

INTEGRATION BETWEEN ADVANCED LIGNOCELLULOSIC BIOFUELS AND FOOD CROPS: IS IT DOABLE?

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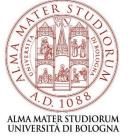
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BECOOL PROJECT AT GLANCE



BECOL

Brazil-EU Cooperation for Development of Advanced Lignocellulosic Biofuels

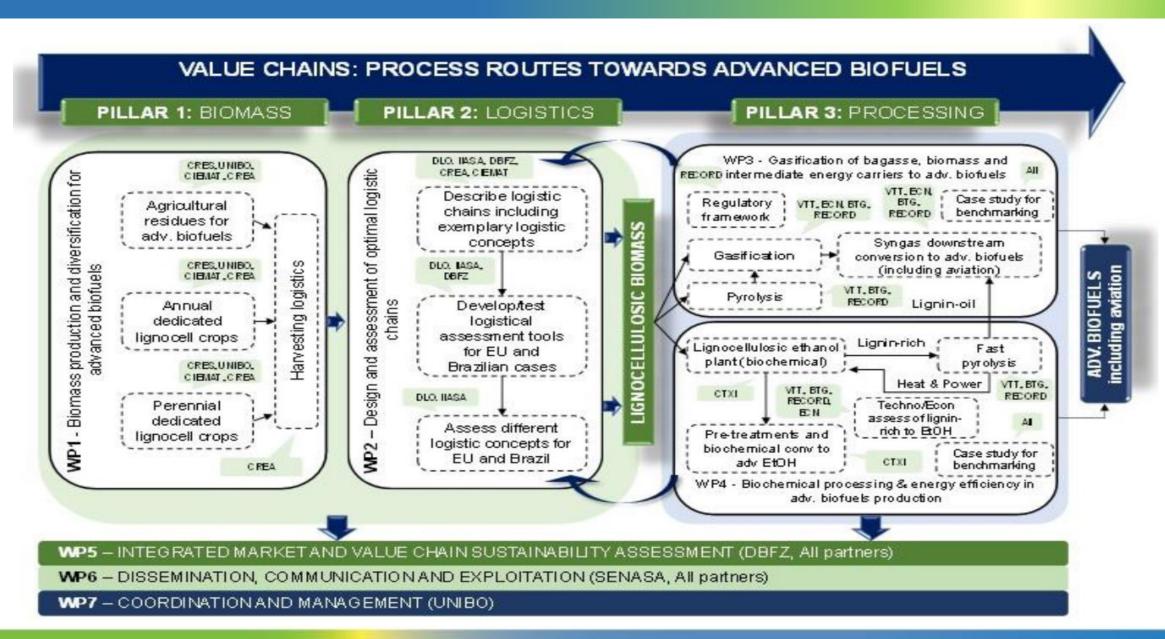
- ➤ **Project title**: Brazil-EU Cooperation for Development of Advanced Lignocellulosic Biofuels
- ➤ Coordinator: University of Bologna (Prof. Andrea Monti)
- >12 Partners
- ➤ **General objective:** Strenghten the EU-Brazil cooperation on advanced lignocellulosic biofuels.
- Twin Brazilian Project: BioValue (20 Partners)
- **Project duration**: 2017-2022 **→**

BECOOL kick off meeting in Bologna



Brazilian coordinators and governatives joined the meeting

Synergistic/complementary activities between BioVAULE and BECOOL



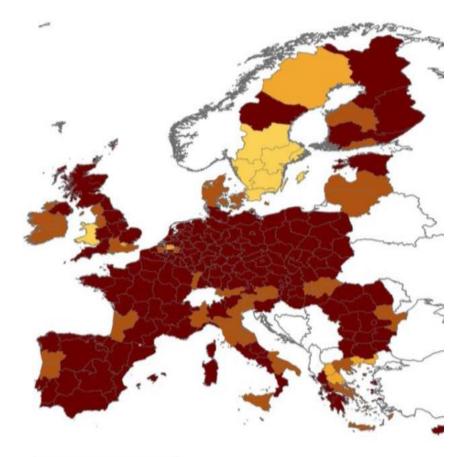
BECOOL - WP1: Biomass production and feedstock diversification

General objective of WP1: to increase lignocellulosic biomass production and feedstock diversification without reducing food crop land.

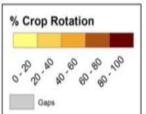
How to reach this target???

