LIFE Project Number

<LIFE14 CCM/GR/000635>

Progress Report[1]

Covering the project activities from 1/07/2018 to 31/10/2019

Reporting Date[2]

<30/11/2019>

LIFE PROJECT NAME or Acronym

<LIFE CLIMATREE>

Data Project

Project location:	
Project start date:	<16/07/2015>
Project end date:	<28/06/2020>
Total budget:	€
EU contribution:	€
(%) of eligible costs:	60%

Data Beneficiary

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Project Website:	http://www.lifeclimatree.eu/

[1] Progress Report without any payment request (for Progress Reports with payment request, use the Mid-term Report template)

[2] Include the reporting date as foreseen in Form C2 of Annex II of the Grant Agreement or as modified in agreement with EASME

Section 1 - Overall assessment of the achievements and as to whether the project objectives and work plan are still viable (2 pages max)

While all CLIMATREE actions have been progressing according to the amended time schedule the reporting period focused on three major objectives:

- To finalize the Model of C3 Action as well as the Algorithm of C4 Action that both permit assessment of the CO2 removal capacity of tree cultivations
- To progress the e-tool that incorporates the Model and the Algorithm
- To initiate the final stage of the dissemination strategy

We summarize the progress achieved in the regard to three objectives as well as the progress of the remaining Actions in brief.

The CO2 sequestration model and the CO2 Removal capacity algorithm

The Model

The core of the project is the development of a new methodology permitting the estimation of CO2 balance of tree cultivations. As defined in the Madrid meeting the scope of this methodology is the feeling of an existing gab between two relevant methodologies. The IPCC-based methodology examines the tree cultivation as three poll-resources of CO2: biomass, soil and detritus. The physiology of the tree and of the orchard is the major subject. This methodology, serving CO2 reporting objecting at the aggregate level -NIRs-, cannot be used for evaluating different cultivation-management practices based on their CO2 balance. Indeed, emissions arising from cultivation practices are not accounted at the farm level in the IPCC-based methodology; these variables are accounted as components of the energy and transport sectors. Life Cycle Assessment (LCA) methods are exploited to evaluate the CO2 emissions induced by certain methods. On the other hand, standard CCA methods, when applied in farms, do not consider the potential CO2 pools: biomass, soil, detritus. In this context, CLIMATREE attempts to exploit both IPCC-based and LCA methodologies in order to assess the actual CO2 balance of tree cultivation. The Model developed by C3 Action incorporates the pools of CO2 while the algorithm developed by C4 Action represent both the pools and the sources of CO2 from cultivation practices. During the reporting period the model of C3 Action has been developed and a web-based application has been designed. Specifically, the web-based model is a spatio-temporal model incorporating the three CO2 pools for all different tree crops. The CO2 sequestration is calculated yearly for regions (NUTS 1,2,3) in Italy, Greece and Spain. The pools consist by biomass, debris and soil. The biomass will include the tree above ground and the roots. The debris includes plant residues through pruning and the fruit products left on the field. Finally, soil is fed through roots and debris and for that purpose, an implementation of RothC is used. The data required for a model run in the web-based version, are a specific region of Italy, Greece or Spain (at the level of Nuts 1, nuts 2 or 3), the area (ha), the tree crop type, the density of the trees (trees/ha), the yield (T/ha) and whether the soil is vegetated and the litter is left on the field. The results are reported in T/ha for each of the cases the user has requested a calculation, for each pool and yearly for the next 50 years.

CSIC updated the data available for the conversion factor to estimate CO2 accumulation in woody tissues for Spain. In order to do so samples have been collected in the selected orchards and within the Region of Murcia and taken to the laboratory analysis for fractioning dry matter into the individual compounds. The results can be downloaded in xls format for further use. The model has been fully developed and it is in the process of final changes.

