



## **UNCOVER AND PROMOTE TOLERANCE TO TEMPERATURE AND WATER STRESS IN CAMELINA SATIVA**



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 862524



### **D7.4**

## **Whitepaper on relevant EU projects on plant adaptation and oil crops such as camelina**

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Whitepaper on relevant EU projects on plant adaptation and oil crops such as camelina



# Document Summary

Deliverable number & title: **D7.4 - Whitepaper on relevant EU projects on plant adaptation and oil crops such as camelina**

Version & submission date: **V1 - 31<sup>st</sup> August 2023**

Lead Beneficiary: **INI**

Related Work package: **WP7**

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Datasets underlined: **non**

Communication level:

☒ **PU** *Public*

☐ **CO** *Confidential, only for members of the consortium (including the Commission Services)*

Approved by:

|                                               |                                           |                                           |                                          |
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| <input checked="" type="checkbox"/> RTDS      | <input checked="" type="checkbox"/> UNIBO | <input checked="" type="checkbox"/> FZJ   | <input checked="" type="checkbox"/> INI  |

Grant Agreement Number: **862524**

Programme: **SFS-30-2019 / Agri-Aqua Labs: Looking behind plant adaptation**

Start date of Project: **1<sup>st</sup> September 2020**

Duration: **5 years**

Project coordinator: **AIT**



# 1 Abstract

UNTWIST is a project funded by the European Union's Horizon 2020 research and innovation programme under the Societal Challenges Pillar *Food security, sustainable agriculture and forestry, marine, maritime, and inland water research, and the bioeconomy*.

Within the framework of the UNTWIST project, a cohesive series of interrelated work packages and tasks are being developed to provide comprehensive, systems-based knowledge on key mechanisms underlying crop stress tolerance strategies to adverse environments; to develop accurate models for the prediction of crop performance; and, to identify markers indicative of crop performance under stressful conditions. Dissemination, Exploitation and Communication (DEC) is a transversal work package that includes a task specifically dedicated to establishing fruitful collaborations and sharing expertise and knowledge on plant adaptation with other projects on the same topic.

As described in the project Grant Agreement, this whitepaper is a report with the results of activities related to networking beyond UNTWIST participants and project boundaries. The document summarizes information about relevant EU-funded projects on plant adaptation and oil crops identified and the activities developed, synergies generated, barriers, and collaboration opportunities that can arise from networking actions.

## 2 List of Abbreviations

|              |                                                                                     |
|--------------|-------------------------------------------------------------------------------------|
| <b>AIT</b>   | Austrian Institute of Technology GmbH                                               |
| <b>CCE</b>   | Camelina Company España                                                             |
| <b>CIRAD</b> | Centre de coopération Internationale en Recherche Agronomique pour le Développement |
| <b>DEC</b>   | Dissemination, Exploitation and Communication                                       |
| <b>DFG</b>   | German Research Foundation                                                          |
| <b>EU</b>    | European Union                                                                      |
| <b>FZJ</b>   | Forschungszentrum Jülich                                                            |
| <b>HHU</b>   | Heinrich-Heine-University (Düsseldorf)                                              |
| <b>INI</b>   | Iniciativas Innovadoras                                                             |
| <b>INRAe</b> | Institut National De La Recherche Agronomique                                       |
| <b>MPIPZ</b> | Max Planck Institute for Plant Breeding Research (Cologne)                          |
| <b>PRIMA</b> | Partnership for Research and Innovation in Mediterranean Area                       |
| <b>PRIN</b>  | Projects of Relevant National Interest                                              |
| <b>PUM</b>   | Philipps University (Marburg)                                                       |
| <b>RIA</b>   | Research and Innovation Action                                                      |
| <b>RUB</b>   | Ruhr University in Bochum                                                           |
| <b>UNIBO</b> | Alma Mater Studiorum Università Bologna                                             |
| <b>UoC</b>   | University of Cologne                                                               |
| <b>UP</b>    | University of Postdam                                                               |
| <b>WP</b>    | Work Package                                                                        |

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## 4 Introduction

### 4.1 The project

Climatic variability and extreme weather events are increasingly impacting crop yield and value. UNTWIST addresses this challenge and takes advantage of the climate-resilient, traditional European oilseed crop camelina to provide a mechanistic understanding of successful adaptation strategies to drought and heat stress. Moreover, it will develop predictive models and robust markers for crop performance in variable environments. UNTWIST's long-term aims are to improve crop resilience and yield stability in changing, challenging climates; its legacy will contribute to increasing the sustainability of European agriculture.

Specifically, UNTWIST will:

- Use a diverse set of cultivars with variable responses to climate extremes to decipher multi-layered responses to environmental change.
- Apply on-farm field-based and greenhouse phenotyping to characterize local adaptation and heat and drought resilience of different camelina genotypes across multiple European locations.
- Use in-depth systems-based approaches (e.g., physiology, morphology, transcriptomics, proteomics, metabolomics, lipidomics & enzyme profiling) to capture the nuanced changes that drive physiological adaptation.
- Integrate combined data into predictive models of plant adaptation to environmental change, enabling the development of optimized agronomic management.
- Develop a Knowledge Hub to translate and disseminate the discoveries into practical know-how for multiple stakeholders in agriculture.

### 4.2 Scope

The scope of this whitepaper is determined by:

- **Time:** the report includes projects linked to UNTWIST and networking activities carried out with them from September 2020 to June 2023. UNTWIST will continue working on these activities until the conclusion of the project.
- **Geographic area:** projects being implemented in Europe and North Africa, including project partners located in more than fifteen countries.
- **Research topics:** projects selected have research areas in common such as oil crops, camelina, stress tolerance, plant adaptation, development of knowledge hubs etc.
- **Community size:** the number of selected projects is balanced and adequate to the effort that can be allocated in networking activities during the time covered by the report.

## 4.3 Methodology

The networking process follows five steps (Figure 1).

