EU FEEDSTOCK POTENTIAL FOR SUSTAINABLE BIOMETHANE

OPPORTUNITIES FROM NOVEL CROPPING SYSTEMS MARGINAL & CONTAMINATED LANDS

26th of June 2024, 16:30-18:00 CET

Organised by:

EUBCE
32nd European Biomass Conference & Exhibition

BIP Europe
Biomethane Industrial Partnership

Session outline

1. Welcome

2. Input presentations

- BIP Task Force 3.1 report by Myrsini Christou
- BIP Task Force 3.2 report by Marco Buffi

3. Perspective from EU Horizon Europe projects

- Gold, Phytoclimate, Ceresis projects by Efi Alexopoulou
- MAGIC, BIKE, MIDAS by Berien Elbersen

4. Q&A

5. Panel discussion

6. Closure

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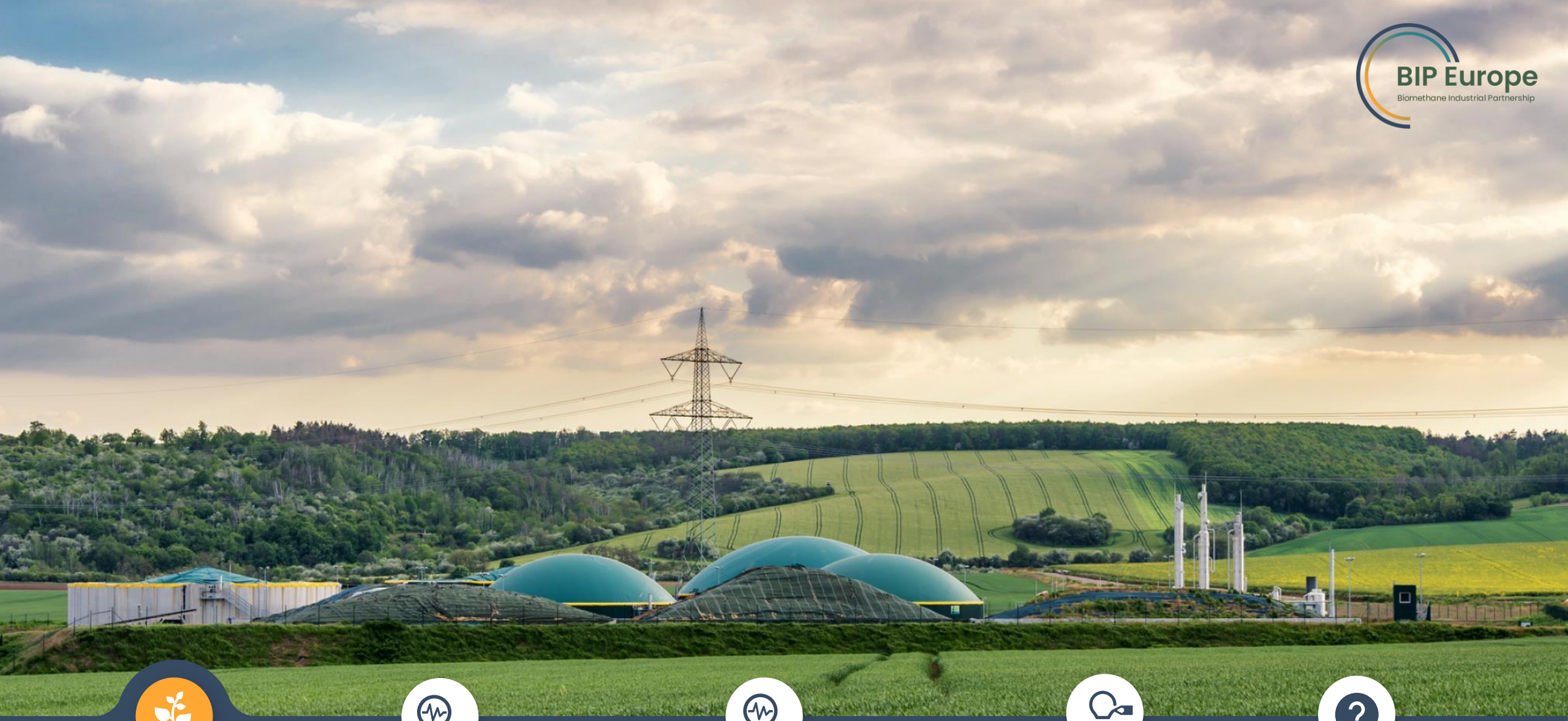


BIP Europe
Biomethane Industrial Partnership

Welcome and introduction

Report presentation
by BIP TF3

Report presentation
by JRC

Presentation of Horizon Europe projects

Q&A

Meet today's speakers

BIP Europe
Biomethane Industrial Partnership



Myrsini Christou
Head of Biomass Department (CRES) & Member of BIP Task Force 3.1



Marco Buffi
Scientific Project Officer (JRC) & Co-chair of BIP Task Force 3



Efi Alexopoulou
Researcher at National and Kapodistrian University of Athens



Berien Elbersen
Senior Researcher Land Use and Integrated Environmental Assessment at Wageningen University



Guido Bezzi
Head of Agronomy Area at Consorzio Italiano Biogas



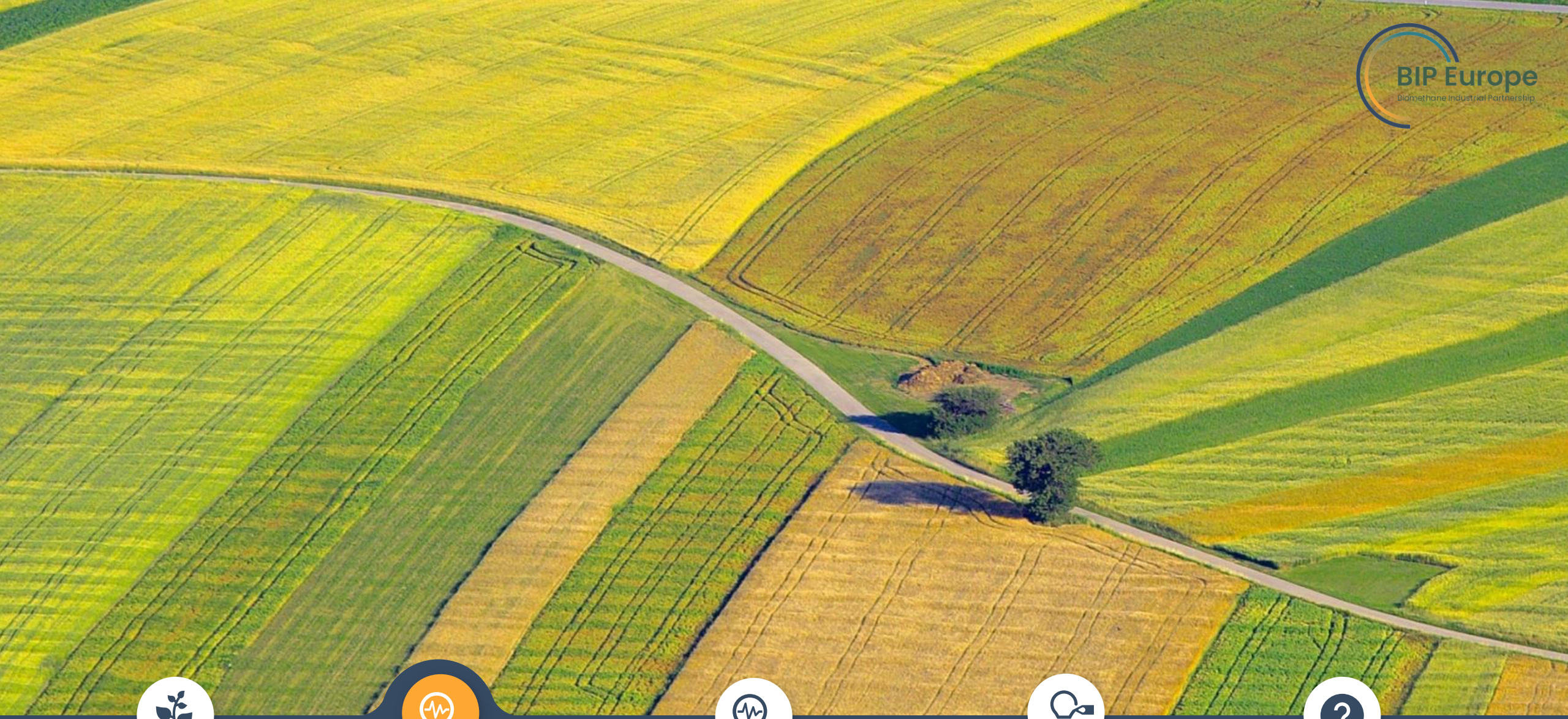
Alessandro Agostini
Head of the Sustainability of Energy Technologies Unit at ENEA



Cyril Flamin
Strategy and Market Analyst for Biomass and co-Products at ENGIE



Jean-François Delaitre
President of the Association des Agriculteurs Méthaniseurs de France



