CLIMATE CHANGE MITIGATION THROUGH A SUSTAINABLE SUPPLY CHAIN FOR THE OLIVE OIL SECTOR

STANDARD FOR *SUSTAINABILITY CREDITS* FROM SUSTAINABLE OLIVE GROVE MANAGEMENT

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Assumption

The LIFE OLIVE4CLIMATE (Climate change mitigation through a sustainable supply chain for the olive oil sector) project proposes the olive-oil production chain as an effective tool for mitigation/adaptation to climate change, through voluntary action implemented by the olive growers. The project's activities have developed the following standard for the quantification and certification of sustainability credits obtained through the implementation of a series of best practices. The proposed best practices will reduce climate-altering emissions or increase carbon storage. Then, produced credits will be traded in a Voluntary Sustainability Credits market where the sellers will be the olive growers and the buyers, those one who want to reduce their CO_2 footprint.

This standard was developed taking into account similar and broader experiences existing on the Italian territory, first of all the “Codice Forestale del Carbonio” in English “Carbon Forest Code”, created to "stimulate a low carbon economy", as required by the EU 2020 Strategy. Carbon Forest Code proposes to forest owners and / or forest managers a scheme of good practices for the realization of projects useful for the generation of carbon credits in compliance with the international standards also recognized by the Italian state.

From this perspective, unlike in the Carbon Forest Code, this Standard for quantification and certification of sustainability credits deriving from the Sustainable Management of the Olive Groves also aims to stimulate voluntary activities to achieve the commitments entered into by our Country under the Kyoto Protocol and the future LULUCF national plans.

Unlike in the Carbon Forest Code, this standard foresees the *sustainability credits* generation instead of carbon credits, through the application of olive grove good practices, as well as the ability to contribute to climate change mitigation. The best practices proposed in the standard occur to the reduction of climate-altering emissions or to the increase in carbon sinks generating a series of ecosystem services also carried out in the fields of social and landscape welfare. Therefore, sustainability credits include larger quantified benefits through the unit of measurement of the tonnes of CO_2 equivalent. This also allows maximum transparency to prevent double counting of credits, ie their simultaneous use on the institutional and voluntary markets.

This standard for sustainability credits from olive grove management is therefore a document that aims to stimulate the main subjects involved in the olive oil sector to take part in a voluntary market considering the carbon sequestration carried out by projects developed at the level of olive groves and emission reductions achieved through good practices applied in them.

This standard was developed in an open, transparent, consultative and consensus-based process involving a broad representation of stakeholders

SCOPE

1 The standard aims are the quantification of sustainability credits, the identification of actions generating credits, the rules and controls necessary to make credible and transparent the credits calculation. The term “shall” is used to indicate the mandatory provisions. The term “should” is used to indicate not mandatory provisions which are expected to be adopted and implemented. The term “may” indicates permission expressed by this standard, and “can” refers to the ability of a user or to a possibility open to the user.

1.1 TERMS:

BAU	*business as usual*
CB	Certification body
CH_4	methane
CO_2	carbon dioxide
GHG	*Green house emission*
IPCC	*Intergovernmental Panel on Climate Change*
MARC	measure, avoid, reduce, compensate
N_2O	nitrous oxide
NMC	Nucleo Monitoraggio Carbonio
O4C	Olive for Climate
PD	Project document
SOC	organic carbon in soils
tCO_{2eq}	tonne of equivalent carbon dioxide
tCO_{2eq}	tonne of equivalent carbon dioxide
UNFCCC	*United Nations Framework Convention on Climate Change*

1.2 DEFINITION

1.2.1 Additionality

The proposed actions foreseen additional measures at the management level of the olive grove compared to the "business as usual" scenario (BAU). Olive groves owners who implement the proposed reduction actions will create a number of additional sustainability credits, respect to the reference scenario or baseline, which can be verified and then sold.

1.2.2 Equivalent Carbon Dioxide (CO2eq)

Unit of measurement used to compare greenhouse gases emission on the basis of their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed in "millions of metric tons of carbon dioxide (MMTCDE)". The carbon dioxide equivalent of a given gas is derived by multiplying the tons of gas emitted by the corresponding GWP. (Source: EEA, source: IPCC Third estimate report, 2001).

1.2.3 Eligible activities

Additional activities respect to regular practices (BAU) able to increase carbon reserves or reduce emissions.