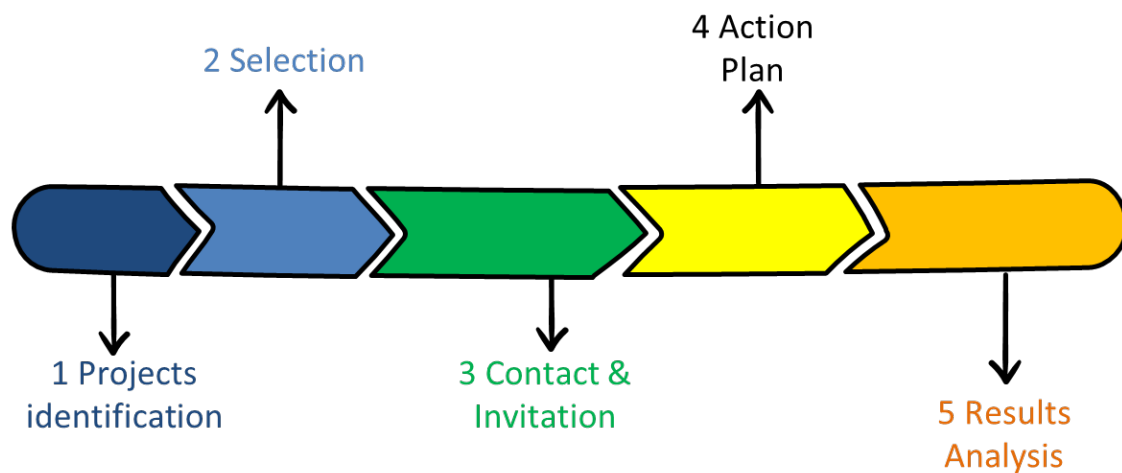


Figure 1. Methodology steps. Credit: Image designed with infographics from [Slidesgo](#) and [Freepik](#).

### 4.3.1 Project Identification

To identify projects with potential interest in developing networking activities with UNTWIST, different areas, criteria and search keywords have been selected in relation to the challenges addressed by the project, the field of research, and the main results expected.

The selection criteria could be classified as:

1. Fields of science
  - Agriculture sciences, social sciences
2. Topics
  - Sustainable agriculture
  - Oil crops, camelina
  - Plant adaptation, stress tolerance, extreme conditions, resilience
  - Farming systems

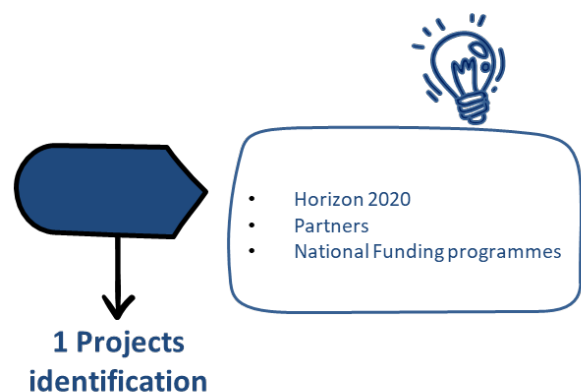


Figure 2 . Methodology: step 1. Projects identification.

Credit: Image designed with infographics from [Slidesgo](#) and [Freepik](#)



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The search has been carried out in different funding programs databases (e.g., CORDIS, DG AGRI) and the following projects have been identified:

1. Horizon 2020, funded under the same topic as UNTWIST. Societal Challenges - *Food security, sustainable agriculture and forestry, marine, maritime, and inland water research, and the bioeconomy* Topic SFS-30-2018-2019-2020 - Agri-Aqua Labs.
  - **AQUA-FAANG** Advancing European Aquaculture by Genome Functional Annotation.
  - **BovReg** Identification of functionally active genomic features relevant to phenotypic diversity and plasticity in cattle.
  - **GENE-SWitCH** The regulatory GENomE of SWine and CHicken: functional annotation during development.
  - **ADAPT** Accelerated Development of multiple-stress tolerAnt PoTato.
2. Horizon 2020 topics, suggested by partners: HORIZON-CL6-2021-BIODIV-01-13 - Breeding for resilience: focus on root-based traits:
  - **Root2Res** Root2Resilience: Root phenotyping and genetic improvement for rotational crops resilient to environmental change.
  - **BOLERO** Breeding for coffee and cocoa root resilience in low input farming systems based on improved rootstocks.
  - **BarleyMicroBreed** Strategies for breeding climate change resilient barley, genetically equipped to optimized root-microbiome interactions.
3. Other programmes: PRIMA Programme (Partnership for Innovation in Mediterranean Area), supported by Horizon 2020.
  - **4CE-MED** Camelina: a cash cover crop enhancing water and soil conservation in Mediterranean dry-farming systems.
4. Projects granted under National funding programs suggested by partners:
  - **ARGENTO** Agronomic and genetic improvement of Camelina for sustainable poultry feeding and healthy food products. Italy.
  - **CRC TRR 341** Plant Ecological Genetics (transregional collaborative research center). Germany.

In addition, the project partners of UNTWIST suggested other projects in which they are or have been involved:

- **PANACEA** Network for use of non-food crops in the European biobased economy.
- **MAGIC** Marginal lands for Growing Industrial Crops: Turning a burden into an opportunity.
- **CARINA** CARinata and CamelINA to boost the sustainable diversification in EU farming systems.

Any project interested in participating in the UNTWIST community can apply via UNTWIST website in the Community section through the contact subsection.



### 4.3.2 Selection

After the project identification, public information of the projects (e.g., CORDIS), project websites, news, social media etc. were collected and the project's suitability for collaboration with the UNTWIST project was analysed. Three projects were discarded because they did not fit with detailed UNTWIST project identification criteria. The four relevant topics for the projects selection are: (1) Sustainable agriculture, (2) Oil crops, camelina, (3) Plant adaptation, stress tolerance, extreme conditions, resilience & (4) Farming systems, so AQUA-FAANG that is focused on aquaculture and BovReg focused on cattle and GENE-SWitCH focused on Swine and Chicken don't match with the topics.

