FIRST2RUN PROJECT

CECILIA GIARDI

Value Chain Event on Oilseed Crops
Imperial College London

27.03.2019

HEADLINES

- Novamont model of integrated biorefinery and FIRST2RUN background
- FIRST2RUN:
  - Concept and objectives
  - Status of the project and main results achieved @M42
  - Key collaborations established
- FIRST2RUN BEYOND FIRST2RUN

NOVAMONT MODEL OF INTEGRATED BIOREFINERY AND FIRST2RUN BACKGROUND

FIRST2RUN

FACTS AND NUMBERS

- Horizon 2020 / BBI-JU; Call: H2020-BBI-PPP-2014-1
- Topic: BBI.VC3.F1/ Type of action: BBI-IA-FLAG
- Action type: innovation action
- 6 partners from 4 different countries

- Starting date: 01/07/2015
- Duration: 48 months
- Number of Work packages: 8
- Number of expected deliverables: 44
- Number of Milestones: 6

THE TOTAL EFFORT IN THE PROJECT IS RELEVANT, BEING 1.665 MMS WITH A TOTAL ELIGIBLE COST OF 25.022.688,75 € AND AROUND 30 MIL € OF ESTIMATED ADDITIONAL ACTIVITIES (GRANTED: 16.995.882,00 €)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 669029

OUR DNA

NOVAMONT: A GROUP WITH A TRIPLE VOCATION

- Turnover> 200 mln/€
- > 600 people
- 4 production plants
- 8 compounding lines
- 4 discontinuous and 2 continuous polymerization lines

- 6% of investments compared to turnover
- 24% of people dedicated to research, development and innovation activities
- 4 world-first technologies
- 1.000 patents

- 350 training activities since 1996 for young researchers and experts
- multidisciplinary training paths activated on complex projects

BIODEGRADABLE BIOPLASTICS

AZELAIC ACID

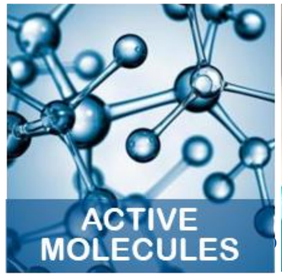
PELARGONIC ACID

C5-C9 ACIDS

POLYMERIC PLASTICISERS

CARDOON OIL

PROTEINS FOR ANIMAL FEED



ACTIVE MOLECULES

BIO-BDO

THE PILLARS OF OUR DEVELOPMENT MODEL

BIOECONOMY AS TERRITORIAL REGENERATION

NOVAMONT is the international leader in the **bioplastics** sector and in the development of **biochemicals** and **bioproducts** obtained from the integration of chemistry, agriculture and the environment.
It promotes a **model of the bioeconomy** as a factor of **territorial regeneration**, based on three pillars:

REGENERATION OF DEINDUSTRIALISED SITES

Reindustrialisation of no longer competitive sites thanks to **proprietary technologies first in the world** in order to create "**bioeconomy infrastructure**", integrated with the territory and interconnected

INTEGRATED AGRICULTURAL VALUE CHAIN

Development of **low impact value chains** through the valorisation of marginal land not in competition with food production, integrated in local areas and connected with the bioeconomy infrastructure

PRODUCTS CONCEIVED AS SOLUTIONS

Products and value chains are conceived and designed to provide **unique** and **sustainable solutions** for specific environmental and social problems.
Elements of a system with broader impacts of the single product

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BIO-BASED INDUSTRIES Public-Private Partnership
Bio-based Industries Consortium
Horizon 2020 European Union Funding for Research & Innovation