1.2.4 Sustainability credit

The sustainability credit is a removal recognition (reduction) of emissions into the atmosphere due to the implementation of CO_2 compensation / absorption actions by the olive growers. The ton of non-emitted or absorbed CO_{2eq} into the atmosphere is the numerical indicator of the project environmental benefit. It has been developed for the first time in 2015 by PEFC Italy and CMCC (Euro Mediterranean Center for Climate Change) for the project “Patto per il clima” created for Raiano (Aq) municipality in Italy.

1.2.5 Carbon sink

“Any process, activity or mechanism removing greenhouse gases, aerosols or a precursor of greenhouse gases from the atmosphere. Carbon sinks (carbon sinks) are therefore activities, processes, or mechanisms of removal (and sequestration) of carbon dioxide (CO_2) from the atmosphere " (by UNFCCC (United Nation Framework Convention on Climate Change)).

1.2.6 Carbon stock

Total amount of carbon contained in a pool at a specific time. The units of measurement are mass. Carbon can be stored / sequestered in natural ecosystems as plant biomass (above ground or underground) or carbon into the soil as a result of decomposition.

1.2.7 Carbon Forest Code

Scheme of best practices for owners and / or managers of forest resources, created by INEA in 2016 (now CREA). Carbon credits generated by the practices application are in compliance with the international standards also recognized by the Italian State.

1.2.8 Scientific Committee

The Committee consists of experts identified among the following figures:

a) expert in system and / or product certifications;
b) expert in accounting for sustainability credits;
c) stakeholder representative with skills related to the project

The Committee's tasks are to:

a) Evaluate the effective need to reconcile the used buffer value, taking into account the risk assessment of individual projects, in order to verify the effective validity of the selected percentage. The buffer recalibration will consider the amount of credits lost by disturbances due to natural or anthropic events during the project period.
b) Update the calculation protocols, taking into account the new research updates;
c) Evaluate the inclusion of new project activities to generate sustainability credits, if required;
d) Verification and validation of the random checks method based on the results produced;
e) Establish a "Monitoring Plan" for the sale of ex-ante credits;
f) Meet annually in order to carry out the standard procedures provided in this manual; meet in extraordinary cases in case of urgent need for standard revision due to new production and trade rules of sustainability credits.

1.2.9 Project Document

The project document (PD) defines the general vision, objectives, scope, organization and execution plan. This standard is in line with the provisions of the Carbon Forest Code, requiring the provision of a Project Document containing the following minimum information for each activity put into practice to produce credits exchanged in the voluntary market:

- eligibility (dates, legal aspects, additionality);
- project area boundaries georeferencing;
- project governance and management (registration, management plan and monitoring);
- carbon sequestration (including permanence risks assessment);

The PD must include all information useful for identifying the area, the way in which the project is managed and the environmental and social characteristics. The PD and the related annexes must to be easily accessible and public will be made available on the network by the market operator.

1.2.10 *Leakage*: environmental Impact

Credits can be lost as a result of indirect or direct carbon emissions occurred outside the project boundaries.

1.2.11 Permanence

Credits certification requires the permanency of carbon sequestration activity over the time. The applied protection is based on the principle of a "buffer". Buffer provides for the non-marketable provision of a portion of credits produced, in order to cover unexpected losses of carbon due to extraordinary events.

1.2.12 Sustainability credits quantification

Credit calculation methodologies refer to emission or absorption factors derived in the most conservative way possible from the scientific literature. Factors applied to the reference surface of the activities carried out will provided conservative mitigation potential of each identified action. That are conservative estimation producing a lower evaluation than the real potential for carbon emissions reduction or absorption.

2 Minimum Requirements

Who intends to verify and receive a certification through this standard must put into practice all the actions necessary to satisfy the following requests and demonstrate their application by the documentation called Document of Project (DDP).

2.1 Additionality evidence:

Additionality can be demonstrated with the Legal test and one of the 3 of the following tests:

I. Common Practical Tests (optional): the project does not represent an ordinary, widespread and widely practiced activity. It is necessary to demonstrate (through the campaign booklet or through the purchase invoices or equivalent documentation) the practice has not been implemented in the terms and quantities set out in this document in previous 5 years.

II. Investment Test (optional): the project would not have been developed without the financial contribution of credits, with the exception of areas affected by natural disasters (eg floods or earthquakes). In cases where there are barriers hindering the project activities implementation, the Investment Test can be replaced by the Test Barriers.

III. Test barriers (optional): To demonstrate how without the realization of the project activities it is not possible to overcome the barriers that hinder its realization (for example technical barriers).