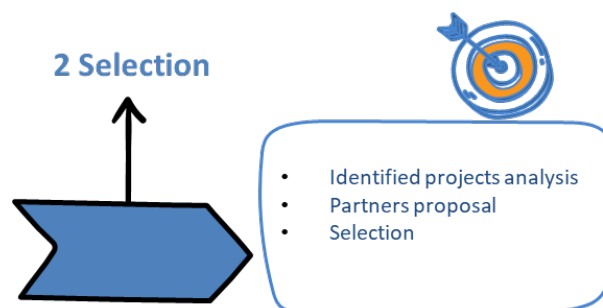


Figure 3 . Methodology Step 2. Selection.

Credit: Image designed with infographics from [Slidesgo](#) and [Freepik](#)

The final selection was agreed by the project consortium. There is a gap in the timeline of the selected projects, some of them, such as PANACEA and MAGIC, ended at a very early stage of UNTWIST (Fig. 7 section 6). The selection of projects for networking activities is an ongoing process throughout the life of the UNTWIST project.

### 4.3.3 Contact & Invitation

The coordinators of the selected projects received a brief description of the UNTWIST project via email, as well as an explanation of the purpose of networking with their project and a proposal of different networking activities to be agreed on:

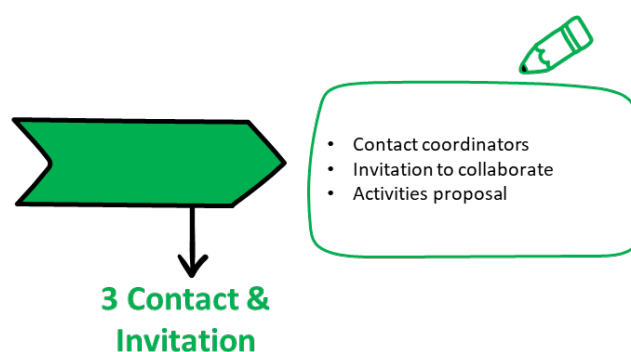


Figure 4 . Methodology Step 3. Contact & Invitation.

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- Inclusion of the linked projects in the Community section of the UNTWIST website.
- Organization of meetings between both projects for results presentation and analysis of present and future collaboration opportunities.
- Possibility of presenting the project in the courses and conferences organized within the framework of UNTWIST and *vice versa*.
- Dissemination of linked project events in the UNTWIST website, newsletter, and social media and *vice versa*.
- Publication of linked project news on the UNTWIST website, newsletter, and social media and *vice versa*.
- Possibility of making technical visits to the demonstration farms of the UNTWIST project and *vice versa*.

Activities are further explained in section 6.

### 4.3.4 Action Plan

The information collected from each project allowed us to draft an action plan for the UNTWIST Community. The Action Plan set out the activities that have been and will be implemented with each of the projects according to the proposal accepted by the project coordinators as well as other tasks carried out for all the projects.

Once the projects have been included in the Community section of the website, their contacts are added to the distribution list to send them the UNTWIST newsletters and increase the dissemination of the project and its activities. In the content of the newsletters, reference is also made to the Community's projects to disseminate them among our subscribers.

In addition, the social media profiles of UNTWIST have been linked to the profiles of our community's projects to keep up to date with their activities to be able to disseminate information of interest about these projects to our followers by retweeting and posting regularly in our social media profiles direct mentions to linked projects.

The presentations, meetings, and workshops carried out with the community's projects have been organized in close cooperation with the UNTWIST coordinator (AIT) and the project partners. UNTWIST and some of the linked projects in UNTWIST Community have some common partners.

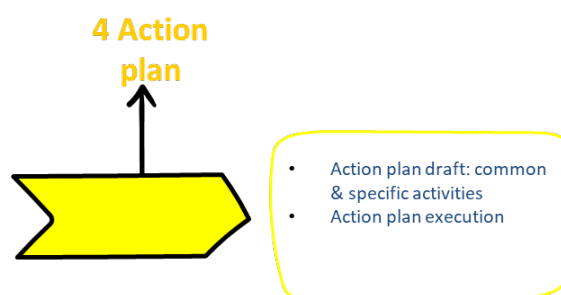


Figure 5 . Methodology Step 4. Action Plan.

Credit: Image designed with infographics from [Slidesgo](#) and [Freepik](#)

### 4.3.5 Results Analysis

Periodically, the activities developed are analysed to plan future activities and update the action plan. The networking task will continue until the end of UNTWIST (August 2025). Some of the linked projects have recently joined the UNTWIST community and potential activities that can be developed with them are yet to be identified.

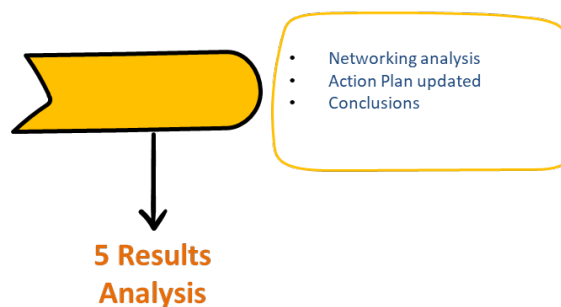


Figure 6 . Methodology Step 5. Results Analysis.

Credit: Image designed with infographics from [Slidesgo](#) and [Freepik](#)

## 5 Linked and contacted projects

Following the methodology set out in section 4.3, 10 projects have been identified. At the time of developing the report 6 projects have been linked: ADAPT, 4CE-MED, Argento, CARINA, PANACEA, and MAGIC (the last two projects are now completed). Four other projects (TRR 341, BOLERO, BarleyMicroBreed and Root2Res) have been recently contacted and it is expected to establish a networking plan with them in following months. The descriptions of the projects, as provided on the CORDIS and project websites, are included below.