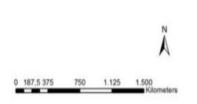
=> Identifying integrated cropping systems including lignocellulosic and food crops

BECOOL - WP1



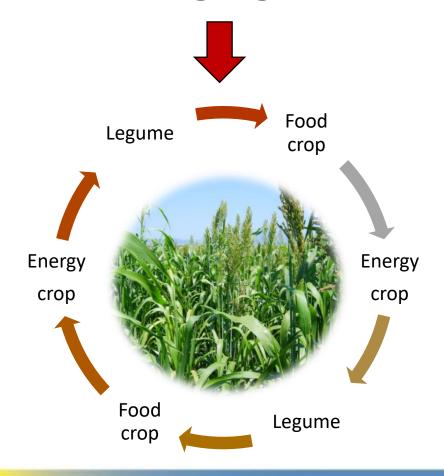
State of the art: two thirds of arable land in EU-28 is dominated by conventional crop rotations based on only two main food species (e.g. wheat-maize rotation)





New cropping schemes: the concept

The today cropping systems could be intensified and diversified including lignocellulosic crops



Potential advantages of innovative cropping systems

- 1. Enhanced soil fertility and soil structure due to positive rotational effects;
- 2. reduced soil erosion due to a longer land cover;
- 3. more sustainable cropping systems due to lower need of agricultural inputs (agrochemicals, fertilizers etc.);
- 4. market opportunities and reduced economic risks for farmers.
- 5. Production of lignocellulosic feedstock without competing with food land

Challanges of the innovative cropping systems

- 1. New farming systems and machineries;
- 2. Innovative logistic concepts;
- 3. Sometime unfamiliar crops for farmers

Challanges of the innovative cropping systems

- The performance of new crops is quantitatively and qualitatively evaluated (e.g. sunn hemp, fibre sorghum, kenaf and industrial hemp).
- Field studies are replicated in Italy, Greece and Spain.



New cropping systems at the experimental farm of the University of Bologna

Challanges of the innovative cropping systems

The integrated cropping systems including food and lignocellulosic crops are:

C: maize – wheat – fallow– maize (reference rotation system)

R1: maize – sunn hemp+wheat – sunn hemp – maize

R2: maize – fiber sorghum+wheat –sunn hemp – maize

R3: maize – kenaf+wheat –sunn hemp – maize

R4: maize – hemp+wheat –sunn hemp – maize

R5: sunn hemp+wheat – sunn hemp+wheat – sunn hemp+wheat – sunn hemp

	2017 201	8	2019		2020		2021	2022
	A M J J A S O N D J	F M A M J J A S	OND J F M A M J	J A S O N D	JFI	M A M J J A S O N D	J F M A M J J A S	O N D J F M A M
С	Maize		Wheat			Maize		Wheat
R1	Maize	Sunn Hemp	Wheat	Sunn Hemp		Maize	Sunn Hemp	Wheat
R2	Maize	Fiber sorghum	Wheat	Sunn Hemp		Maize	Fiber sorghum	Wheat
R3	Maize	Kenaf	Wheat	Sunn Hemp		Maize	Kenaf	Wheat
R4	Maize	Hemp	Wheat	Sunn Hemp		Maize	Hemp	Wheat
R5	Sunn Hemp Wheat	Sunn Hem	ι Wheat	Sunn Hemr Wheat		Sunn Hemr Wheat	Sunn Hem	ր Wheat

Example of new crop: sunn hemp (Crotalaria juncea)





- A tropical Asian plant of the legume family (Fabaceae).
- Widely grown throughout the tropics and subtropics as a source of green manure, fodder and lignified fiber obtained from its stem.

Sunn hemp in rotation system:

> Advantages:

- It is particularly beneficial because of its resistance to rootknot nematodes
- Through biological N2 fixation, it can improve soil fertility and the yields of succeeding food crops reducing also inputs requirement
- Low input requirements

Disadvantages:

- New to EU environments
- Limited information available on the rotational effect of sunn hemp

Energy crops harvest in Italy (August - September 2018)

Hemp harvesting with mowers



Field drying



Kenaf harvesting with shredder



Baling



Sorghum harvesting with shredder



Weighing



Wheat succeding energy crops

Quick seedbed preparation November 2018



Sowing November 2018



Wheat emergence December 2018



Wheat elongation April 2019



Wheat fully ripe June 2019



Harvesting July 2019



Weighing July 2019



Preliminary conclusions from the italian rotations

- The preliminary results indicates that the tested systems are promising and that dedicated energy crop can coexist with food crops
- ➤ Wheat grain production following the energy crops was not affected
- ➤ Biomass sorghum seems to be the highest biomass yielding crop but it was affected by lodging that hampered the mechanical harvest
- Industrial hemp and sunn hemp mechanical harvesting should be improved even though the yields were satisfactory
- High kenaf humidity at harvest and low yield
- Further evaluation are ongoing (soil and biomass qualitative analysis)

Thanks for your attention





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