Legal Test: project is not compulsory to current legislation or project must make reductions in emissions or increase in absorptions higher than those required by current legislation.

2.2 Buffer

The amount of saved credits is a pre-established credit percentage equal to 10% of the total (see paragraph 1.2.11). This value takes into account the incidence of risk related to what has occurred at national level in the olive groves in the last 5 years, a returning time corresponding to the duration of the stay of the credit.

2.3 Unfounded *leakage risk*

Must be demonstrated that the application of the activities proposed by this standard have no negative impact outside the project area (*leakage*)

2.4 Document and Inspection

The olive grove manager is obliged to send / prepare the necessary documentation (PD Project Document) to verify the credit generation. Full cooperation will be offered in case of an inspection visit by the Monitoring Body. The PD must report the following information:

the starting date, the credit period and the project duration (credit period for the activities 1 and 2 of the list of eligible activities is 9 years while the activities 3, 4 and 5 of 20 years)

the project activity (must be part of the eligible activities defined by the standard for certification of sustainability credits O4C)

a) If the manager is also the owner of the area

b) Geographical coordinates of the project area boundaries

c) Demonstrate the additionality of the project activities compared to the business as usual (BAU), according to the following legal test (mandatory) and one of the three optional tests (Common, Investment, Barriers)

d)

e) Respect the permanence of credits using the sales buffer

f) Document immediately the occurrence of events that compromise or limit the permanence of the carbon stock, by means of written communication attached to the Manual

g)

h) Demonstrate the absence of the risk that some of the activities foreseen by the project could determine indirect or direct losses (leakage) of carbon, in terms of CO2 emissions, also outside the area strictly affected by the project

i) Provide periodically evidence demonstrating the real and correct realization of the activity (Field Manual)

j) Transfer the obligations related to this contract to the new owner / manager, in the case of transfer of all or part of the property or management.

3 How to estimate sustainability credits

The unit of measurement used is the tonne of equivalent carbon dioxide (tCO_{2eq}).

This manual for quantification and certification of sustainability credits (product) uses a methodological approach following the Intergovernmental Panel on Climate Change guidelines (IPCC 2006). IPCC is the reference body for the UN Climate Change Convention scientific climate change and methodological guide for the measurement, estimation and calculation of greenhouse gases for national inventories. As far as possible, the emission factors applied by Italy in its National Greenhouse Gas Inventory has been used.

If none of the approved methodologies can be applied, the participants will be able to propose a new method for approval and only once the methodologies have been approved, it will be possible to proceed with the following phases.

4 Proposed activities

1) Making new olive orchard
2) Reduction of chemical fertilizer
3) Pruning used as energy production;
4) Pruning used as soil improver;
5) Green Cover;
6) Minimum tillage.

4.1 Making a new olive orchard

The activity consists in the construction of a new olive grove on abandoned land, not used or previously used as arable land or pasture. This would allow an increase in carbon pools, with a consequent increasing in CO2 absorption from the atmosphere, compared to the Business as Usual (BAU)

This transaction generates an increase in the absorption of CO2 around 3.69 tons of CO2 / ha / year if both above ground biomass and soil pools are considered. However, only an half of the credits generated annually can be used for the purpose of a conservative approach (last column table).

	Produced credits in 20 years ($t CO_2$/ha/anno)			**Usable credits in 20 years ($t CO_2$/ha/anno)**		
	Above ground biomass	**Soil**	**Total**	**Above ground biomass**	**Soil**	**Total**
Olive	2.59	1.1	3.69	1.29	0.57	1.84

Conditions of applicability. To access to this activity, in order to comply with the principle of additionality with respect to Business as Usual (BAU), it is necessary to demonstrate through orthophotos (or photos) or equivalent documentation that the new plant is built on abandoned, unused or previously used as arable land or pasture, for a period of at least 5 years. Sustainability credits deriving can be sold annually, starting from the end of the first year of activity after being actually generated. In order to verify the effective reduction, it is necessary to prepare a monitoring plan that provides annually for the collection of the documents, such as orthophotos (or photos) or equivalent documentation.

Minimum duration. The project duration for this activity corresponds to a minimum time of 20 years, when the maintenance of the plant must be guaranteed.

Applied methodology. IPCC, 2006 - Vol. 4 chapter 2 - Eq. 2.10 for biomass and 2.25 for soils

Data Sources Carbon data in soil from literature (CARBIUS Project Report, 2005; Facini et al., 2007, Sofo et al., 2005, Freibauer et al., 2004).