### 5.1 Ongoing linked projects

#### ADAPT Accelerated Development of multiple-stress tolerant Potato.

**Funding programme & project ID:** Horizon 2020. Call SFS-2018-2020. ID: [862858]

**Start date:** 1 July 2020 **End date:** 30 June 2024

**Coordinator:** UNIVIE University of Vienna

**Partners:** 17

**Description:** The ADAPT project studies the dynamics of complex signalling and response mechanisms to identify the molecular mechanisms of adaptation to combined stress in potatoes. The project develops new strategies for increased productivity, yield stability, and quality under multiple stress conditions. It combines molecular biology, stress physiology, systems biology, and analytics with engineering and molecular breeding, engaging user-driven agencies for testing and implementation of the project's results.

**Project links:** <https://adapt.univie.ac.at/> <https://cordis.europa.eu/project/id/862858>



#### 4CE-MED A Cash Cover Crop Enhancing water and soil conservation in MEDiterranean dry-farming systems.

**Funding programme & project ID:** PRIMA (Partnership for Research and Innovation in Mediterranean Area) Programme 2019 Section 1 Farming RIA. ID: [1911]

**Start date:** 1 May 2020 **End date:** 31 July 2024

**Coordinator:** UNIBO Alma Mater Studiorum Università di Bologna

**Partners:** 11

**Partners in common with UNTWIST:** UNIBO Alma Mater Studiorum Università di Bologna, INI Iniciativas Innovadoras, CCE Camelina Company España

**Description:** 4CE-MED project aims at developing Mediterranean innovative, diversified, and resilient farming systems not competing for land with actual food chain, following a participatory approach for identifying smallholder needs, while planning, monitoring, and evaluating the project actions. The 4CE-MED systems are modified conventional farming systems including camelina, as a cash cover crop. The project tries to demonstrate environmental and economic benefits and the feasibility and convenience of the new 4CE-MED



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systems training local farmers, farm women, students, and practitioners about the benefits of the camelina systems from an agronomic and economic point of view.

**Project links:** <https://www.4cemed.eu/> <https://prima-med.org/projects/4cemed/>

### **ARGENTO Agronomic and genetic improvement of Camelina for sustainable poultry feeding and healthy food products.**

**Funding programme & project ID:** PRIN Research Projects of Relevant National Interest. Announcement [2017 Prot. 2017LZ3CHF] (Italy)



**Start date:** 29 August 2019 **End date:** 28 August 2023

**Coordinator:** UNIBO Alma Mater Studiorum Università di Bologna

**Partners:** 4

**Partners in common with UNTWIST:** UNIBO Alma Mater Studiorum Università di Bologna.

**Description:** In the actual scenario of lack of vegetable raw materials for animal feeding and scarcity of crop alternatives for farmers, the rationale behind Argento project is a win-win story. Camelina represents an alternative oil crop to be introduced into cereal-based cropping systems, able to grow with a low environmental footprint and to source valuable seed cake for poultry feeding (i.e., quails) to produce healthy meat and eggs. The final scope of the Argento project is to evaluate with a fully integrate multi-disciplinary approach the effects of the agronomic management (i.e., sowing dates) under different environments on the final seed quality of the newly released camelina lines aiming at optimizing seed qualitative traits for poultry feeding (i.e., quails).

**Project link:** <https://site.unibo.it/progetto-argento/en/research>

### **CARINA CARinata and CamelINA to boost the sustainable diversification in EU farming systems.**

**Funding programme & project ID:** Horizon Europe programme Research and Innovation HORIZON-CL6-2022-CIRCBIO-01. ID: [101081839]



**Start date:** 1 November 2022 **End date:** 31 October 2026

**Coordinator:** UNIBO Alma Mater Studiorum Università di Bologna

**Partners:** 19

**Partners in common with UNTWIST:** UNIBO Alma Mater Studiorum Università di Bologna & CCE Camelina Company Spain.

**Description:** The project focuses on new sustainable and diversified farming systems including 2 new oilseed crops, carinata and camelina, which can grow almost everywhere in Europe and Northern Africa, able to provide multiple low iLUC (indirect land-use change) feedstocks for the bio-based economy. They also provide high quality oils that will be transformed into innovative biobased products (bioherbicides, bioplastics). What's more, the co-product from oil extraction from these crops is a protein-rich cake that can be used as animal feed.

**Project link:** <https://www.carina-project.eu/>



## 5.2 Closed linked projects

**MAGIC Marginal lands for Growing Industrial Crops: Turning a burden into an opportunity.**



**Funding Programme & project ID:** ID: 727698 Call Horizon 2020 research and innovation programme. H2020-RUR-2016-2017

**Start date:** 1 July 2017 **End date:** 31 December 2021

**Coordinator:** CRES Centre for renewable energy sources and saving foundation

**Partners:** 26

**Partners in common with UNTWIST:** UNIBO Alma Mater Studiorum Università di Bologna, INRAE Institut National de la Recherche Agronomique

**Description:** The project aimed at promoting the sustainable development of resource-efficient and economically profitable industrial crops grown on marginal lands, considering that industrial crops can provide valuable resources for high added value products and bioenergy. To achieve the project objective, an up-to-date database of existing resource-efficient industrial crops was developed with information on their agronomic characteristics, input requirements, yield performance and quality traits for end-use applications.

**Project link:** <https://magic-h2020.eu/> <https://cordis.europa.eu/project/id/727698/es>

**PANACEA A thematic network to design the penetration PAth of Non-food Agricultural Crops into European Agriculture**



**Funding Programme & project ID:** Horizon 2020: RUR-10-2016-2017 ID: [773501]

**Start date:** 1 November 2017 **End date:** 28 February 2021

**Coordinator:** CRES Centre for renewable energy sources and saving foundation

**Partners:** 18

**Partners in common with UNTWIST:** UNIBO Alma Mater Studiorum Università di Bologna, INI Iniciativas Innovadoras, CCE Camelina Company España

**Description:** PANACEA was a Thematic Network aimed at the dissemination of near to practice applicable cases of Non-food Crops and at the cooperation between research, industry, and farming community, to increase the contribution of Non-food Crops to the European Bio-economy Strategy.

