Activity Data on Cropland and Grassland Types and Management Systems

Deliverable D3/A3

Project MediNet

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We note however that the methodology, the selection of data for compilation, views and opinions expressed in this report are of the responsibility of the authors, and do not necessarily reflect the views of any individual listed below.

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1 Introduction

The main objective of this report is to make an overview of existing information on cropland and grassland types and respective management practices, and how to make best use of if for the purposes of reporting on emissions and removals in cropland and grassland under the UNFCCC in each Mediterranean Country considered in Project MediNet (Figure 1).

Figure 1: Area of Intervention of Project MediNet

This report identifies some of the data sources that Project MediNet identified as potentially relevant for the reporting of cropland and grassland.

Activity data is presented divided in two large groups, depending on their main data source: "statistics" (Section 2), which contain data sets available from statistical offices, usually not geographically explicit; and "cartographic information" (Section 3), which contains data sets that are geographically explicit.

Section 4 provides an evaluation of the data sources for activity data analysed and the potential and limitations of each of them for the purposes of reporting cropland and grassland.

Finally, Section 5 discusses the gaps found in the information and some possibilities for future improvements of activity data.

2 Statistics

As Member States of the European Union, all MediNet countries participate in several harmonized data collection exercises coordinated by Eurostat. Eurostat is the statistical office of the European Union. The National Statistical Institutes (NSIs) of the Member-States are responsible for the collection and production of harmonised data that are then compiled by Eurostat to construct statistics at EU level. Accordingly, all the information mentioned in this section should also be available for each Member-State in their respective National Statistics Institute (Table 1).

Table 1: National Statistical Institutes of MediNet Countries

Member-State	National Statistical Institutes	
Croatia	Državni Zavod za Statistiku	http://www.dzs.hr/
Cyprus	Στατιστική Υπηρεσία της Κυπριακής Δημοκρατίας	http://www.mof.gov.cy/
France	Institut National de la Statistique et des Études Économiques	https://www.insee.fr/
Greece	Ελληνική Στατιστική Αρχή	http://www.statistics.gr/
Italy	Istituto Nazionale di Statistica	http://www.istat.it/
Malta	Awtorità ta 'l-Istatistika ta' Malta	http://msa.gov.mt/
Portugal	Instituto Nacional de Estatística	https://www.ine.pt/
Slovenia	Statistični urad Republike Slovenije	http://www.stat.si/
Spain	Instituto Nacional de Estadistica	http://www.ine.es/

The sections below identify and describe the data sets from Eurostat databases that may contain useful information in the context of Cropland and Grassland reporting. An additional section identifies other statistical data available at country level only.

2.1 Crop Statistics

Crop statistics refers to the following types of annual data:

- area under cultivation, harvested production, yield, humidity and main area for cereals and for other main field crops (mainly dried pulses, root crops, fodder and industrial crops);
- harvested area, harvested production and main area for vegetables;
- production area, harvested production and main area for permanent crops.

The data are provided at national level. For some products regional figures (NUTS 1 or 2) are available too. The areas are expressed in 1 000 hectares, the harvested quantities in 1 000 tonnes and the yields in 100kg/ha. The current list of crops covered is published in the Commission Delegated Regulation (EU) 2015/1557. The main crop groups and crops are presented in Table 2.

Table 2: Crop Groups included in the Crop Statistics

Level 1	Level 2	Level 3	Level 4	MediNet Classification
Cereals for the production of grain (including seed)	Cereals (excluding rice) for the production of grain (including seed)	Common wheat and spelt	Total	Cropland Annual crops Cereals
			Common winter wheat and spelt	
		Durum wheat		
		Rye and winter cereal mixtures (maslin)		
		Barley	Total	
			Winter barley	
		Oats		

Level 1	Level 2	Level 3	Level 4	MediNet Classification
		Spring cereal mixtures (mixed grain other than maslin)		
		Grain maize and corn-cob-mix		
		Triticale		
		Sorghum		
		Other cereals n.e.c. (buckwheat, millet, canary seed, etc.)		
	Rice	Rice Indica		Cropland Annual crops Rice
		Rice Japonica		
Dry pulses and protein crops for the production of grain (including seed and mixtures of cereals and pulses)	Field peas			Cropland Annual crops Other
	Broad and field beans			
	Sweet lupines			
	Other dry pulses and protein crops n.e.c.			
Root crops	Potatoes (including seed potatoes)			
	Sugar beet (excluding seed)			
	Other root crops n.e.c.			
Industrial crops	Rape and turnip rape seeds	Total		
		Winter rape and turnip rape seeds		
	Sunflower seed			
	Soya			
	Linseed (oil flax)			
	Cotton seed			
	Other oilseed crops n.e.c.			
	Fibre flax			
	Hemp			
	Cotton fibre			
	Tobacco			
	Hops			
	Aromatic and culinary plants			
	Energy crops n.e.c.			
Plants harvested green from arable land	Temporary grasses and grazing			
	Leguminous plants harvested green			
	Green maize			
	Other cereals harvested green (excluding green maize)			
Fresh vegetables (including melons) and strawberries	Brassicas	Cauliflower and broccoli		
		Cabbages		
	Leafy and stalked vegetables (excluding brassicas)	Leeks		
		Celery		
		Lettuces	Total	
			Lettuces under glass or high accessible cover	
		Endives		
		Spinach		
		Asparagus		
		Chicory for fresh consumption		
		Artichokes		
	Vegetables cultivated for fruit (including melons)	Tomatoes	Total	
			Tomatoes for fresh consumption	
			Tomatoes under glass or	

Level 1	Level 2	Level 3	Level 4	MediNet Classification
			high accessible cover	
		Cucumbers	Total	
			Cucumbers under glass or high accessible cover	
		Gherkins		
		Eggplants		
		Courgettes and marrows		
		Muskmelons		
		Watermelons		
		Peppers (capsicum)	Total	
			Peppers (capsicum) under glass or high accessible cover	
	Root, tuber and bulb vegetables	Carrots		
		Onions		
		Shallots		
		Celeriac		
		Radishes		
		Garlic		
	Fresh pulses	Fresh peas		
		Fresh beans		
	Strawberries	Total		
		Strawberries under glass or high accessible cover		
Cultivated mushrooms				NA
Permanent crops for human consumption	Fruits from temperate climate zones	Apples	Total	Cropland Fruit trees
			Apples for fresh consumption	
		Pears		
		Peaches		
		Nectarines		
		Apricots		
		Cherries	Total	
			Sour cherries	
		Plums		
	Fruits from subtropical and tropical climate zones	Figs		
		Kiwis		
		Avocados		
		Bananas		
	Berries (excluding strawberries)	Blackcurrants		
		Raspberries		
	Nuts	Walnuts		
		Hazelnuts		
		Almonds		
		Chestnuts		
	Citrus fruits	Oranges		
		Small citrus	Total	
			Satsumas	
			Clementines	
		Lemons and acid limes		
		Pomelos and grapefruit		

Level 1	Level 2	Level 3	Level 4	MediNet Classification
	Grapes	Grapes for wines	Grapes for wines with protected designation of origin (PDO)	Cropland Vineyards
			Grapes for wines with protected geographical indication (PGI)	
			Grapes for other wines n.e.c. (without PDO/PGI)	
		Grapes for table use		
		Grapes for raisins		
	Olives	Olives for table use		Cropland Olive trees
		Olives for oil		
Permanent grassland				Grassland Pastures
Fallow land				Cropland Annual crops Other

For most Member States, this information is available since 1990 (Table 3).

Table 3: Geographic Coverage of Crop Statistics over Time

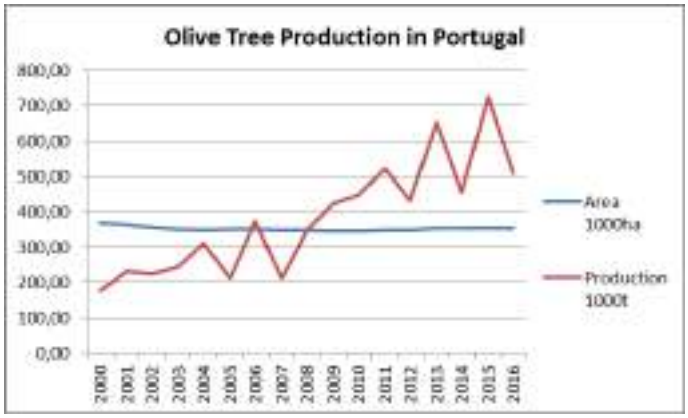
Country	1990	1991 to 1999	2000 to 2015
Croatia	NA	NA	X
Cyprus	X	X	X
France	X	X	X
Greece	X	X	X
Italy	X	X	X
Malta	NA	NA	X
Portugal	X	X	X
Slovenia	NA	X	X
Spain	X	X	X

An example of the type of information that can be derived from this data set is provided in Box 1.

Box 1: Example: Use of the Crop Statistics to characterize Olive Groves in Portugal

Olive Groves in Portugal

Data from the crop statistics in Portugal shows that the area under active production has been relatively stable, but also that it has been recording increasing productivities, which suggests that the olive grove's structure is under transformation. It also shows the inter-annual changes in productivity.



2.2 Farm Structure Survey

The Farm Structure Survey collects information on agricultural holdings in the Member States at national and regional levels and over different periods to follow up the changes in agricultural sector.

Two kinds of Farm Structure Survey (FSS) are carried out:

- a full scope Agricultural Census every 10 years
- several sample based intermediate surveys between them

The FSS are organised in all Member States on a harmonised base, i.e., the same data are available for all countries in each survey.

The variables are arranged into groups:

- general overview with key variables,
- and other specialized groups containing detailed data on
    - land use
    - livestock
    - farm labour force
    - rural development issues as well as management and practices

The statistical unit is the agricultural holding, defined as a single unit, both technically and economically, which has a single management and which produces agricultural products, which has:

- an utilised agricultural area >1 ha (before 2010) and >5 ha (from 2010 onwards),
- an utilised agricultural area <1 ha if it markets produce on a certain scale or if its production units exceed certain natural thresholds

The information contained in the Farm Structure Survey with most value for cropland and grassland reporting is the information on land-use, which is stratified as shown in Table 4.

Table 4: Crop Groups included in the Farm Structure Survey / Land-Use

Level 1	Level 2	Level 3	Level 4	MediNet Classification
Utilised Agricultural Area	Arable Land	Cereals	Common wheat and spelt	Cropland Annual crops Cereals
			Durum wheat	
			Rye	
			Barley	
			Oats	
			Grain maize	
			Rice	Cropland Annual crops Rice
			Other cereals	Cropland Annual crops Cereals
		Pulses		Cropland Annual crops Other
		Potatoes		
		Sugar beet		
		Fodder roots and brassicas		
		Industrial crops	Tobacco	
			Hops	
			Cotton	
			Rape and turnip	
			Sunflower	
			Soya	
			Other oil-seed and fibre crops	
			Aromatic, medicinal and culinary plants	
			Other industrial crops	
		Fresh vegetables, melons and strawberries	Outdoor: Fresh vegetables, melons, strawberries	
			Under glass: Fresh vegetables, melons, strawberries	
		Flowers and ornamental plants	Outdoor: Flowers and ornamental plants	
			Under glass: Flowers and ornamental plants	
		Fodder crops	Temporary grass	
			Other green fodder (green maize and leguminous plants)	
		Seeds and seedlings		
		Other crops on arable lands		
		Fallow land - total (with and w/o subsidies)		
	Kitchen gardens			
	Permanent grassland and meadow	Pasture and meadow		Grassland Pastures
		Rough grazing		
		Permanent grassland and meadow - not used for production, eligible for subsidies		
	Permanent crops	Fruit and berry plantations	Fruit species (temperate and subtropical)	Cropland Fruit trees
			Berry species	

Level 1	Level 2	Level 3	Level 4	MediNet Classification
			Nuts	
		Citrus plantations		
		Olive plantations	Table olives	Cropland Olive trees
			Oil production	
		Vineyards	Quality wines	Cropland Vineyards
			Other wines	
			Table grapes	
			Raisins	
		Nurseries		Cropland Fruit trees
		Other permanent crops		
		Permanent crops under glass		
	Other land	Unutilised agricultural land and other areas		No direct correspondence
		Wooded area		
	Other	Mushrooms		
		Energy crops		
		Genetically modified crops		

The information is currently available for all MediNet Countries. However, the time coverage reflects the enlargement of the European Union.

Table 5: Geographic Coverage of the Farm Structure Survey over Time

Country	1989/1990	1993	1995	1997	1999/2000	2003	2005	2007	2009/2010	2013
Croatia	NA	NA	NA	NA	NA	NA	NA	X	X	X
Cyprus	NA	NA	NA	NA	NA	X	X	X	X	X
France	X	X	X	X	X	X	X	X	X	X
Greece	X	X	X	X	X	X	X	X	X	X
Italy	X	X	X	X	X	X	X	X	X	X
Malta	NA	NA	NA	NA	NA	X	X	X	X	X
Portugal	X	X	X	X	X	X	X	X	X	X
Slovenia	NA	NA	NA	NA	X	X	X	X	X	X
Spain	X	X	X	X	X	X	X	X	X	X

2.3 Orchards Survey

The Orchard Survey refers to the surveys of areas under certain species of fruit trees. The statistical surveys on orchards are carried out every five years by the Member States in order to determine the production potential of plantations of certain species of fruit trees. These surveys have been carried out since 1977.