4.2 Chemical fertilizer reduction

According to the National Integrated Production Guidelines 2018, to containing water pollution due to the excess of fertilising elements, the maximum quantities of nitrogenous fertilizers that can be used for the olive cultivation are defined. In order to increase sustainability, a 15% reduction compared to the values reported in the National Integrated Production Guidelines 2018 is proposed.

	Used fertilizes kg N/ha		**Fertilizer reduction (15%) kg N/ha**	**Generable Credits t CO_2/hectar/year**
Olive tree	Medium/Low production	40	35	**0.03**
	High production	80	69.5	**0.07**

Conditions of applicability. In order to access this activity, in order to comply with the principle of additionality with respect to the Business as Usual (BAU), it is necessary to demonstrate its effectiveness through the legal tests and one of the three tests proposed in the Demonstration of additionality (chapter 2.1).

Minimum duration. The minimum commitment duration of this activity is 9 years.

Applied Methodology IPCC, 2006 - Vol. 4 chapter 11 - Eq. 11.1; 11.9; 11:10

Data source National Integrated Production Guidelines 2018.

Emission factors IPCC (2006)

4.3 Management of pruning residues for energy

A change in the use of pruning residues annually generable compared to the Business as Usual (BAU) in favor of energy production is proposed.

Species	Annual Pruning (t d.m./ha)	Energy production from biomass (kW/ha/year)	Avoided emission (t CO_2/ha/year)
Olive tree	1.7	8,502	3.49

Conditions of applicability. To access this activity, in order to comply with the principle of additionality with respect to the Business as Usual (BAU), it is necessary to demonstrate its effectiveness through the legal tests and one of the three tests proposed in the Demonstration of additionality (chapter 2.1).

Minimum duration. The minimum commitment duration of this activity is 9 years.

Applied methodology CO_2 avoided emissions thanks to the use of waste biomass for energy purposes has been calculated by applying the coefficient of the calorific index of olive biomass (ENEA 2008) and of the emission factor related to the national thermoelectric industry (ISPRA, 2011)

Data source Biomass data from literature

Emission factors ISPRA (2011) and ENEA (2008)

4.4 Use of pruning as soil improver

A change is proposed in the use of pruning residues annually generable with respect to the Business as Usual (BAU) in favor of their burial for the soil C increase.

Species	Annual pruning (d.m./ha)	SOC change t C/ha/year	Generable Credits t CO_2/ha/year
Olive	1.7	0.16-0.4	0.59 - 1.47

Conditions of applicability. To access this activity, in order to comply with the principle of additionality with respect to the Business as Usual (BAU), it is necessary to demonstrate its effectiveness through the legal tests and one of the three tests proposed in the Demonstration of additionality (chapter 2.1).

Minimum duration. The project duration for this activity corresponds to a minimum time of 20 years. This time is in compliant with the average time required to achieve the carbon balance in soils (20 years) identified by default by the IPCC (2006).

Applied Methodology IPCC, 2006 - Vol. 4 chapter 2 - Eq. 2:25

Data source Land carbon data from literature (Freibauer et al., 2004; Triberti et al., 2008; Bos et al., 2017)

4.5 Green Cover

An extension of the practice of permanent embedding to all the land both flat and sloping is proposed. Permanent and natural grassing (to be preferred) provides a soil covering for the entire vegetative cycle.

Pratice	**SOC Variation t C/ha/year**	**Generable Credits t CO_2/ha/year**
Green covering	0.32 - 0.6	**1.17 – 2.20**

Conditions of applicability. To access this activity, in order to comply with the principle of additionality with respect to the Business as Usual (BAU), it is necessary to demonstrate its effectiveness through the legal tests and one of the three tests proposed in the Demonstration of additionality (chapter 2.1) and also that:

• permanent cultivation not find in soils with average gradients between 10% and 30% and with rainfall of more than 500 mm / year, for which soil already exists a requirement for grassing in the autumn-winter period;

• permanent cultivation not find on flat land or slopes of more than 30% for which already exists a requirement for grassing;

Minimum duration. The project duration for this activity corresponds to a minimum time of 20 years. This time horizon is in compliant with the average time required to achieve the carbon balance in soils (20 years) identified by default by the IPCC (2006).

Applied Methodology IPCC, 2006 - Vol. 4 chapter 2 - Eq. 2:25

Data source Land carbon data from literature (Freibauer et al., 2004; White Paper, 2012; Poeplau and Don, 2015).