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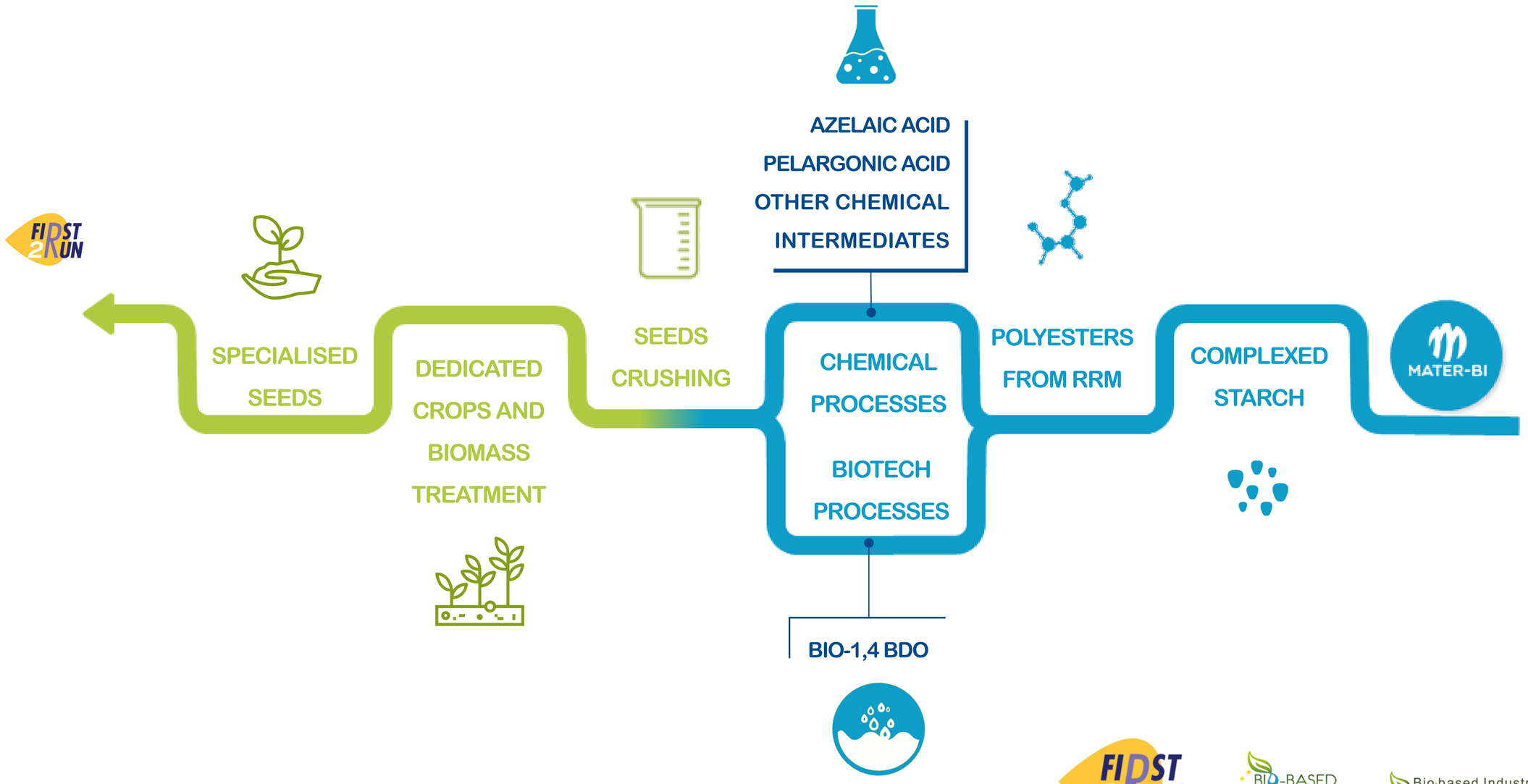
NOVAMONT PROPRIETARY TECHNOLOGIES