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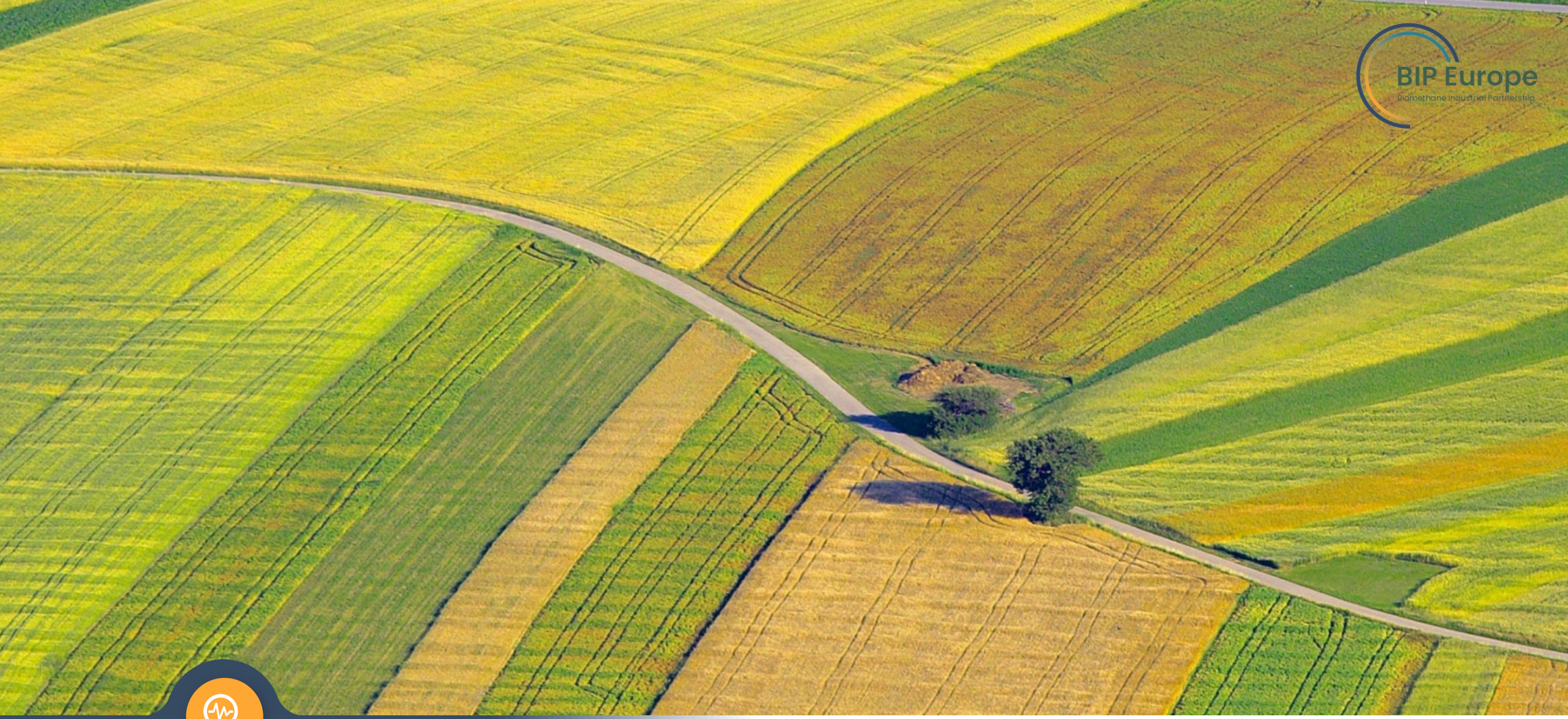

Report presentation “Sequential and rotational cropping for biomethane”

Myrsini Christou

Head of Biomass Department at CRES

Member of BIP TF3

About the Partnership



The launch of the BIP by EVP Timmermans and Commissioner Simson on the 28th of September during the European Sustainable Energy Week.

- The Commission's REPowerEU plan set the target of 35 BCM of biomethane by 2030.
- A new Biomethane Industrial Partnership (BIP) was established upon the REPowerEU plan to '*support the achievement of the target and create the preconditions for a further ramp up towards 2050*'.
- Scaling up the biomethane production is vital because of:

1. The need to reduce European dependency on natural gas imports from Russia;
2. To achieve EU energy independence;
3. The high energy prices;
4. The aggravation of the climate crisis.

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Task Force 3 at a glance

Assessing sustainable potential for innovative biomass sources to produce biomethane

SCOPE OF THE WORK

Task Force 3 aims to identify the potentials across the EU for innovative biomass sources and the conditions under which these potentials could be unlocked.

Deliverables			
3.1	3.2	3.3	3.4
Biomethane potential from the deployment of novel cropping systems across Europe	EU-wide potential assessment for feedstock production on marginal and contaminated land;	The Environmental Co-Benefits of Integrated Food and Fuel Cropping Systems	Identification of additional innovative sustainable biomethane feedstocks. These include wastes and residues.

Presented today

Presentation of the Report by Task Force 3.1

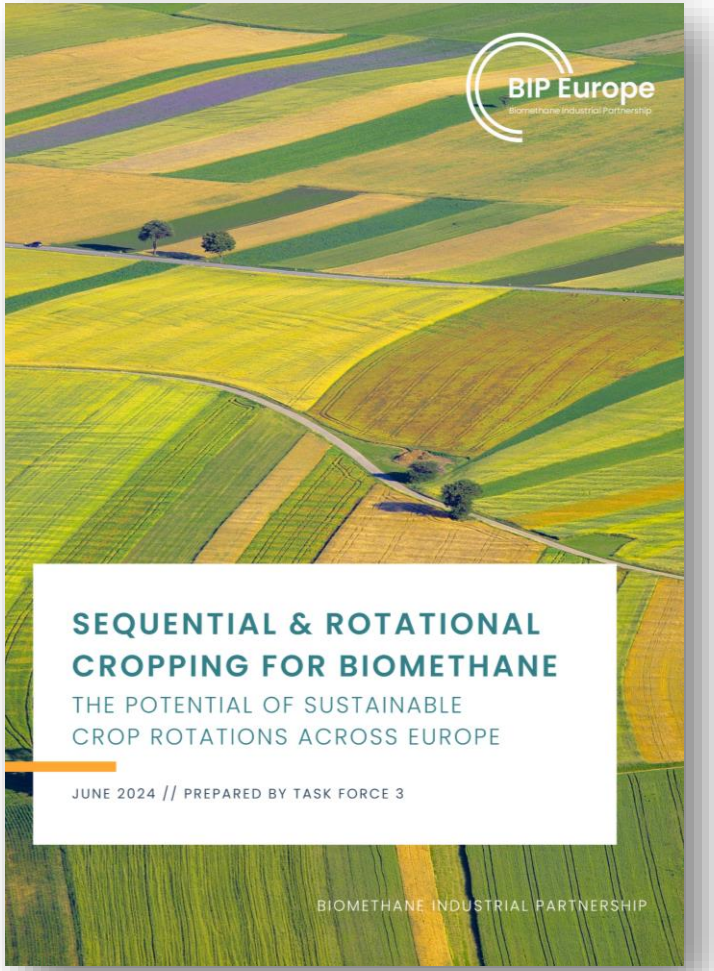
Sequential and rotational cropping for biomethane: The potential of sustainable crop rotations across Europe

Explores the how **sequential** and **rotational** crops can:

- Improve agricultural resilience
- Restore soil health
- Sequester carbon in soils
- Diversify agricultural incomes
- Enrich biodiversity
- Enhance food security