The results are presented in areas (in hectares) by variety, age and density classes by country and by production region. Data are mainly grouped by fruit tree species (see Table 6).

Table 6: Species Surveyed in the Orchards Survey

Orchard Survey Species	MediNet Classification
Dessert apple trees[1]	Cropland Fruit trees
Dessert pear trees	
Apricot trees	
Dessert peach trees	
Orange trees	
Small-citrus fruit trees[2]	
Lemon trees	
Olive trees	Cropland Olive trees
Table grapes[3]	Cropland Vineyards

The species of fruit and the varieties are listed in Annex III to Commission Decision (EC) 38/2002 and, from 2012 onwards, in Article 1 and Annex I of Regulation (EU) 1337/2011.

Orchard survey data is available for the following years: 1977, 1982, 1987, 1992, 1997, 2002, 2007 and 2012, although coverage differs from survey to survey.

Table 7: Geographic and Thematic Coverage of the Orchards Survey over Time

Country	1977	1982	1987	1992	1997	2002	2007	2012
Croatia	NA	NA	NA	NA	NA	NA	NA	apple peach small citrus olive
Cyprus	NA	NA	NA	NA	NA	NA	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon olive table grapes
France	apple pear peach	apple pear peach	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon table grapes
Greece	NA	apple pear	apple pear	apple pear	apple pear	apple pear	apple pear	apple pear

[1] Data on plantations producing apples and pears and also peaches from 2012 on for uses other than dessert fruit were sent optionally by some countries since 1987

[2] The group small-citrus fruit trees (including tangerines and satsumas; clementines, wilkings and other similar citrus hybrids) is considered as a single species

[3] From 2012 on, some Member States also sent data on vines intended for the production of table grapes on optional basis.

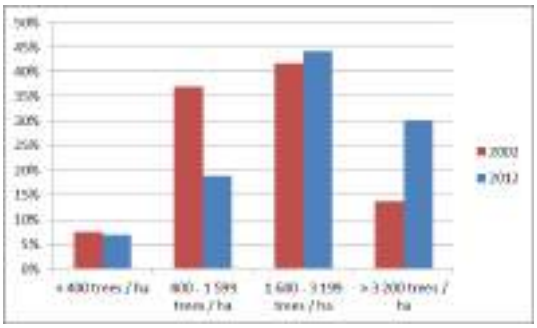
Country	1977	1982	1987	1992	1997	2002	2007	2012
		peach orange	peach apricot orange small citrus lemon	peach apricot orange small citrus lemon	peach apricot orange small citrus lemon	peach apricot orange small citrus lemon	peach apricot orange small citrus lemon	peach apricot orange small citrus lemon olive table grapes
Italy	apple pear peach orange	apple pear peach orange	apple pear peach orange apricot small citrus lemon	apple pear peach orange apricot small citrus lemon	apple pear peach orange apricot small citrus lemon	apple pear peach orange apricot small citrus lemon	apple pear peach orange apricot small citrus lemon	apple pear peach orange apricot small citrus lemon olive table grapes
Malta	NA	NA	NA	NA	NA	NA	NA	NA
Portugal	NA	NA	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon olive table grapes
Slovenia	NA	NA	NA	NA	NA	NA	apple pear peach apricot	apple pear peach apricot orange small citrus lemon table grapes
Spain	NA	NA	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon	apple pear peach apricot orange small citrus lemon olive table grapes

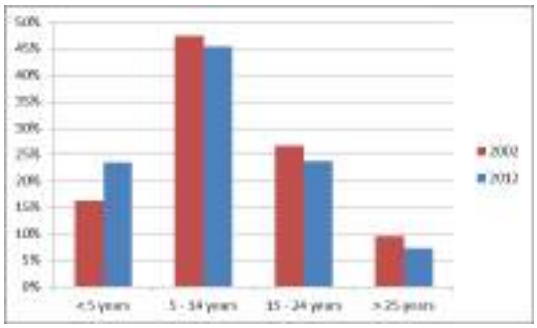
An example of the type of information that can be derived from this data set is provided in Box 2.

Box 2: Example: Use of the Orchards Survey to Better Understand Apple Tree Dynamics in Italy

Apple Tree Dynamics in Italy

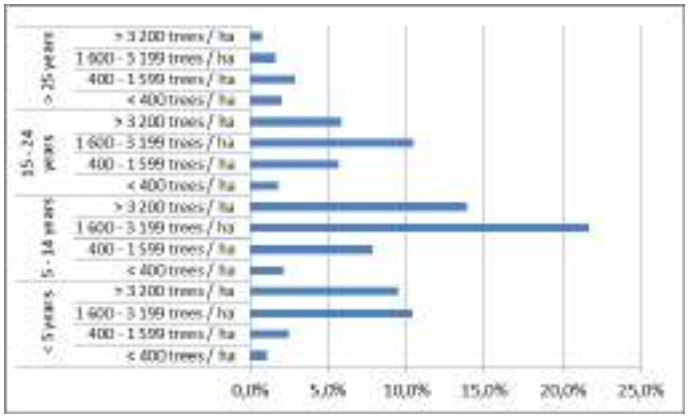
Comparing data over different surveys suggests that apple tree orchards in Italy are becoming increasingly dense (56% had more than 1600 trees/ha in 2002 while this number increased to 74% in 2012) and younger (64% were below 14 years in 2002, while in 2012 this number had increased to 69%), suggesting that older and less dense orchards are being replaced by younger and more dense ones.





Combining data for age and density for the most recent survey (2012) shows that most areas (36%) are between 15 and 14 years AND have tree densities over 1600 trees / ha.

It also confirms the trend for higher densities is likely to continue in the future, as it shows that most of the orchards established in the last 5 years have densities over 1600 trees / ha (85% of all apple tree areas < 5 years). Data on the younger age classes suggests that 4 to 6% of the area is renewed annually.



2.4 Vineyard Survey

The vineyard survey covers vines for other purposes than producing table grapes, i.e., vines mainly used for the production of wine, dried grapes, other spirits and vegetative propagation of vines. Vines producing table grapes are covered by the orchards survey.

It includes all areas in production (i.e. vines for which the grapes are harvested) and not yet in production (i.e. the young vines which have been planted but do not bear grapes or the grapes are not yet harvested), as well as areas producing materials for vegetative propagation of vines. It does not include abandoned areas, which are not any more in production and have not been harvested for at least eight years.

It collects data for the main vine varieties by age class at national and regional level. It has been conducted since 1979 and every ten years until 2009. From 2015, the data collection is planned with a periodicity of 5 years.

Table 8: Species Surveyed in the Vineyards Survey

Vineyard Survey Species	MediNet Classification
Vineyard except Table grapes	Cropland Vineyards

Table 9: Geographic Coverage of the Vineyard Survey over Time

Country	1979	1989	1999	2009	2015
Croatia	NA	NA	NA	NA	X
Cyprus	NA	NA	NA	X	X
France	X	X	X	X	X
Greece	NA	X	X	X	X
Italy	X	X	X	X	X
Malta	NA	NA	NA	X	X
Portugal	NA	NA	X	X	X
Slovenia	NA	NA	NA	X	X
Spain	NA	X	X	X	X

An example of the type of information that can be derived from this data set is provided in Box 3.

Box 3: Example: Use of the Vineyard Survey to Better Understand Vineyards in Greece

Vineyard Dynamics in Greece

There seems to be a trend towards aging of the vineyards in production, as shown by the increase in the areas of the higher ages. Data on the younger age classes suggests that 2 to 4% of the area is renewed (or new plantations are established) annually.

Greece	Total	< 3 years	3 - 9 years	10 - 29 years	> 30 years
1999	50.878	1.918	7.704	41.258	
2009	54.389	1.369	7.938	32.760	12.332
2015	52.451	1.530	4.209	20.992	25.720

2.5 Survey on Agricultural Production Methods

The Survey on Agricultural Production Methods (SAPM) was a one off survey made in 2010 to collect farm level data on agri-environmental measures. The results are linked at the level of individual agricultural holdings to the data obtained from the farm structure survey (FSS) in 2010, so that cross-comparisons can be made on characteristics covered in both surveys (e.g. land use, livestock, farmer's age, etc.).

Member States could choose whether to carry out the SAPM as a sample survey or as a census survey. Census data is normally more accurate as it covers the whole universe of possible respondents; Survey data depends on the share of total universe that was sampled. In the case of SAPM, the survey intensity ranged between 6% and 18% of the total number of agricultural holdings in the respective country (see Table 10).

Table 10: Type of Survey in MediNet Countries and Sample Size in the SAPM

Country	Type of Survey (size of sample[4])
Croatia	Sample Survey (8%)
Cyprus	Sample Survey (18%)
France	Census
Greece	Sample Survey (6%)
Italy	Census
Malta	Census
Portugal	Census
Slovenia	Sample Survey (11%)
Spain	Sample Survey (7%)

Eight different characteristics were surveyed: soil coverage and tillage practices; crop rotation; animal housing; storage facilities for manure; manure application techniques; manure exports; grazing; and landscape features.

2.5.1 Soil coverage and tillage practices

Soil coverage practices refer to arable areas covered with: normal winter crop[5]; cover crop or intermediate crop[6]; plant residues[7]; or bare soil[8].

Tillage practices refer to arable areas under: conventional tillage[9]; conservation tillage[10]; and zero tillage[11].

Information is available for total arable land only, i.e., information of those practices in particular crops or crop groups is not available.

2.5.2 Crop rotation

Crop rotation is the practice of alternating annual crops grown on a specific field in a planned pattern or sequence in successive crop years so that crops of the same species are not grown without interruption on the same field. Land is considered to be out of crop rotation when it is cultivated with the same crop for 3 years or more consecutively and when it is not part of a planned crop rotation.

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[4] Expressed as a percentage of agricultural holdings

[5] Crops that are sown in the autumn and grow during the winter (normal winter crops, such as winter wheat), normally harvested or used for grazing

[6] Plants are sown specifically to reduce the loss of soil, nutrients and plant protection products during the winter or other periods when the land would otherwise be bare and susceptible to losses

[7] Area covered with the plant residues and stubble of the previous crop season during winter

[8] Area that is ploughed or otherwise tilled in autumn and is not sown or covered during winter with any plant residues, remaining bare until the pre-seeding or seeding agro-technical operations in the following spring period

[9] Area treated by conventional tillage which involves inversion of the soil, normally with a mouldboard or a disc plough as the primary tillage operation, followed by secondary tillage with a disc harrow

[10] Area treated by conservation (low) tillage, which is a tillage practice or system of practices that leaves plant residues (at least 30 %) on the soil surface for erosion control and moisture conservation, normally by not inverting the soil

[11] Area on which no tillage is applied between harvest and sowing

Data is presented as the share of arable land in each holding out of a crop rotation in classes: 0%;]0%-25%[; [25%-50%[; [50%-75%[; [75%-100%].

Information is available for total arable land only, i.e., information of those practices in particular crops or crop groups is not available.

2.5.3 Manure application techniques

Data consists on the proportion of utilised agricultural area (UAA) on which solid/farmyard manure[12] was applied through immediate incorporation[13]; and on the proportion of UAA on which slurry[14] was applied through immediate incorporation or injection[15].

Data was collected in percentage bands of utilised agricultural area on which manure or slurry is incorporated or injected in the soil: 0%; [0%-25%]; [25%-50%]; [50%-75%]; [75%-100%].

The respective areas on which solid/farmyard manure or slurry was applied were counted only once, even if subject to several applications over the year.

Information is available for total utilised agricultural area only, i.e., information of those practices in particular crops or crop groups is not available.

2.5.4 Grazing

Data were collected on: the area grazed[16] (rented, owned or otherwise allotted to agricultural holdings) during the reference year; the amount of time[17] for which animals are outdoors on these pastures.

If, on the day of survey, there were no animals on the holding, the average number of grazing animals during the reference year was recorded. If different animal species and/or categories on the agricultural holding were outdoors for different lengths of time, the longest time period was recorded. However, only species and/or categories that have a significant impact on the holding's production should have been recorded. When both/several species were of comparable significance, the species that spent more time outdoors should be recorded.

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[12] Includes farmyard manure, are excrements, with or without litter, of domestic animals including possibly a small amount of urine.

[13] Consists on the application of techniques, which allow an immediate incorporation of solid dung or slurry into the soil. The manure is directly incorporated by a manure spreading machine or the spreading machine is immediately followed by another machine incorporating the manure into the soil (e.g. chisel or disk ploughing).

[14] Includes manure in liquid form, that is to say a mixture of excrements and urine of domestic animals, including possibly also water and/or a small amount of litter.

[15] Consists on the application of slurry by placement in slots cut into the soil, mainly to reduce ammonia emission and but also odour. The following types of injection can be distinguished: shallow injection; deep injection; and sod injection.

[16] Total area of pastures owned, rented or otherwise allocated to the agricultural holding on which animals were kept for grazing during the reference year. The grazed area can also be harvested by mowing or other means. It includes all grasslands that are grazed, independent if they are temporary or permanent nature. Permanent grasslands no longer used for production purposes are however excluded, as well as common lands not allotted to individual holdings.

[17] Measured by the number of months for which animals have been grazing on pastures owned, rented or otherwise allocated to the agricultural holding during the reference year. A day is counted as grazing day when the animals were on the grazing area for at minimum 2 hours per day.