**Project link:** <https://cordis.europa.eu/project/id/773501/es>



## 5.3 Contacted projects

### BarleyMicroBreed Improving drought resistance in barley using microbiomes



**Funding Programme & project ID:** Horizon Europe Breeding for resilience: focus on root-based traits TOPIC ID: HORIZON-CL6-2021-BIODIV-01-13 ID: [101060057]

**Start date:** 1 November 2022 **End date:** 31 October 2028

**Coordinator:** Aarhus University

**Partners:** 8

**Description:** Barley Micro Breed is a project that seeks to improve plant resistance to drought by exploiting the interaction between barley and its root microbiome. If the microbiome can increase barley's drought resistance, it could turn out to be one of the ways to increased food security in the future. BarleyMicroBreed builds on the paradigm that optimized interactions between plant roots and the existing soil microbiota can improve crop plant resource efficiency and drought resilience.

**Project links:** <https://agro.au.dk/forskning/internationale-platforme/barleymicrobreed/>  
<https://cordis.europa.eu/project/id/101060057>

### BOLERO Breeding for coffee and cocoa root resilience in low input farming systems based on improved rootstocks. (logo not available)

**Funding programme & project ID:** Horizon Europe. Breeding for resilience: focus on root-based traits HORIZON-CL6-2021-BIODIV-01-13 ID: [101060393]

**Start date:** 1 October 2022 **End date:** 30 September 2026

**Coordinator:** CIRAD Centre de coopération Internationale en Recherche Agronomique pour le Développement

**Partners:** 18

**Description:** The EU-funded BOLERO project will develop phenotyping tools, apply them to assess coffee/cocoa root system architecture (RSA) traits, and decode the microbiome of coffee/cocoa plants and their interface with root exudates using large-scale metabolic modelling. The project will exploit these resources to develop predictive models of the characteristics of the ASR in terms of genotypic data and microbiome composition/abundance, with a view to improving coffee/cocoa breeding.

**Project link:** <https://cordis.europa.eu/project/id/101060393>

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## CRC TRR 341 Plant ecological genetics

trr\_341 plant ecological genetics

**Funding Programme & Project ID:** German Research Foundation (DFG).

CRC TRR 341

**Start date:** 1 July 2022 **End date:** 30 June 2026

**Coordinator:** DFG German Research Foundation

**Partners:** 6 institutions, 19 projects developed by the collaborative research centre.

Transregional collaborative research centre funded by the German Research Foundation (DFG)

**Researcher from UNTWIST partners:** Björn Usadel

**Description:** is a transregional collaborative research centre. Researchers from the University of Cologne (UoC) team up with their colleagues from the Heinrich-Heine-University (HHU) in Düsseldorf, the Ruhr University in Bochum (RUB), the University of Potsdam (UP), the Philipps University in Marburg (PUM) and the Max Planck Institute for Plant Breeding Research (MIPZ) in Cologne to work in identifying the genetic mechanisms of trait variation promoting plant adaptation to environmental changes.

Work in this consortium will provide key information on the traits, genes and genetic variants promoting adaptations to global environmental change in plants and assist future efforts to preserve natural ecosystems. It comprises two research areas: A (Candidate genes and traits), B (Scanning for past and ongoing adaptation).

The project A4: Genetic basis and ecological importance of adaptive myxospermic strategies to drought stress in the Camelinaeae tribe and the Brassicaceae family is led by Björn Usadel, researcher of FZJ.

The project A1: Adaptive potential of the leaf economics spectrum in the Brassicaceae will analyse the leaf economics spectrum in multiple Brassicaceae species.

**Project link:** <https://trr341.uni-koeln.de/>

Two other projects, entitled CASOM and COSMOS, have been included in the UNTWIST Community section of the website because common partners with UNTWIST (INRAE and UNIBO) capitalize on some knowledge and results of these projects. However, no activities were carried out with these projects because they have been completed.





## 6 Networking Activities

Networking is a win-win process for UNTWIST and the linked projects. Different objectives are pursued:

- Ensure and increase the dissemination of project activities and outcomes to a specialised and much larger audience.
- Bring together experts working on similar topics for the exchange of methodologies, research, or results.
- Identify synergies between projects and their research.
- Create contacts and generate long-term networks and strategies for future collaborations.

This report covers the activities performed from the launch of UNTWIST project in September 2020 to June 2023. The timeline of the linked projects is very different. The image below shows the timeline of all projects linked to UNTWIST. Currently, two projects have been completed, four are in a similar advanced stage as UNTWIST and the other five are in an early stage.

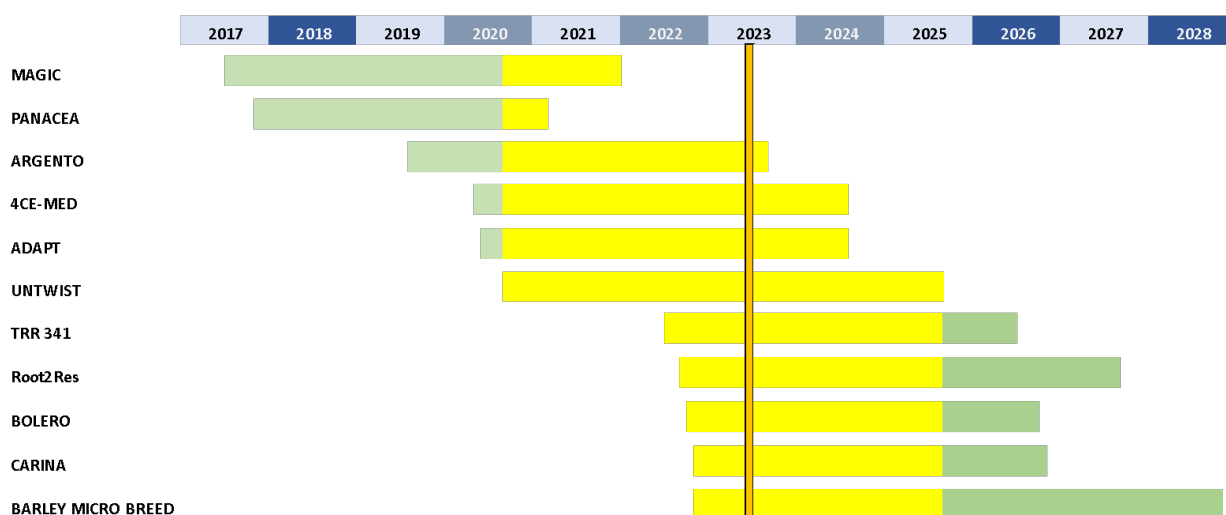


Figure 7: Projects calendar. Credit. INICIATIVAS INNOVADORAS

The networking activities will continue until the end of UNTWIST project. This chapter includes the networking activities carried out to date and future activities.