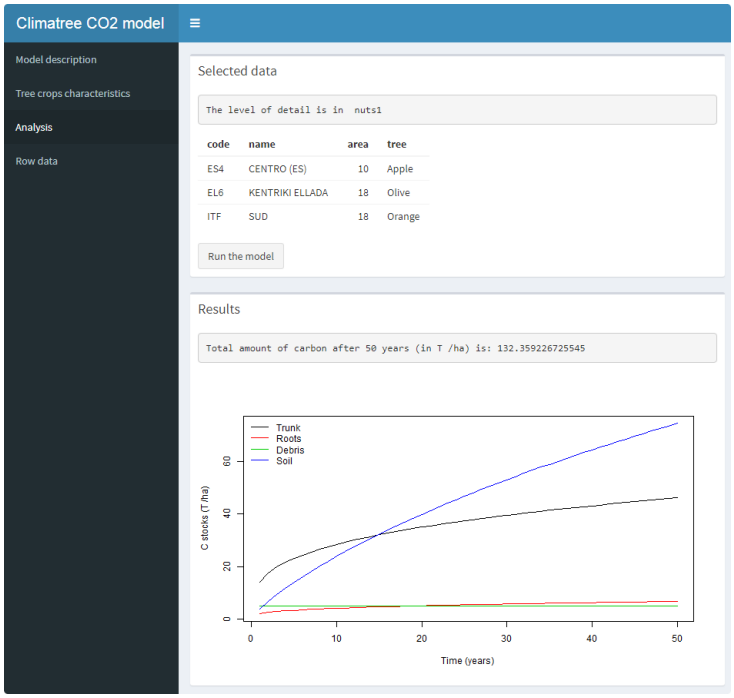


Figure 2. A view of the total results produced by the climatree model.

The Algorithm

During the reporting period, the design of the tree crops CO_2 Removal Capacity Algorithm was completed and the data/ coefficients of the back-end data base that supports the operation of the Algorithm were finalized.

It has to be noted that the title of the Algorithm changed from CO_2 Removal Potential Algorithm to CO_2 Removal Capacity Algorithm after a fruitful discussion that took place between I. Spanos and Prof. Lučka Kajfež Bogataj (Nobel Peace Prize Winner 2007, Former Vice-Chair of the IPCC, University of Ljubljana) after Spanos' presentation of the Algorithm during the CLIMATICO 2019 Conference (Limassol, Cyprus 11-12.4.2019).

The pending issues that were reported in the previous (2nd) Progress Report (completion of back-end data base, development of the pesticides and the soil sections, trial operations) were completed.

Moreover, there were some significant improvements in the conceptual design of the Algorithm by introducing the CO_2 gain from the use of prunings as a wood fuel for heating purposes (acknowledged, e.g. by UN FAO, as a climate change mitigation measure) in activities outside the farm as well from the use of in-field Renewable Energy Sources to cover the electricity needs of the farm.

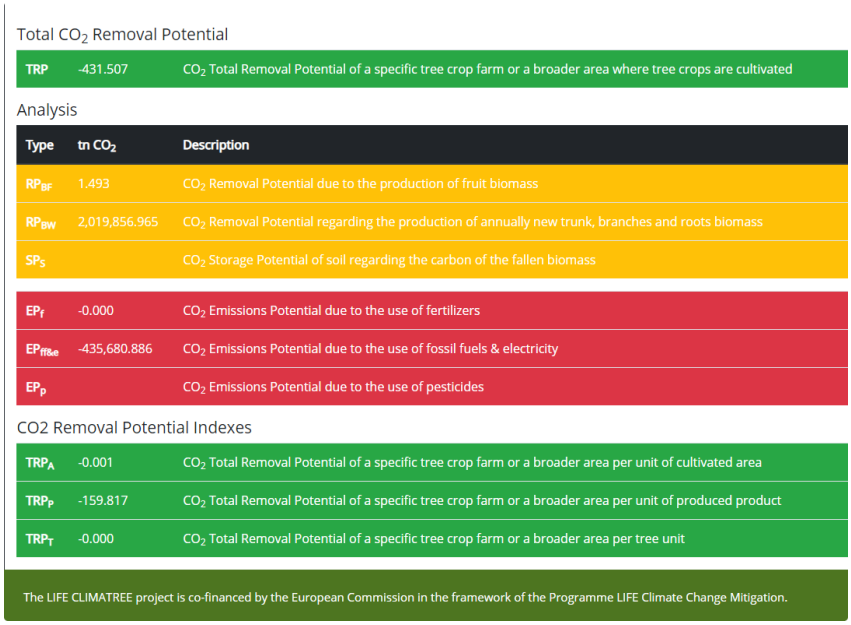
The excel v.29 version is considered as the final one and it is scheduled to be uploaded on the project website as r.1 version (release 1) within November 2019, as soon as the translation of the user interface (first 2 sheets) to Greek, Italian and Spanish is completed.

