European Network for Rural Development

PRATI_CO Parmigiano Reggiano: Agrotecnica organic carbon footprint

EAFRD-funded projects

PRATI-CO is an EIP-AGRI Operational Group project dedicated to the study of good agricultural practices recommended for the preservation and maintenance of organic matter in the area which is famous for the production of Parmigiano-Reggiano cheese.

ITALY

Carbon conservation & sequestration

Location
Bologna

Programming period
2014 – 2020

Priority
P5 – Resource efficiency & climate

Measure
M16 - Cooperation

Funding (EUR)
RDP contrib. 168 284.32 (100% EAFRD funded)

Project duration
2016 – 2019

Project promoter*
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Website
https://www.pedologia.net/it/PRATI-CO/cms/Pagina.action?pageAction=&page=InfoSuolo.37&localeSite=it

Summary

The Kyoto protocol established that the organic substances represent the main reserve of carbon in the continental biosphere (source of CO_2/carbon sink). Permanent meadows represent important capture sites for carbon and are synonymous with biodiversity.

They are also symbolic of the rural landscape between Reggio Emilia and Parma, which is the area that is famous for the production of Parmigiano-Reggiano cheese. The permanent meadows in the area produce excellent fodder for cattle feed, which contributes to the characteristic scents and aromas of the famous Parmesan cheese. The PRATI-CO project is dedicated to the study of good agricultural practices recommended for the preservation and maintenance of organic matter.

Results

The data collected showed that the accumulation of carbon in the soil of alfalfa meadows was similar to that of other rotating crops, however the accumulation was almost doubled in the case of permanent meadows.

Guidelines and training have been made, developed and delivered by the Operational Group.

Lessons & Recommendations

- The project demonstrated that agriculture and food production, despite their contribution to climate change through the emissions of GHGs, can also be part of the solution, by helping to mitigate climate change though climate smart agricultural practices and carbon storage.
- The project also relied on an innovative approach, collecting data resulting from the use of isoflow maps which have shown a certain trend of permanent meadows to release a greater amount of CO_2 emissions in conditions of higher humidity/greater content of organic matter in the soil. Isoflow mapping should be regarded as an essential tool to fully estimate and maximise the contribution of the soil to carbon storage and to adjust the climate smart soil management practices to the different weather conditions and temperatures.

* The Project promoter/beneficiary is an EIP-AGRI Operational Group (https://ec.europa.eu/eip/agriculture/en)

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Context

The European Commission's working group 'Organic Substance and Biodiversity' highlights the importance of monitoring the soil in order to improve the make up of the organic matter. They underline its role and the consequences of its decrease; develop harmonised methods to measure/monitor organic carbon in the soil; and detail the processes which lead to its impoverishment.

Permanent meadows are synonymous with excellence and biodiversity. Indeed, they have not been ploughed for many years, sometimes over 100 and consequently present a wide variety of herbs and aromatic plants (over 60 per m^2). Additionally, they contribute to the enrichment of organic matter in soils and the containment of carbon dioxide emissions from the air. As the project title suggest the function of permanent meadows not only reflects the distinctive and characteristic aromas and flavours in Parmigiano Reggiano, but play a fundamental role in agro-environmental sustainability, compared to other fields/meadows cultivated with other aromatic plants. These meadows favour 'carbon sequestration', which is the enrichment of the organic substance in the soils. As a consequence they contain emission of carbon dioxide, which along with methane and nitrous oxide, are the gasses responsible for determining the greenhouse effect and global warming.

In the soil, however, the organic substance plays an important role determining its fertility and good structure. The permanent meadows also represent a precious source of cattle feed which is used in the production of Parmigiano Reggiano. As such, the monitoring of the organic matter content and the carbon footprint throughout the cheese production process, starting from the soil, demonstrated the fundamental role that the meadows play in the environmental sustainability of the whole production. Understanding this context was made possible through the participation of multiple actors in this EIP-AGRI project.

Objectives

The objectives of the EIP-AGRI Operational Group (OG) project were to:

- Monitor the organic matter content and the carbon footprint throughout the Parmigiano Reggiano production process starting from the soil;
- Demonstrate the fundamental role that the meadows play in the environmental sustainability of Parmigiano-Reggiano production, contributing to the preservation of the agricultural landscape and to the protection of the soil and the environment;
- Define 'guidelines aimed at better soil management for the organic matter maintenance and carbon sequestration';
- 'Give impetus and strength to the role of the farmer as a real custodian, guarantor of soil protection, as well as producer of quality products with high environmental sustainability'.

Activities

General description. The project consisted of experimental activities aimed at protecting the soil and enhancing the role of permanent meadows in carbon sequestration and agro-environmental sustainability. The focus of the project was to quantify the carbon footprint in the entire milk production process starting from the soil, from which the fodder is derived, and including the entire zootechnical milk production process. The activities led to the definition of guidelines for better soil management in relation to carbon sequestration and the maintenance of organic matter.