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## 6.1 UNTWIST Community

### Description and objectives

A specific section of the UNTWIST website (named [Community](#)) has been devoted to the linked projects. The main objective of this section is to give visibility to all the projects interacting with UNTWIST and motivate other projects to join the community.

### Activities carried out by UNTWIST

- Create the Community section in UNTWIST website and include the project's logo with the link to their websites and a brief description of each project.
- Announce and give visibility to the Community via social media, news, and newsletter. More than 140 partners from linked projects receive periodically an update on project publications. The project newsletter is distributed also to the UNTWIST subscribers and gives visibility to the Community.



### LINK TO OTHER PROJECTS



Figure 8: UNTWIST website, Community section.

*Note: CASOM and COSMOS have been included in the UNTWIST Community section of the website because common partners with UNTWIST (INRAE and UNIBO) capitalize on some knowledge and results of these projects. However, no activities carried out with these projects because they have been completed.*

### Activities carried out by linked projects

The linked projects [4CE-MED](#) and [ARGENTO](#) have included the logo and link to UNTWIST in their websites.



### Action plan: future activities

- Link new projects and include them into the UNTWIST community.
- Encourage linked projects to Include UNTWIST information and link into the linked projects websites.

### Benefits for UNTWIST project

- Create a community of projects with common areas of research and developing networking activities providing mutual benefits for UNTWIST and linked projects.
- Give UNTWIST visibility to a wider audience.
- Create synergies and collaboration among projects working on related or complementary topics. By bringing together projects from different fields or disciplines, networking fosters the exchange of knowledge and best practices. It promotes collaboration between project partners, enabling them to leverage each other's expertise and resources.

## 6.2 Social Media

### Description and objectives

The UNTWIST project is present on [Twitter](#), following more than 580 profiles from researchers, stakeholders and projects, on [LinkedIn](#), with more than 380 contacts, and on [YouTube](#).

Following and connecting with linked projects via social media pursues several objectives:

- Increase the dissemination of UNTWIST news and results shared via social media by the linked projects.
- Be updated about activities and results of other projects working on related topics.
- Create community: following other research projects on social media connects UNTWIST to a community of people with similar interests. UNTWIST experts can interact with scientists, researchers, and enthusiasts from all over the world, providing an opportunity to share ideas, ask questions, engage in discussions, and network with science professionals.
- Find inspiration and motivation: following successful research projects and achievements of other researchers on social media can be inspiring. In addition, UNTWIST can also get information about research opportunities and relevant events developed by linked projects.

### Activities carried out by UNTWIST

- Monitoring social media profiles of linked projects and vice versa to keep updated the results, news, and activities of those projects and to have the opportunity to disseminate project activities and outcomes via their profiles. Not all UNTWIST Community projects have Twitter or LinkedIn profiles.
  - Projects profiles followed on Twitter: [ACE-MED](#), [Root2Res](#), [ARGENTO](#), [CARINA](#), [ADAPT](#), [PANACEA](#).
  - Project LinkedIn pages followed: [CARINA](#), [Root2Res](#), [PANACEA](#).

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- UNTWIST and linked projects help each other to get a broader audience via re-tweeting, mentioning, or writing specific posts. Linked projects also make mentions and publications on social media about. Some examples of publications:
  - UNTWIST: [Presentation](#) of CARINA, ARGENTO and 4CE-MED projects to UNTWIST partners, [announcement](#) of new projects (CARINA) joining the UNTWIST Community re-tweet 4CE-MED [post](#).

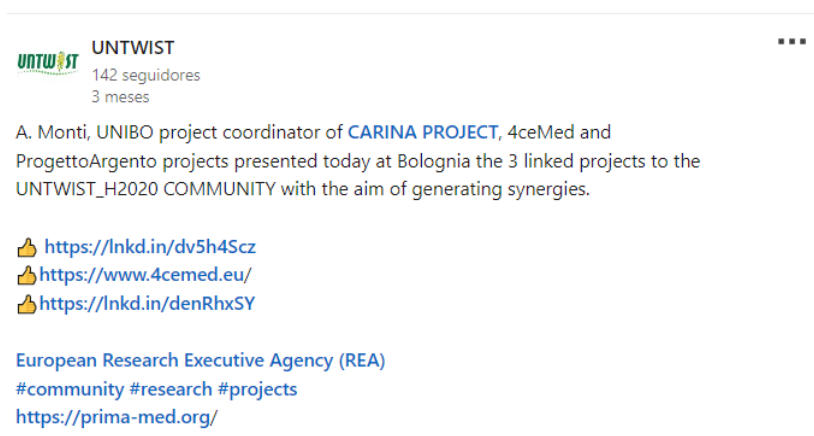


Figure 9: Post on LinkedIn UNTWIST profile.



Figure 10: Post on Twitter UNTWIST profile.



Figure 11: Post on Twitter 4CE-MED profile.



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Figure 12: Post on Twitter UNTWIST profile mentioning projects on related topics.

- 4CE-MED: UNTWIST repost on Twitter.



Figure 13: Re-tweet on Twitter 4CE-MED profile about UNTWIST activity.