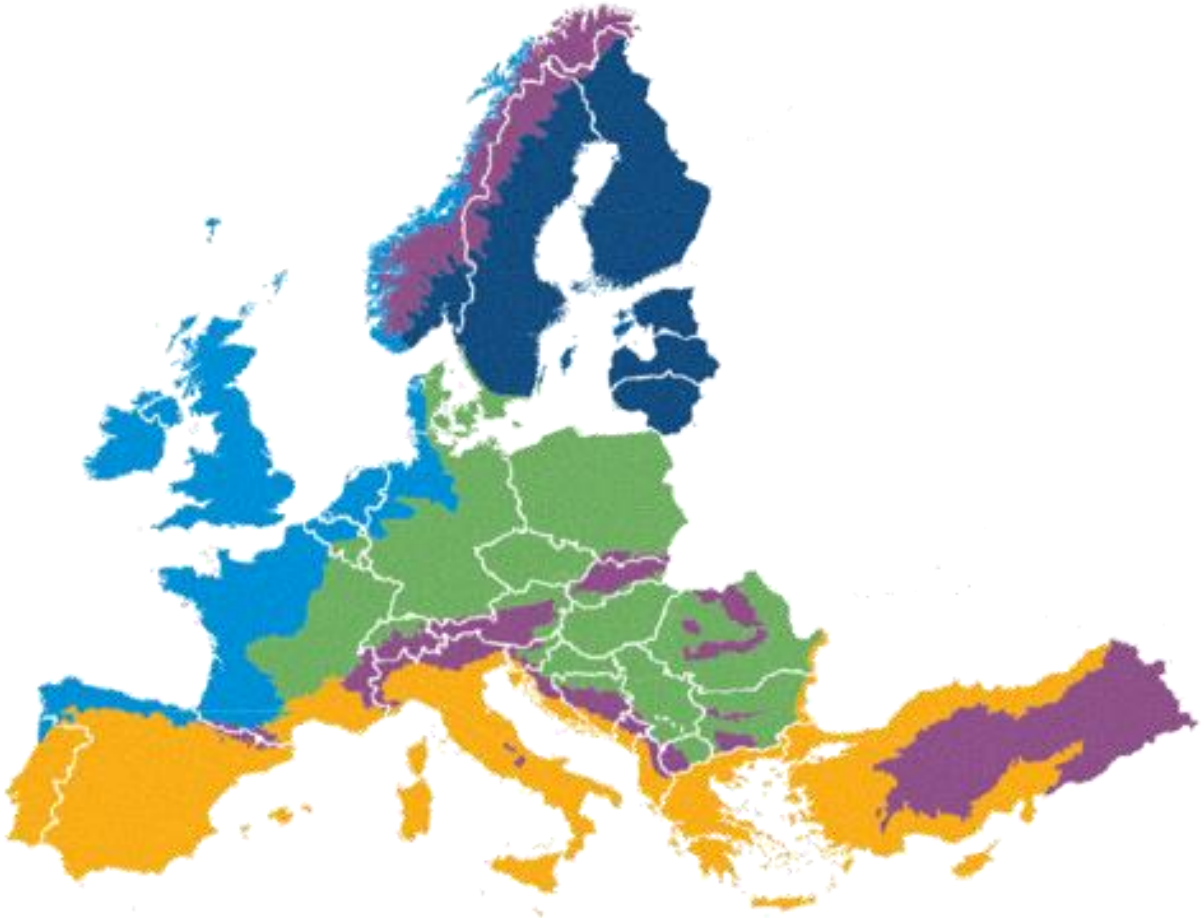
AND

- Increase the production of biomethane



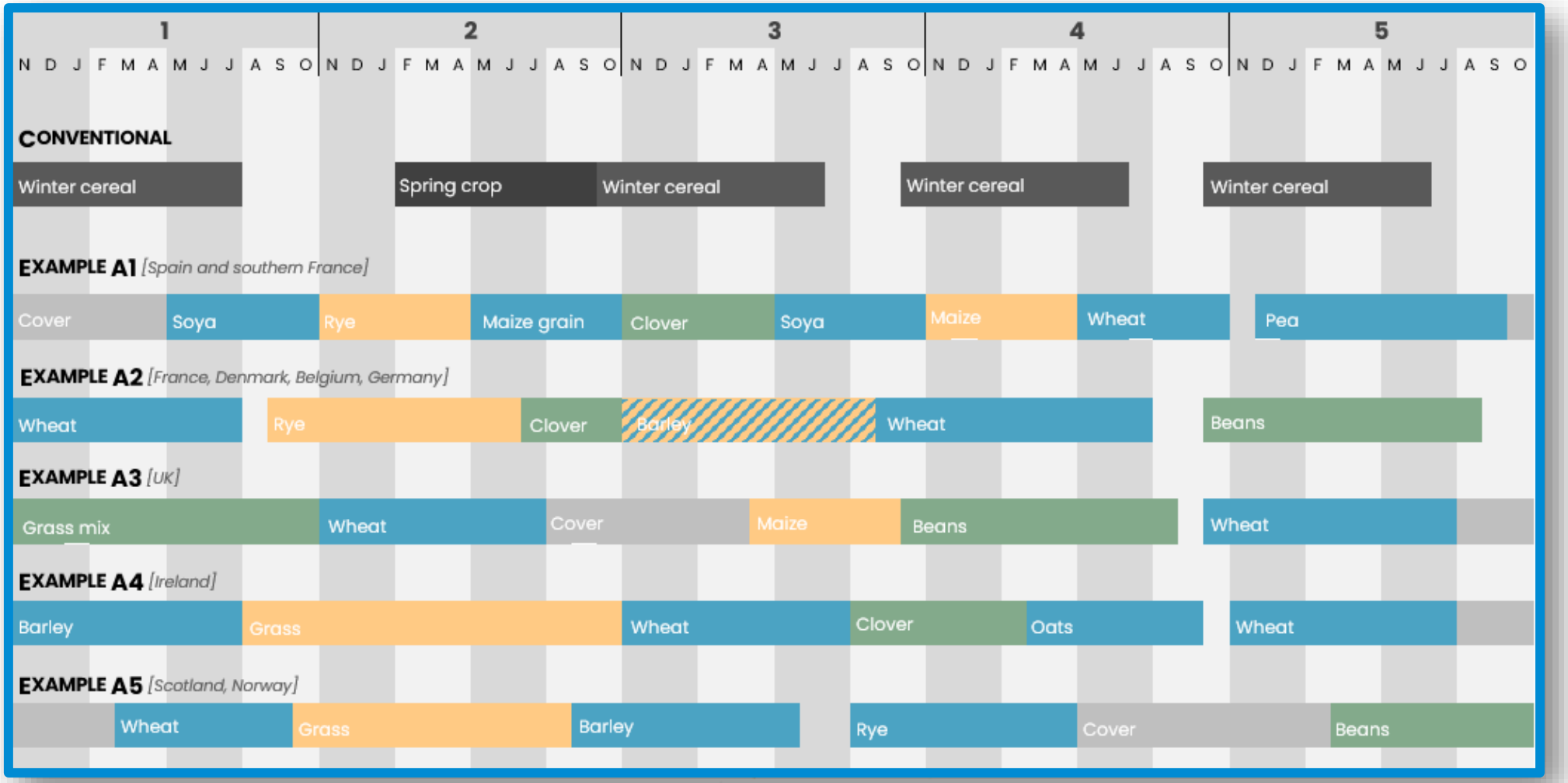
Analysis

Developed potential crop rotations for each European region



Developed potential crop rotations for each European region

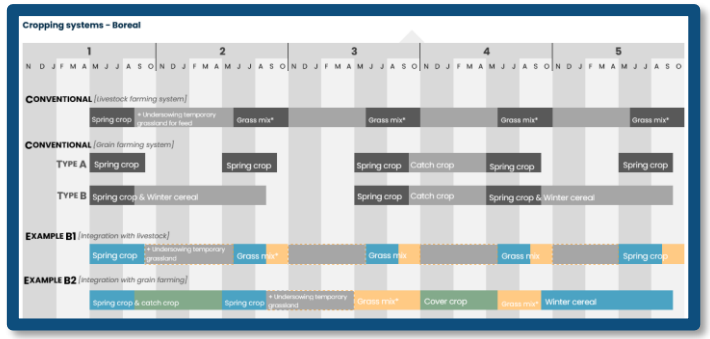
Atlantic



Analysis

Developed potential crop rotations for each European region

Boreal



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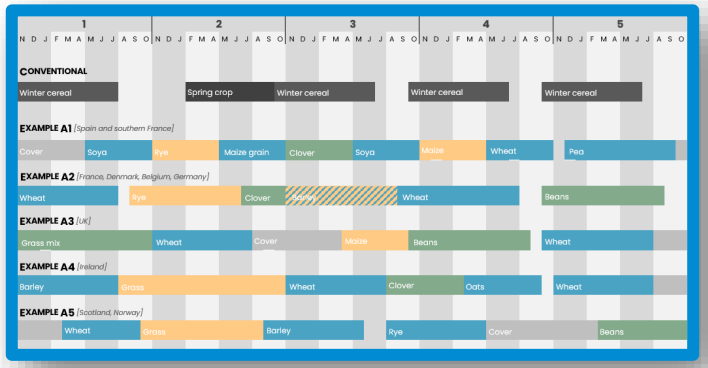
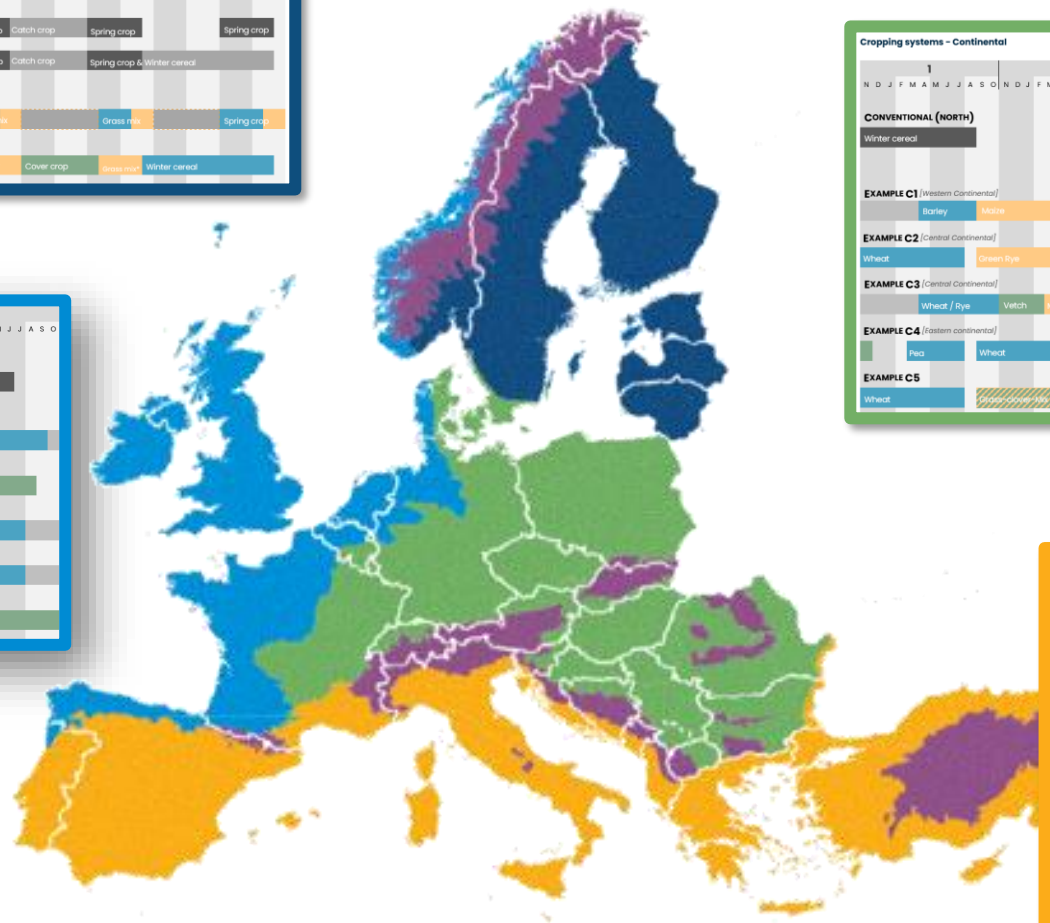
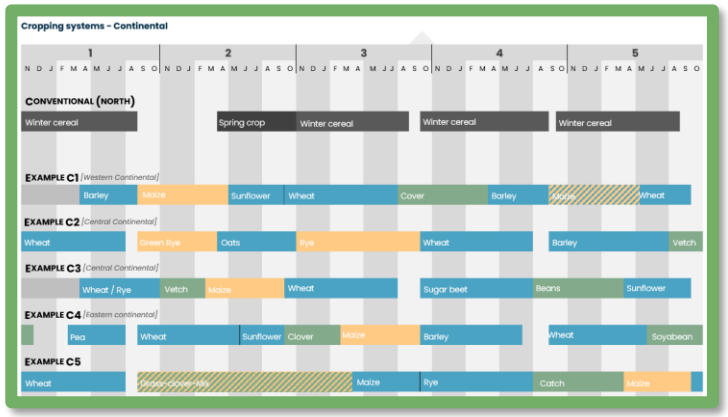
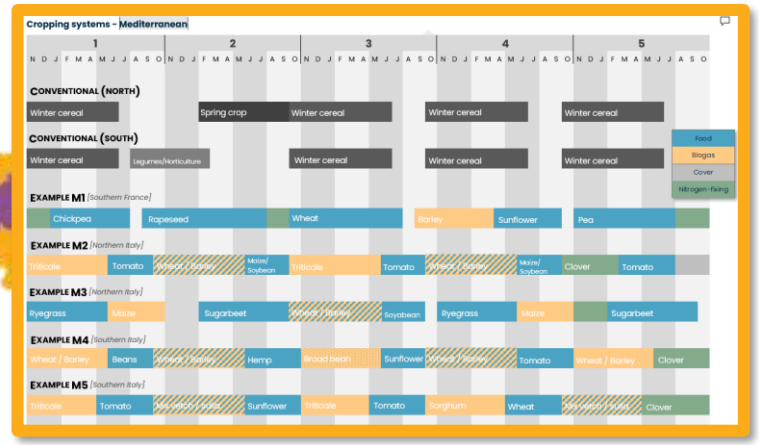




Continental



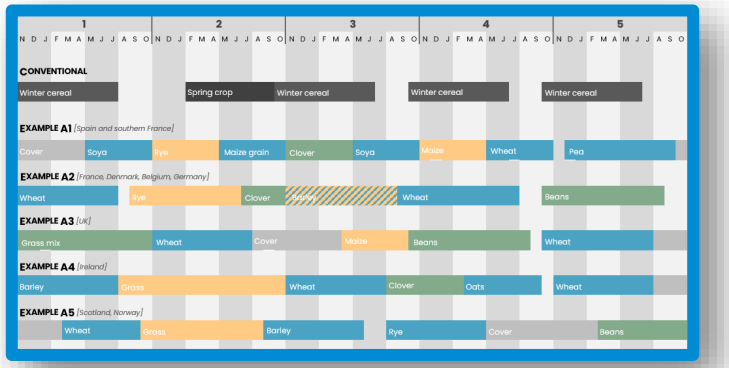
Mediterranean



Analysis

Developed potential crop rotations for each European region

Atlantic



Country	Total arable land (ha)	Proportion of land within the Atlantic biogeographical region (%)	Crop rotation assumed	Average annual biomass grown for AD (tonnes)	Biomethane max potential per year (bcm)
Belgium	870,420	50%	2	1,175,067	0.3
Denmark	2,357,950	30%	2	1,909,940	0.6
France	18,044,450	50%	$1^{(10\%)}$ & $2^{(90\%)}$	26,976,453	8.7
Germany	11,657,900	20%	2	6,295,266	1.9
Ireland	434,940	100%	4	1,043,856	0.2
Netherlands	1,003,450	100%	2	2,709,315	0.8
Spain	11,732,660	10%	1	6,570,290	2.1
Non-EU					
Norway	804,310	15%	5	193,034	0.0
UK	5,857,460	100%	$3^{(50\%)}$ & $5^{(50\%)}$	12,886,412	3.4

Applied correction factors

	Example data
1. Food vs Fuel	100%
2. Biomass competition	98%
3. Arable competition	89%
4. Soil readiness	89%
5. Climate change	Unknown
6. Uncertainty	80%

***Deliverable* biomethane potential**
= ~45 bcm

futurebiogas

Analysis:

Comparison with other estimates


agronomy

MDPI

Article

The Role of Sequential Cropping and Biogasdoneright™ in Enhancing the Sustainability of Agricultural Systems in Europe

Francesca Magnolo [1,*], Harmen Dekker [2], Mieke Decorte [2], Guido Bezzi [3], Lorella Rossi [3], Erik Meers [4] and Stijn Speelman [1]

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4 Green Chemistry and Technology Department, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, 9000 Gent, Belgium; erik.meers@ugent.be
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Abstract: Sequential cropping in the Biogasdoneright™ (BDR™) system in Italy has recently gained attention to combine food and renewable energy production in a sustainable way, as well as for carbon sequestration. However, little is known on the potential to expand the practice in other regions of Europe. In this paper, sequential crop calendars were developed for different EU climate regions, and the EU biomethane potential of the anaerobic digestion (AD) of sequential crops was estimated for