At this point it has to be underlined that although the CO_2 Removal Capacity Algorithm and its excel tool are completed, any potential future feedback, comments or suggestions by users of the tool will be analyzed, assessed and taken into account if appropriate towards the direction of potential improvements of its performance. This procedure will be a dynamic one and will be continued until the end of the project and further beyond during the After-LIFE period.

The web e-tool.

The web tool based on the algorithm of Action C4 which calculates yearly the CO2 balance in terms firstly of the removal potential of the production of new trunk, branches and roots biomass, the production of fruit biomass and the storage potential in soil due to the fallen biomass and secondly on the emission potential due to the use of fertilizers, fossil fuel and electricity and use of pesticides. The dataset required to run a calculation is the specific region in a country of the study, are the area (ha), the tree crop type, the density of the trees (trees/ha), the yield (T/ha) and the percentage of the trees in juvenile phase. These values are automatically fed by the database created by the national statistics in each country. Further, information is required on the lt of diesel, gasoline and electricity consumed and, on the management, practices concerning the pruning. Finally, the amount of fertilizers is required. In the results the input data are reported together with the total CO2 removal potential in total and in each corresponding category. The calculations are saved for future reference and can be edited and the removal potential re-calculated.

The tool has been fully developed and it is in the process of testing and making the final changes.



Total CO_2 Removal Potential

TRP	-431.507	CO_2 Total Removal Potential of a specific tree crop farm or a broader area where tree crops are cultivated

Analysis

Type	tn CO_2	Description
RP_{BF}	1.493	CO_2 Removal Potential due to the production of fruit biomass
RP_{BW}	2,019,856.965	CO_2 Removal Potential regarding the production of annually new trunk, branches and roots biomass
SP_S		CO_2 Storage Potential of soil regarding the carbon of the fallen biomass
EP_f	-0.000	CO_2 Emissions Potential due to the use of fertilizers
$EP_{ff\&e}$	-435,680.886	CO_2 Emissions Potential due to the use of fossil fuels & electricity
EP_p		CO_2 Emissions Potential due to the use of pesticides

CO2 Removal Potential Indexes

TRP_A	-0.001	CO_2 Total Removal Potential of a specific tree crop farm or a broader area per unit of cultivated area
TRP_P	-159.817	CO_2 Total Removal Potential of a specific tree crop farm or a broader area per unit of produced product
TRP_T	-0.000	CO_2 Total Removal Potential of a specific tree crop farm or a broader area per tree unit

The LIFE CLIMATREE project is co-financed by the European Commission in the framework of the Programme LIFE Climate Change Mitigation.

The progress of the C3, C4 Action permit now the evaluation of different cultivation methods.

The tree crops CO_2 Removal Capacity Algorithm (the excel tool) is used to run alternative cultivation scenarios by modifying specific parameters (e.g. use of pesticides, fertilizers, fossil fuels, electricity, management of prunings, etc.). The analysis of the results of these runs leads to important conclusions regarding the CO_2 removal capacity of the tree crops farms, the potentials for decreasing the CO_2 emissions due to the cultivation practices and the increase of the environmental performance of these cultivations. Based on these conclusions, measures and policies suggestions are developed towards climate change mitigation while simultaneously enhancing the feasibility of the tree crops agricultural sector through financial incentives and exploitation of the CO_2 removal capacity potential of the specific sector.