- ARGENTO: UNTWIST post [re-tweeted](#).



Figure 14: Argento reposted UNTWIST activity on Twitter.



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- CARINA: project collaboration with UNTWIST [announcement](#).



Figure15: News on the website about networking with Carina project.

- Root2Res: re-tweet Root2Res [post](#) mentioning other two linked projects.



Figure 16: Re-tweet on UNTWIST Twitter profile Root2Res project post about sister projects.

**Action plan: future activities**

- Publication of post mentions and re-tweets on social media related with linked projects.
- Encourage the linked projects to increase the publications related to UNTWIST.

**Benefits for the UNTWIST project**

The main benefit to link projects' social media profiles is to increase the audience reached by each post published. There are currently more than 750 social media followers of the UNTWIST community alive projects (213 from 4CE-MED, 273 from ADAPT, 37 from CARINA and 192 from Root2Res), one publication re-posted by them gives UNTWIST the possibility to duplicate the potential audience. Additionally, publications may generate interest in the UNTWIST project among readers who may become followers of our social media profiles. Considering that some of the followers are not people but institutions or projects the diffusion can be higher.

## 6.3 Project presentations

**Description and objective(s)**

The coordinators of UNTWIST and linked projects invite each other to present their project at meetings or events they organize to further communicate and disseminate the project results and to promote the development of future research collaborations.

**Activities carried out by UNTWIST**

Presentation of UNTWIST at events and meetings organized within the framework of the linked projects and vice versa. Five projects were involved: PANACEA, ADAPT, 4CE-MED, CARINA and ARGENTO.

- UNTWIST project was presented by the coordinator at:
  - [online final event](#) of PANACEA in 2021 (Value Chain Event on Carbohydrate and Specialty Industrial Crops).
  - [ADAPT](#) project meeting in December 2020. The coordinator of ADAPT (Markus Teige) has been approached and agreed to be an EEAB (External Experts Advisory Board) member.
- ADAPT project was presented by the coordinator Markus Teige at:
  - UNTWIST Kick-off Meeting in September 2020.
- [4CE-MED, CARINA and ARGENTO](#) were presented by their coordinator Andrea Monti at the UNTWIST consortium meeting in Bologna 2023.

**Action plan: future activities**

- Presentation of UNTWIST at meetings or events related to TRR 341, that has recently joined the UNTWIST Community.
- Invitation to all the UNTWIST Community projects to present their results during the UNTWIST final event.

**Benefits for UNTWIST project**

Promotion of the project and its results to a larger number of experts from different entities and countries working in research areas related to UNTWIST.



## 6.4 Workshops and joint meetings

### Description and objectives

Workshops and meetings with other research projects on the same topic provide an opportunity to exchange knowledge and experience. Such exchanges enrich all linked project perspectives, help to keep abreast of the latest developments in the field, and foster an environment of collaboration and mutual learning. Technical meetings can also be a good environment to discuss and solve scientific and technical problems. UNTWIST and linked projects can address challenges or difficulties in the project and receive suggestions for solutions from other researchers.

### Activities carried out

Two workshops have been jointly organised by UNTWIST and ADAPT:

- The UNTWIST-ADAPT [joint workshop](#) on best practice of data sampling and management: discussion about sampling strategies, sample transfer and data management and exchange of practical tips to optimize outcome and maximize the impact of intended research.
- The UNTWIST-ADAPT [joint modelling workshop](#): discussion about the modelling approaches of the both projects. Ideas and approaches were exchanged promoting knowledge and experience sharing further strengthening the interaction between the projects.

### Action plan: future activities

- On October 24<sup>th</sup>-25<sup>th</sup> of 2023, UNTWIST partners will participate at the ADAPT conference entitled “Crops in climate change - Breeding for resilience” in Ljubljana (Slovenia) to further strengthen the interaction between the two projects. The UNTWIST coordinator (AIT) and UNTWIST partners from INRAE and FZJ will give talks at this international conference organised by the ADAPT project.
- Identification and proposal of meetings to the other linked projects.

### Benefits for the UNTWIST project

Provide space for sharing expertise, experiences, challenges, and best practice.

## 6.5 Technical visits

### Description and objectives

Technical visits organized by UNTWIST or linked projects allow researchers to observe and evaluate ongoing scientific trials at first hand. The researchers can provide valuable and detailed feedback on the methods, techniques and results obtained. This direct feedback can help to improve the quality of the experimental design, to provide ideas and suggestions for addressing challenges in research.

**Activities carried out:** Technical visits to the demonstration farms of linked projects and vice versa:

- UNTWIST partners visited the [4CE-MED camelina plots](#) at the experimental farm of UNIBO, leader of the project, located in Cadriano (Italy) in May 2023. The visit took place in parallel with the UNTWIST field visit during the consortium meeting in Bologna.



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#### Action plan: future activities

- Invitation to linked projects to visit UNTWIST fields.
- UNTWIST will take advantage of having common partners with linked projects such as 4CE-MED or CARINA to organize field visits coinciding with consortium meetings. The next scheduled field visit by common partners of the 4CE-MED and UNTWIST project (INI, CEE and UNIBO), will take place in November 2023 in Tunisia.

#### Benefits for UNTWIST project

Experts participating in the technical visits can learn about the research carried out by other projects and the results obtained, exchange ideas with the project partners in charge of the field trials.

#### Other networking activities

On 29<sup>th</sup> July 2023, Claudia Jonak, coordinator of UNTWIST became Management Committee Member for Austria in the COST Action CA22157 ([RECROP](#) “Reproductive Enhancement of CROP resilience to extreme climate”) providing a good opportunity to link the UNTWIST knowledge hub with the RECROP platform. RECROP will start in autumn 2023.

UNTWIST is developing a Knowledge Hub that will provide access to (epi)genetic, metabolic, physiological, and agronomic data on camelina, tools for data exploitation and training to increase awareness of stakeholders, enabling effective translation of research outcomes to in-field applications. The linked project ADAPT is developing the Stress Knowledge Map as a hub that compiles the knowledge on mechanisms underlying responses of plants to stress. To date, no activities have been developed yet linking the two hubs, but this will be envisaged in the future.

