Miscanthus biomass options for contaminated and marginal land: quality, quantity and soil interactions

miscomar

- MARTA POGRZEBA
- INSTITUTE FOR ECOLOGY OF INDUSTRIAL AREAS, KATOWICE, POLAND

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 652615.

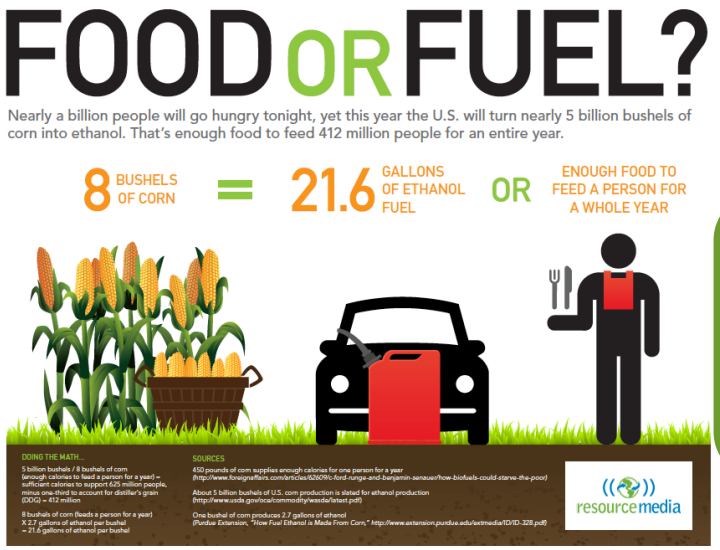
FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

Why MISCOMAR?

About 10% of arable lands across Europe seems to be marginal

Renewability of biomass makes it an attractive source of energy

About 100 million to 1 billion ha of marginal lands are theoretically available for production worldwide



Use of land for biomass production should not compete with its use for food production

Some energy crop species demonstrate potential for heavy metal removal

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE
FOR FOOD AND NON-FOOD SYSTEMS

miscomar

MISCOMAR CONSORTIUM

INSTITUTE FOR ECOLOGY OF INDUSTRIAL AREAS

UNIVERSITY OF HOHENHEIM

PRIFYSGOL ABERYSTWYTH UNIVERSITY

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE
FOR FOOD AND NON-FOOD SYSTEMS

miscomar

MISCOMAR FUNDED BY

The National Centre
for Research and Development

Federal Ministry
of Education
and Research

Department
for Environment
Food & Rural Affairs

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

miscomar

OBJECTIVE: develop techniques for biomass production on marginal land in Europe

MISCOMAR GOALS:

- **investigate the field performance** of novel, stress tolerant *Miscanthus* hybrids in comparison to the standard genotype *M.* x *giganteus* on economically marginal and heavy metal contaminated soils,
- **quantify the impacts** of *Miscanthus* production on soil parameters,
- **identify utilisation options** for biomass and study the impact of varying environmental conditions on potential *Miscanthus* end uses,
- **develop concepts** for the integration of *Miscanthus* into existing landscapes, crop rotations and farming systems.

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

miscomar

METHODS AND MATERIALS

Plant:
Miscanthus promising near-to-market seed-based hybrids from IBERS' breeding program;
control - the commercial standard *M.* x *giganteus* ,

photo from Terravesta Ltd., www.terravesta.com

Planting:
novel agronomic techniques repeating approaches taken at the existing Lincolnshire trial

Three locations (in the three different climates)**:**

1. heavy metal contaminated soils - Katowice, Southern Poland (dry continental),
2. low grade shallow, stony soils – Aberystwyth (temperate)
3. high clay content, waterlogged soils - Unterer Lindenhof, Southern Germany (wet continental)

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

miscomar

METHODS AND MATERIALS

Measurements:

- **plant production potential** (quantity and quality), crop and yield development,

- **soil analyses:** bulk density, pH, electrical conductivity, organic matter, organic carbon, total concentration (*aqua regia* extraction) of Pb, Cd, Zn, N, P, K, Ca, Mg, Fe, S and bioavailable fraction ($CaCl_2$ extraction) of Pb, Cd and Zn,

- **plant analyses** (autumn and winter harvest): content of macronutrients and contaminants (Pb, Cd, Zn),

