Promotion of agro-ecological practices to improve biodiversity and sustainability in the production of common wheat (*Triticum aestivum* L.) (AGRECOblado)

Summary

Most biodiversity indicators show a marked decline, yet many of the factors driving this global decline are not only still occurring, but have, in some cases, intensified.

A key element in biodiversity loss is the decline in pollinating insects; these play a vital role on the planet and their decline is associated with a major global problem. Insects and other pollinating animals ensure the fruiting of flowers, hence significant changes in pollination are associated with major ecosystem imbalances. Their decline also has a profound impact on agricultural production worldwide, with the consequent impact on food and human health, while also producing significant financial losses in the agricultural and food sectors. In this context, safeguarding pollinators is a major challenge for mankind that must be addressed.

Several factors contribute to the decline in pollinating and auxiliary insect biodiversity, one being the intensification of agriculture, which has a major impact on natural ecosystems.

One of the most promising ways of maintaining more biodiversity-friendly agricultural activity is organic farming and the implementation of integrated agricultural production, committed to establishing a quality food production system using methods that are respectful of human health and the environment.

In this context, PANIFICADORA ALIMENTARIA defines the present project by the operational groups as investing in and promoting the use of innovative, sustainable and environmentally friendly agricultural practices with the aim of reducing their environmental impact and promoting proximity, while also fostering ethical and responsible behaviour.

The project aims to give much needed emphasis to the importance of creating conservation and protection plans for pollinators. Incorporating the techniques proposed in this project will help conserve biodiversity and increase the quality and quantity of insect populations, while also achieving more sustainable production.

Objectives

The general objective of the project is to introduce agronomic practices that improve the sustainability of common wheat (*Triticum aestivum* L.) production.

These innovative practices pursue the following goals:

- Implement alternative methods to plant protection products.
- Improve the sustainability of pest and disease control.
- Promote ecological and crop biodiversity in common wheat-based farming systems.

The following specific technical objectives were set:

- Reducing the toxic load and application of phytosanitary products, mainly herbicides and fungicides, which are most commonly used in common wheat farming.
- Promoting biodiversity in common wheat farming by incorporating melliferous species capable of

attracting and sheltering pollinating and auxiliary insects.

- Increasing biodiversity by extending the period of vegetation cover on agricultural plots.

Description of the actions carried out in the project

The follow actions are proposed to achieved the project objectives:

Activity 1. Implementing alternative methods to chemical weeding

The work defined for the first project activity focuses on the use of alternatives to synthetic products for the control of adventitious flora within the crop. Specific examples are mechanical weeding with a flexible tine rake or precision hoe and mixed mechanical and chemical weeding. The action also includes assessing certain characteristics of common wheat varieties that may help in introducing mechanical weeding.

Four trials will be carried out from 2023-2024 where different chemical, mechanical and mixed mechanical-chemical weeding systems will be assessed. The work will focus on areas in the humid cold drylands of inland Catalonia and areas in the humid temperate drylands.

In addition, the incidence of row spacing for soft wheat varieties differing in their vegetative development will be studied during the 2022-23 and 2023-24 trial periods.

Finally, for both winter and spring wheat, soil covering capacity during tillering and plant height (cm) will be measured.

Activity 2. Decreasing the environmental impact of pest and disease control with plant protection products

In the second project activity, strategies will be established to provide protection mainly from foliar diseases in common wheat with the aim of rationalising the use of plant protection products, with a maximum single application.

To do this, four experimental plots will be defined during the 2023-24 trial period, in which the following strategies will be carried out and a set of parameters studied:

- Strategy 1. One normally used by farmers in a given production area.
- Strategy 2. To control foliar diseases, plant material resistant to the main foliar diseases and a low-cost commercial product will be used.

  Strategy 3. To control foliar diseases, plant material resistant to the main foliar diseases and a high-end commercial product will be used.

Activity 3. Promoting biodiversity in common wheat farming

This activity will involve a number of actions to recover, conserve and increase biodiversity in the common wheat plots, in order to increase the populations of pollinating and auxiliary insects.

During the 2022-23 trial period, four experimental plots will the planted with flower strips. Approximately 4-5% of the plot will be covered with the flower strips, seeking a balance between maintaining productivity and increasing biodiversity.

The flower strips will consist of a mixture of species from different botanical families with pre-defined

characteristics.

