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The GRACE project has received funding from the Bio-Based Industries Joint Undertaking (BBI JU) under the European Union’s Horizon 2020 research and innovation programme under grant agreement No 748012.

BBI DEMO project GRACE

GRowing Advanced industrial Crops on marginal lands for biorEfineries

Assist. Prof. Vanja Jurišić, PhD
University of Zagreb Faculty of Agriculture

27.03.2018, IEA Bioenergy Task 43 Workshop, Osijek, Croatia
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Project application

2015
• Cooperation between the University of Zagreb Faculty of Agriculture and INA d.d.
• “Biorafinery” project → estimation of the potential of agricultural biomass and energy crops for 2G ethanol production.

September 2016
• University of Zagreb Faculty of Agriculture joins the project consortium and helps in preparation of the project application for the call BBI D2/2016, due in September 2016.

June 2017
• Project was approved in December 2016.
• Beginning of the GRACE project on June 1st 2017.
Previous projects

- *Miscanthus x giganteus* plantation established by the University of Zagreb Faculty of Agriculture in 2011 → we started with 11 locations, approx. 3,000 m².

- Miscanthus-related projects:
  - „Introducing Miscanthus as energy crop for greenhouse heating purposes on small farms“ (period: 2012-2014, funding: Ministry of Agriculture),
  - „Optimization of harvesting date of Miscanthus for energy production“ (period: 2014, Ministry of Science, Education and Sports),
  - “Converting agricultural biomass and dedicated crops into energy and added value products - bio-oil and biochar production” (period: 2014-2018, Croatian Science Foundation).
About GRACE

- BBI Demonstration project
  - Bio-Based Industries Joint Undertaking (BBI JU) is a 3.7 billion Eur Public-Private Partnership between the EU and the Bio-based Industries Consortium for the period of 2014-2020 → 975 million Eur of EU funds (Horizon 2020) and 2.7 billion Eur of private investments.

- Call BBI 2016.D2 - *Improvement and adaptation of industrial crop varieties and novel sources of biomass to diversify biomass feedstock for biorefineries*

- Coordinator: A. Kiesel, I. Lewandowski, University of Hohenheim

- Consortium: 22 partners (8 countries) from science, industry (incl. SME) and agricultural sector

- Total Budget: 15 million Eur

- Duration: 5 Years (June 2017 - May 2022)

- Crops: Miscanthenus and Hemp

http://www.bbi-europe.eu
The objective of the GRACE project is to demonstrate and optimize the techno economic viability and environmental sustainability of 10 promising miscanthus and hemp biomass based value chains on marginal, contaminated and unused (abandoned) land at an industry relevant scale.
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**GRACE - Scope and aims**

- Large scale demonstration of seed-based miscanthus hybrids (>80 ha across Europe).
- Focus areas: marginal, contaminated and abandoned land.
- Linking biomass production to industrial application.
- Assessment of environmental, social and economic impacts.
- Connecting all stakeholders along various value chains (from farmer to industry).
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Propagation and crop production

- 13 novel, seed-based miscanthus hybrids (+ control rhizome propagated *M. giganteus*)

- Upscaling: seed production, seed-based propagation and crop production (Logistics!)

- Suitability of hemp and miscanthus varieties for marginal, abandoned and contaminated land

Connecting stakeholders along value chains - From farmer to industry -
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**Value chains Platform chemicals (bioplastics)**

- Demonstration of industrial processing and application platform chemicals based on lignocellulose and hemp oil, e.g. HMF, phenol,…
  - Bio-Butandiol (BDO) → 1:1 replacement of fossil BDO
  - Phenols and HMF → e.g. Polyethylenfuranoat (PEF) to replace PET

Source: AVABIOCHEM
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Value chains
Bioherbicide and Pharmaceutical

- Bioherbicide from hemp oil (Novamont).
- Pharmaceutical and cosmetic products, containing non psychotropic cannabinoids from hemp threshing residues (INDENA).

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Value chains
Building material and composites

- Building materials from miscanthus and hemp biomass and natural fibre-reinforced composites.

Source: Gießereitechnik Kühn
Source: CMF Greentech
Source: MOGU s.r.L.
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**Value Chain Assessment**

- Assessment of environmental, social and economic sustainability, identification of hot spots and potential for optimization

**Conventional crops:**
- High fertilizer demand
- Chemical crop protection
- Annual cultivation

**Miscanthus and hemp:**
- No/low fertilizer demand
- No/low chemical crop protection
- Cultivation for 20-30 years (only Misc.)
- Increase in Soil organic carbon - C-sequestration (esp. Misc.)
Demo-to-market strategy

- Spread knowledge about advantages of bio-based products
- Market for biomass and bio-based products
- Industry Panel:
  - industry, SMEs and farmers can join,
  - „to bring together the actors (e.g. industry and farmers) along value chains“, 
  - access to biomass for own tests (novel miscanthus varieties, hemp).
Kick-off meeting

➢ Project beginning: 01.06.2017, after Consortium Agreement and Grant Agreement have been signed

➢ Kick-off meeting: 26.-28.06.2017, University of Hohenheim, Stuttgart
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Role of FAZ and INA

FAZ
Task 3.5 Monitoring invasive potential from potentially fertile Miscanthus hybrids

INA

WP1: Management

WP 2: Supply and propagation of germplasm and their biochemical characterization

WP 3: Miscanthus and hemp for utilization of marginal, contaminated or unused lands

WP 4: Demonstration cases

WP 5: Value chain assessment and organization

WP 6: Demo-to-market strategy

27.03.2018, IEA Bioenergy Task 43 Workshop, Osijek, Croatia

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Work package 3
Planting Miscanthus in Croatia

- Overall planting of 14 different genotypes of Miscanthus variety on marginal land.

- In Croatia, 3 different types of plantation fields:
  1. PS („Plot scale” - FAZ) - 14 hybrids on overall area of 0.7 ha
  2. FS („Field scale” - INA) - 4 hybrids on overall area of 8 ha
  3. CS („Commercial scale” - INA) - 1 hybrid (Miscanthus x giganteus) on overall area of 5 ha

<table>
<thead>
<tr>
<th>Project name</th>
<th>Genotype</th>
<th>Planting density (plants/ha)</th>
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<tr>
<td>GRC_2</td>
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</table>
Work package 3
Planting Miscanthus in Croatia

FAZ - Plot scale
Experimental field Šašinovec
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