UPSTREAM INTEGRATION 1996-2018



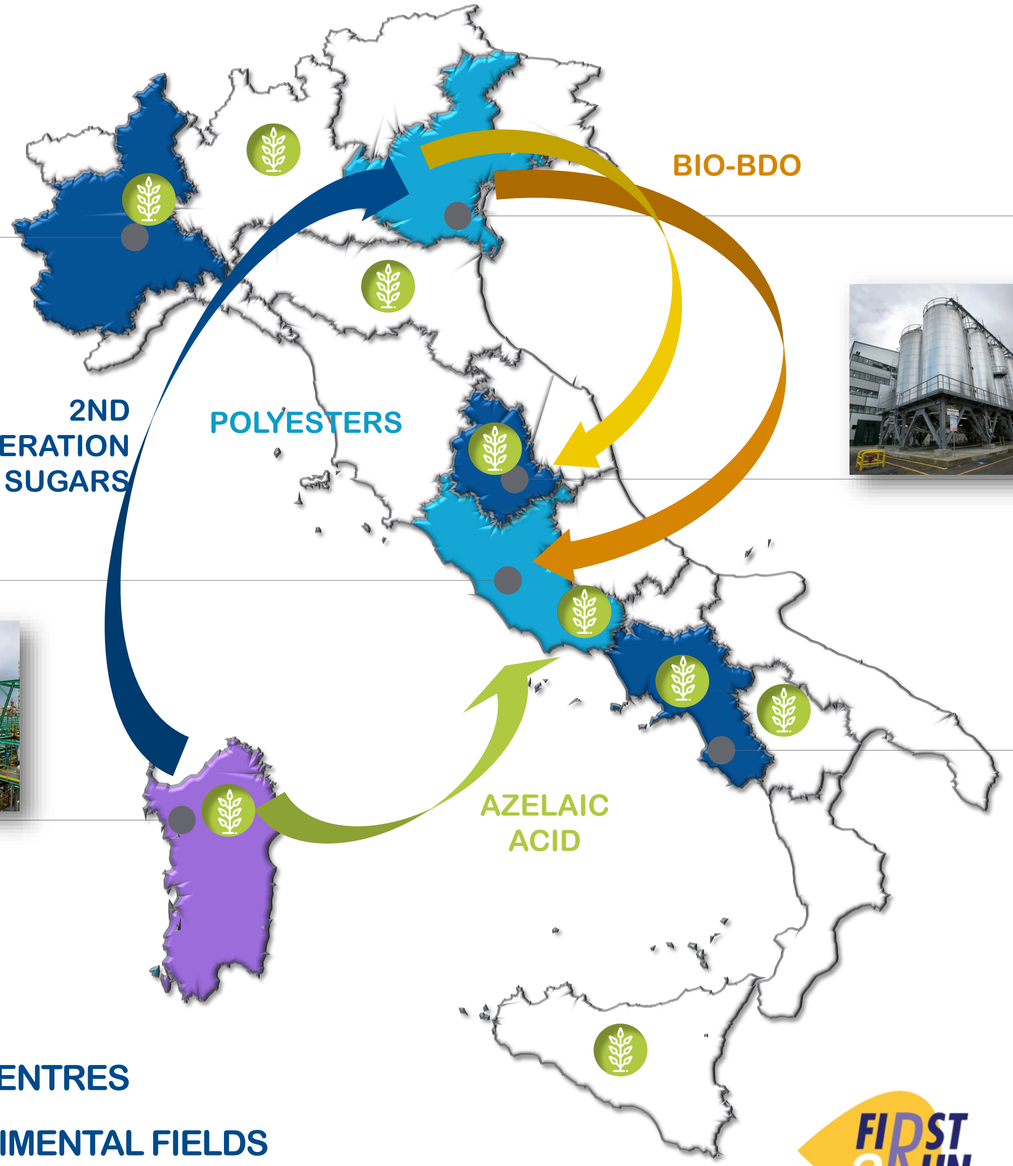
A COMPANY WITH ROOTS IN THE TERRITORY

THE NOVAMONT GROUP IN ITALY

HEADQUARTER AND RESEARCH CENTRE
Novara - Piedmont

MATER-BIOPOLYMER ORIGO-BI PRODUCTION BIOPOLYESTERS
Patrica (FR) - Lazio

MATRÌCA PRODUCTION OF CHEMICAL INTERMEDIATES FROM RENEWABLE RESOURCES
Porto Torres (SS)
Sardinia



MATER-BIOTECH BIOBDO PRODUCTION
Adria (RO) - Veneto

MATER-BI PRODUCTION AND RESEARCH ON INTERMEDIATES FROM RENEWABLE RESOURCES
Terni - Umbria

BIOTECHNOLOGY RESEARCH CENTRE
Piana di Monte Verna
(CE) - Campania

- **NOVAMONT'S SITES**
- **SUBSIDIARY COMPANIES**
- **JV NOVAMONT/VERSALIS**

- **HEADQUARTERS**
- **PRODUCTION SITES**
- **R&D CENTRES**
- **EXPERIMENTAL FIELDS**

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MATER-BI AREAS OF APPLICATION

DESIGNED IN ORDER TO FIND SOLUTIONS TO SPECIFIC ENVIRONMENTAL ISSUES, WITHIN THE LOGIC OF ENTIRELY RETHINK SPECIFIC AREAS OF APPLICATION

FOODSERVICE

LARGE RETAIL

AGRICULTURAL SECTOR

WASTE COLLECTION

PACKAGING

THE PILLARS OF OUR DEVELOPMENT MODEL

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SOIL, A NON-RENEWABLE RESOURCE

EUROPEAN LAND, FROM SOURCE TO SINK

SOIL FUNDAMENTAL FUNCTIONS:

- AGRICULTURAL PRODUCTION
- GROWTH OF VEGETATION
- RETENTION, FILTRATION AND MODERATION OF THE FLOW OF WATER TOWARDS THE WATER TABLES AND RIVERS
- REMOVAL OF CONTAMINANTS AND REDUCTION OF THE FREQUENCY AND RISK OF FLOODS
- REGULATION OF ENERGY FLOWS TO AND FROM THE ATMOSPHERE
- MITIGATION OF CLIMATE AND THE IMPACT OF DROUGHT

SOIL IS A "NON-RENEWABLE" RESOURCE
AND MANY DEGRADATION PROCESSES ARE ACCELERATING DUE TO HUMAN PRESSURE EXERTED ON IT.
20% OF EUROPE'S LAND SURFACE IS SUBJECT TO EROSION RATES ABOVE 10 T/HA/YR,
WHILE SOIL SEALING LEADS TO THE LOSS OF MORE THAN 1000 KM2 OF PRODUCTIVE LAND EACH YEAR.*

* Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "The implementation of the Soil Thematic Strategy and ongoing activities" - COM/2012/046 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52012DC0046

CARBON STOCK IN SOIL IN THE PLANET TOPSOIL

SOIL ORGANIC MATTER (SOM) PIVOTAL TO MANY SDGS (LAND, WATER, HEALTHY SOILS, CLIMATE AND GLOBAL WARMING)