Preliminary results have been presented (a) to Spanish stakeholders during the 21.3.2019 Workshop took place in Madrid, and (b) to the Hellenic Ministries of Environment & Energy and Agricultural Development via a series of working meetings at political and technical level. Based on the feedback of these stakeholders, the policies to be finally proposed were improved and finetuned.

C5 Action: Suggestions of Climate Change Mitigation policies and measures

The above findings feed C5 Action which traces relevant Mitigation policies and measures.C5 traced the fundamental principles that could be incorporated in the agriculture policies at the national and regional level to promote the mitigation potentials of tree cultivations. Now, C5 attempts a more detail analysis of these principles and seeks ways to incorporate them within the existing and the forthcoming CAP. Furthermore, C5 examines the use of quasi innovative framework such as voluntary markets in order to create incentives. During the reporting period C5 developed a framework for a monetary valuation of CO2 absorption by Tree cultivations. Alternative and mean full values, assigned to CO2 removals, could be now used for the monetary evaluation of the positive

externality provided by tree cultivations. This attempt is linked end tested with the progress of D2 Action. D2 Action attempts the definition of CO2 monetary value for olive trees absorption capacity in Greece. D2 is based on an extensive summary research which has been accomplished within the reporting period.

D1 Action: Evaluation of the effectiveness of the proposed policies and measures

The D1 Action is committed to the evaluation of the policy for the ClimaTree's "best cultivation practices" (BCP) to help climate change mitigation considering also the strategies descripted in the C1 Action deliverable “Best Available Practices Guide for Tree-Crops Carbon Sequestration.”
The performance of suggested policies will be based on the following indicators:
- Impact of reduction of Greenhouse Gas (GHG) emissions
- Improve the potential of agricultural tree crops land use as carbon sink area

The approach to be used will be a comparative analysis of CO2 fluxes between “conventional” and “Climatree_BCP) showing potential practices that will be encouraged/discourage through appropriate policies as developed in C5 Action. Here below a preliminary exercise that will be implemented. Dicem is completing the recruitment of a post-graduated fellowship to be involved in the development of the D1 Action.
The example below shows a relatively small difference (or even comparable) in term of amount of diesel used (and in turn CO2 emissions) in the two scenarios, however interpretation of the effectiveness of practices will be performed considering the impact of the practices on C sequestration.

CLIMATREE BCP	
	Kg DIESEL PER YEAR
pest/disease spray	100.20
compost distribution	40.08
mulching of winter pruning residues	33.40
mulching of summer pruning residues	25.05
cover crops mowing	50.10
Harvest	80.16
TOTAL	**328.99**

CONVENTIONAL	
pest/disease spray	100.20
mineral fertilisers distribution	20.04
soil tillage to cover mineral fertilisers	20.04
moving pruning residues outside the orchard	26.72
soil tillage	53.44
mulching of summer pruning residuals	33.40
harvest	80.16
TOTAL	**334.00**

D2 Action: Assessment of socioeconomic impact of project's outputs

An extensive survey research has been contacted with major objective to assign monetary value at the positive externality arising from the absorption of CO2. The survey research adopts a scenario of a mitigation relevant cultivation method for olive trees and assess the monetary value of the regulatory ecosystem service of CO2 sequestration.

D3 Action: Assessment of the impact of the proposed methodology in supporting the ecosystem function restoration

Attended a relevant and representation case study in Spain. An analysis of potential CO2 carbon removal by promoting the plantation of woody perennial crops in the area of Murcia was initiated. This includes an area currently cultivated with horticultural crops and different scenarios were taken into account.

In the already established areas planted with perennial crops, an initial work to consider the impacts of using cover crops to promote the whole orchard carbon fixation was carried out. Data from on-going field demonstration trail comparing bare soils with cover crop was taken as a starting point for the ecosystem function restoration analysis.