Data were also collected on: the number of animals grazing on common land (not allotted to agricultural holdings) during the reference year; the amount of time for which animals are grazing on common land.

The number of heads grazing on common land and the number of months in question were collected by holding, but in most countries not all the common land area was included in these individual holdings.

Information is available for total grazed area only, i.e., information of those practices in particular crops or crop groups is not available.

2.5.5 Landscape features

Data were collected on linear elements (hedges[18], stone walls[19] and tree lines[20]) maintained and established in the last three years, regardless of whether the farmer received payments for their maintenance or establishment.

2.5.6 Other Indicators

Information is also collected for animal housing, storage facilities for manure and manure exports, but is not further developed, because it is not relevant for MediNet.

2.6 Organic Farming

Farming is considered to be organic if it complies with the Council Regulation (EC) No 834/2007 (organic production and labelling of organic products). Broadly speaking, "organic farming" can be described as a method of production which has a stronger focus on environmental protection, by avoiding or largely reducing the use of synthetic inputs to farming such as fertilisers, pesticides, additives and medicinal products.

Organic farming differs from other agricultural production methods in the application of regulated standards (production rules), but also because its use is under a compulsory control scheme and a specific labelling scheme.

The questionnaire on organic farming provides data on area and production of crops under organic farming and is available annually since 1997, although the current version of the questionnaire was initiated only in 2012.

The data is provided for all crops available in crop statistics (see Table 2 above) and separately for: (1) areas fully converted to organic farming; (2) areas under conversion to organic farming; and (3) areas in greenhouse converted and under conversion to organic farming.

[18] Formed by a continuous (usually without free space between the bushes) line of woody plants (shrubs or bushes, sometimes with a central row of trees) that is less than around 2 m in height.

[19] Man-made structures of brick or stone e.g. dry stone and mortared walls.

[20] Continuous linear array of woody vegetation, usually forming a field boundary within agricultural land or alongside roads or water courses. A tree line is made up of individual trees (usually more than 2 m high) with gaps between them that are normally less than around 20 m (depending on the local customs and species). Vegetation, which can be considered as part of the utilised agricultural area (e.g. vineyards, fruit tree plantations, etc.) is excluded.

2.7 Other National Statistics

Only one additional statistical source with potential value for emissions reporting was reported in Portugal.

2.7.1 Portugal

Fruit and olive trees sold annually by tree nurseries are available since 1996.

The fruit tree categories available are: Olive trees; Carob trees; Plum trees; Almond trees; Hazelnut trees; Chestnut trees; Cherry trees; Apricot trees; Kaki trees; Fig trees; Sour Cherry trees; Kiwi; Orange trees; Lemon trees; Apple trees; Quince trees; Medlar tree; Nuts trees; Pears trees; Peach trees; Pomegranate trees; Tangerine trees; Pomelo trees; and Others.

Information is also discriminated by buyer: directly to farmers; to resellers; to other nurseries; and imported trees sold directly to non-nursery farmers.

This information can be combined with information on areas and plantation densities to estimate the areas being planted each year (either expanding areas or replacing older plantations).

3 Cartographic Information

3.1 CORINE Land Cover and Land Use Change Maps

The CORINE Land Cover (CLC) inventory consists of an inventory of land cover in 44 classes (see Table 12) and has been produced since 1990. It uses a Minimum Mapping Unit of 25ha and a minimum width of 100m for linear structures (roads, rivers, etc.). The combination of different CLC maps for different years allows the production of Land Cover Change (LCC) maps, which highlight changes in land cover with a smaller Minimum Mapping Unit of 5ha[21]. CLC maps are available for 1990, 2000, 2006, and 2012 and LCC maps are available for 1990-2000, 2000-2006 and 2006-2012 (Table 11).

Table 11: Geographic Coverage of CORINE Land Cover (CLC) and Land Cover Change (LCC) over Time

Country	CLC 1990	LCC 1990-2000	CLC 2000	LCC 2000-2006	CLC 2006	LCC 2006-2012	CLC 2012
Croatia	X	X	X	X	X	X	X
Cyprus	NA	NA	X	X	X	X	X
France	X	X	X	X	X	X	X
Greece	X	X	X	X	X	X	X
Italy	X	X	X	X	X	X	X
Malta	X	X	X	X	X	X	X
Portugal	X	X	X	X	X	X	X
Slovenia	X	X	X	X	X	X	X
Spain	X	X	X	X	X	X	X

Table 12: Land Cover Classes included in CORINE Land Cover Maps

Level 1	Level 2	Level 3	MediNet Classification	
1. Artificial surfaces	1.1 Urban fabric	1.1.1 Continuous urban fabric	NA	
		1.1.2 Discontinuous urban fabric		
	1.2 Industrial, commercial and transport units	1.2.1 Industrial or commercial units		
		1.2.2 Road and rail networks and associated land		
		1.2.3 Port areas		
		1.2.4 Airports		
	1.3 Mine, dump and construction sites	1.3.1 Mineral extraction sites		
		1.3.2 Dump sites		
		1.3.3 Construction sites		
	1.4 Artificial, non-agricultural vegetated areas	1.4.1 Green urban areas		
		1.4.2 Sport and leisure facilities		
2. Agricultural areas	2.1 Arable land	2.1.1 Non-irrigated arable land	Cropland Annual crops	Cropland Annual crops
		2.1.2 Permanently irrigated		

[21] The detailed methodology and land-use classes considered in CLC is described in the link below
http://land.copernicus.eu/user-corner/technical-library/CLC2006_Nomenclature_illustrated_guide_enhanced_final.pdf

Level 1	Level 2	Level 3	MediNet Classification	
		land	Cereals	Other
		2.1.3 Rice fields	Cropland Annual crops Rice	
	2.2 Permanent crops	2.2.1 Vineyards	Cropland Vineyards	
		2.2.2 Fruit trees and berry plantations	Cropland Fruit trees	
		2.2.3 Olive groves	Cropland Olive trees	
	2.3 Pastures	2.3.1 Pastures	Grassland Pastures	
	2.4 Heterogeneous agricultural areas	2.4.1 Annual crops associated with permanent crops	No direct correspondence. These classes include a mix of different cropland sub-types, but also grasslands, settlements and other land uses.	
		2.4.2 Complex cultivation patterns		
		2.4.3 Land principally occupied by agriculture, with significant areas of natural vegetation		
		2.4.4 Agro-forestry areas	No direct correspondence. Depends on forest definition and crop undercover	
3. Forest and semi natural areas	3.1 Forests	3.1.1 Broad-leaved forest	NA	
		3.1.2 Coniferous forest		
		3.1.3 Mixed forest		
	3.2 Scrub and/or herbaceous vegetation associations	3.2.1 Natural grasslands	Grassland Pastures	
		3.2.2 Moors and heathland	Grassland Shrubland	
		3.2.3 Sclerophyllous vegetation		
		3.2.4 Transitional woodland-shrub		
	3.3 Open spaces with little or no vegetation	3.3.1 Beaches, dunes, sands	NA	
		3.3.2 Bare rocks		
		3.3.3 Sparsely vegetated areas		
		3.3.4 Burnt areas	No direct correspondence. May include burnt cropland and grassland areas	
		3.3.5 Glaciers and perpetual snow	NA	
4. Wetlands	4.1 Inland wetlands	4.1.1 Inland marshes		
		4.1.2 Peat bogs		
	4.2 Maritime wetlands	4.2.1 Salt marshes		
		4.2.2 Salines		
		4.2.3 Intertidal flats		

Level 1	Level 2	Level 3	MediNet Classification
5. Water bodies	5.1 Inland waters	5.1.1 Water courses	
		5.1.2 Water bodies	
	5.2 Marine waters	5.2.1 Coastal lagoons	
		5.2.2 Estuaries	
		5.2.3 Sea and ocean	

As shown in Table 12, some of the classes used in CORINE do not have a clear correspondence with a particular land-use. Particularly relevant in the MediNet Region (see Figure 1), some of these classes are cropland relevant and have a significant expression. For example class "2.4.2 Complex Cultivation Patterns" in MediNet countries represents 12.1% (6.22 Mha), and the class "2.4.3 Land principally occupied by agriculture, with significant areas of natural vegetation" represents an additional 11.8% (6.10 Mha) of class "2. Agricultural areas" (51.5 Mha).

In addition to this limitation, and as there is a minimum mapping unit, this means that areas smaller than that value need to be aggregated to another land-use, a process called generalization.

In the case of CORINE maps, all areas smaller than 25 ha are assigned to a neighbouring polygon (classified with a different land-use). The final land-use allocated to a polygon needs to cover at least 75% of the respective area, which means that *up to* 25% of the area may actually correspond to other land-uses than those recorded. Likewise, changes in land-use that occurs in areas smaller than 5 ha are not described accurately. Detailed generalization rules[22] ensure that this is done in a consistent manner in all countries, but do not overcome these limitations.

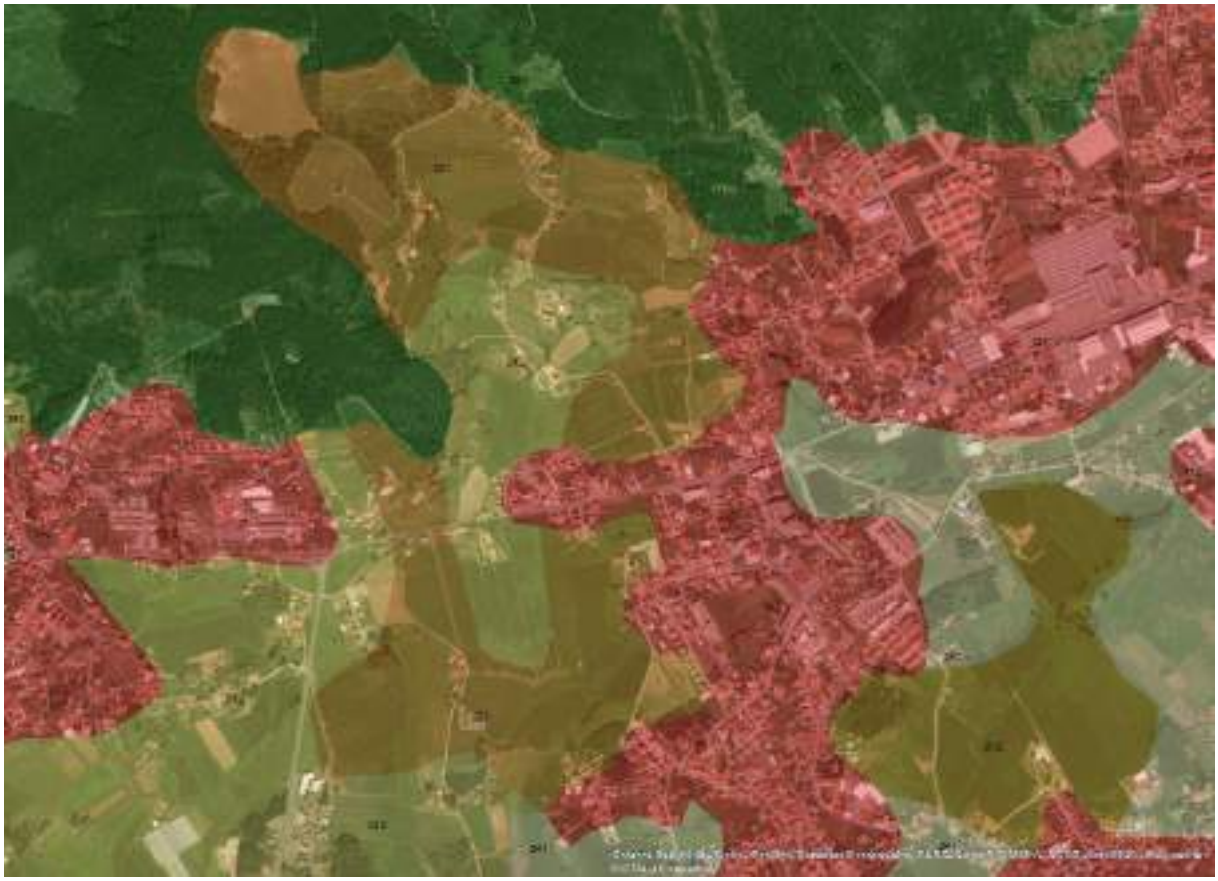
This is illustrated in Figure 2 and Figure 3, which show, e.g. that areas marked as agriculture (categories starting with 2) actually include also settlements and forests (i.e there is an over estimation of areas of agriculture; and the corresponding underestimation of the areas of settlements and forests). It also shows that there are many parcels smaller than 5ha, which will not be reported if land-use changes take place in the future.

In very fragmented landscapes, as is the case in the Mediterranean area, this may constitute a severe limitation to track actual land-use changes.

Figure 2: CLC 2012 Map of an Area in North Portugal and the Corresponding Aerial Photography

[22] http://land.copernicus.eu/user-corner/technical-library/CLC2006_technical_guidelines.pdf

Figure 3: Overlap between CLC 2012 and Aerial Photography



3.2 LUCAS Land Use and Coverage Area frame Survey

EUROSTAT has carried out a Land Use and Coverage Area frame Survey (LUCAS) to identify changes in land use and cover in the European Union.