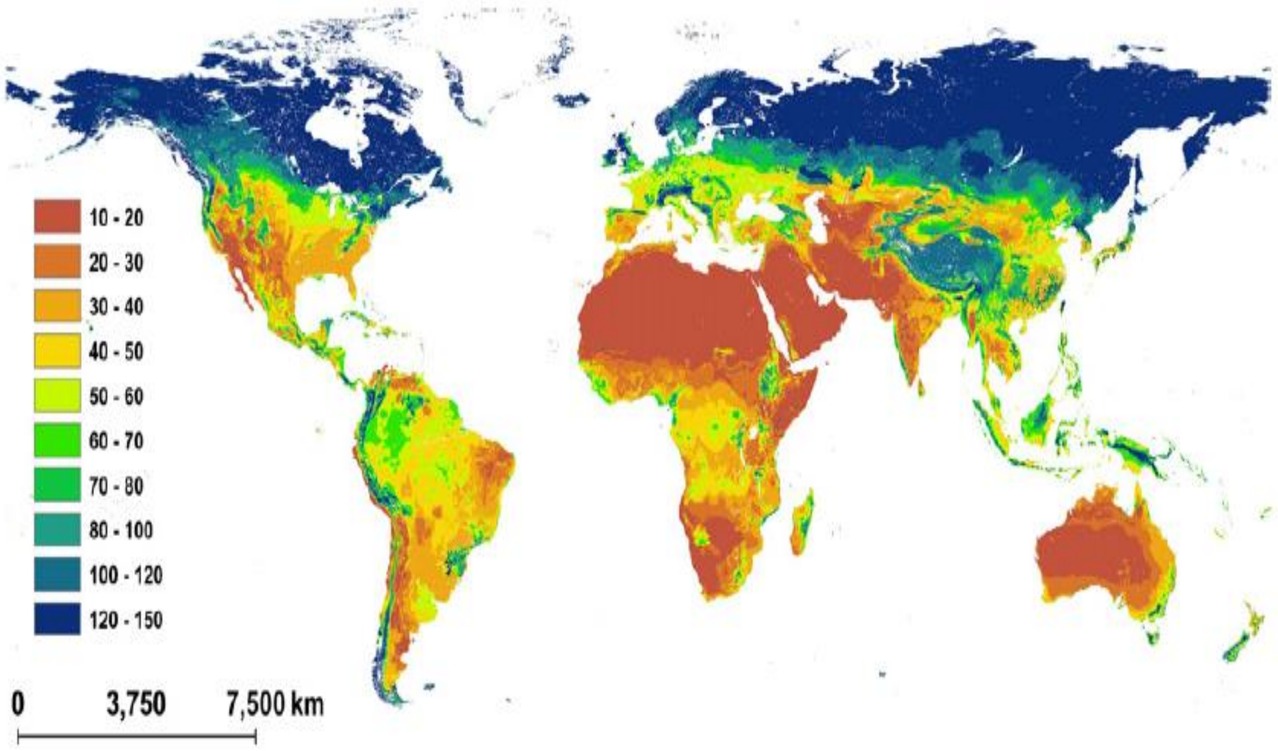


Fig. 2. Soil C stocks of the world's topsoil (0–0.3 m) in tonne C per hectare. The map was generated based on global datasets of C stock from the study of Stockmann et al. (2015).

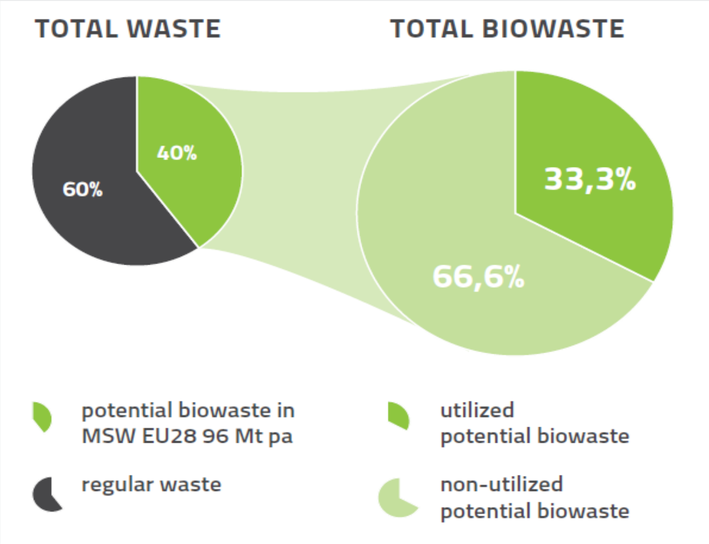
The Italian scenario concerning agricultural soils: between 1971 and 2010 it fell by 5 million hectares, going from almost 18 million hectares to just below 13: an area equal to Lombardy, Liguria and Emilia Romagna combined *. In the last 30 years 3 million hectares of cultivated land have been abandoned

* Source: INEA, ISPRA, ISTAT dossier Building the future: defending agriculture from overbuilding