- **combustion and anaerobic digestion quality**: ash content, mineral content (N, P, K, Mg, Ca), content of critical elements (Cl, Si), ash melting behaviour, substrate-specific biogas and methane yield (including methane content of the biogas), fibre content (hemicellulose, cellulose and lignin), protein content ,

- **plant physiological parameters** (for Katowice trial): photosynthesis rate, transpiration rate, stomatal conductance, chlorophyll, flavonoids and anthocyanins content, leaf index area (LAI),

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

miscomar

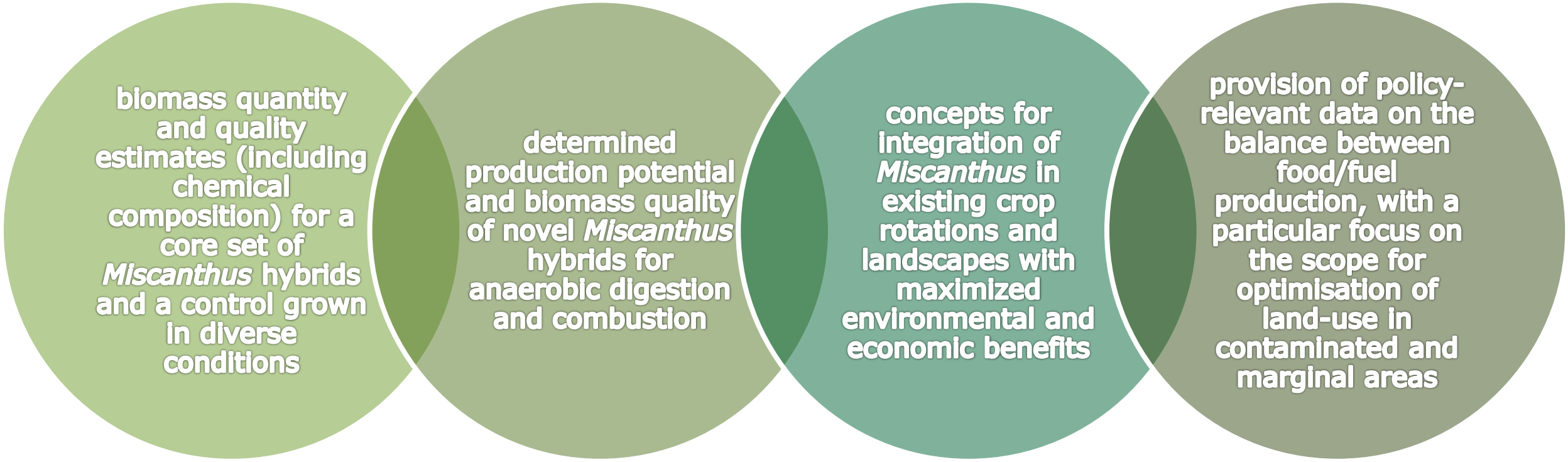
TARGET GROUP(S) / WHO WILL BENEFIT?

- **farmers:** MISCOMAR will show how to improve and diversify their income by involving biomass production on non-profitable land to their crop rotation,
- **marginal land owners/managers:** MISCOMAR will introduce alternative management options for contaminated land and help avoiding introduction of harmful substances into the food-chain,
- **policy makers:** MISCOMAR will help them drive an agenda of reduced health risks, environmental resilience and economic recovery in rural and polluted areas.

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

miscomar

EXPECTED RESULTS



The project results will offer alternatives for land less suitable or unsuitable for food production, with reduced risk for heavy metal introduction into the food-chain

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

miscomar

RESEARCH GAPS / POTENTIAL FOR FURTHER RESEARCH

- How the seed-based *Miscanthus* hybrids will perform when cultivated on marginal land in different climate conditions (soil improvement, landscape interaction, crop rotation)?
- Can novel *Miscanthus* hybrids be used for phytoremediation?
- How the produced biomass could be converted into energy by combustion and anaerobic digestion taking into account environmental aspects?

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

miscomar

Thank you for your attention

Dr. Marta Pogrzeba
Head of Environmental Remediation Team,
IETU, Katowice, Poland
mail: mag@ietu.katowice.pl
mobile: +48 602 484 667

Follow us also on Research Gate and LinkedIn