a *Conservative_Scenario* and a *Maximum_Scenario*, assuming different percentages of primary crop land dedicated to the practice and biogas yields. A total EU biomethane potential of 46 bcm/yr and 185 bcm/yr was estimated from the AD of sequential crops in the two scenarios, respectively, and the Continental region registered the highest potential compared to the other regions. The additional benefits of the combination of sequential cropping with other agricultural conservation practices and digestate use included in BDR™ systems were also discussed. In conclusion, the paper shows that with appropriate innovations in crop management, sequential cropping could be applied in different agroclimatic regions of Europe, contributing to climate and renewable energy targets.

Keywords: Biogasdoneright™; biomethane; carbon sequestration; circular bioeconomy; sequential cropping

1. Introduction

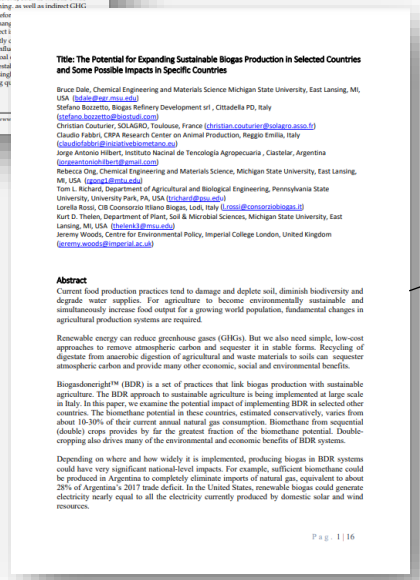
Agriculture is at the heart of the most important global challenges mankind is currently facing and will face in the future, including food security, environmental degradation, economic development and climate change [1]. Agriculture is highly exposed to climate change, as its activities directly depend on climatic conditions [2]. At the same time, the agricultural sector itself is responsible for direct GHG emissions, such as nitrous oxide emissions from soils, fertilizer application and livestock farming, as well as indirect GHG emissions from land-use changes, such as land clearing and defor… agriculture holds the potential to also help mitigate climate chan… sions and sequestering carbon. The magnitude of the net effect … factors, such as land-use changes that are directly or indirectly … the fossil energy input required [4]. In turn, these factors are influ… ing practices used [5]. In order to reach the climate-neutral goal … and cut European GHG emissions by 55% by 2030 [6], while estab… circular bioeconomy [7], agricultural practices need to increasing… role in tackling climate change while concurrently providing q…

Agronomy 2021, 11, 2102. https://doi.org/10.3390/agronomy11112102

Max

46 bcm

Magnolo et al. (2021)


Title: The Potential for Expanding Sustainable Biogas Production in Selected Countries and Some Possible Impacts in Specific Countries

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Abstract

Current food production practices tend to damage and deplete soil, diminish biodiversity and degrade water supplies. For agriculture to become environmentally sustainable and simultaneously increase food output for a growing world population, fundamental changes in agricultural production systems are required.