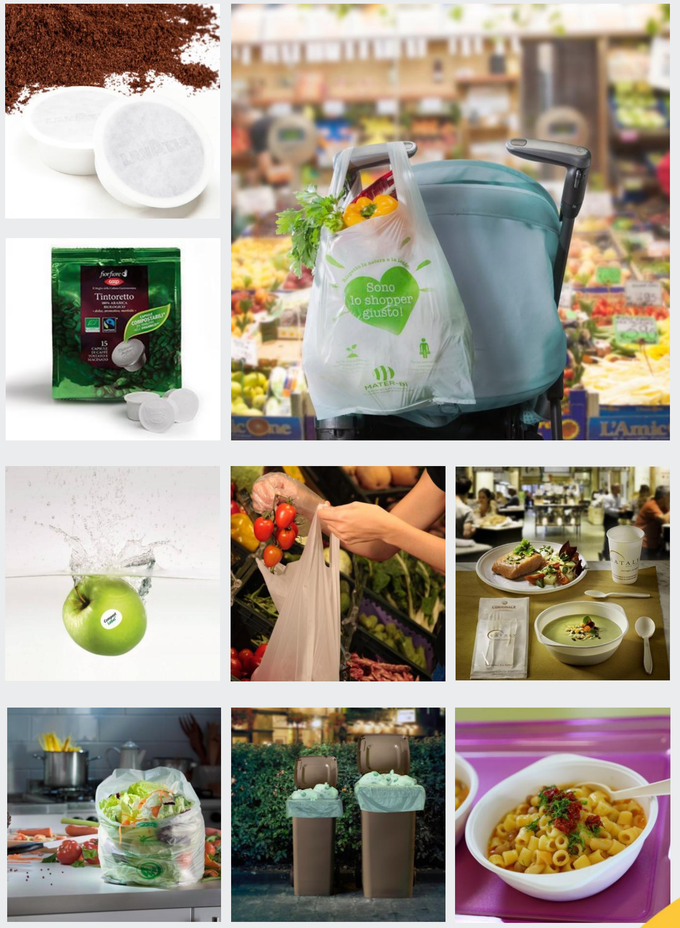
TRANSFORM PROBLEMS INTO OPPORTUNITIES

SOURCE: EUROPEAN COMPOST NETWORK, BUDIMAN MINASNY ET AL. (2017)

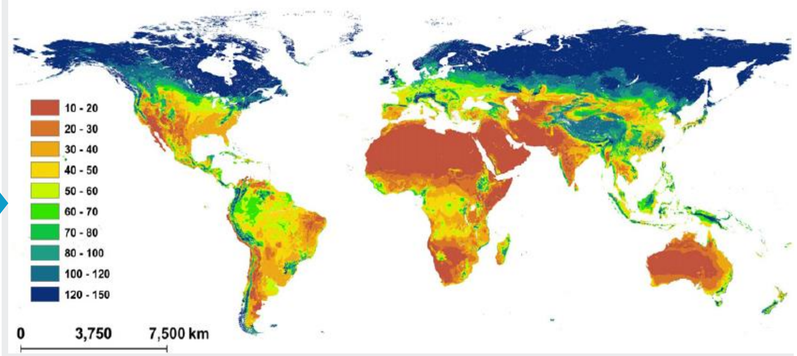
ORGANIC WASTE IN LANDIFILL



DEVELOPMENT OF NEW ORGANIC WASTE COLLECTION SYSTEM THROUGH THE USE OF BIOPLASTICS



COMPOST AS A DRIVER FOR SOILS FERTILITY



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BENEFITS FOR THE WHOLE SYSTEM

THE INTEGRATED AGRICULTURAL VALUE CHAIN INTERCONNECTED WITH THE BIOECONOMY INFRASTRUCTURES

Restoration of organic matter of soils through the identification of dry farming in marginal and abandoned land

ADDED VALUE FOR THE SUPPLY CHAIN ACTORS

Through the creation of **new income opportunities for farmers** working on **abandoned or uncultivated land**, with negative economic margins and through the stipulation of supply chain **contracts** for the exploitation of crops

CASCADING USE OF RESOURCES

From oil seeds of oilseed farming can be obtained **numerous chemical intermediates and bioproducts** that are applied in many sectors: bioplastics, biolubricants, cosmetics, plasticizers, etc.