4.6 Minimum tillage

A reduction of soil workings, or "minimum tillage" in which a substantial part (at least 30%) of the soil is not worked and remains covered by the residues of the previous crop is proposed. In the context of sustainable agricultural practices, an extension of the application of the

practice of reduction of work to all land both flat and sloping is proposed. The solutions proposed are:

- simple surface processing with disc harrow or 8-20 cm deep milling;
- milling or working with a disc harrow only on the row (strips from 5-10 to 20-30 cm) leaving the inter-row intact where the depth reached varies from 30 to 5 cm.

Pratice	**SOC Variation t C/ha/year**	**Generable Credits t CO_2/ha/year**
Minimum tillage	0.15 - 0.3	0.55 - 1.10

Conditions of applicability. To access this activity, in order to comply with the principle of additionality with respect to the Business as Usual (BAU), it is necessary to demonstrate its effectiveness through the legal tests and one of the three tests proposed in the Demonstration of additionality (chapter 2.1) and also that:

• the minimum tillage practices have not been applied in the previous 5 years;

• there is no minimum tillage requirement for that land.

Minimum duration. The project duration for this activity corresponds to a minimum time of 20 years. This time horizon is in compliant with the average time required to achieve the carbon balance in soils (20 years) identified by default by the IPCC (2006).

Applied Methodology IPCC, 2006 - Vol. 4 chapter 2 - Eq. 2:25

Data source Land carbon data from literature (Freibauer et al., 2004; White Paper, 2012)

Bibliography

Bos J.F.F.P., Hein F.M. ten Berge, Jan Verhagen, Martin K. van Ittersum. (2017). Trade-offs in soil fertility management on arable farms, Agricultural Systems, Volume 157, Pages 292-302, ISSN 0308-521X. https://doi.org/10.1016/j.agsy.2016.09.013.

Brotto L., Corradini G., Maso D., Portaccio A., Perugini L., Pettenella D., Storti D., Maluccio S. e Romano, R. (2016). Stato del Mercato Forestale del Carbonio in Italia 2016. Nucleo Monitoraggio del Carbonio, CREA, Rome.

CARBIUS 2005. Papale D, Castaldi S, Ciccioli P, Corona P, Di Tizio A, Masci A, Miglietta F, Reichstein M, Vannini A, Va-lentini R, 2005. Assessment of full carbon budget of Italy: the CarbIUS project. Conference Proceedings. Fourth Annual Conference on Carbon capture and sequestration DOE/NETL May 2-5, 2005.

ENEA, (2008). Energia dalle biomasse. Tecnologie e prospettive. Roma, pp. 135

Facini O., Georgiadis T., Nardino M., Rossi F., Maracchi G., Motisi A. 2007. Il contributo degli impianti da frutto all'assorbimento della CO2 atmosferica. Clima e Cambiamenti Climatici: le attività di ricerca del CNR, pag 665-668, 2007.

Freibauer, A., Rounsevell, M.D.A., Smith, P., Verhagen, J. (2004): Carbon sequestration in the agricultural soils of Europe. Geoderma 122, 1-23.

Gruppo Tecniche Agronomiche DM 4890 del 8/05/2014. (2017) LINEE GUIDA NAZIONALI DI PRODUZIONE INTEGRATA 2018 - sezione tecniche agronomiche Rev. 2 del 25 10 2017

IPCC 2006, (2006) IPCC Guidelines for National Greenhouse Gas Inventories. Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan.

ISPRA, (2011). Produzione termoelettrica ed emissioni di CO_2. Fonti rinnovabili e impianti soggetti a ETS. ISPRA, Rapporti 135/2011.

Libro Bianco, (2012). Sfide e opportunità dello sviluppo rurale per la mitigazione e l'adattamento ai cambiamenti climatici. pp 302. Rete Rurale Nazionale 2007-2013.

Nucleo Monitoraggio Carbonio INEA, (2016). Codice Forestale del Carbonio 2016.

Poeplau, C., Don, A., (2014). Carbon sequestration in agricultural soils via cultivation of cover crops – A meta-analysis. Agriculture, Ecosystems and Environment 200, 33-41.

Triberti L., Anna Nastri, Gianni Giordani, Franca Comellini, Guido Baldoni, Giovanni Toderi. (2018) Can mineral and organic fertilization help sequestrate carbon dioxide in cropland? European Journal of Agronomy, Volume 29, Issue 1, Pages 13-20, ISSN 1161-0301. https://doi.org/10.1016/j.eja.2008.01.009.