#### Action plan: future activities

- Invitation to RECROP to join the community and explore the potential networking activities.
- Identify and carry out activities related to the UNTWIST Knowledge Hub and other hubs or data repositories or projects collecting or using data related to that of the UNTWIST Knowledge Hub.

## 7 Conclusions and Recommendations

The conclusions come from the analysis done with a double approach:

- UNTWIST perspective: lessons learnt from networking activities carried out to date, barriers and opportunities found.
- Linked projects feedback: interest shown by the projects, response, activities proposed and interaction level.

As explained in section 6, networking activities have multiple benefits in general and specifically for the UNTWIST project and its research. In addition, the UNTWIST network opens doors to a broad research community, both in terms of the number of partner organisations (more than 140) and geographically (more than 15 countries). Partners of the linked projects include researchers, many of them with a long track records and extensive international experience, and some of them with a long history of close collaboration, in many cases reflected in previous research projects. The activities performed allow the researchers to further expand their network.



However, during the implementation of the networking activities, UNTWIST and other projects also faced some barriers or limitations explained here below with some recommendations on how to overcome them. Some of them are general limitations and others are specifics related to each type of networking activity.

**1. Project implementation period:** linked projects have a different duration and time frame. This time mismatch brings about some limitations. Projects at an advanced stage can share results and carry out activities in an agile manner, while projects in the launching phase need time to implement the tools and activities. The impact of activities carried out with projects at this initial state is much lower and slower.

Scientific research projects that have similar timelines have higher potential to establish beneficial relationships and collaborations like sharing of resources and equipment, collaborating on data collection and analyses, providing feedback and mutual support, and joint dissemination of results. An extended research network and common partners in projects facilitates to establish relationships and collaborations, to improve their effectiveness, to increase their impact, and to foster a collaborative and enriching research environment.

***Recommendations:***

Promote the creation of stable and long-term networks or clusters for projects working on similar topics so that new projects do not need to make an initial effort to create the network but can instead join existing networks. Newly joined projects would benefit from the results, experience and tools put in place by completed projects. In addition, it would be beneficial if completed projects were supported for a reasonable time after their completion to actively participate in these networks to share the results with the newly joined projects. The participation in such networks should be recommended for projects granted under same call or topic.

**2. Confidentiality of data and results.** Confidentiality is a constraint to engage research projects collaborations due to protection of sensitive data, confidentiality agreements, intellectual property protection, competition and competitive advantage, legal and ethical restrictions, and conflicts of interest. In the case of projects funded under the Horizon 2020 programme, there is a mandate on open access to publications. The Article 29.2 of the Model Grant Agreement sets out detailed legal requirements on open access to scientific publications: under Horizon 2020, each beneficiary must ensure open access to all peer-reviewed scientific publications relating to its results. However, open access to project data and publications does not usually occur during the life of the project, but rather towards end or after the completion of the project. Each project has its own Data Management and Exploitation Plan, which sets rules for protecting data and results that limit dissemination, communication, and exploitation activities. Projects usually end long before the data can be shared or published.

***Recommendations:***

- Draft action plans that balance confidentiality with the need for collaboration and knowledge sharing to promote scientific progress.
- Projects should have resources to be committed with the dissemination activities after the project ends which is not feasible with the current Horizon2020 financial rules.
- The projects participating in networking activities could sign non-disclosure agreements to keep data confidentiality.

**3. Inherent differences between projects:** each project has its own objectives, activities planned and budget in terms of dissemination and communication. The priorities therefore do not necessarily have to be the same and the channels and tools for the dissemination could not be the same. The activities carried out with linked projects do not have the same benefits for the different projects, and sometimes it is difficult to know the outcome beforehand. Organising and attending face-to-face exchange meetings can involve significant costs, such as personnel, travel, accommodation, and registration. In addition, coordinating the logistics of a meeting is complex, especially if projects are in different geographic regions. Not all projects are willing to do this. In addition, the availability of the project partners can be a constraint, especially if they have many commitments.

**Recommendation:** EU Programs Calls should encourage to establish networking activities setting specific budget to granted projects.

The majority of UNTWIST linked projects have previous experience in networking but not all of them have a plan for networking activities. All the linked projects agreed in participating in basic communication activities as: UNTWIST Community including linked projects logo and description; social media for disseminating linked projects activities and events; Linked project presentation to involved partners; Workshops and Joint meetings; and technical visits. On the other side, one third of projects contacted are not interested to share project news and less than a half agreed to make technical meetings or field visits.

Consulted linked projects confirmed that time lag and confidentiality are the main barriers to develop networking activities and half of them also point out that budget restrictions and lack of time of researchers to participate in networking activities represents a limitation.

#### 4. Specific limitations related to activity type:

**Social media:** the project profiles present a fast and up-to-date information for linked projects. Although lengthy procedures for validating content make information obsolete or not interesting. In addition, social networks are not always reliable sources of scientific information and is limited to present images or complex data. For this reason, it is important to understand the topic and the results to be published to prepare the information correctly oriented to the target groups. Question that requires a dedication that the immediacy of social networks does not allow for.

**Recommendation:** Despite these limitations, social networks can still play an important role in science outreach to communicate the linked projects activities and connecting science projects. However, it is important to recognise their limitations and to complement them with other activities that are better suited to promote scientific collaboration and knowledge sharing.

#### Project Presentations:

- Limited time: usually consortium meetings have a very busy agenda, the time to present other projects is limited and does not allow to explain in-depth the project content in detail.
- One-way approach: presenters share information with the audience but not discussion occurs, or no time is allocated for questions or debates.
- Format constraints: Presentations often follow a structured format, which can make it difficult to present interesting information. Time constraints and the need to simplify information can make it difficult to fully understand the projects.

**Recommendation:** schedule specific presentation sessions for joint projects separate from other technical meetings of the consortium.

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