DEVELOPMENT OF NEW INNOVATIVE PRODUCTS

Use of all crop components to produce a **range of products** and co-products ranging from biochemicals to animal feed, including energy recovery to fuel the energy requirement of the industrial process

INCREASE SOIL FERTILITY

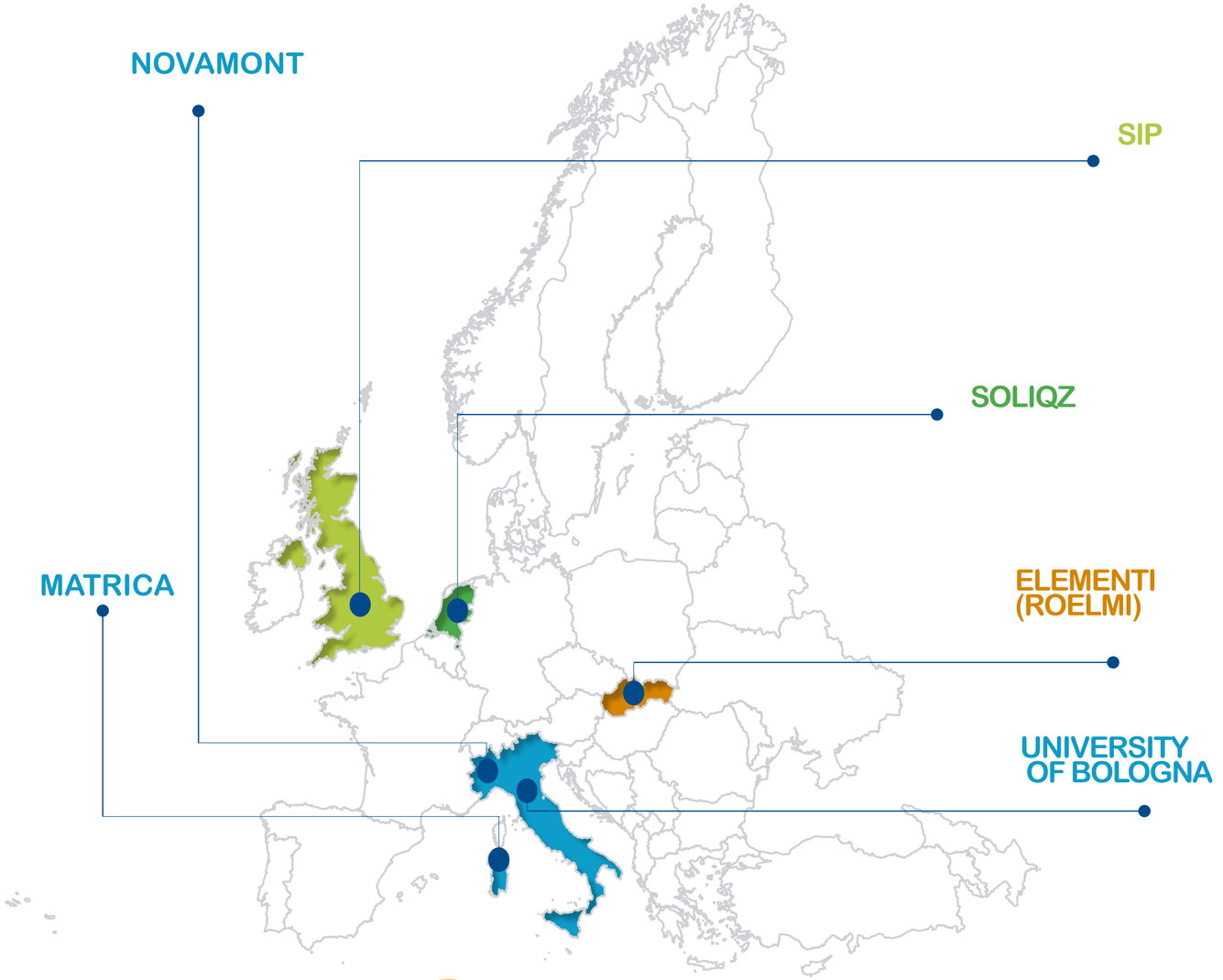
FOCUS AND OBJECTIVES

FIRST2RUN: INTEGRATED BIOREFINERY FOR DRY CROPS SUSTAINABLE EXPLOITATION TOWARDS BIOBASED MATERIALS PRODUCTION

- The FIRST2RUN flagship project aims at demonstrating the **technical**, **economic**, **environmental** and **social sustainability** at pre-industrial/large scale of a **value chain** in which **low input** and **underutilized oil crops** (i.e. cardoon) grown in arid and marginal lands and not in competition with food or feed, are exploited for the **extraction of vegetable oils** to be further converted into **bio-monomers** (mainly pelargonic and azelaic acids) **as building blocks for high added value bioproducts** (biolubricants, cosmetics, bioplastics, additives) through the integration of chemical and biotech processes.

- **By-products** resulting from these manufacturing processes will be further enhanced to obtain **animal feed**, **other value-added chemicals** and **energy from scraps** in order to increase the sustainability of the value chain.