E3 Action: Dissemination of project's progress and results

Two pilots underline the dissemination strategy of CLIMATRRE: first, the communication of the project findings to the decision makers and high-status stakeholders (those which are able to influence a great number of stakeholders). Second, the diffusion of the results to scientists (mainly agronomists) and regional authorities. The first objective has been pursued through the following activities:

- Model meeting with the participation of high-level stakeholders from Spain
- Meeting with the Greek ministry of Agriculture (minister and its supporting authorities)
- Presentation of LIFE CLIMATREE project on 4/10/2019 to K. Kadis, Gypriot minister of Agriculture
- Communication with the Bank of Greece which has developed clime policy actions; for exploiting potentials for collaboration
- Collaboration with the Greek Center for Agricultural Research (ELGO DIMITRA) for functionally incorporation of CLIMATREE results in its formal educational activities.
- Meeting with the Greek ministry of the Environment and climate change

The second objective has been pursued through potential in high number of events with the following list indicated some of them:

1. Sotiropoulou R.E.P., I. Stergiou, and E. Tagaris, Projection of future changes in climate in the Mediterranean Region, European Geosciences Union (EGU), General Assembly 2017, Vienna, Austria, April 2017

2. Sotiropoulou, R.E.P., J. Stergiou., E. Tagaris, High-resolution downscaling of climate projections for temperature and precipitation over the Mediterranean Region, 14th International Conference on Meteorology, Climatology and Atmospheric Physics, COMECAP, Alexandroupoli, October 2018
   Sotiropoulou, R.E.P., J. Stergiou., E. Tagaris, Comparison of precipitation change projections between two RCPs over Southern Europe, European Geosciences Union (EGU) General Assembly 2019, Vienna, Austria, April 2019
3. Oral presentation of LIFE CLIMATREE project on 8/9/2019 at AGROTICA International exhibition by Prof. S. Haroutounian
4. An article devoted to this presentation was appeared as highlighted subject in the middle frame page of AGRENDA newspaper of 24-25/9/2019
5. Article for LIFE CLIMATREE which will be appeared in the forthcoming issue of Tripotlemos (AUA journal distributed free to all Academic and Agricultural stakeholders of Greece)
6. Project Coordinator Prof. K. Bithas presented the "Novel aspects for accounting & monitoring carbon sequestration of tree crops in the Mediterranean; Environmental and Economic Benefits" at the 2nd Euro-Mediterranean Conference for Environmental Integration (EMCEI-2), which took place in Tunisia (10-13 October 2019).
7. Angelos Mimis from UEHR presented the "Novel approaches for accounting & monitoring carbon sequestration and the socioeconomic impacts of tree crops in Southern Europe" at the "IATRC - EU Summer Symposium, which took place in Seville, Spain 2019 (23-25 June 2019).
8. CLIMATICO 2019, 11-12.4.2019, Limassol, Cyprus

   EFITA 2019, 27-29.6.2019, Rhodes, Greece.

Details can be found in the site of CLIMATREE.

Section 2 - Identified deviations, problems and corrective actions taken in the period (max 2 pages)

No significant obstacle that creates a deviation from the amended time – schedule has occurred. Remarkably, the progress of CLIMATREE, after its prolongation, permit the delineation of a more rigorous Key Project Indicator which incorporates its rationale and attempts an evaluation of the strategic achievements of the project: the assessment of the mitigation potentials of tree crops. The Key Project Indicator will reflect the mitigation potentials estimated for the 3 countries, the tree crops, at 2020 as well as 5 years after the end. The mitigation potentials will be estimated for the existing cultivation methods and these potentials will be compared with these from those basing in the existing IPCC – based methods as applied at Tier 1 level in the three countries. Any difference reflects potential improvement in the CO2 accounts incorporating knowhow developed by CLIMATREE. Furthermore, the mitigation potentials will be estimated for the more effective (best) cultivations practices. They can be compared with the current CO2 balance and CO2 removal gains can be defined. This key indicator can be enriched by examining scenarios concerning land use changes.