The Land Use/Cover Area frame Survey (LUCAS) is a harmonised in situ land cover and land use data collection exercise that extends over the whole of the EU's territory. Surveyors examine land cover and land use, irrigation management and structural elements in the landscape. The points at which measurements are taken can fall on all land cover types (cropland, grassland, forest, built-up areas, transport networks, etc.).

LUCAS surveys are carried out *in situ* and in specific survey points. The "LUCAS point" is a theoretical point located on a systematic 2 km x 2 km grid (called a "master grid"). The master grid is reduced by a number of additional criteria, such as altitude (points above 1500m are excluded), distance to roads, accessibility and other criteria. The number of sample points per MediNet Country in the 2015 survey is presented in Table 13[23].

[23] http://ec.europa.eu/eurostat/documents/205002/6786255/LUCAS+2015+sampling_20160922.pdf

Table 13: Number of Sample Points in the 2015 LUCAS Land-Use Survey per MediNet Country

Country	Master Grid Sample Points	Eligible Sample Points [total]	Eligible Sample Points [with field visit]
Croatia	14 141	12 727	3 533
Cyprus	2 311	1 442	1 442
Greece	33 045	24 915	7 852
Italy	75 335	62 273	20 931
Malta	80	80	79
Portugal	22 261	20 542	7 318
Slovenia	5 067	4 705	1 614
Spain	124 613	106 524	35 231

All eligible points are visited[24] by a surveyor and the land-uses referred to in Table 14 are recorded.

Table 14: Land Cover Classes included in LUCAS Land Cover Survey

Level 1	Level 2	Level 3	MediNet Classification
A00 Artificial Land	A10 Roofed built-up areas	A11 Buildings with one to three floors	NA
		A12 Buildings with more than three floors	
		A13 Greenhouses	
	A20 Artificial non-built up areas	A21 Non built-up area features	
		A22 Non built-up linear features	
	A30 Other artificial areas		
B00 Cropland	B10 Cereals	B11 Common wheat	Cropland Annual crops Cereals
		B12 Durum wheat	
		B13 Barley	
		B14 Rye	
		B15 Oats	
		B16 Maize	
		B17 Rice	Cropland Annual crops Rice
		B18 Triticale	Cropland Annual crops Cereals
		B19 Other cereals	
	B20 Root crops	B21 Potatoes	Cropland Annual crops Other
		B22 Sugar beet	
		B23 Other root crops	
	B30 Non-permanent industrial crops	B31 Sunflower	
		B32 Rape and turnip rape	

[24] "Visited" may mean "field visit" or "visit on an orthophotomap".

Level 1	Level 2	Level 3	MediNet Classification
		B33 Soya	
		B34 Cotton	
		B35 Other fibre and oleaginous crops	
		B36 Tobacco	
		B37 Other non-permanent industrial crops	
	B40 Dry pulses, vegetables and flowers	B41 Dry pulses	
		B42 Tomatoes	
		B43 Other fresh vegetables	
		B44 Floriculture and ornamental plants	
		B45 Strawberries	
	B50 Fodder crops	B51 Clovers	
		B52 Lucerne	
		B53 Other leguminous and mixtures for fodder	
		B54 Mixed cereals for fodder	
		B55 Temporary grasslands	
	B70 Permanent crops: fruit trees	B71 Apple fruit	Cropland Fruit Trees
		B72 Pear fruit	
		B73 Chery fruit	
		B74 Nuts trees	
		B75 Other fruit trees and berries	
		B76 Oranges	
		B77 Other citrus fruits	
	B80 Other permanent crops	B81 Olive groves	Cropland Olive Trees
		B82 Vineyards	Cropland Vineyards
		B83 Nurseries	Cropland Annual crops Other
		B84 Permanent industrial crops	
C00 Woodland[25]	C10 Broadleaved woodland		NA
	C20 Coniferous woodland	C21 Spruce dominated coniferous woodland	
		C22 Pine dominated coniferous woodland	
		C23 Other coniferous woodland	
	C30 Mixed woodland	C31 Spruce dominated mixed woodland	
		C32 Pine dominated mixed woodland	

[25] Forests are further classified according to the forest type classification of the European Environment Agency. See EEA Technical Report No 9/2006 http://reports.eea.europa.eu/technical_report_2006_9/en

Level 1	Level 2	Level 3	MediNet Classification
		C33 Other mixed woodland	
D00 Shrubland	D10 Shrubland with sparse tree cover		Grassland Shrubland
	D20 Shrubland without tree cover		
E00 Grassland	E10 Grassland with sparse tree/shrub cover		Grassland Pasture
	E20 Grassland without tree/shrub cover		
	E30 Spontaneously re-vegetated surfaces		
F00 Bare land and lichens/moss	F10 Rocks and stones		NA
	F20 Sand		
	F30 Lichens and moss		
	F40 Other bare soil		May include some cropland
G00 Water Areas	G10 Inland water bodies	G11 Inland fresh water bodies	NA
		G12 Inland salty water bodies	
	G20 Inland running water	G21 Inland fresh running water	
		G22 Inland salty running water	
	G30 Transitional water bodies		
	G50 Glaciers, permanent snow		
H00 Wetlands	H10 Inland wetlands	H11 Inland marshes	
		H12 Peatbogs	
	H20 Coastal wetlands	H21 Salt marshes	
		H22 Salines and other chemical deposits	
		H23 Intertidal flats	

The LUCAS survey was initiated in 2006 and updates have been made every 3 years (see Table 15).

Table 15: Geographic Coverage of LUCAS Survey over Time

Country	2006	2009	2012	2015
Croatia	NA	NA	NA	X
Cyprus	NA	NA	X	X
France	X	X	X	X
Greece	NA	X	X	X
Italy	X	X	X	X
Malta	NA	NA	X	X
Portugal[26]	NA	X	X	X
Slovenia	NA	X	X	X
Spain[27]	X	X	X	X

[26] The islands of Azores and Madeira were not included

[27] The islands of Canaries were not included. The Balearic Islands were only included from 2012 onwards.

3.3 LPIS Land Parcel Identification System

The Common Agricultural Policy (CAP) finances direct payments to farmers and measures to respond to market instabilities or environmental challenges, in what is known as "Pillar 1" and co-finances rural development programmes within the EU Member States, in what is known as "Pillar 2".

All these payments are administered and controlled through the Integrated Administration and Control System (IACS), which consists on a series of comprehensive administrative and on-the-spot checks on subsidy applications, which is managed by the Member States.

In its current form, the Land Parcel Identification System (LPIS) was established by Article 70 of Regulation 1306/2013 and is a key component of the IACS. It is an IT system based on aerial or satellite photographs, which records all agricultural parcels in the Member States. It is designed to serve two main objectives: (1) to clearly locate all eligible agricultural land contained within reference parcels; (2) to calculate their maximum eligible area (MEA). The LPIS is used directly for crosschecking during the administrative control procedures of farmer's applications and as a basis for on-the-spot checks by the paying agency, which e.g. confirms the information provided by farmers or the maintenance of certain eligibility criteria for payments.

The LPIS operates on the basis of reference parcels. A reference parcel is a uniquely identified and geographically delimited agricultural area. The LPISs are managed by the Member States, which are responsible for setting their own system and for the quality of the data entered into their systems.

The LPIS's technical specifications vary between Member States, including how reference parcels were established (Table 16). Farmers participate in the process by carefully examining each map and identifying and excluding from their applications all unfarmed land, and ineligible features on parcels, such as buildings, farmyards, scrub, roadways, forests, lakes, etc.

REGULATION (EU) No 1306/2013

Article 70 / Identification system for agricultural parcels

1. The identification system for agricultural parcels shall be established on the basis of maps, land registry documents or other cartographic references. Use shall be made of computerized geographical information system techniques, including aerial or spatial orthoimagery, with a homogenous standard that guarantees a level of accuracy that is at least equivalent to that of cartography at a scale of 1:10000 and, as from 2016, at a scale of 1:5000, while taking into account the outline and condition of the parcel. This shall be fixed in accordance with existing Union standards.

[…]

2. MS shall ensure that the identification system for agricultural parcels contains a reference layer to accommodate ecological focus areas. That reference layer shall, in particular, cover the relevant specific commitments and/or environmental certification schemes referred to in Art. 43(3) of Regulation (EU) 1307/2013 that are equivalent to the practices in Article 46 of that Regulation before the application forms referred to in Art. 72 of this Regulation for payments for agricultural practices beneficial for the climate and the environment referred to in Art. 43 to 46 of Regulation (EU) 1307/2013 are provided in respect of claim year 2018 at the latest.

http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013R1306&qid=1479383474759

Table 16: Types, Characteristics and Use of LPIS systems in MediNet Countries

	Agricultural parcel	Cadastral parcel	Farmer's block	Physical / Topographical block
Main Features	 • 1 crop group • 1 farmer	 • 1 or more farmers • Based on ownership • 1 or more crop groups	 • 1 farmer • 1 or more crop groups • No natural boundaries	 • 1 or more farmers • Area bordered by features (ditches, hedges, walls, etc.) • 1 or more crop groups
Main Data Source	Farmer's application	Cadastre, land register	Farmer's application	Administrative classification
LPIS type used by	• Malta	• Italy • Spain	• Croatia • France • Portugal • Slovenia	• Cyprus • Greece

Adapted from table 1 and figure 1 of the European Court of Auditors Special Report "The Land Parcel Identification System: a useful tool to determine the eligibility of agricultural land – but its management could be further improved"

Member States must regularly update their LPISs in order to be able to check that farmers are only paid for eligible agricultural area. Given the potential for natural or anthropogenic changes to parcels, Member States mainly focus their efforts on frequently supplying new orthoimagery and promptly entering it into their LPIS. This is necessary in order to ensure that the system reliably and correctly reflects the site specific conditions.

3.4 Copernicus Land Monitoring Service

Copernicus is a European system for monitoring the Earth. Data is collected by different sources, including Earth observation satellites and in-situ sensors. The data is processed and provides reliable and up-to-date information about six thematic areas: land, marine, atmosphere, climate change, emergency management and security.

The Copernicus Land Monitoring service became operational in 2012. The object of the service is to provide land cover information to users working in the field of environmental and other terrestrial applications. The service is designed to provide geographical information on land cover and related variables such as the vegetation state or the water cycle, and supports applications in other domains including spatial planning, forest management, water management, agriculture and food security.

The SENTINEL-2 mission provides support to land monitoring services and, with its twin-satellite capability, will ensure frequent and systematic coverage to support the mapping of land cover, classification and change maps, and accurate assessment of geophysical parameters. The acquired data, mission coverage and high revisit frequency enables provision of geoinformation at local, regional, national and international scales.

In addition, monitoring of crop conditions, soil properties and mapping tillage activities, may help to assess land use, predict harvests, monitor seasonal changes and assist in implementing policy for sustainable development. SENTINEL-1 will also be used for monitoring the changes of agricultural

production and productivity of pastures caused by drought and monitoring the decline of land productivity and soil degradation due to excessive cultivation and pasturage and improper irrigation.

The Sentinel constellation of satellites is relatively recent and has been launched in phases (see Table 17). The satellites undergo a series of calibrations and tests before being made available for broader use.

Table 17: Launching Dates of Sentinel Satellites

Satellite	Launch Date
Sentinel 1A	3 April 2014
Sentinel 1B	25 April 2016
Sentinel 2A	23 June 2015
Sentinel 2B	7 March 2017

Sentinel based imagery will be processed in a number of standard, periodically updated, products. These will include land-use and land-use change, but are currently still being tested and developed further. They are therefore not yet available for end-uses and cannot yet be used as a basis for emissions reporting. However, there is a huge potential in this new information source.

3.5 Other National Cartography

3.5.1 Italy

3.5.1.1 IUTI (Inventario dell'uso delle terre d'Italia/Italian Land Use Inventory)

IUTI is the national register of land-uses and land-use changes and of carbon sinks to assist the greenhouse gas accounting system, according to the Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol.

The information is based on a uniformly distributed sampling points, each randomly located within a 500m x 500m grid. The dataset covers the full Italian national territory, in a total of about 1.2 million points[28].

Each sample point is photo-interpreted in order to classify the sample into IUTI land use classes at different points in time (1990, 2008 and 2012). The repeated sampling allows to detect land-use changes between consecutive samplings and to calculate total land-use areas in each of the years.

In addition, and for sample points where a land use change in the forest category was detected between 1990 and 2008, as a result of afforestation/reforestation/deforestation activities, the land use classification is performed also in an intermediate point in time (2000), in order to estimate by interpolation the annual gain/loss of forest area in different time periods (1990-2000 and 2000-2008).

IUTI classifies each point according to one of the six IPCC land use categories: 1 Forest Land; 2 Cropland; 3 Grassland; 4 Wetland; 5 Settlements; and 6 Other Lands. Category 1 “Forest Land”, is further divided into: "Woodland"; and "Wooded areas temporarily unstocked". Category 2

[28] For 2012 only a sub-set of about 301,300 points, covering the entire country, was assessed.

"Cropland" is further divided into: "Arable land and other herbaceous cultivations"; and "Arboreal cultivations": the latter is further subdivided into "Fruit orchards and nurseries" and "Wood plantations". Category 3 "Grassland" is further divided into: "Grasslands, pasture and uncultivated herbaceous areas" and "Other wooded lands".