Renewable energy can reduce greenhouse gases (GHGs). But we also need simple, low-cost approaches to remove atmospheric carbon and sequester it in stable forms. Recycling of digestate from anaerobic digestion of agricultural and waste materials to soils can sequester atmospheric carbon and provide many other economic, social and environmental benefits.

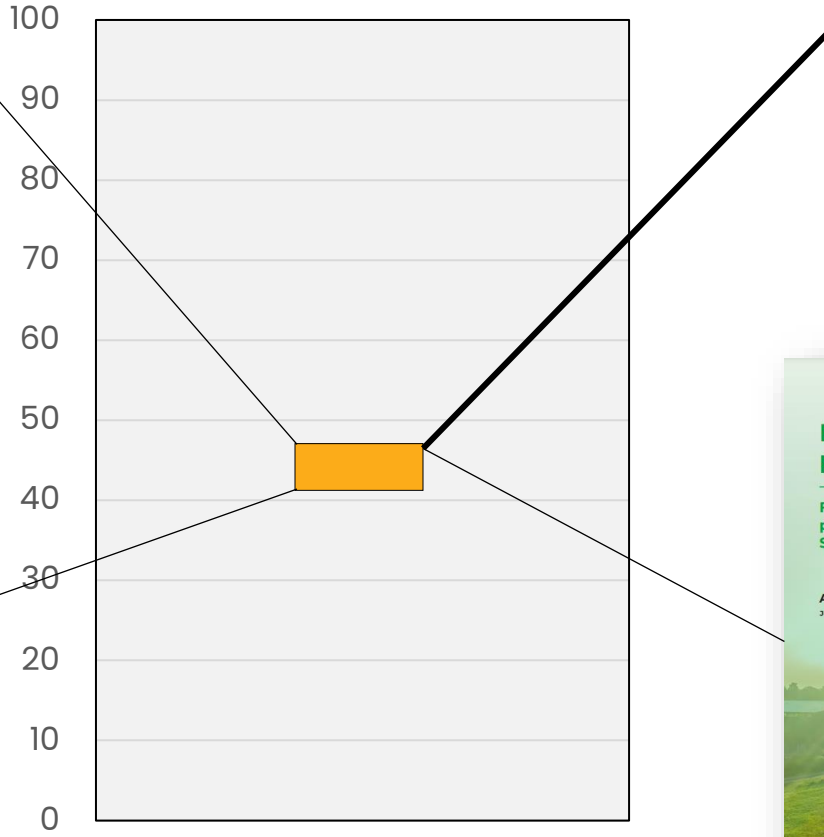
Biogasdoneright™ (BDR) is a set of practices that link biogas production with sustainable agriculture. The BDR approach to sustainable agriculture is being implemented at large scale in Italy. In this paper, we examine the potential impact of implementing BDR in selected other countries. The biomethane potential in these countries, estimated conservatively, varies from about 10-30% of their current annual natural gas consumption. Biomethane from sequential (double) crops provides by far the greatest fraction of the biomethane potential. Double-cropping also drives many of the environmental and economic benefits of BDR systems.

Depending on where and how widely it is implemented, producing biogas in BDR systems could have very significant national-level impacts. For example, sufficient biomethane could be produced in Argentina to completely eliminate imports of natural gas, equivalent to about 28% of Argentina's 2017 trade deficit. In the United States, renewable biogas could generate electricity nearly equal to all the electricity currently produced by domestic solar and wind resources.

Min

40 bcm

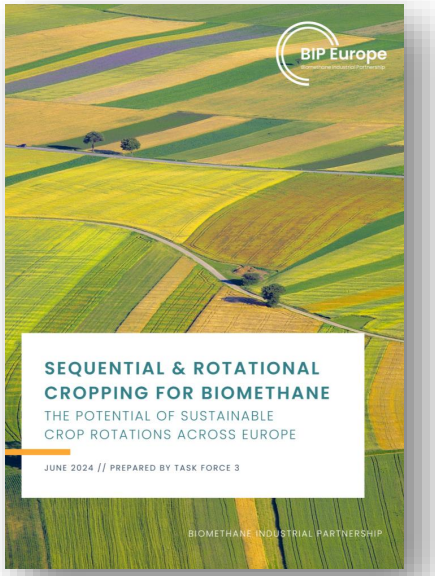
Dale et al. (2020)

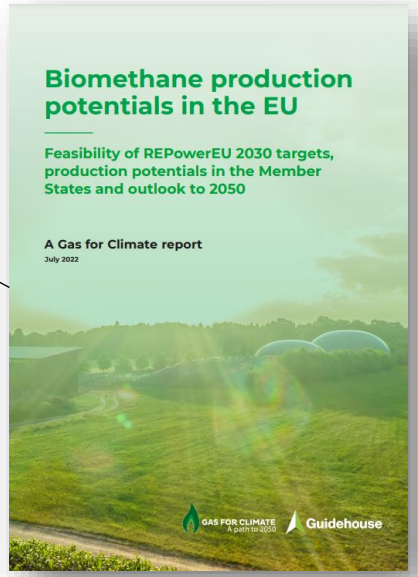


Deliverable

44-46 bcm

BIP (2024)





46 bcm

Gas for Climate (2022)

Acknowledgments

Group leader and Rapporteur: Nick Primmer (**Future Biogas**)

Task Force 3.1 members:

- **Future Biogas:** Nick Primmer
- **Center for Renewable Energy Sources and Saving**: Myrsini Christou
- **Vattenfall Energy Trading**: Martin Daronnat
- **Finnish Biocycle and Biogas Association:** Anna Virolainen – Hynna
- **agriFERM**: Zdenek Nesnal
- **Farm Europe**: Luc Vernet, Morgane Schnoller, Yves Madre, Matteo Scodanibbio
- **CRPA**: Mirco Garuti
- **Anaergia**: Giulia Filippini
- **BPC Instruments**: Jing Liu
- **CEFS**: Josh Gartland
- **Air Liquide**: Arnaud de Veron
- **EBA**: Mieke Decorte

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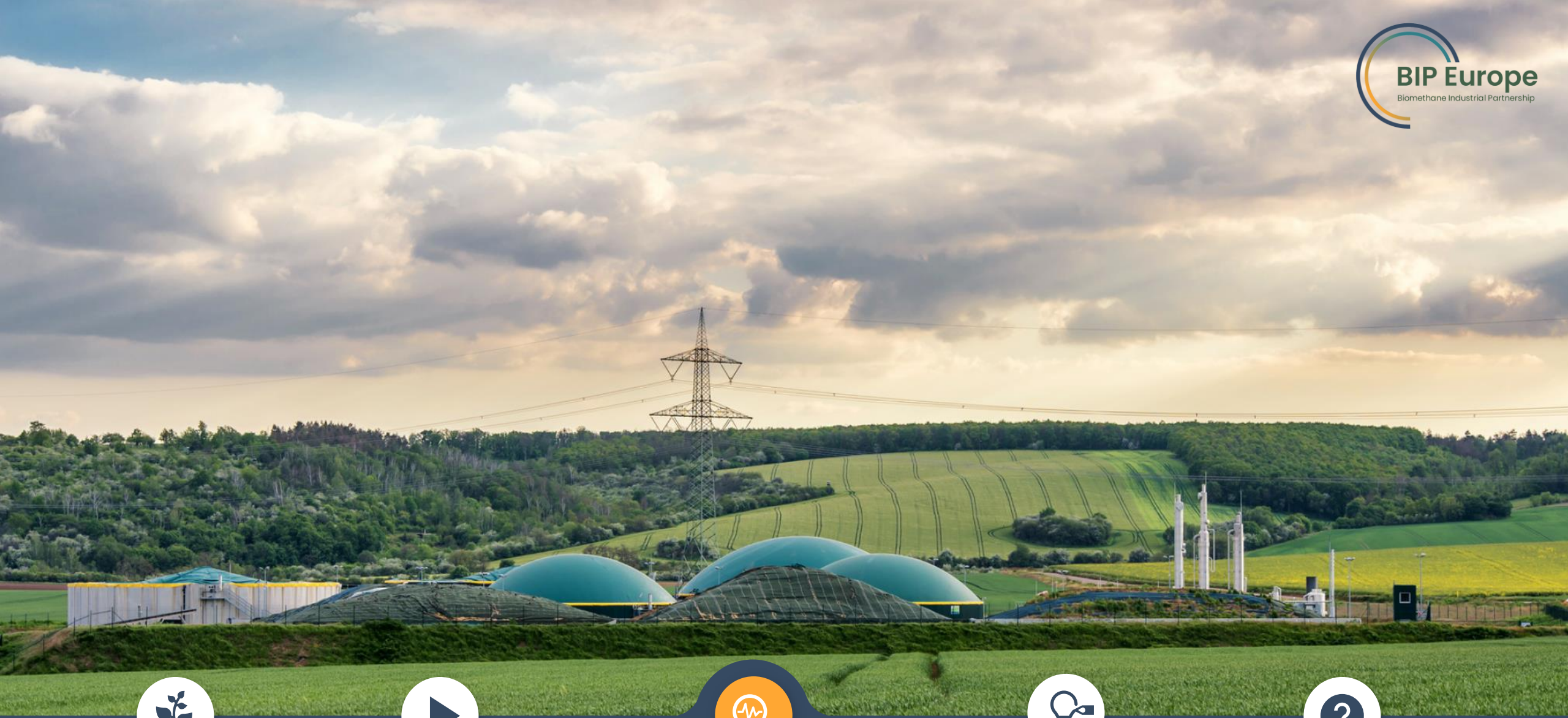