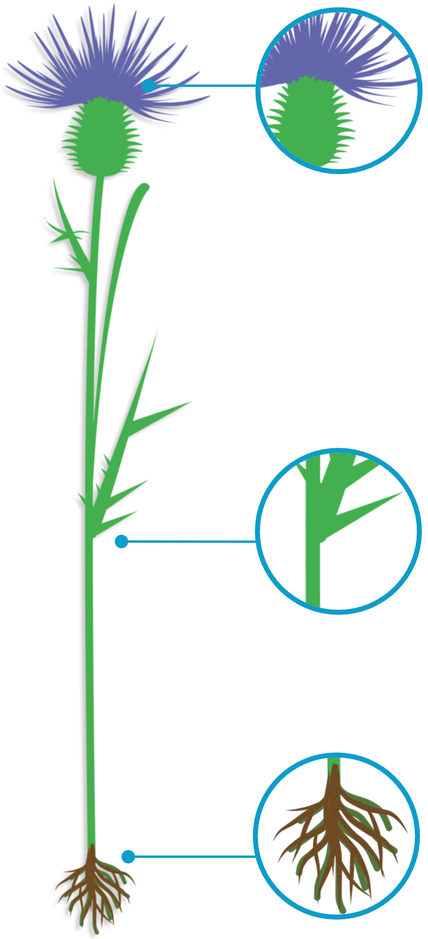
- **Standardisation**, **certification** and **dissemination** will be integral aspects of the project, as well as a study into the **social impact** of products deriving from renewable resources.



BUILDING AN INTEGRATED AGRICULTURAL VALUE-CHAIN

THROUGH THE COOPERATION WITH FARMERS AND THEIR ASSOCIATIONS

OUTPUT FOR THE BIOPLASTICS AND BIOCHEMICALS VALUE CHAIN



OIL

ACTIVE MOLECULES

PROTEINS FOR ANIMAL FEED

STEAM, DIATHERMIC OIL

OTHER CHEMICALS

OTHER CHEMICALS

2015

AGREEMENT BETWEEN NOVAMONT AND COLDIRETTI (THE LARGEST AGRICULTURAL ORGANISATION IN EUROPE) FOR THE DEVELOPMENT OF INNOVATIVE AGROINUSTRIAL VALUE CHAINS FOR BIOPLASTICS AND BIOPRODUCTS

OPPORTUNITIES FOR FARMERS, SHEPHERDS AND OTHER STAKEHOLDERS IN THE AGRICULTURAL SECTOR

- Valorisation of marginal rural areas (i.e. cardoon trinaseed, ad hoc machinery, agronomic protocols and agronomic support)
- Reduction of environmental impact for soil, water and air though the use of:
  - biodegradable mulch films
  - pelargonic acid for weed control
  - biolubricants
- Availability of local production of proteins for animal feed
- Energy efficiency and independency
- On-field innovation approaches

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FIRST2RUN RESULTS: SUSTAINABILITY

- Development of **LCA model of F2R supply chain** and elaboration of Soil Organic Matter (SOM) model for the evaluation of **soil organic content dynamics and benefits for soil following cardoon establishment**
- A specific **SOM (Soil Organic Matter) model** has been therefore developed and applied within F2R with the aim of defining a predictive tool suitable for estimating the site- specific SOM dynamics following cardoon establishment in marginal lands in function both of pedoclimatic conditions and agricultural practices.
- Results suggested that **growing cardoon using compost** as suggested by the protocol defined in First2run (during the 1st and the 4th cultivation year) **significantly contributes to the increase the SOM pool of agricultural soils**, thus reducing the carbon-footprint of cardoon due to a C-sink. According to the SOM model analysis implemented by Novamont and CREA the innovative oil cropping system (cardoon) in marginal lands grown also with compost application would result into an **increment SOM after 22 years of 6.2 metric tonnes per ha** (*The Role of Compost in Bio-waste Management and Circular Economy (F. Razza, L. D'Avino, G. L'Abate and L. Lazzeri, 2018*)
- These figures suggest that cardoon establishment applying compost (only during the 1st and the 4th cultivation year) in the cultivation protocol has substantial benefits in **mitigating the carbon footprint of cardoon cultivation** since the amount of CO_2 uptaken has the same order of magnitude of "Cradle to farm gate" of cardoon.
- This results reinforce the **interconnection with compostable bioplastics development** within First2Run project, validating a circular bioeconomy model based on a strong cooperation between agriculture and industry.

FIRST2RUN:MODEL OF COOPERATION WITH FARMES

- FIRST2RUN stands out for having demonstrated at **flagship scale** a highly innovative agro-industrial **value chain** based on the valorisation of low-input oil crops grown in marginal lands towards the production of biobased and biodegradable plastics, cosmetics and biolubricants.
- **Coldiretti** has been a key partner of the value chain, allowing to facilitate the interconnection and dialogue between Novamont and local farmers
- Establishment of **new models of contracts with farmers** for the cultivation of oilseed crops on marginal lands for a local innovative value chain: from 2015 agreement among Novamont – Coldiretti – farmers to implement the cultivation of oilseed crops for bioproducts and valorisation of by-products
- The agreement foresees a **strong support to local farmers from Novamont** side to provide support, training and assistance on low input cultivation protocols including innovations in machines and agronomic practices