3.5.2 Portugal

3.5.2.1 COS (Cartografia de Ocupação de Solo/Land-Use Cartography)

COS[29] is a national cartographic product which allows for a consistent representation of land-uses and land-use changes. To date, 3 maps have been produced, relative to the years 1995, 2007 and 2010. A COS referred to 1990 is also available, but is not consistent with the subsequent maps.

It is based on orthophotomaps with a spatial resolution of 50cm from the same years (100cm in the 1995 version), which were photo interpreted and classified according to a legend with 225 classes (89 classes in the 1995 version) and with a minimum cartographic unit of 1ha and 20m minimum width for linear elements (e.g. rivers, roads). The legend is fully compatible with UNFCCC Classification of land-uses and 3 maps have been produced for reporting purposes (COS_KP) with 19 classes covering all the UNFCCC categories.

Only Mainland Portugal is covered, i.e., the Autonomous Regions of Azores and Madeira are excluded from this exercise.

The Autonomous Region of Azores has its own COS[30]. However, this exercise is based on Landsat 7 images from the years 2000-2003. It has a simpler legend of only 9 classes and a minimum cartographic unit of 1 ha. As only one map has been produced, it is not possible to estimate land-use changes from COS Azores.

There is no equivalent product for the Autonomous Region of Madeira.

3.5.2.2 IFN (Inventário Florestal Nacional/National Forest Inventory)

IFN consists of different tasks, including an evaluation of land-uses and land-use changes[31]. The land-use "module" is based on a systematic grid of 500x500 m (about 360 000 plots), i.e., each plot represents an area of 25 ha. Each plot is assigned to a land-use through visual interpretation of the plot over a orthophotomap, and provided that the respective land-use covers a minimum area of 0.5ha.

This system has been applied consistently for the years 1995, 2005 and 2010 and with the same legend, consisting on 27 main land-use types (including non-forest ones). The use of a systematic grid allows the estimation of land-uses in each reference year and the land-use changes between 2 consecutive reference years.

The legend is fully compatible with UNFCCC Classification of land-uses and covers all the UNFCCC categories.

[29] http://mapas.dgterritorio.pt/atom-dgt/pdf-cous/COS2007/ET-COS-1995-2007-2010.pdf

[30] http://www.azores.gov.pt/NR/rdonlyres/730FD13F-9AEE-4C6A-A2DA-4226FC77DCE0/388321/COSRAARELATORIO.pdf

[31] http://www.icnf.pt/portal/florestas/ifn/resource/ficheiros/ifn/ifn6-res-prelimv1-1

Only Mainland Portugal is covered, i.e., the Autonomous Regions of Azores and Madeira are excluded from this exercise.

The Autonomous Region of Madeira has its own IFRAM[32] (Inventário Florestal da Região Autónoma da Madeira/Forest Inventory of the Autonomous Region of Madeira), conducted 2 times. It is based on a similar methodology as the IFN, although with a simpler legend. Land-use data is referred to 2004 and 2010. The use of a systematic grid allows the estimation of land-uses in each reference year and the land-use changes between 2 consecutive reference years.

The legend is only partly compatible with UNFCCC Classification of land-uses. Particularly relevant for MediNet, the class "agriculture" includes all arable land, permanent crops, pastures and grasslands, i.e. it does not allow the differentiation between cropland and grassland.

The Autonomous Region of Azores has its own IFRAA[33] (Inventário Florestal da Região Autónoma da Madeira/Forest Inventory of the Autonomous Region of Madeira), conducted only in 2007. However, its land-use information is restricted to forests only, i.e. it does not contain information on cropland and grassland.

3.5.3 Spain

3.5.3.1 FF (Foto Fija/Still Photo)

FF has 2 main objectives: (1) to obtain a Forest Map with a date of reference and data model common for all the national territory; and (2) to estimate changes occurred between two consecutive MFE.

This map was created fundamentally from the need to respond to the information requirements of climate change reporting. To date, 2 maps have been produced, relative to the years 2009 and 2012; and the map for 2015 is under preparation.

FF 2012 is made by means of a photointerpretation of possible abrupt changes that occurred in the forest area in the period between FF 2009 and FF 2012. The methodology consists on photointerpretation on high-resolution orthophotos on computer screen.

A series of auxiliary layers are used to, according to the available information, locate those places that are likely to have undergone a change of use and therefore they will be object of further analysis, i.e. not all the territory is analysed.

All those areas identified in the auxiliary layers of changes are then photointerpreted, comparing the image of 2009 with that of 2012, resulting in the layer "change FF". This layer of changes is then integrated into the national coverage, resulting in the final layer.

[32] https://ifcn.madeira.gov.pt/florestas/inventarios-florestais.html

[33] http://drrf-sraa.azores.gov.pt/areas/inventario-florestal/Paginas/Introducao.aspx

4 Evaluation of the Data Sets as Activity Data Sources

The IPCC considers a series of principles for good reporting, which are known as the TACCC Principles[34]. TACCC is the acronym that stands for:

Transparency: Data, assumptions and methodologies need to be clearly explained and documented to facilitate replication and assessment.

Accuracy: Values used or calculated must be collected systematically and should not lead to neither over nor under true emissions/removals, as far as can be judged according to the available data and information. Uncertainties must be reduced as far as practicable. Appropriate methodologies must be used, in accordance with IPCC guidelines.

Consistency: Information and data needs to be consistent in all its elements with values from previous years. Consistent data sets and methodologies for the base year and all subsequent years need to be used.

Comparability: Estimates must be comparable among UNFCCC Parties. Methodologies and formats need to follow decisions agreed by the Conference of Parties. Stratification of source/sink categories needs to comply with the IPCC Guidelines.

Completeness: All sources/sinks and gases included in the IPCC Guidelines should be reported. Full geographic coverage of sources/sinks of a Party needs to be ensured.

This section analyses how each of the data sets identified in Section 3 complies with such Principles and Criteria.

4.1 Transparency

MediNet is interpreting “transparency” applied to a specific data set, as referring to the availability of metadata information, i.e., the capacity of someone using that data set to know, e.g. how this information is collected/produced (methodology); the units used; the geographic scope of the information; or the periodicity of updates.

[34] http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol1.html

Table 18: Transparency in the Different Data Sets Analysed

Data set	Transparency
Statistics	
Crop Statistics	Data is fully transparent. Detailed metadata is available for the data set, which includes, amongst other, descriptions of methodology for data collection, definitions, areas covered/excluded, and units.
Farm Structure Survey	Data is fully transparent. Detailed metadata is available for the data set, which includes, amongst other, descriptions of methodology for data collection, definitions, areas covered/excluded, and units.
Orchard Survey	Data is fully transparent. Detailed metadata is available for the data set, which includes, amongst other, descriptions of methodology for data collection, definitions, areas covered/excluded, and units.
Vineyards Survey	Data is fully transparent. Detailed metadata is available for the data set, which includes, amongst other, descriptions of methodology for data collection, definitions, areas covered/excluded, and units.
Survey on Agricultural Production Methods	Data is fully transparent. Detailed metadata is available for the data set, which includes, amongst other, descriptions of methodology for data collection, definitions, areas covered/excluded, and units.
Organic farming Survey	Data is fully transparent. Detailed metadata is available for the data set, which includes, amongst other, descriptions of methodology for data collection, definitions, areas covered/excluded, and units.
Cartographic information	
CORINE	Data is fully transparent. Detailed metadata is available for the data set, which includes, amongst other, descriptions of methodology for map elaboration, definitions, areas covered/excluded, and units.
LUCAS	Data is fully transparent. Detailed metadata is available for the data set, which includes, amongst other, descriptions of methodology for map elaboration, definitions, areas covered/excluded, and units.
LPIS	Country specific.
Copernicus	Not evaluated.

4.2 Accuracy

MediNet is interpreting "accuracy" applied to a specific data set, as referring to the [potential] difference between the *real* number and the number provided by the data set, e.g. how many hectares of olive trees *that really exist* in a country/region compared to the hectares of olive trees *that are reported* in a particular data set.

This can be qualitatively inferred, through a review of the data set methodology and other meta-information or measured as an uncertainty, usually expressed as a % around the estimated (published) value.

In general, it is not possible to determine the (quantified) uncertainty of the data sets analysed, as uncertainty is not reported or even calculated (see Table 19).

Table 19: Accuracy in the Different Data Sets Analysed

Data set	Accuracy
Statistics	Emission factors and removal factors are different for *gross* gains of area and for *gross* losses of area from a particular land-use to another one. Statistical data sets only allow the estimation *net* land-use changes (i.e., the result of the sum of all areas gained and areas lost of a particular land-use between 2 years), and therefore the estimation of *gross* land-use changes is not possible. Also, information of which types of land-uses are being converted to that particular land-use cannot be inferred from this data set and are relevant for the estimation of emissions and removals and may result in a significant over or under estimation of emissions and removals.
Crop Statistics	Crop Statistics are very detailed and provide data for all relevant cropland and grassland areas *under production* in each year. Data is obtained using several statistical methods such as sample surveys, administrative sources, expert estimates or (often) combinations of those methods. As data on land which is not under production is not collected (e.g. fallow land, abandoned olive groves, shrublands, etc.), the areas obtained from crop statistics may be an under-estimation of total cropland and total grassland areas. This problem might not be equally relevant for all crops and all countries. Uncertainty of the published values is not available. However, the sampling error is required to be smaller than 3%. Non-sampling errors are not available.
Farm Structure Survey	Farm Structure Survey are very detailed and provide data for all relevant cropland and grassland areas *reported by farmers* in each year, but only represents areas above a certain minimum size of agricultural holdings. As data on land which is not managed by farmers is not collected (e.g. abandoned agricultural land, shrublands, etc.), the areas obtained from crop statistics may be an under-estimation of total cropland and total grassland areas. Also, the existence of a minimum area threshold might also lead to an under-estimation of total cropland and total grassland areas. This problem might not be equally relevant for all crops and all countries. Uncertainty of the published values is not available. However, data is not published if the estimated errors are above 25%.
Orchard Survey	As data on orchards which are not under production is not collected and data on non-dessert varieties is not mandatory, the areas obtained from the orchard survey may be an under-estimation of total fruit tree areas. This problem might not be equally relevant for all crops and all countries. Uncertainty of the published values is not available. However, the sample used is required to be representative of 95% of the area planted with fruit trees and the sampling errors should be smaller than 3% of the whole national area planted with fruit trees of each species. Non-sampling errors are not available.
Vineyards Survey	As data on vineyards which are not under production, or that produce table grapes, is not collected, the areas obtained from the vineyards survey may be an under-estimation of total vineyard areas. However, in many cases data from table grapes can be obtained from the "Orchard Survey". Uncertainty of the published values is not available. Non-sampling errors are not available.
Survey on Agricultural Production Methods	Data can be obtained by census or sample surveys. In principle, data obtained from census will be more accurate and that based on samples, particularly where the samples are smaller and/or the crop is less relevant. Uncertainty of the published values is not available. However, data is not published if the estimated errors are above 25%.
Organic farming Survey	Data is collected on the basis of a harmonised questionnaire for all farmers *registered* as practicing organic farming. Double counting of operators is possible where several control bodies are involved. On the other hand, areas might be underestimated if significant number of farmers practice organic farming but do not register themselves as "organic farmers". Data series show significant "missing data" in some Member States and some of the recorded inter-annual variations indicate that there might still be some problems in the collection of this information. Uncertainty of the published values is not available. Non-sampling errors are not available.

Data set	Accuracy
Cartographic information	Emission factors and removal factors are different for *gross* gains of area and for *gross* losses of area from a particular land-use to another one. Where cartographic information is consistent over time, it provides estimations of *gross* area gains and losses between any two land-uses recorded in those maps. It also contains information of which types of land-uses are being converted to that particular land-use, thus minimising the risk for significant over or under estimation of emissions and removals.
CORINE	Accuracy (for reporting purposes) is likely low where very fragmented landscapes exist. This is due to the very large minimum cartographic unit (25ha), which fails to properly represent the land-uses that are present and (even further) the land-use changes that are taking place within those larger units. Generalization rules (attribution of a polygon with multiple land-uses to a single land-use) will tend to overestimate the recorded land-use and underestimated the land-uses being omitted. Land-use changes in areas smaller than 5ha will not be recorded and may therefore be under-estimated. This problem might not be equally relevant for all crops and all countries, or even all regions within a single country. Uncertainty of the published values is not available.
LUCAS	Sampling intensity is constant in all Europe (based on a 2x2km grid). This leads to a reduced number of sample plots in smaller countries or in less representative crops, which may introduce a bias in the estimates of areas of particular land-uses and even further in estimates of land-use changes in those countries. Other sources of uncertainty may include incorrect recording of land-uses in a particular plot, incorrect placement of sample plot on the ground, etc., which may suggest land-use changes that are not, in fact, taking place. Uncertainty of the published values is not available, but will be much higher in smaller countries than in larger countries.
LPIS	Country specific.
Copernicus	Not evaluated.

4.3 Consistency

MediNet is interpreting “consistency” applied to a specific data set, as referring to “time series consistency”, i.e., to whether the comparison between numbers obtained for the same crop in different years/surveys are methodologically comparable. Possible changes over time that could limit that comparability include changes in e.g. definitions, census/sampling/mapping methodologies or intensities, geographic coverage, minimum thresholds, etc.

