

## Cardoon, a low environmental impact cultivation to redevelopment of marginal areas

<b>Geographical scope</b>	Italia - Italy
<b>Keywords</b>	Aridoculture / Aridoculture Bioeconomia / Bioeconomy Economia circolare / Circular economy Assetto del paesaggio / del territorio - Landscape /land management Gestione / funzionalità del suolo - Soil management / functionality Competitività e diversificazione dell'agricoltura/silvicoltura - Farming/forestry competitiveness and diversification

To offer a new income opportunity to farmers operating in marginal or no longer productive land in the Tuscany region, the Italian operating group GO CARD promoted the creation and development of an agro-industrial supply chain based on the cardoon cultivation.

Where traditional crops are no longer profitable and soils are progressively abandoned, a low environmental impact crop for industrial uses, such as the cardoon, can provide important answers to the needs of restructuring the agricultural sector and redevelopment of the territory from the environmental, landscape and socio-economic point of view.

In fact, both the cardoon seed (to extract oil), and the biomass (to obtain cellulose and hemicellulose) can be processed and become a source of income, corresponding to low production cost. Moreover, from the seeds, once the oil is extracted, a highly proteinaceous flour is obtained which can be used to feed animals as a substitute for soy, as well as active molecules to be used in the field of nutraceuticals. Finally, vegetable waste from processing can be used to produce energy, but also in the field of fertilization.

GO CARD tested the cardoon productivity and sustainability, cultivating it in some marginal lands in the Tuscany region -lands which are excluded from cultivation due to economic infeasibility or physical restriction for growing conventional crops .

The cardoon sowing began in March 2019: during the project cardoon covered a total area of about 22 hectares in the provinces of Grosseto, Pisa and Florence in extremely variable pedoclimatic areas, in the presence of different cultivation systems (biological and conventional) and through the use of different cultural protocols.





*Azienda agricola La Commenda, luglio 2019*

At the end of June 2019, the feeding test also began. After the initial measurements (ponderal, zoometric, sanitary and metabolic analyzes) the administration to the 32 involved heads of the experimental diet based on the substitution of 50% of the soy flour with cardoon flour began.



*Azienda Agricola Lippi e Nocentini, 1 ottobre 2019*

During the project, GO CARD carried out tests about the use of the residual biomass resulting from the collection of the seeds (eg co-combustion and anaerobic digestion tests) and studies of monofloral honey produced during the cardoon flowering period.

In May 2019, a group of Tuscan farmers, in addition to the project partners, participated in a visit to Sardinia where the integrated agricultural-industrial supply chain based on the cardoon's production and transformation is already a solid reality.



In the three-year period, other visits were carried out on the farms involved in the experimentation. During the visit it was possible to observe the cultivation during the harvesting operations and speak with the farms who are partners of the GO CARD project.

With this activity other farms have decided to start the cardoon cultivations, in addition to those of the OG - Card. In this way it was possible to triple the hectares cultivated with cardoon during the Project and to expand the experimentation in the Tuscany region.

Training courses were organized too during the Project. In the last year of activity, two short training courses concerned the livestock sector related to the use of cardoon flour as food.

### **Expected results of the project**

The expected results were:

- advancement of research and scientific-technological skills in the agronomic and agro-industry sector (use of agricultural biomass for non-food purposes);
- effective collaboration between farms, industry, universities and research bodies, to develop circular economy in the Region;
- solutions to recover and to enhance the uncultivated or no longer suitable agricultural land for food production (eg marginal areas and low productivity due to pedo-climatic limitations);
- reduction in the abandonment of agricultural activity and rural areas;
- new income opportunities by innovating in agriculture.

### **Project actions**

The activities planned and carried out were:

1. Cardoon cultivation tests to identify the optimal technical-agronomic itinerary for the cultivation of cardoon in the region
2. Experimentation of the use of cardoon flour in the feeding of beef cattle
3. Study and test of use of residual biomass to produce energy on site
4. Study of the production of monofloral honey during the flowering period
5. Overall sustainability and economic-environmental analysis of the cardoon crop in the region
6. Transfer and training actions

### **Results achieved**

All the activities foreseen by the Project were carried out regularly.

The crop did not present any problems in non marginal land under study.

The experimentation was mainly in marginal areas. In these areas it was possible to deepen the knowledge of the crop and its ability to adapt. Thanks to the project, more information is now available on the risk that can occur in the cardoon cultivation in marginal areas and as well as on possible cultivation protocols.



An effective collaboration between farms, industry, universities, and research institutions has been implemented thanks to the Project.

New income opportunities by innovating in agriculture have been disseminated.

### The dissemination of result

<https://www.go-card.eu/>

### Project partners

Partner	Role in the project
Impresa Verde Toscana srl  Viale Fratelli Rosselli 20 50123 Firenze <a href="http://www.toscana.coldiretti.it">www.toscana.coldiretti.it</a>	Project leader, responsible for GO CARD coordination
Novamont S.p.A.  Via G. Fauser, 8 Novara <a href="http://www.novamont.com">www.novamont.com</a>	Industrial partner to support GO in the different phases, through a technical-scientific supervision and ensuring a systematic comparison (benchmarking) with the experience gained in other Italian regions (Sardinia), and European countries such as Spain and France
Istituto Zooprofilattico Sperimentale del Lazio e della Toscana  Via Appia Nuova, 1411 Roma <a href="http://www.izslt.it">www.izslt.it</a>	Scientific partner to realize evaluations and proof about the use of cardoon flour for cattle beef feeding
Consorzio RECORD  Viale Kennedy, 182 Pianvallico Scarperia e San Piero FI <a href="http://www.re-cord.org/">http://www.re-cord.org/</a>	Scientific partner for the valorization of cardoon biomass for energy production
Istituto di Scienze della Vita della Scuola Superiore Sant'Anna  Via Santa Cecilia, 3 Pisa	Scientific partner for the optimization of cardoon production technique in the selected farms

<a href="http://www.santannapisa.it/it/istituto/scienze-della-vita/istituto-di-scienze-della-vita">www.santannapisa.it/it/istituto/scienze-della-vita/istituto-di-scienze-della-vita</a>	
<p>Centro Assistenza Imprese Coldiretti Toscana (C.A.I.C.T.)</p> <p>Viale Fratelli Rosselli 20 50123 Firenze</p> <p><a href="http://www.toscana.coldiretti.it">www.toscana.coldiretti.it</a></p>	Consultancy company responsible for information actions for organization of study visits and training courses on topics related to the project

Farms:

- Soc. Agr. Bacciotti, Sant'Agata (FI)
- Az. Agr. La Commenda, Vicchio (FI)
- Soc. Agr. Lippi Nocentini, Dicomano (FI)
- Az. Agr. Il Poggiolo, Montieri (GR)
- Soc. Agr. Le Cornate, Gerfalco (PI)
- Az. Agr. Lela, Pomarance (PI)