COLDIRETTI

Novamont
PRESS RELEASE

FILIERE CORTE AGROINDUSTRIALI PER BIOPRODOTTI:
ACCORDO STRATEGICO COLDIRETTI NOVAMONT
Si parte con il cardo in Sardegna

Novara - Roma, 23 gennaio 2015 - "L'attivazione di una filiera agricola rispettosa del territorio, che valorizzi aree abbandonate non irrigue per alimentare il primo modello di bioraffineria integrata nel territorio, sinergica con la filiera alimentare e rivolta a prodotti ad alto valore aggiunto, capaci di ridurre e sostituire materie prime più impattanti provenienti da lontano". E' quanto prevede l'accordo siglato da Catia Bastioli, amministratore delegato di Novamont e di Matrica (joint venture paritetica tra Novamont e Versalis), Roberto Moncalvo, presidente di Coldiretti, e Mauro Tonello, presidente di Consorzi Agrari d'Italia (CAI), **finalizzato alla creazione di filiere agroindustriali innovative delle bioplastiche e dei biolubrificanti a filiera corta.**

FIRST2RUN · BIO-BASED INDUSTRIES Public-Private Partnership · Bio-based Industries Consortium · Horizon 2020 European Union Funding for Research & Innovation

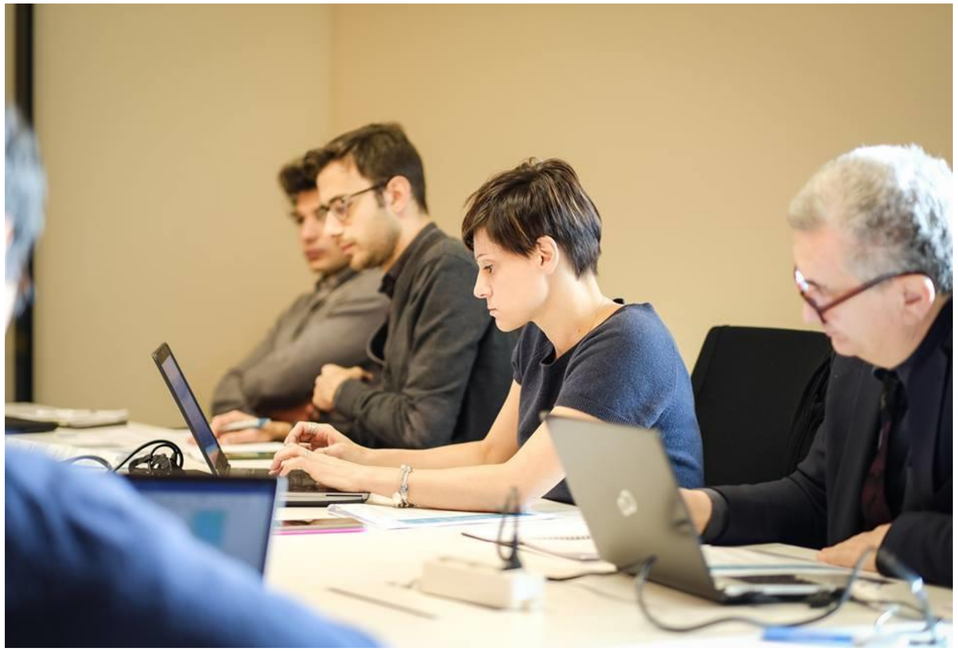
FIRST2RUN AS ACCELERATOR OF NEW OPPORTUNITIES FOR A RURAL BIOECONOMY

WHAT NEXT?

- The main objective, while continuing with F2RUN agricultural value chain implementation, is to **integrate all the different technologies and practices** (some already demonstrated in First2run and other under development activated as side result of the project) into one comprehensive "**Multipurpose Circular Farm**" to demonstrate **new circular bio-based business models for rural communities interconnected with biobased industry**

- In such a perspective, Novamont has launched a **call for Open Innovation collaborations to select start-up and SMEs to further develop and scale-up promising results from First2Run project** (collaboration with the Circular Economy Lab, a new joint platform between Fondazione Cariplo and Banca Intesa San Paolo, acting as facilitator of the initiative)

- **Different areas of collaboration have been selected**, most of them are highly **interconnected with the agricultural value chain**



NOVAMONT

INTESA SANPAOLO INNOVATION CENTER

In collaborazione con

CARIPLO FACTORY

TRACE | NOVAMONT

SAVE THE DATE

SAVE THE DATE

FIRST 2 RUN

A virtuous industrial model to turn vegetable oil into bio-products

20th June 2019

Location: Brussels

RSVP

Discover more on: first2run.eu/final-event

BIO-BASED INDUSTRIES Public-Private Partnership

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This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 669029.

""The challenge of our millennium is in the balance between the technical means that humanity possesses and the wisdom in how we will make use of them"

UMBERTO COLOMBO

CECILIA GIARDI

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THANK YOU FOR YOUR ATTENTION

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