



Boosting
sustainable
diversification in
farming systems

Carinata and **camelina** two minor *Brassicaceae* with great potential for the European bioeconomy

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The Project Overview

- ✿ **CARINA (CARINATA AND CAMELINA BOOSTING THE SUSTAINABLE DIVERSIFICATION IN AGRICULTURAL PRODUCTION SYSTEMS)** is a cross-national, 4-year long Innovation Action, supported by the European Union under the Horizon Europe programme.
- ✿ **Duration:** 01/11/2022 - 31/10/2026
- ✿ **Focus:** New sustainable and diversified farming systems with carinata and camelina oilseed crops for low iLUC feedstocks in the bio-based economy.

Camelina (*Camelina sativa* (L.) Crantz)



Annual oilseed crop : *Brassicaceae*

Seed production: 1.5-3.0 t/ha

Oil content: 26-43%

Protein content: 24-32%



Dr. Franeta IFVCNS

1999-11-22



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Environmental-Friendly Crop



- ☀️ Suitable for different pedo-climatic conditions
- ☀️ Extremely drought tolerant
- ☀️ Germinates at low temperature
- ☀️ Low input requirements
- ☀️ Winter and spring types are available
- ☀️ Short growing cycle (up to 80 d)
- ☀️ Suitable for conventional harvesting machines



Carinata (*Brassica carinata* (A. Braun))



HYBRID
NON-FOOD NON-GMO

HIGH BIOMASS COVER CROP

- Maximum** GHG reduction
- Positive impact** to land use
- Sustainable** agriculture practices

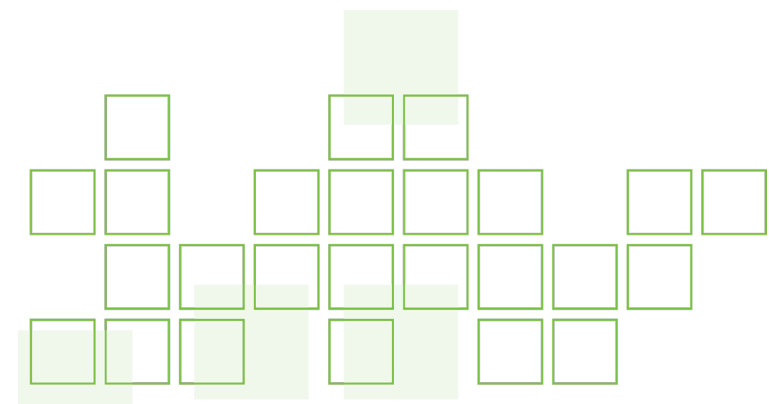
CONTRACT COVER CROP

- Additional** grower revenue
- Water & nutrient** management
- Biodiversity** in crop systems
- Improves** disease and pest management
- Certified** production system

DEEP ROOTED BIOMASS

- Efficient** nutrient uptake
- Improves** soil quality
- Soil carbon** sequestration

Independently
certified and
globally
recognized as
a lower carbon
feedstock



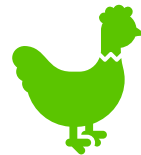


HIGH QUALITY OIL

- ✓ Non-food oil, grown between main crop rotations
- ✓ Independently certified and traceable from field to oil
- ✓ Drop-in, high quality, clean oil product
- ✓ Feedstock for SAF/Biojet, Renewable Diesel, FAME and co-processing
- ✓ Qualified in large biofuel markets



HIGH PROTEIN NON-GMO MEAL



- ✓ High protein/low fiber offers several feeding options
- ✓ Up to 45% protein content
- ✓ Additional protein source to meet growing market demand



Concept and Methodology

- ✿ **CARINA** aims to **enhance** yield stability, farmers' revenue, and overall sustainability by increasing diversification in cropping systems.
- ✿ **Adoption** of carinata and camelina oilseed crops for sourcing multiple **low iLUC** (indirect Land Use Change) feedstocks.
- ✿ **Supplementing** the domestic **bioeconomy** sector.
- ✿ **Co-creation** of innovation actions through **9 lighthouses**, **3 living labs**, and **3 policy innovation labs**.