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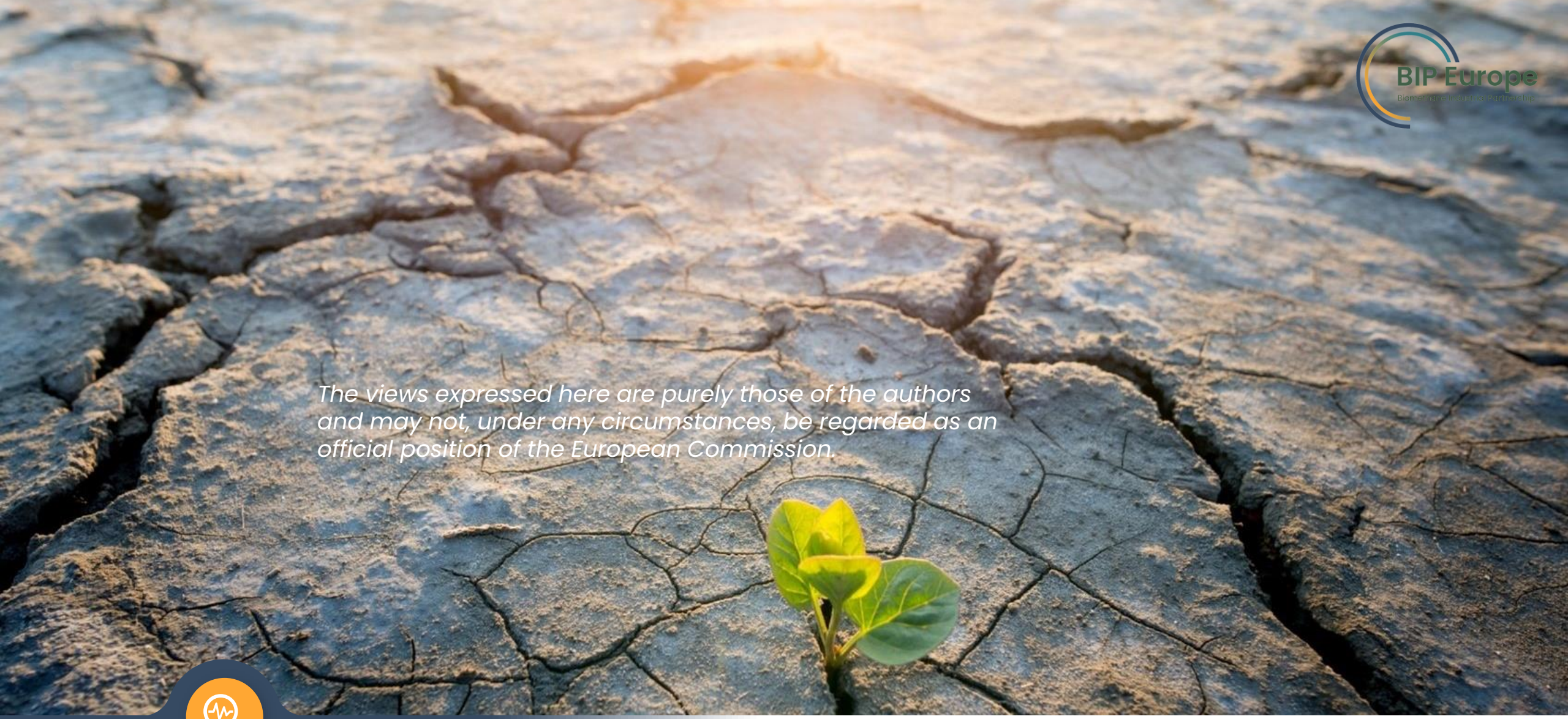

The views expressed here are purely those of the authors and may not, under any circumstances, be regarded as an official position of the European Commission.

Report presentation "Marginal and contaminated lands"

Marco Buffi

Scientific Project Officer, JRC

Co-chair TF3

European Commission

Summary and Disclaimer

- The JRC is the **European Commission's science and knowledge service**.
- Aim at providing **independent, evidence-based knowledge and science, supporting EU policies** to positively impact society.
- The C2 unit is based in Ispra, Northern Italy, and serves the **EU renewable energy** and **energy efficiency policies**.
- We support research communities, standards organizations and public and private stakeholders.
- We work on bio-energies, renewables and alternative fuels, assessing **GHG emissions accounting** and **energy balances.**
- We are also collaborating with International agencies and initiatives.



Source: geoERA groundwater



(JRC, 2020)

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Definitions



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Definitions 

- **Marginal lands**: no clear definition - generally referring to areas less productive or less suitable for traditional agricultural lands.
- **Unused lands** are areas with no cultivations in the last 5 years.
- **Abandoned lands**: unused land where the cultivation of food and feed crops was stopped due to biophysical or socioeconomic constraints.
- **'Severely degraded lands'** means 'land that for a significant period of time has either been significantly salinized or presented significantly low organic matter content and/or has been severely eroded' from RED II.
- **Contaminated lands** are generally defined as a site where pollutants or hazardous substances are present in the soil, surface water, or groundwater at levels that pose a risk to human health or the environment
- **Grasslands** are lands predominated by grass. Multiple uses depending on the national legislation.

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EU Legislation



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European legislative framework

Energy policy

- The **European Green Deal** set the path in 2019 to a green transition, towards climate neutrality by 2050.
- EC released in 2021 the **'fit for 55'** package, updating the EU target for GHG emissions reduction at 55% by 2030
- **REPowerEU** set in 2022 more ambitious RES target and **35 bcm biomethane** by 2030 (not binding)
- Revision of the Renewable Energy Directive 2023/2413 (**RED III**) set a target of 42.5% RES by 2030, **14.5% GHG intensity reduction** or binding 29% RES. Sub-target of 5.5% for **advanced biofuels** & **renewable fuels of non-biological origin** (minimum requirement of 1% **RFNBO).**

Agro-policies

- **Common Agricultural Policy (CAP)** 2023-2027 support agriculture ana farmers focusing on environmentally friendly practices with agro-incentives to avoid land degradation and promote sustainable land management.
- **Sustainable Carbon Cycles** within Farm-To-Fork strategy aiming to address current challenges to carbon farming.

Biodiversity: EU Soil Strategy to promote the sustainable soil management.

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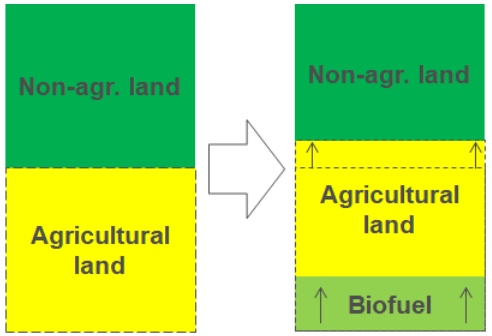
Biofuels: sustainability requirements

- **Commission Delegated Regulation (EU) 2019/181** identifies "**high-iLUC risk**" feedstock from **high-carbon stock areas**, which is gradually phased-out by 2030. Conversely, when feedstock is "**low-iLUC risk**", there are no limits.



- According to **RED III,** food-based biofuels are capped (**7%**) while advanced biofuels (produced with feedstock listed in **Annex IX part A, RED II**) are considered for the targets. However RED III allows the possibility to increase the Annex IX part B cap:

> Member States may, where justified, increase the limit referred to in the first subparagraph, point (c)(iv), of this paragraph, taking into account the availability of feedstock listed in Part B of Annex IX. Any such increase shall be notified to the Commission, together with the reasons therefor, and shall be subject to approval by the Commission.

- The new **Delegated Regulation updating Annex IX (EU) 2024/1405** set out new feedstocks in part A (in addition to some bio-wastes categories and cyanobacteria):
  - Intermediate crops (additionality requirement), only for aviation
  - Non-food and feed crops from severely degraded lands, only for aviation
- **GHG emissions savings** requirements: ranging from 50-65% depending on the start date of the installation and power output.
- Other requirements for biomass harvesting, wastes, … (from other pieces of legislation)

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How to achieve sustainability?

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RED II: GHG accounting methodology

- **GHG emissions calculation for bioenergy and biofuels pathways** are available in the **Annex V & VI (part C) in RED II** (developed by JRC).
- The calculation model considers also **savings and credits** generated by some cultivation practices and/or initial feedstock (e.g. use of manure)
- Operators can use **default values** or **actual values**
- **Default values** include a "safety" factor compared to **typical values**
- **Disaggregated** values can be used.

$$E = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr}$$

where

E	=	total emissions from the use of the fuel;
e_{ec}	=	emissions from the extraction or cultivation of raw materials;
e_l	=	annualised emissions from carbon stock changes caused by land-use change;
e_p	=	emissions from processing;
e_{td}	=	emissions from transport and distribution;
e_u	=	emissions from the fuel in use;
e_{sca}	=	emission savings from soil carbon accumulation via improved agricultural management;
e_{ccs}	=	emission savings from CO_2 capture and geological storage; and
e_{ccr}	=	emission savings from CO_2 capture and replacement.

Emissions from the manufacture of machinery and equipment shall not be taken into account.