Table 20: Consistency in the Different Data Sets Analysed

Data set	Consistency
Statistics	
Crop Statistics	Data is not fully consistent. The legal basis for reporting has evolved over time and, with it, methodological changes and new classifications have been introduced since the onset of this time series. Despite that, data for the main crops can be considered generally consistent, particularly if groups of crops are considered rather than individual crops.
Farm Structure Survey	Data is not fully consistent. Changes in survey thresholds have taken place as well as changes in the definition of "agricultural holding", changes in the criterion for including/excluding "common land", changes in the level of detail in legend (e.g. fruits and berries). In some Member States the geographic coverage of the territory was also not constant over time. Despite that, data for the main crops can be considered generally consistent, particularly if groups of crops are considered rather than individual crops.
Orchard Survey	Data is not fully consistent. Data from the "orchards survey" is not equally long for all species considered, e.g. data for "olive" and "table grapes" is only available in the survey of 2012, while data on "apples", "pears", "peaches" and "oranges" are available since 1977. The survey parameters as e.g. the list of varieties have a certain dynamic and are being revised and updated from one survey to another, and so comparisons at this level of disaggregation are probably not advisable. Age and density classes changed in 2002. Some Member States have also changed the thresholds applied in the surveys. Despite that, data for the main crops can be considered generally consistent, particularly if groups of crops are considered rather than individual crops.
Vineyards Survey	Data is not fully consistent. The data source changed in many countries between 2009 and 2015 data collections from statistical surveys into a vineyard register. In some Member States the change of the data source caused a break in the time series. Despite that, data can be considered generally consistent, particularly for country totals and where data on table grapes (see Orchard survey) is also available.
Survey on Agricultural Production Methods	Not applicable. The SAPM was conducted only once.
Organic farming Survey	Data is not fully consistent. The questionnaire before and after 2012 is different. The survey became mandatory for Member States only since 2007, but for many Member States the actual data submitted is still very incomplete or lack the finer detail that is requested by the questionnaire. The "high" inter-annual changes for some crops (in some Member States) suggest that the collection of this information might not yet be fully stabilised.
Cartographic information	
CORINE	Data is generally consistent. The legend of the maps produced for each country has remained constant, and so have the minimum mapping units used over time. Land-use changes in 1990/2000 were calculated differently from subsequent ones[35]. This may result in an under-estimation or over-estimation of land-use changes in that period compared to more recent periods.
LUCAS	Data is generally consistent. The legend of the maps produced for each country has remained constant, and so have the methodology.
LPIS	Country specific.
Copernicus	Not evaluated.

[35] In 1990/2000 land-use change map all changes in *existing* polygons bigger than 5ha and isolated changes bigger than 25ha were recorded. In the subsequent land-use change maps all changes bigger than 5ha were recorded.

4.4 Comparability

MediNet is interpreting "comparability" applied to a specific data set, as referring to the possibility for data from different Member States to be compared.

Table 21: Comparability in the Different Data Sets Analysed

Data set	Comparability
Statistics	
Crop Statistics	Data is generally comparable. All countries use similar methodologies in data gathering and processing, which have been harmonized by EUROSTAT.
Farm Structure Survey	Data is generally comparable. All countries use similar methodologies in data gathering and processing, which have been harmonized by EUROSTAT.
Orchard Survey	Data is generally comparable. All countries use similar methodologies in data gathering and processing, which have been harmonized by EUROSTAT.
Vineyards Survey	Data is generally comparable. All countries use similar methodologies in data gathering and processing, which have been harmonized by EUROSTAT.
Survey on Agricultural Production Methods	Data is generally comparable. All countries use similar methodologies in data gathering and processing, which have been harmonized by EUROSTAT.
Organic farming Survey	Data is generally comparable. All countries use similar methodologies in data gathering and processing, which have been harmonized by EUROSTAT.
Cartographic information	
CORINE	Data is generally comparable. All countries use similar methodologies in data gathering and processing, which have been harmonized by EUROSTAT.
LUCAS	Data is generally comparable. All countries use similar methodologies in data gathering and processing, which have been harmonized by EUROSTAT.
LPIS	Data is not comparable. Each country sets its own system, which means that different approaches, legends, spatial units, etc. are followed by each country.
Copernicus	Not evaluated.

4.5 Completeness

MediNet is interpreting "completeness" applied to a specific data set as referring to the following dimensions: (1) the inclusion of all major cropland and grassland types; (2) full geographic coverage of the territory of the Party; (3) the inclusion of the full time series required for reporting[36].

[36] According to the IPCC 2006 Guideline, all years from 1990 to present need to be included in the reporting of emissions and removals from cropland and grassland. As land-use changes take about 20 years to stabilize their emissions and removals, and for proper representation of 1990, a time series starting in 1970 (=1990- 20 years) is considered ideal.

Table 22: Completeness in the Different Data Sets Analysed

Data set	Completeness
Statistics	
Crop Statistics	1. All major cropland types are included. Pastures are partly included and woody grasslands (shrubland) are not included. 2. All Member States are represented. 3. The time series length depends on date of accession of the respective Member State, i.e., it is usually "shorter" for Member States that joined the EU more recently (e.g. Croatia, Malta, Cyprus) and "longer" for Member States that joined the EEC in 1957 (e.g. Italy, France). However, in many cases, the time series is longer than the respective accession date, as some statistics already existed before the process of adhesion to the Union.
Farm Structure Survey	1. All major cropland types are included. Pastures are partly included and woody grasslands (shrubland) are only partly included. 2. All Member States are represented. 3. The time series length depends on date of accession of the respective Member State, but can be quite complete for some MSs.
Orchard Survey	1. Only woody cropland types are included and coverage of cropland types has been increasing over time (4 species in 1977; 9 species in 2012). 2. All Member States are represented. 3. The time series length depends on date of accession of the respective Member State, but can be quite complete for some MSs for some species (apple, pear, peach, orange). For other species (olive trees and table grapes) there is only one year of information (2012).
Vineyards Survey	1. Only vineyards not producing table grapes are included. 2. All Member States are represented. 3. The time series length depends on date of accession of the respective Member State, but can be quite complete for some MSs.
Survey on Agricultural Production Methods	1. Only practices are recorded on the total or arable land; allocation to specific crops or crop groups is not possible. 2. All Member States are represented. 3. There is no time series, as this questionnaire was conducted only once.
Organic farming Survey	1. All major cropland types are included. Pastures are partly included and woody grasslands (shrubland) are only partly included. The exclusion of shrublands is probably irrelevant as the practice is most likely not practiced. 2. All Member States are represented. 3. The time series is insufficient, as collection of information began in 1997. However, the practice was probably less relevant in the years preceding 1997. The time series length depends on date of accession of the respective Member State.
Cartographic information	
CORINE	1. All major cropland and grassland types are included. However, the class 2.4 heterogeneous agricultural areas and its sub-classes cannot be allocated to any cropland type, as it contains different types of cropland and even other non-cropland related land-uses. 2. All Member States are represented. 3. The time series is insufficient, as collection of information began only in 1990. Updates have been produced every 6 years since 2000 (10 years in the first update 1990/2000).
LUCAS	1. All major cropland and grassland types are included. 2. All Member States are represented, although some areas are excluded (high altitude, low accessibility, etc.). 3. The time series is insufficient, as collection of information began only in 2006 (2009 for most MSs in the MediNet region). Updates have been produced every 3 years.
LPIS	Country specific.
Copernicus	Not evaluated.

5 Information Gaps and Possibilities for Further Improvement

Although there is a wealth of information about particular crops and land-uses, currently there is no information source that meets all the criteria required by the IPCC.

The "ideal data set" should include: (1) areas per crop type and changes in land-use; (2) annual areas per crop/management system, and changes in management systems; and (3) comparable and consistent data source for the period 1970-present.

5.1 Areas per Crop Type and Changes in Land-Use

Areas per crop type and changes in crop types or land-uses can be found in multiple sources. However, ensuring consistency can be challenging in at least the following aspects:

- Difficulty in representing simultaneously and consistently multiple land-uses (forests, agriculture, settlements), due to partial of cover of some datasets, and the IPCC requirement to report on ALL managed lands
- Minimum area representations that do not comply with a minimum area of 1ha, as requested by the IPCC
- Changes in definitions (e.g. which crops belong to which crop groups) or representation criteria (e.g. different sampling intensities or mapping units over time), which may result in "false" estimates of changes in total area per land-use type or in the respective gross gains and gross losses of area

5.2 Annual Areas per Crop/Management System, and Changes in Management Systems

Systematic information about management systems is almost inexistent.

Information from the Survey on Agricultural Production Methods only covers one year (2010) and a limited number of practices. Attribution of practices to particular crops is also not easy and can only be made using assumptions. The repetition of this survey would allow deriving some information on how practices are changing over time, but only if the same practices (including the definitions of practices) are kept.

Information from the Common Agriculture Policy (LPIS) is focused on crops and information on management practices is collected only for farmers that in a particular point in time are being supported to implement some climate-friendly practices under agri-environment-climate measures. This excludes farmers that implement the practice without support, farmers implementing "bad" practices (which are not supported, but may still occur), and information on the practices before and after the agri-environment-climate contract is usually not collected.

This means that reporting the emissions and removals within a particular crop can currently only be made by using assumptions about shares of the areas using each management system within the same crop group.

More importantly, reporting the emissions and removals which result from management changes in a particular crop can only be made by using assumptions about shares of area undergoing such management changes or where such changes have been introduced in recent years and are still emitting or sequestering carbon.

This is a severe limitation, since a lot of the support from agri-environment-climate measures under the Common Agriculture Policy is designed to drive changes in management practices (more than land-use changes).

5.3 Comparable and Consistent Data Source for the Period 1970-Present

Except for crop statistics, there is no information source covering the whole time series from 1970, as required by the IPCC. Even so, differences in data collection and definitions over time may limit the comparability and consistency of the data provided by statistics.

This means that reporting the emissions and removals within a particular crop can currently only be made by combining different information sources, with more recent (cartographic) information being combined with older (statistical) time-series to produce a land-use and land-use change narrative for each country.

5.4 Possibilities for Further Improvement

A system to derive information covering all IPCC land-uses and possible land-use changes needs to be implemented as soon as possible.

This can be done at national level (e.g. the COS system in Portugal) or at European Level. Currently Copernicus products are the most likely candidates to supply this information, since the other EU level systems fail to deliver the information at the required level of detail.

However for Copernicus to deliver, its products should ensure:

- Full wall-to-wall coverage of Member States
    - no gaps (areas with unknown land-uses) and
    - no areas with overlaps (same area with different land-use classifications)
- Representation of all IPCC land-uses
    - forest land; cropland; grassland; wetlands; settlements; other land
- Consistency in land-representation over time and accurate identification of land-use changes
    - Consistency in definitions, minimum spatial units and other relevant cartographic parameters
- Identification of (some) management practices in addition to land-uses

Annex I: References

Crop statistics

Available from: https://ec.europa.eu/eurostat/data/database

Database by themes > Agriculture, forestry and fisheries > Agriculture (agr) > Agricultural production (apro) > Crops (apro_crops) > Crop production (apro_cp)

Metainformation: https://ec.europa.eu/eurostat/cache/metadata/en/apro_cp_esms.htm

Farm Structure Survey

Available from: https://ec.europa.eu/eurostat/data/database

Database by themes > Agriculture, forestry and fisheries > Agriculture (agr) > Farm structure (ef)

Metainformation: https://ec.europa.eu/eurostat/cache/metadata/en/ef_esms.htm

Orchards Survey

Available from: https://ec.europa.eu/eurostat/data/database

Database by themes > Agriculture, forestry and fisheries > Agriculture (agr) > Structure of orchards and vineyards (orch_vit) > Orchard (orch)

Metainformation: https://ec.europa.eu/eurostat/cache/metadata/en/orch_esms.htm

Vineyards Survey

Available from: https://ec.europa.eu/eurostat/data/database

Database by themes > Agriculture, forestry and fisheries > Agriculture (agr) > Structure of orchards and vineyards (orch_vit) > Vineyard (vit)

Metainformation: https://ec.europa.eu/eurostat/cache/metadata/en/vit_esms.htm

Survey on Agricultural Production Methods

Available from: https://ec.europa.eu/eurostat/data/database

Database by themes > Agriculture, forestry and fisheries > Agriculture (agr) > Farm structure (ef) > Farm structure 2010 (ef_2010) > Survey on agricultural production methods (SAPM, 2010) (ef_pm)

Metainformation: https://ec.europa.eu/eurostat/statistics-explained/index.php/Survey_on_agricultural_production_methods#Characteristics_surveyed

CORINE Land Cover

Available from: https://land.copernicus.eu/pan-european/corine-land-cover

LUCAS Land Use and Coverage Area frame Survey

Available from: https://ec.europa.eu/eurostat/web/lucas/data/primary-data/2009

Annex II: IPCC Protocol for expert elicitation

[text taken from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 1: General Guidance and Reporting; Chapter 2: Approaches to Data Collection; Annex 2A.1 A protocol for expert elicitation]

Wherever possible, expert judgement should be elicited using an appropriate protocol. An example of a well-known protocol for expert elicitation, Stanford/SRI protocol, has been adapted and is described below.

