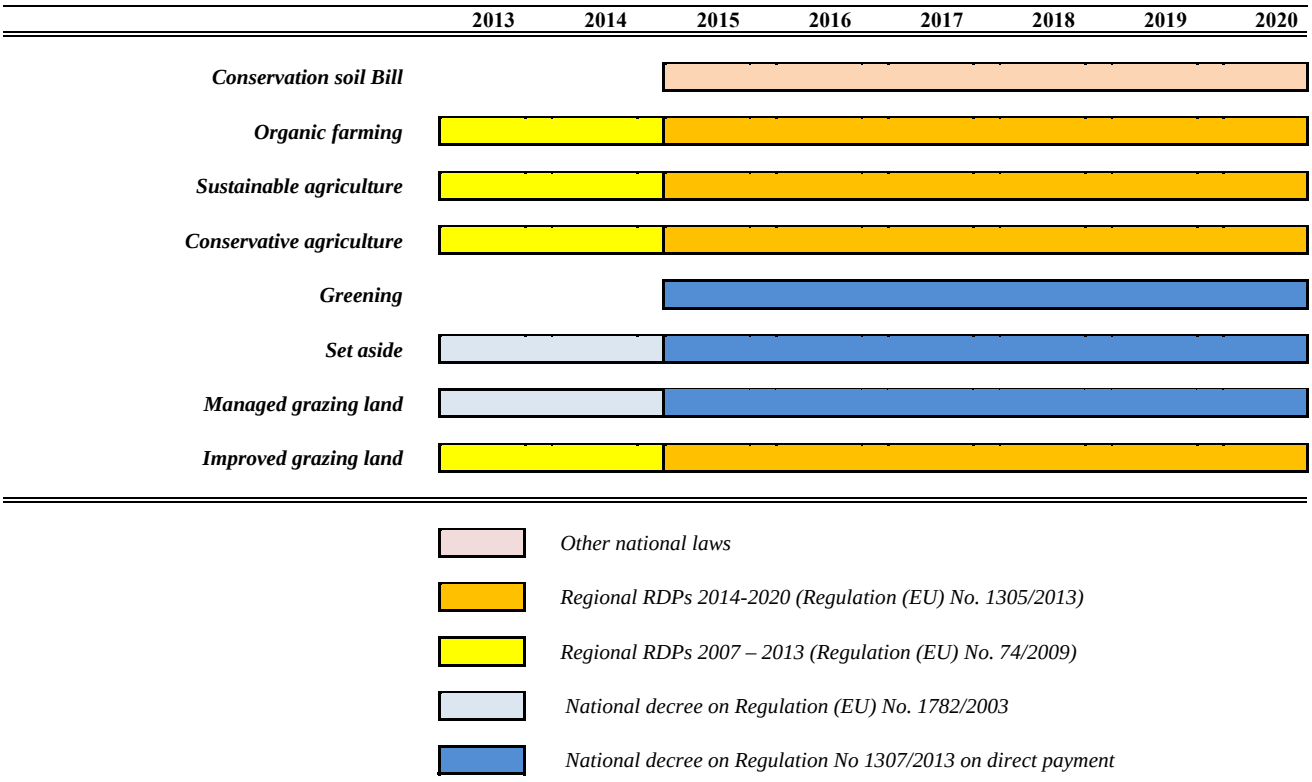
Name of policy	Objective	Key sources/ key land areas	Type of instrument	Status	Implementing body	Quantitative impact (Mt CO2 eq.)
Fruit & vegetables CMO - Environmental Framework (in force)	Soil protection, protection of water resources, management of waste aimed at environmental protection, mitigation of Climate Change and air quality preservation, conservation/restoration biodiversity	About 168.000 Ha (2011)	Voluntary commitments remunerated on the basis of the additional costs and lost profit	Environmental guidelines under the National Strategy fruit and vegetables 09-13 - DM 5460/2011	Ministry of Agriculture, Food and Forest Policies - Regions and Autonomous Provinces - AGEA and OPR -	+
EMFF Operational Programmes (programmed as part of the Partnership Agreement)	Reduce CO2 emissions through: • reducing over-exploitation of fish resources capacity, • investments on board, • audit and energy efficiency schemes, • modernization or replacement of main or auxiliary engines • economic incentives for organic aquaculture production methodologies	National fleet: 12.689 units (01.03.2014) - Aquaculture enterprises	Voluntary commitments	Operational programmes	Ministry of Agriculture, Food and Forest Policies - Regions and Autonomous Provinces - AGEA and OPR - Port authorities	+

8.1 Partnership Agreement: "Carbon" thematic objective

In the rural development policies, the Thematic Objective n.4, will provide a significant contribution, although not exclusively, to reduce emissions of greenhouse gases and pollutants and to stimulate conservation and carbon sequestration in agriculture and forestry.
In this context, all forestry or agronomic interventions will be considered, supported with specific agriculture and forestry measures (including the active management of forests, in line with the strategy outlined in the National Framework).
In particular, we refer to those forestry and agri-environment-climate measures capable of acting through two mechanisms: reducing emissions of climate-changing gases; promote an increase of the absorption of atmospheric carbon dioxide.
The goal is to encourage innovative measures and agricultural techniques (such as introduction of legumes in crop plans, controlled turfing, zero tillage, minimum tillage, rational use of fertilizers and pesticides, etc.) less impactful on carbon dioxide emissions and on the denitrification and mineralization of soil organic matter. Concerning the absorption of CO_2, the target is to encourage agricultural and forestry practices useful to increase the soil organic carbon and the biomass production in agricultural and forestry systems.
Good results will be achieved if the actions will be supported by adequate operative actions, such as training (to enhance the skills of human resources), technical support to governance processes, strengthening of financial management, with particular reference to the planning efficiency and management of expenditures.

9. Timetables

The following timetables sit within the overall planning for the implementation of the EU LULUCF Decision. The timetable is realized for the measures which are being implemented (or are yet implemented) under the policies, and the abovementioned measures and planned to be implemented in the period 2013-2020.



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