The project was characterized by four actions:

Action 1 - Monitoring of the organic matter according to sustainable soil and agronomic management practices. The study of the organic matter content was carried out by identifying 8 monitoring sites in the companies associated with the OG. The sites were chosen on the basis of agronomic management (permanent meadows and alfalfa meadows) and location/representativeness of the main soil environments. The monitoring of the organic substance involved two depths (0-15 cm; 15-30 cm) and the Area-Frame Randomised Soil Sampling (AFRSS) method was used to sample. In total 96 samples were taken for analysis of organic matter.

Action 2 - Monitoring of soil breathing. The measurements were carried out by two technicians equipped with West Systems flowmeters through the on-stationary static storage chamber technique. This technique is applied for quantification of surface fluxes of non-reactive gaseous compounds (e.g. greenhouse gases) at the biosphere-atmosphere interface. The principle of the static chamber technique for calculation of flux rates is to monitor changes in concentration over time (enrichment or depletion). In total, 600 flow measurements were carried out on 3 farms in which one plot was alfalfa and one was permanent meadow (June and September 2019).

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Action 3 – Develop models to evaluate the carbon capture in the soil and the carbon footprint. Simulations on the dynamics of carbon in the soils of permanent meadows have been carried out in order to evaluate the organic matter content of the soil and its related capacity to sequester carbon.

Action 4 - Identify and share guidelines for the best management of the soils linked to the production of Parmigiano Reggiano for the maintenance of the organic matter and the carbon capture. This action concerned the definition of the 'guidelines of good agronomic practices for soil conservation' instrumental to the promotion and enhancement of the role of the farmer.

Action 5 – Dissemination. This action was characterised by dissemination activities of the OG's results and goals.

Action 6 - Training activity. Cooperation also took place in training through coaching activities in line with the stages of the plan. The first training was aimed at the knowledge of soil structure and the role of organic matter, whilst the second was aimed at the company's livestock sector.

Actors involved

The research was carried out taking into account the soil conditions of land and agricultural practices of the companies participating in the OG. There was a participatory/shared approach aimed at giving impetus to the role of the farmer as a real custodian of soil protection, as well as a manufacturer of excellent quality products with high environmental sustainability.

The project was coordinated by the Cooperative I.TER Ecological Design of the Territory and carried out in collaboration with the regional Animal Production Research Centre (CRPA S.p.A.), five farms (Scalabrini, Carcarena, Chierici, Pelosi, La Valle) and the Bibbiano la Culla Consortium.

I.TER carried out a soil survey on the partner farms and monitored the carbon content in the soil, as well as coordinating the group and the communication plan.

C.R.P.A. quantified the carbon footprint throughout the production process of Parmigiano Reggiano and carried out the botanical reliefs of the biodiversity of the meadows.

Agricultural partners (farms) managed the demonstration sites and participated in the sharing of scientific results. All partners, farmers and researchers, collaborated to create Guidelines for the production of Parmigiano Reggiano and for the maintenance of the organic substance/captured carbon.

Action 1. The results showed that the accumulation of carbon in the soil of alfalfa meadows was similar to other rotating crops, however the accumulation was almost doubled in the case of permanent meadows. The soils cultivated with alfalfa showed there was little difference between the two depths 0-15 and 15-30 cm. This can be attributed to ploughing as it breaks up the first 30-40 cm of depth. In permanent meadows there is a greater sequestration of carbon and the accumulation of carbon in the first 15 cm highlights the total absence of tillage.

Action 2. The simulations of the dynamics of carbon in the soils of permanent meadows have led to this conclusion: the permanent meadow is able to increase the organic substance of the soil over time, sequestering carbon.

Action 3. Guidelines have been validated by the farms and partners participating in the OG. They include: maximising the distribution of sewage in the vegetative phases of the meadows, by the use of irrigation in the absence of rain; and management of the shift and water volumes based on the characteristics of the soil.

Action 4. Dissemination activities include the production of a brochure and popular technical article. Other channels used include a TV service, meetings, technical seminars, participation in fairs, conferences and events. A video-spot entitled 'Rural communication' and radio broadcasts have been produced.

Action 5. Training activities in line with the stages of the plan have been organised aimed at increasing the knowledge of soil structure and the role of organic matter and of the companies' livestock sector.

Key lessons

The project was an opportunity to exchange awareness and create synergy among actors involved in the project activity, particularly in the key sectors of agriculture and the environment. It allowed the exchange of professional and personal experiences, as well as the sharing and comparing of interesting ideas and practices between the partners of the Operational Group.

It was important to recognise that the perception of the importance of the soil has changed in the last decades. At farm level, actors have understood the importance of the right soil management and its role for the protection of the environment. Also consumers are even more aware of the link between soil and food products (in this case Parmigiano Reggiano).

The project demonstrated that although agriculture and food production can contribute to climate change through the emissions of GHGs, they can also be part of the solution, by helping to mitigate climate change though carbon storage and climate smart agricultural practices.

Finally, the project relied on an innovative approach, by collecting data resulting from isoflow maps which have shown a certain trend of permanent meadows to release greater CO_2 emissions in conditions of higher humidity/greater content of organic matter in the soil. Also through the use of these data, the project raised awareness on the importance of soil structure and of adapting soil management practices to weather conditions.

Additional sources of information

www.youtube.com/watch?v=cmQERMWiK1Q&feature=youtu.be

www.youtube.com/watch?v=-a172srV25k

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