Details reported in the JRC' reports:

- *ANNEX V - http://data.europa.eu/89h/e51f4304-7023-4fca-8900-7d206f89b914*
- *ANNEX VI - https://data.jrc.ec.europa.eu/dataset/jrc-alf-bio-bioenergy_jrc_annexvi_com2016-767_v1_july17*

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RED II: GHG reduction and carbon farming

- **RED II** already provides a **bonus** of 29 g CO2eq/MJ for those biofuels cultivated in **"restored" severely degraded land** (Annex VI part C point (8)).
- **RED II Implementing Regulation (EU) 2022/996** introduces "rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land-use change-risk criteria" and definitions on unused, abandoned, and severely degraded lands that might be suitable for biomass production.
- RED II Implementing Regulation (EU) 2022/996 introduces also **emission savings from soil carbon accumulation via improved agricultural management (e_{sca})**. This option allows to receive a GHG emissions credit for producing biofuels in the same lands where such practices are performed, with the scope of increasing soil organic carbon (max 25 g CO2eq/MJ for the entire period applying e_{sca} practices).
- Definitions and implications may vary depending on the context and objectives of each legislative framework: RED II and the EU Green Deal targets vs Common Agricultural Policy (CAP).

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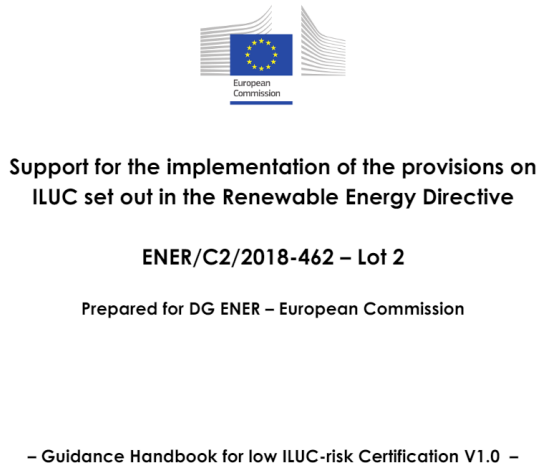
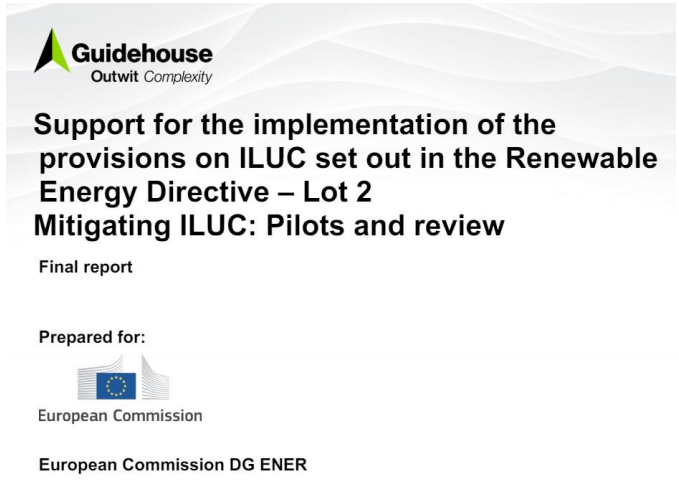
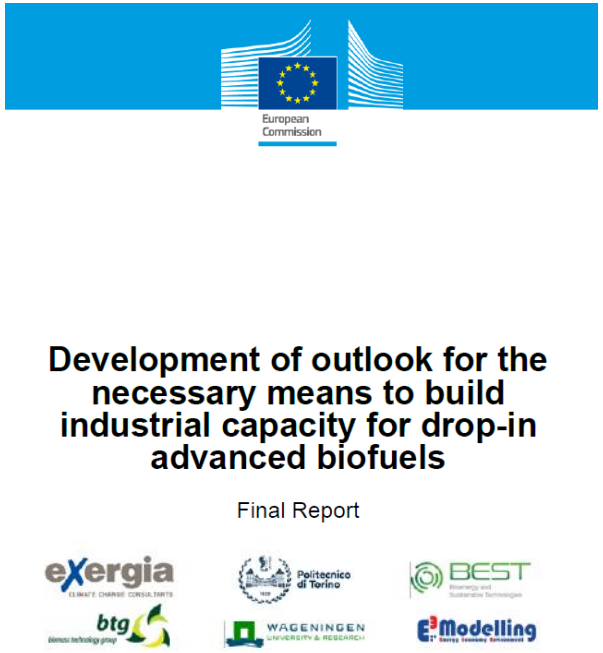
How to achieve the targets?

- For aviation and maritime sector, short-term decarbonization needs **other feedstock than UCO and animal fats**, which are limited (so Annex IX part A feedstocks)
- Severely degraded lands and contaminated lands (producing **low-ILUC feedstocks**) can contribute to provide sustainable biomass: how to define low-ILUC case studies?







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TF3.2 - Feedstock from marginal and contaminated lands

Cross-opportunities

Energy policies (Green Deal, RED II, RePowerEU)	CAP	Farm-to-Fork and Climate Targets	Biodiversity
• Biomass supply to achieve the mandate for advanced biofuels production (no food/feed competition) • Contributing to achieve 35 bcm biomethane target with sustainable feedstock • Contributing to reduce GHG emissions using low ILUC-risk feedstock • GHG emissions crediting system for marginal lands recovery and soil organic carbon increase (no ETS)	• Recovering lands for agriculture • Promoting new soil restoration techniques using catch-, cover-, inter-cropping • Using digestate to recover degraded soil and to reduce synthetic fertilizers • New business models for farmers based on biomethane/biochemicals and food & feed production • Food security	• Promoting carbon farming according to the sustainable carbon cycles target • Protecting soils, reducing soil loss by erosion, and enhancing soil organic carbon on degraded arable land • Biological carbon capture opportunities	• Recovering degraded soils • Recovering lands/areas to restore biodiversity (reafforesting, restoring native plants, …) • Contributing to carbon sequestration • Restoration of contaminated areas • Restoration of peatlands and wetlands reducing oxidation of existing carbon stock

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Current findings



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Main findings from literature and projects

- **Model exercises and tools** are available to map marginal and contaminated lands (soils).
- **Best practices and sustainable cropping systems** have been developed and tested to cultivate sustainable biomass.
- **Estimations of biomass potential** have been carried out for EU and for specific Member States.
- There are no business models (i.e. **no incentives**) in place to apply such practices at commercial level.
- Barriers from legislation still exist, in particular for **not-harmonized land definitions** and **different interpretation at National level.**
- For biomass from contaminated lands, **phytoremediation solutions** are currently under development within EU-funded projects.
- For biogas production, **contaminants end in the digestate**, complicating nutrients recycling.

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Acknowledgements

- MOTOLA Vincenzo, SCHILLACI Calogero (JRC)
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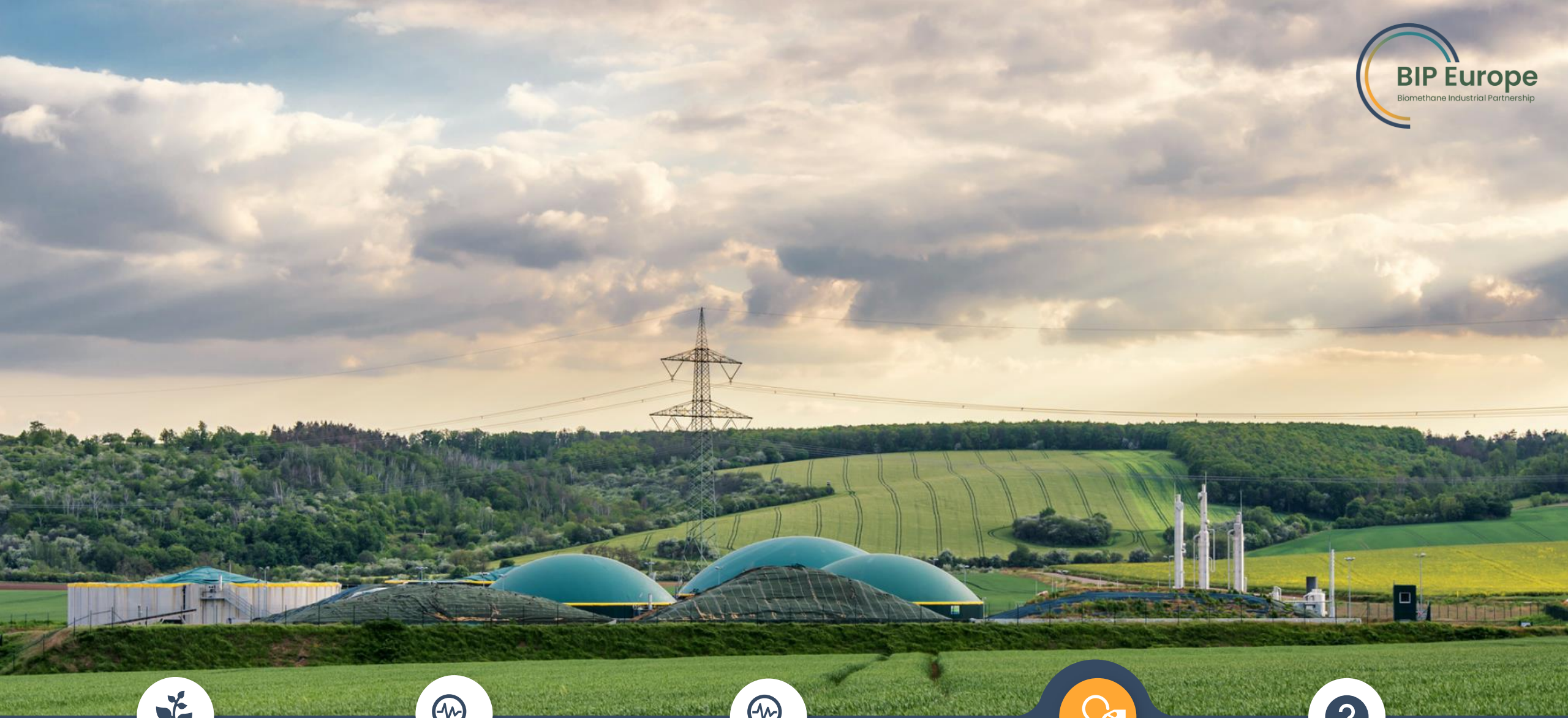