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Steps Towards Sustainable and Diversified Farming Systems

WP1. Designing and Implementing Innovative and Sustainable Farming Systems

WP2. Full Biomass Valorization with a Circular Economy Approach

WP3. Integrated Sustainability Assessment of the New Bio-based CARINA System

WP4. Co-creation of Policy Interventions for Feedstock Provision and Certification

WP5. Social Innovation to Scale-up CARINA Solutions

WP6. Dissemination, Communication and Exploitation

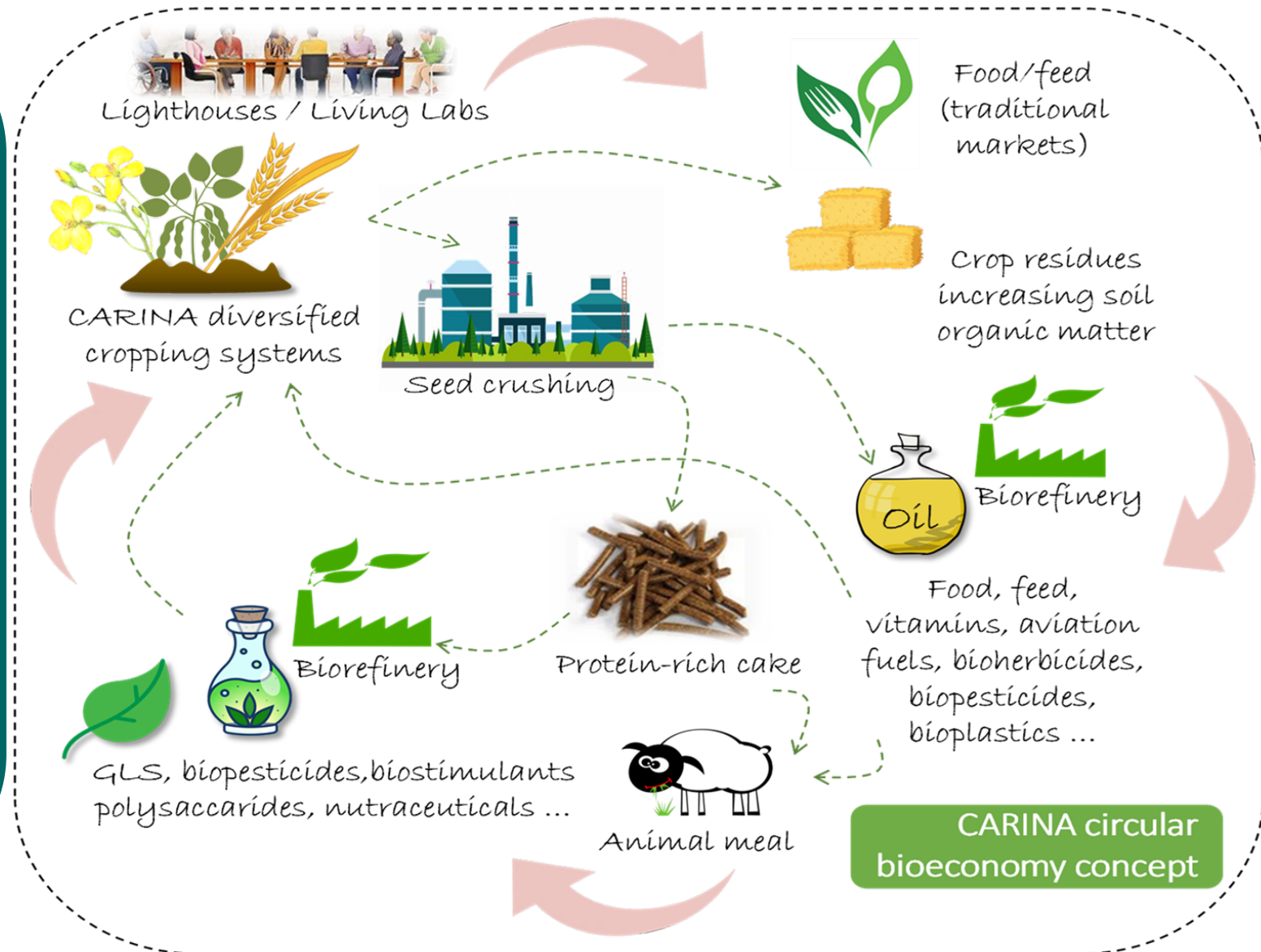


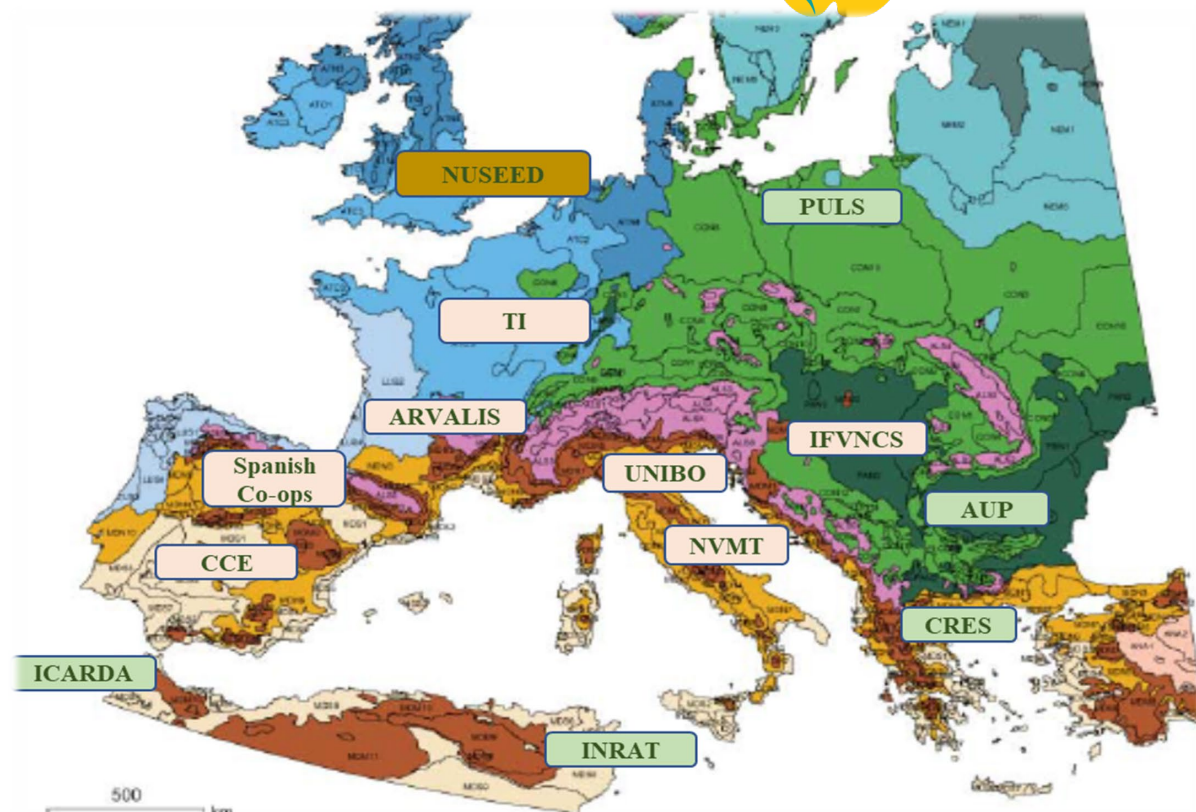
Fig. 1 – Circular bioeconomy concept in the CARINA proposal.

Our Team

CARINA has a competent team of **19 partners**:

- ✿ **EU Countries:** Italy, France, Spain, Germany, Greece, Slovakia, Bulgaria, and Poland;
- ✿ **5 Associated Countries:** UK, Serbia, Tunisia, Morocco, and Switzerland.

To strengthen a multi-actor approach perspective, the CARINA consortium includes:
research organizations/institutes,
universities,
SMEs,
companies,
farmers' cooperatives,
NGO,
farming consultants.



 This project has received funding from the European Union's Horizon Europe research and innovation program under grant agreement No 101081839.