• Motivating: Establish a rapport with the expert, and describe the context of the elicitation. Explain the elicitation method to be used and the reason it was designed that way. The elicitor should also try to explain the most commonly occurring biases to the expert, and to identify possible biases in the expert.

• Structuring: Clearly define the quantities for which judgements are to be sought, including, for example, the year and country, the source/sink category, the averaging time to be used (one year), the focus activity data, emission factor or, for uncertainty, the mean value of emission factors or other estimation parameter, and the structure of the inventory model. Clearly identify conditioning factors and assumptions (e.g., resulting emissions or removals should be for typical conditions averaged over a one-year period).

• Conditioning: Work with the expert to identify and record all relevant data, models, and theory relating to the formulation of the judgements.

• Encoding: Request and quantify the expert's judgement. The specific qualification will differ for different elements and be present in the form of a probability distribution for uncertainty, and an activity or emission factor estimate for activity data and emission factors. If appropriately managed, information on uncertainty (probability density function) can be gathered at the same time as gathering estimates of activity or emission factor. The section on encoding in Chapter 3 describes some alternative methods to use for encoding uncertainty.

• Verification: Analyze the expert's response and provide the expert with feedback as to what has been concluded regarding his or her judgement. Is what has been encoded really what the expert meant? Are there inconsistencies in the expert's judgement?

Possible Biases in Expert Elicitation

Elicitation protocols should be designed to overcome the biases that can be introduced by the rules of thumb (sometimes called heuristics) that experts use when formulating judgements. The most common unconscious biases introduced by rules of thumb are:

• Availability bias: This is basing judgements on outcomes that are more easily remembered.

• Representativeness bias: This is basing judgements on limited data and experience without fully considering other relevant evidence.

• Anchoring and adjustment bias: This is fixating on a particular value in a range and making insufficient adjustments away from it in constructing representative estimate.

To counteract the first two potential sources of biases, elicitation protocols should include a review of relevant evidence. In order to counteract the third potential source of bias, it is important to ask the expert to make judgments regarding extreme values first, before asking for judgments regarding the best estimate or central values for an uncertainty distribution.

There is also the possibility of more conscious biases:

• Motivational bias: is a desire by an expert to influence an outcome or to avoid contradicting prior positions on an issue.

• Expert bias: arises from an unqualified expert's desire to appear as a true expert in the field. This would typically lead to overconfident estimates of uncertainty.

• Managerial bias: is a situation in which an expert makes judgements that achieve organisational goals, rather than judgements that reflect the actual state of knowledge regarding an inventory input.

• Selection bias: occurs when the inventory compiler selects the expert who tells it what it wants to hear.

The best way to avoid these biases is to be careful in the selection of experts. Expert judgments can be elicited from individuals or groups. Groups can be useful for sharing knowledge and hence could be part of the motivation, structuring, and conditioning steps of the elicitation. However, group dynamics occasionally introduce other biases. Thus, it is usually preferable to elicit judgement on an individual basis. When eliciting judgments independently for a given quantity from two or more experts, it is possible that different views on distributions (or ranges) will be obtained. In some cases, the differences may not lead to a significant difference in the overall estimate for the inventory, such as when the inventory is not sensitive to the particular quantity. Thus, in these cases, disagreements among experts do not matter significantly to the overall assessment. However, when judgments differ, and when the quantity for the judgments is made is important to the overall inventory, there are two main approaches that can be used. One is to estimate resulting emissions or removals and perform the uncertainty analysis separately for each set of judgments and compare the results. The other is to ask the experts to weight the judgments and combine them into one assessment. The former approach is preferred where possible, but the latter is acceptable provided that the judgments are weighted and not averaged. The difference is that weighting enables sampling from each of the expert's estimations, whereas averaging can produce intermediate values that are not supported by any of the expert's judgement. A similar situation can occur when comparing predictions with alternative models, as described in the section of 'Combining Data Sets Numerically' in Section 2.2.3. The distinction between weighting and averaging is explained there. Although the development of weighting schemes can be complex, it is reasonable to start with assuming equal weights for each expert and refines the development of weights only as needed or as appropriate for a given situation.

Expert judgement documentation

The subjective nature of expert judgment increases the need for quality assurance and quality control procedures to improve comparability of emission and uncertainty estimates between countries. It is recommended that expert judgments are documented as part of the national archiving process, and inventory compilers are encouraged to review expert judgments, particularly for key categories. Table 2A.1 below shows an example of the document elements necessary to provide transparent expert judgment (Column 1) and an example of the data to record (Column 2).

Such documentation will save the compiler a considerable amount of time in reporting and documenting the inventory through the enhanced transparency of the inventory. More general text on documentation, checking and review of methods is included in Chapter 6, QA/QC and Verification, of Volume 1. These principles should also be applied to the use of expert judgement in inventory compilation and uncertainty assessment.

TABLE 2A.1 EXAMPLE OF DOCUMENTATION OF EXPERT JUDGEMENT	
Documentation Element	**Documentation Example**
Reference number for judgement	*EJIPPU2005-001*
Date	*14th January 2005*
Name of expert(s) involved	*Dr Anne N Other*
Experts' background (references, roles, etc.)	*Nitric Acid Process emissions and abatement industrial expert*
The quantity being judged	*National emission factor for emissions of N_2O from Nitric Acid Plant*
The logical basis for judgement, including any data taken into consideration. This should include the rationale for the high end, low end, and central tendency of any uncertainty distribution	*An absence of measurement data for 9 out of the 10 Nitric Acid plant. The single plant estimate has been recommended as the basis for a national factor to be applied to national nitric acid production.*
The result: e.g., activity value, emission factor or for uncertainty the probability distribution, or the range and most likely value and the probability distribution subsequently inferred	*8.5 kgN_2O/tonne nitric acid produced for 1990 – 2003*
Identification of any ***external reviewers***	*Nitric Acid Trade Association*
Results of any external review	*See document: e:/2003/ExpertJudgement/ EJIPPU2005-001.doc*
Approval by inventory compiler specifying date and person	*25th January 2005, Dr S.B Else*

Annex III: WS Report

MediNet Participatory Workshop on Activity Data and Biomass Emission Factors for Cropland

The first workshop of Project MediNet was held in Hotel Sana Malhoa in Lisbon, Portugal, on the 4th and 5th of December 2017.

The general objective of the workshop was to receive feedback from participants on the methodologies and results used by the project and to receive guidance on the refinement of the deliverables and main conclusions of the project.

Participants were selected and invited on the basis on their personal capacity and on the basis of their expertise in one or more of the following fields: experience in estimation of emissions and removals in cropland and in inventory compilation; experience in statistics compilation; knowledge in biomass in cropland; involvement in the IPCC work on guidance for reporting. A list of participants is provided at the end of this report.

It focused on the work already carried out under MediNet related to the collection of activity data, and the development of biomass emission factors for cropland.

The workshop was designed to allow as much interaction between participants as possible, so as to maximise their input and contribution. Participants were asked to participate freely and, to facilitate that, were given guarantees that the workshop report would contain references to the discussions held, but not contain attribution of opinions or views (Chatman House rules).

The main results of the work done are summarised below. All documents mentioned in this report are available at the site of Project MediNet (http://www.lifemedinet.com). The summary is of the responsibility of the Project Team and does not necessarily reflect the views of each of the participants.

Agenda 4th of December	*Documents and Presentations Distributed at the Workshop*
09:00-09:20	**Welcome to Participants**  
09:20-09:40	**Project MediNet** A brief presentation (Tommaso Chiti – MediNet Team) about the MediNet project was made with the objective to familiarise the participants with the project. *01 Project MediNet - general presentation.pdf*

Agenda 4th of December	*Documents and Presentations Distributed at the Workshop*
09:40-10:00	**IPCC Methodologies: part 1 – Land Representation** A brief presentation (Lucia Perugini) about key IPCC reporting concepts was made with the objective to familiarise the participants with the reporting approaches that Member States are required to use for the purpose of estimating Emission and Removals in cropland and grassland. This presentation was split in 2 parts. Part 1 focused on Land Representation approaches and concepts such as Land-Use Categories, Definitions of cropland and grassland, Reporting and Accounting, Land-Use conversion Matrix and Approaches to Land Representation. A report on the same topic was prepared and sent to participants in advance of the Workshop. *MediNet Background Report - IPCC Reporting.pdf* *02 IPCC Reporting Methods Part 1.pdf*
10:30-12:30	**National Experiences in Activity Data for Cropland** Representatives from participant countries were asked to make a brief presentation about their country experiences in reporting cropland and grassland emissions and removals. Presentations from Cyprus (Melina Menelaou), Slovenia (Boštjan Mali) and Italy (Marina Vitullo) were made. A presentation (Sara Manso – MediNet Team) on the State of the Art in Emission and Removals Reporting of cropland and grassland in Mediterranean Countries was also made. *03 Experience of Cyprus.pdf* *04 Experience of Slovenia.pdf* *05 Experience of Italy.pdf* *06 State of the Art in Emission Reporting in CL and GL in Med Countries.pdf*
14:00-15:30	**MediNet Report on Activity Data** MediNet's report on activity data was presented (Paulo Canaveira – MediNet Team). It identifies statistical and cartographical datasets that can be used to assist emissions reporting of cropland and grassland and discusses the potentials and limitations the project found for each of those datasets. A report on the same topic was prepared and sent to participants in advance of the Workshop. *MediNet Discussion Report - Activity Data.pdf* *07 Activity Data Review.pdf*
15:30-16:30	**Group Work on Activity Data**  
16:30-17:00	**Report Back and Conclusions** Participants were divided in groups and asked to comment on the potential and limitations of different data sets for use as activity data to report cropland and grassland. The following questions were made to guide de discussions: 1. Are you aware of any additional sources of data that we should have considered? (including data sources at European and national level) 2. Do you agree with the assessment made for the use / limitations of the data sets analysed? 3. Discuss and propose research or further work needs (beyond this project) A rapporteur from each of the groups presented the conclusions of his or hers group. This was followed by a "plenary" group discussion on possible WS conclusions and/or recommendations

Agenda 4th of December	*Documents and Presentations Distributed at the Workshop*
	On additional sources (question 1), participants commented/suggested the following: • Data from satellites could be used to complement information. Some products that could be used for this purpose include: Open Foris Collect Earth (FAO); CCI Land Cover (ESA); COPERNICUS/Sentinel including HRL - Pan European High Resolution Layers; better use of INSPIRE Directive; better use of LPIS data combined with Sentinel images; explore the use of CAP evaluation data • Additional national data available included: use of nursery sales data (Portugal); use of the energy biomass survey (Italy); IUTI (National Inventory of land-use / Italy); use of FotoFija and Map of Crops and Uses (Spain); use of LIDAR sampling points (Spain); use of National Cadastre data where available. On the assessment made by MediNet on the datasets identified (question 2), participants commented/suggested the following: • There was general agreement on the assessment made by the project team • There could be value in splitting shrublands into transition shrubland (vegetation that develops after fire) from more permanent shrublands/maquis • On datasets that rely on replies by farmers, there could be declaration biases • On cartographic products, there could be problems that result from overlapping different maps • Statistical data could be preferred to wall-to-wall maps and there is a need to combine better stratification and sampling with ground data; the use of maps should be complementary to the use of statistics • Some of the considerations may be valid in most countries, but not at individual country level On research and further work (question 3), participants commented/suggested the following: • Improve collaboration between different data providers at country and EU Levels • Develop methodologies for combining and refining existing products • Develop automatic learning algorithms for image classification • Improve complementarity and consistency of different products (e.g. through use of MAUP) • Provide platform for sharing experiences, methodologies and models, including data users and data providers • Develop more information on uncultivated lands • Combine land data with other dynamic indicators (albedo, NDVI, …) and with other socio-economic indexes • Improve definition and systematization of management systems
20:00-22:00	**Workshop Dinner**

Agenda 5th of December	*Documents and Presentations Distributed at the Workshop*
9:00-9:30	**IPCC Methodologies: part 2 – Biomass Data** A brief presentation about key IPCC reporting concepts was made (Lucia Perugini) with the objective to familiarise the participants with the reporting approaches that Member States are required to use for the purpose of estimating Emission and Removals in cropland and grassland. This presentation was split in 2 parts. Part 2 focused on approaches and concepts for estimating emission factors such as: Carbon Pools and Carbon Flows and the IPCC approaches to emission and removals estimation, i.e. "Stock-Change" and "Gains-Losses". A report on the same topic was prepared and sent to participants in advance of the Workshop. *MediNet Background Report - IPCC Reporting.pdf* *08 IPCC Reporting Methods Part 2.pdf*
9:30-10:30	**MediNet Report on Biomass Data** MediNet's report on activity data was presented (Paulo Canaveira – MediNet Team). It describes the methodology and results of a literature survey on data for Biomass in permanent crops in Mediterranean Countries. A report on the same topic was prepared and sent to participants in advance of the Workshop. *MediNet Discussion Report - Biomass Data.pdf* *09 Biomass Data Review.pdf*
10:30-12:30	**Group Work on Biomass Data**   
14:00-15:30	**Report Back and Conclusions** Participants were divided in groups and asked to assist the project team in developing default emission factors for permanent crops in the Mediterranean. The process was organising taking into account the IPCC Elicitation Process. Each group received a graphical summary of the database that was developed by MediNet containing the values of Biomass per hectare found in literature for different permanent crops. Crops were aggregated in three crop categories: Olive Trees, Vineyards and Fruit Trees; and three pools: stock of permanent above ground biomass; stock of below ground biomass; biomass harvested in annual pruning. To assist group discussions data was presented as biomass as a function of age. Additional graphs highlighted the [possible] relevance of other factors such as country; irrigation, species (fruit trees only), intensive/extensive (olive only); training method (vineyard only). An additional graph showed which data plots had been (re)calculated by MediNet and which plots came directly from the literature. A rapporteur from each of the groups presented the conclusions of his or hers group. This was followed by a "plenary" group discussion on possible default values, WS conclusions and/or recommendations.