Insect hotels will also be set up and their occupancy rate monitored during 2023 and part of 2024 by counting the number of holes used by bees.

Activity 4. Increasing crop biodiversity by planting species that lengthen the period with vegetation cover

This activity will be limited to the agroclimatic area of humid cold drylands, particularly in the Osona region, where rainfall is highest during the summer. In the experimental plots, grain or fodder sorghum, buckwheat and sunflower will be sown after the wheat harvest and a set of parameters will be assessed.

Activity 5. Transfer of the results

The last project activity focuses exclusively on disseminating the project, covering all the work carried out to transfer the results. The dissemination activities will include a number of field trips and workshops, the production of a video on promoting biodiversity in common wheat plots and drawing up a guide on planting flower strips.

Final results and practical recommendations

The results expected from implementing this operational group are:

Activity 1. Similar results from the proposed techniques as with chemical herbicides.

Activity 2. The proposed strategies reduce the use of plant protection products.

Activity 3. Natural increase in biodiversity in wheat fields.

Activity 4. Sowing other crops after harvesting the common wheat increases biodiversity and provides more economic benefits.

Activity 5. Dissemination of the most innovative project results in the sector and among scientific bodies, communications at conferences, seminars, etc., and the publication of a video and a guide to promoting biodiversity in common wheat plots.

Leader of the Operational Group

ORGANISATION: PANIFICADORA ALIMENTÀRIA, SL

Coordinator of the Operational Group

ORGANISATION: PANIFICADORA ALIMENTÀRIA, SL

Other members of the Operational Group (grant recipients)

ORGANISATION: COOPERATIVA AGRÍCOLA DE BANYOLES, SCCL

Other members of the Operational Group (not recipients of the grant)

ORGANISATION: IRTA - Institute of Agrifood Research and Technology

ORGANISATION: ADV CONREUS HERBACIS SOSTENIBLES

ORGANISATION: COOPERATIVA DE CASTELLÓ D'EMPÚRIES, SCCL

Subject area(s) of application

☒ Agricultural production system

☒	Agricultural practice
☐	Agricultural equipment and machinery
☐	Livestock farming and animal welfare
☒	Vegetable production and horticulture
☐	Landscape / Territorial management
☒	Pest and disease control
☐	Fertilisation and nutrient management
☐	Soil management
☐	Genetic resources
☐	Forestry
☐	Water management
☐	Climate and Climate Change
☐	Energy management
☐	Waste and by-product management
☒	Biodiversity and environmental management
☐	Food quality/processing and nutrition
☐	Supply chain, marketing and consumption
☐	Competitiveness and agricultural and forestry diversification
☐	General

Geographical area(s) of application

PROVINCE(S)	REGION(S)
Barcelona Girona	Osona Gironès

Dissemination of the project (publications, conferences, multimedia, etc.)

The project results will be disseminated and communicated through a communication plan based on new developments and innovations from the project, in both the sector and among scientific bodies, including the patents and publications that are generated.

The dissemination plan defined for this project has four main channels:

- Field trips: to provide on-site visibility of the work carried out on the plots.
- Workshops: to inform the public of the activities carried out and to disseminate results and conclusions.
- A video to explain the promotion of biodiversity in common wheat plots.
- A guide to planting flower strips, to raise awareness of the use of these practices and facilitate possible extrapolation to other types of crops.

Moreover, other communication channels are also defined according to the target group:

Industrial sectors

All the knowledge and results generated from executing the project may be exploited by the different sectors and companies involved, thus exponentially magnifying the dissemination effect of the project, as

the organisations involved develop and apply their communication plan.

Technology and research centres and the scientific community
The knowledge generated by the project will be shared with the scientific community through the presentation of papers at national and international conferences.

Project website

More information on the project

PROJECT DATES	TOTAL BUDGET	
Starting date: July 2021	**Total budget:**	€198,279.36
	DACC funding:	€91,694.85
Current status: Under way	**EU funding:**	€69,173.31
	Own funding:	€37,411.20

With funding from:

Project funded through Operation 16.01.01 (Cooperation for Innovation) through the Catalan Rural Development Programme 2014-2022.

Order ARP/113/2021 of 20 May, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ACC/1660/2021, of 27 May, announcing the call for the grant.

Generalitat de Catalunya
Departament d'Agricultura, Ramaderia, Pesca i Alimentació

Fons Europeu Agrícola de Desenvolupament Rural:
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