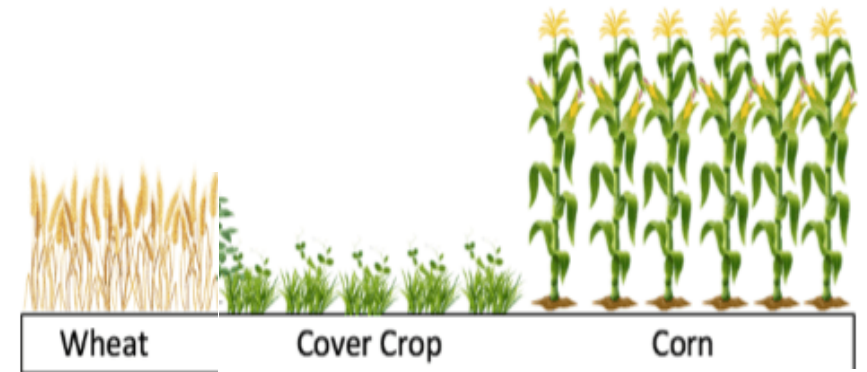
www.carina-project.eu

Carina Investigated Farming Systems

Carinata or camelina used as cash cover crops

REFERENCE SYSTEM					
<u>Summer fallow</u>					
Winter food crop		FALLOW		Winter food crop	
autumn	winter	spring	summer	autumn	winter
<u>Winter fallow</u>					
FALLOW		Spring/summer food crop		FALLOW	
autumn	winter	spring	summer	autumn	winter
CARINA cash cover cropping					
Winter food crop		Carinata/camelina as summer cover crop		Winter food crop	
autumn	winter	spring	summer	autumn	winter
Camelina as a winter cover crop		Summer food crop		Winter food crop	
autumn	winter	spring	summer	autumn	winter

Example of cash cover cropping



Relay-cropping



Preliminary results for camelina



Double cropping demo trials ITALY

- 3 different camelina varieties: CCE 117 (spring, Camelina Company), CCE 44 (winter, Camelina Company) and Lenka (winter, Poznan University) planted on 26 Oct 2022 in large strips of > 1000 m², replicated X2.
 - Sorghum and sunflower in the business as usual strips were planted on 5 April 2023.
 - Camelina was harvested on 20 Jun 2023, about 3 weeks later than typical in relation to the flooding events which avoided to enter the field earlier.
 - Sorghum and sunflower after camelina were planted on 26 June 2023.
- Significant differences emerged among camelina varieties.
- Camelina seed yield was on average lower than in previous trials due to flooding in May (> 350 mm of precipitation).
- So far sorghum seemed to be a suitable option for double cropping after camelina, while sunflower is suffering weed pressure.



Double cropping demo trials SERBIA



- IFVCNS camelina spring varieties (NS Zlatka & NS Slatka) sown in autumn (31 October 2022) and in spring (13 March 2023)
- IFVCNS sorghum (Gold) and sunflower (NS H 7749) in the business as usual were sown on 23 May and 28 April 2023
- Camelina sown in autumn** was harvested on 21 June 2023;
 - Seed yield: 1,5696 t/ha NS Zlatka and 1,6819 t/ha NS Slatka
- Camelina sown in spring** was harvested on 3 July 2023;
 - Seed yield: NS Zlatka 1,6705 t/ha and NS Slatka 1,4764 t/ha
- Sorghum and sunflower** proceeding camelina (from autumn sowing) were sown on 23 June.



Sunflower – business as usual



Sowing date: 28 April 2023
Emergence date: 08 May 2023
Full flowering date: 10 July 2023
Maturation date: 10 August 2023

Harvest date: 25.August.2023. **Yield: 3,8 t/ha**



The crop was hit by two high intensity storms on 19 July and 21 July!

Sunflower after autumn sown camelina



Sowing date: 23 Jun 2023
Emergence date: 04 July 2023
Full flowering date: 19 August 2023
Maturation time: 19 September 2023





Conclusions / Future steps

- ✿ Meteorological conditions during this first year of trials were quite unusual - warmer temperatures and much higher precipitation than usual.
- ✿ The summer crops (sunflower and sorghum) are about to be harvested in both Italy and Serbia
- ✿ Next autumn CARINA field trials with **CAMELINA** will be repeated
- ✿ **CARINATA** (NUJET 350 by NUSEED) will be sown in both Italy and Serbia in a relay-cropping system with winter barley.



Thank you

Stay in touch
with **CARINA**



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