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The default values suggested by the participants are shown in the tables below:

Default Value		Olive Trees (int | ext)	Vineyards	Fruit Trees
Permanent Aboveground Biomass	At 5 years	Average 0-5 3-7|5-8 5-8 5	Average 0-5 8-12 1-5 7	Average 0-5 10-20 5-15 10
	At 10 years	Average 6-10 12-17|10-20 10-20 15	Average 6-10 18-22 5-10 10	Average 6-10 10-20 12-20 15
	At 20 years	Average 10-15 X|25-35 18-30 20	Median +10 18-22 10-15 12	Median +10 10-20 15-25 18
	At 30+ years	Average? X|25-35 30-35 30	 18-22 10-15 15	18-22 10-20 25-30 10-15

Default Value		Olive Trees (int | ext)	Vineyards (trellis | vase)	Fruit Trees
Pruning	At 5 years	- 2-2.5|0.5-1 0.8-1 2	- 2.5-3.5 1.5-2|1.5-2.5 1.5	- 3-5 1.5-2.5 2.5
	At 10 years	- 3-5|2-3 1.5-2.5 3	- 4-5 1.5-3.5|1.5-2.5 2.5	- 3-5 2.5-3.5 4
	At 20 years	- X|5-7 2-4 4	- 4-5 1.5-3.8|1-2 4	- 2-4 3-4 4
	At 30+ years	- X|5-7 2-4 5	- 4-5 1.5-2.5|1-2 4	- 2-4 3-4 2.5

Default Value		Olive Trees (int | ext)	Vineyards	Fruit Trees
Belowground Biomass	At 5 years	- 2-5|1-2 1.5-2 (20-30%) 2	- 9-13 2.4-4.2 8	- 7-15 0.5-18 5
	At 10 years	- 10-12|1-3 3-6 (20-30%) 3	- 13-25 4.5-9.8 10	- 7-15 2-22 10
	At 20 years	- X|9-12 4.5-10 (25-35%) 3	- 20-30 5-12 15	- 8-14 8-30 15
	At 30+ years	.2 X|9-12 12-20 (40-60%) 5	- 20-30 5-12 10	- 8-14 8-30 8-10

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In addition, and following the general discussion of the exercise, the following comments and suggestions were made:

- One group suggested age 15 and 25 instead of, respectively, 10 and 20;
- Another group mentioned that for the age class 30+ could be further disaggregated in the case of olive trees, since some olive groves reach much higher ages;
- Results for Olive trees should be disaggregated between intensive and extensive systems;
- Results as a function of plant density should also be presented as an additional variable. This is particularly relevant for olive groves and vineyards;
- Rather than doing a "visual approximation" of the default values, one group suggested that the defaults could be calculated as the median or an average. These should maybe be divided by age range, instead of a single value;
- Substitute "training method" by "training system";
- Citrus trees should be separated from remaining fruit trees, as they have different physical and biological characteristics, such as permanent leafs;
- The maximum age in above ground biomass should be no more than 20 years for fruit trees;
- Ideal default values for Olive groves should be further stratified. The main variables most likely to affect biomass values are: density (including differentiation between extensive, intensive and super-intensive); annual pruning vs. biannual pruning; and age;
- Data on chestnuts and walnuts should be removed from fruit tree category, as the trees are very different in size and shape from the other fruit trees and should not be considered in the same category;
- Ideal default values for Vineyards should be further stratified. The main variables most likely to affect dry matter values are: density; training system; and age;
- It would be preferable to present root-to-shoot ratios instead of below ground biomass;
- BGB: in absence of values for BGB or root-to-shoot, default values defined as averages of AGB values should be used rather than averages from BGB from other studies
- Ideal default values for root-to-shoot should include the effects of factors influencing root development; soil types (e.g., % of clay, existence of stones; etc.); and irrigation;
- The focus of the project should not be on an agreement on biomass values, but it should be on an agreement on the methodology for sampling instead;
- The National Statistics Offices from each Member-state will most likely have enough data on orchards to allow for the definition of a significant sample of trees where data collection could be focused on in future projects;
- Is necessary to include an estimate the standard deviation or the % of "uncertainty" of the data collected and produced;
- Is necessary to complete information and data on fruit categories;
- For future data collection priority should be given to more representative species and training systems in terms of area;
- The final report should explain data limitations for the proposed default values;
- Agree on a methodology to collect and refine biomass data
- More data/measurements is needed, especially for mature classes and to reflect differences in age, plant density, training system. A methodology to collect and refine biomass data should be proposed;
- Ideal default values for Fruit Trees should distinguish between different species. Ex, nut trees, citrus, apples, pears, etc.
- A scientific paper should be published containing the main results and gaps identified by the project. This publication would: reach a higher proportion of the scientific community and provide background/ rationale for research projects focused in addressing the gaps identified by the project. The Carbon Management journal, from Taylor & Francis was suggested as an option for such publication.

Agenda 5th of December	*Documents and Presentations Distributed at the Workshop*
15:55-16:30	**Other LIFE Projects dealing with topics relevant for MediNet** Participants representing other related projects were invited to share their project's experiences and to identify areas where possible cooperation with project MediNet could be reinforced. Two LIFE projects, Olive4Climate (Antonio Brunori) and ClimaTree (Kostas Bithas), and one Horizon 2020 project, Diverfarming (Raul Zornoza) presented their views.  *10 LIFE Olive4Climate.pdf* *11 LIFE Climatree.pdf* *12 H2020 Diverfarming.pdf*
16:30-17:00	**Closure of the Workshop and Next Steps** The workshop was closed with a note acknowledging and thanking all participants for their active engagement. It was agreed that a Workshop Summary Report would be produced distributed to all participants and posted on the project's website and that the MediNet reports on Activity Data and Biomass Data will be updated to reflect the contributions made during the Workshop. 

WS List of Participants

Country	Name
Cyprus	Melina Menalaou
FAO	Sandro Federici
France	Robert Colas
Greece	Angelos Mimis
Greece	Kostas Bithas
Greece	Myrsini Christou
Italy	Antonio Brunori
Italy	Giuseppe Montanaro
Italy	Guido Pellis
Italy	Lucia Perugini
Italy	Marina Vitullo
Italy	Paolo De Angelis
Italy	Tommaso Chiti
JRC	Simone Rossi
Portugal	Ana Pina
Portugal	Carlos Carvalho
Portugal	Carlos Lopes
Portugal	Clara Lopes
Portugal	Eduardo Santos
Portugal	José Paulino
Portugal	Lúcio do Rosário
Portugal	Paulo Canaveira
Portugal	Ricardo Vieira
Portugal	Sara Manso
Slovenia	Bostjan Mali
Spain	Borja Velázquez Martí
Spain	Carlos Miranda
Spain	Cristina Garcia
Spain	Magdalena Galvez
Spain	Mar Ferrero
Spain	Maria Jose Sanz
Spain	Paz Fuentes
Spain	Raul Zornosa

Annex IV: Project MediNet

Project focus

Improve the transparency, consistency, comparability, completeness and accuracy of cropland and grassland reporting of emissions and removals in Mediterranean Countries

Project objectives:

1. Compilation and systematization of existing knowledge and data with relevance for reporting croplands and grasslands emissions in Mediterranean conditions, in particular for mineral soil and above ground biomass of perennial crops
2. Sharing experiences and approaches in reporting croplands and grasslands emissions in Mediterranean conditions
3. Exploring the possible use of common methods and/or reference data and/or data sets for reporting purposes
4. Identifying information and research gaps
5. Enhance the participation and involvement of agriculture stakeholders in climate change mitigation and adaptation

Actions and means involved

To accomplish its objectives, MediNet will involve public Institutions and Universities from different countries in the Mediterranean basin working specifically on themes related to Agriculture and emissions and removals reporting. For this purpose, different Actions of the project will involve both the Institutions with the official responsibilities of reporting on Cropland and Grassland emissions and removals at National level, and the Institutions/Universities working in specific themes related to Grassland and Cropland management.

The establishment of the MediNet network, involving Italy and Portugal as beneficiaries of the project, and Spain, Greece, France, Malta, Cyprus, Croatia, Slovenia as stakeholders, will allow identifying, sharing and maximising the potential of existing knowledge that can be used for reporting purposes. The identification of gaps in data at National level and the adoption of solution to fill these gaps coming from the experience gained by other Mediterranean counties is an aim of the MediNet project. The main objective of the MediNet network is to increase the knowledge on the effect that different management activities applied to croplands (e.g. conventional agriculture, biological, reduced tillage, other) and grasslands (e.g. grazed, mowed, sown, other) have on the soil organic carbon (SOC) and biomass C stocks.

This represents a crucial and necessary point, needed to allow for an identification of new and more specific factors to be related to different management activities for cropland and grassland management in the Mediterranean area. As a result, more accurate, complete and consistent estimates of C gain and losses due to emission and removal from Cropland and Grassland will be provided at National level. The sharing of reporting experiences and of specific solutions for reporting (i.e., methodologies, activity data and emission factors) will also allow for increased comparability across Mediterranean Countries.

A preliminary action characterizes the Institutional arrangements (Institution and data provision) for each country involved in MediNet (Actions A.1). Subsequently, the preliminary Action A.2 will select the types of Management Systems for Cropland and Grassland to be used in subsequent Actions. The core of MediNet will be expressed through Actions A.3, A.4 and A.5, that will specifically identify the

type of data and methodologies present in the different Institutions/Universities necessary to report emissions and covering three main topic areas:

- Activity data for Cropland and Grassland under different management types and the area that is annually subject to a land use/management change: methodologies and data sharing;
- Assessment of the contribution of the above and below ground biomass of perennial crops to annual Carbon gains and losses: data available and gaps.
- Soil organic carbon stock and variations in mineral soils under different management options for Cropland and Grassland: data available and gaps;

To accomplish the purposes of MediNet, specific workshops will be held during the course of the project involving both the Institutions doing the emission & removal estimations and the Institutions/Universities working on Cropland and Grassland related themes. People from other LIFE and non-LIFE projects will be also invited so to possibly increase the exchange of data and of experiences. Specifically, the workshops will follow the specific themes treated in Actions A.3, A.4 and A.5, and will be focused on: a) Cropland and Grassland areas that are subject to a change in management; b) SOC data for the different types of management used in Cropland and Grassland; c) contribution of above ground biomass and deadwood from perennial crops. The workshops are included in the implementation Actions rather then in the communication Actions since they aim specifically at allowing for a wider exchange of data, rather than on communicating project results.

An important part of the project is devoted to increase project visibility and in sharing of information among partners and stakeholders. A project website (Action B1) will be created soon after the beginning of the project to specifically widespread information useful for stakeholders (e.g. Institutions) and the general public. To allow information to be spread widely a Facebook page with the LIFE logo will be also created allowing for a wider visibility of the proposed Actions and of the project results (Action B1). Twice per year, the status of the progress made on the different themes treated by the project will be published on the webpage.

Brochures reporting the results/decisions of the specific workshops will be made available soon after their conclusion on the project website. Networking with other projects will also represent an important part of the project (Action B2) allowing collecting information useful for the project.

A Farmer's day (Action B3 and B4) will be organized in each of the two countries (Italy and Portugal) to involve farmers and provide capacity building on agriculture and climate change, the opportunities for improved climate management practices in each of the Rural Development Programmes and share information on specific themes such has the effectiveness of the application of good managements practices (e.g. reduce tillage; organic fertilizers) aimed at soil conservation and to increase soil fertility. Questionnaires will be spread among farmers so to evaluate the uptake and quality of implementation of these practices. The involvement of stakeholders in those workshops, particularly farmers and/or their representative organisations, represents a crucial and fundamental part of the project. All the outputs of the farmer's day will be available on the website of the project (Action B1). A Layman's report (Action B5) and Board Notices (Action B6) will be also performed so to allow for a wider visibility of the project structure and its results, particularly among the general public.

Expected results

The main results expected at the end of the project are the following:

1. Increased knowledge on the soil organic carbon data for at least the top 30 cm (if possible 50 or 100 cm depth) of mineral soil for different crops/grassland management types from each Mediterranean country involved in MediNet. A database will be created to collect all the information correlating the average SOC content and stock to the different management activities applied for Cropland and Grassland.
2. Improved default emission factors in SOC as a result of land management change in Cropland and Grassland for use in Mediterranean conditions, to replace the IPCC tier 1 default factors and to increase the number of management practices that are currently used for reporting purposes at National level.
3. Increased knowledge on the contribution from the above ground biomass of perennial crops and from deadwood to annual emissions and removals. A database will be created to collect all the information and to relate the carbon in the above ground biomass of perennial crops to the different management activities applied for Cropland and Grassland.
4. Creation of a network of stakeholders to be used for monitoring the agriculture contribution to climate change in the Mediterranean area.