BIP Europe
Biomethane Industrial Partnership

Welcome and introduction

Report presentation *by BIP TF3*

Report presentation *by JRC*

Presentation of Horizon Europe projects

Q&A



BIP Europe
Biomethane Industrial Partnership

Presentation of Horizon Europe projects (GOLD, CERESIS, PHY2CLIMATE)

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ΚΑΠΕ
CRES

Projects on contaminated lands (GOLD, CERESIS, PHY2CLIMATE)

The projects have been funded by the topic entitled "Combined clean biofuel production and phytoremediation solutions from contaminated lands worldwide"

- **The GOLD project (www.gold-h2020.eu), 1/5/21-30/4/25**
- **The CERESiS project (http://ceresis.eu), 1/11/20-31/7/24**
- **The Phy2Climate project (www.phy2climate.eu), 1/7/21-30/6/25**

The three projects were sister ones and although had similarities they had all of them a different point of view and they act complementary.

The GOLD project

- In GOLD project (www.gold-2020.eu) four selected lignocellulosic crops (miscanthus, switchgrass, hemp and sorghum) are being grown in a variety of contaminated soils to provide feedstock for advanced biofuels.




Miscanthus in Greece

Presentation of GOLD project

Common protocol was followed by all partners

ENERGY CROPS



Sorghum (var. Bulldozer)



Miscanthus x giganteus



Switchgrass (var. Blackwell)



Hemp (var. FUTURA 75)

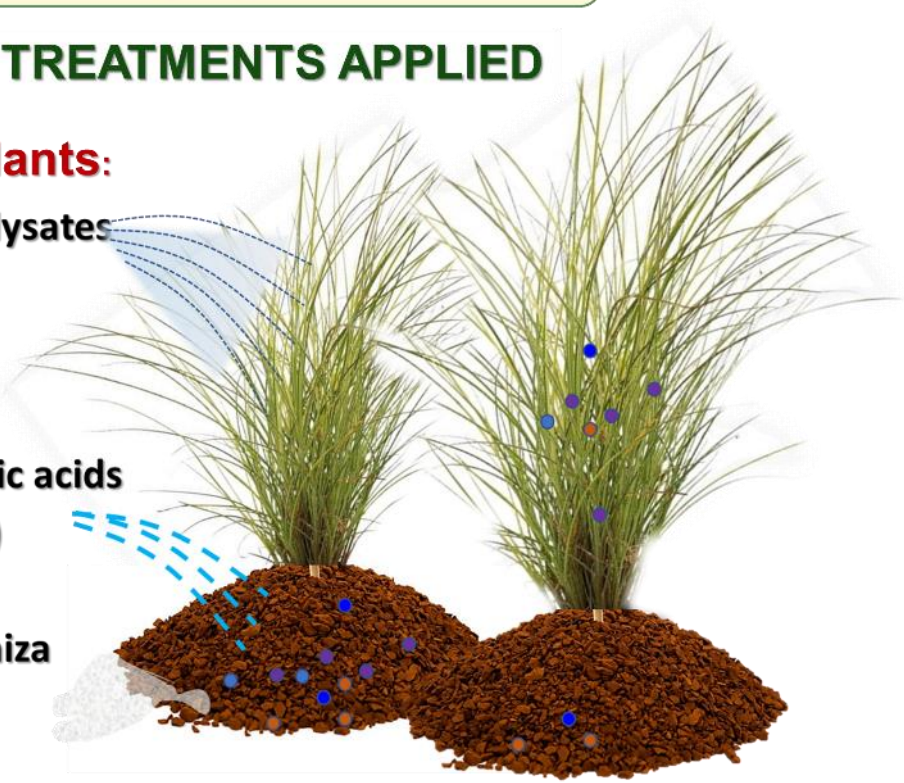
TREATMENTS APPLIED

Biostimulants:

protein hydrolysates (B1)

fulvic/humic acids (B2)

mycorrhiza (M)



Treatments:

1. **Control**
2. **B1:** SIAPTON (protein hydrolysates)
3. **B2:** LONITE (fulvic/humic acids)
4. **M:** SYMBIVIT (mycorrhizae fungi)
5. **B1xM**
6. **B2xM (common for all partners)**

Crop characteristics:

- ✓ high yielding, giving biomass suitable for bioenergy production
- ✓ relatively tolerant to metal(loid)s, with ability to grow on metal(loid)-contaminated soils
- ✓ have relatively low agricultural requirements

Presentation of GOLD project

Switchgrass

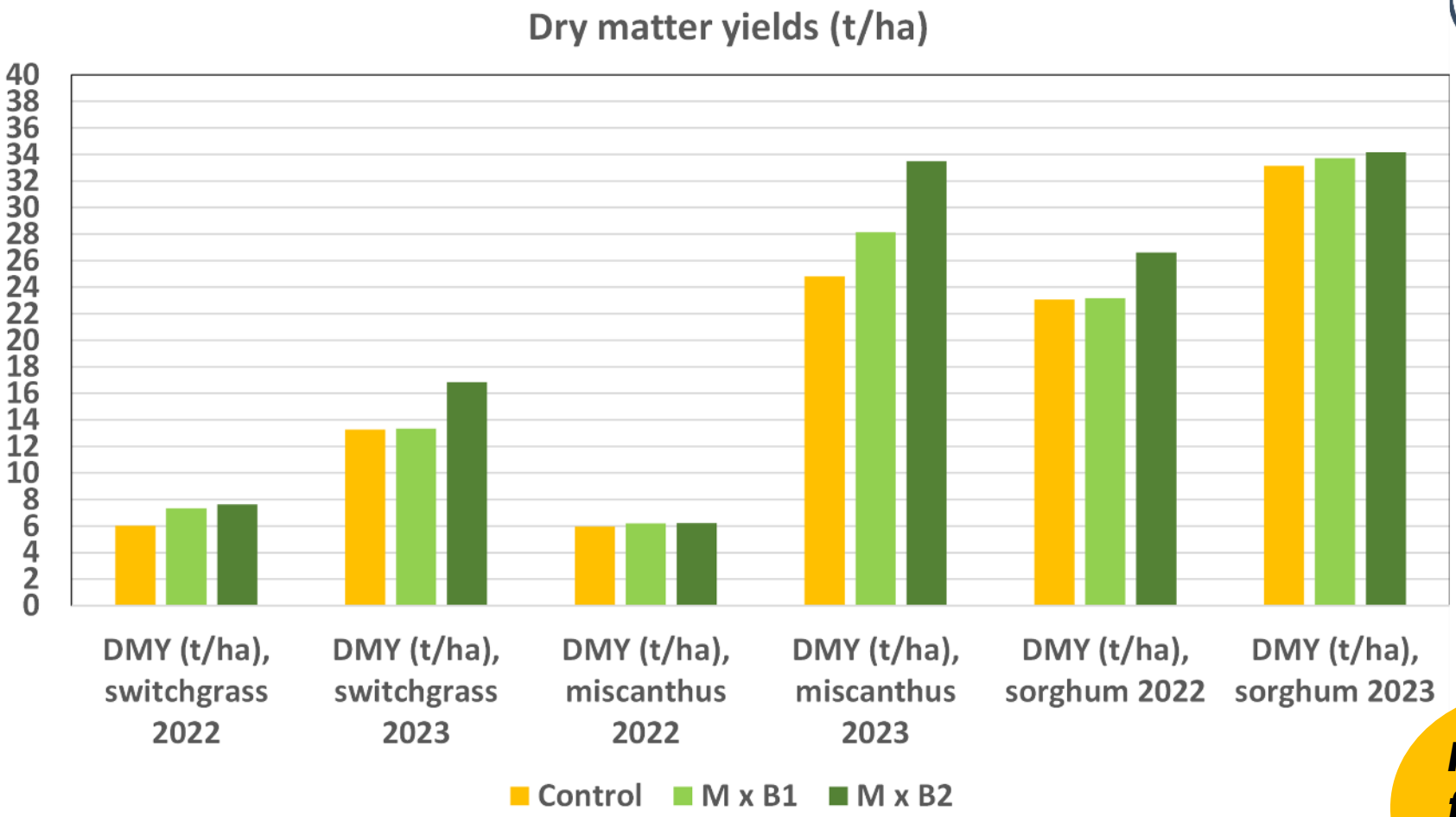


Miscanthus



Sorghum





Results from Kozani

- The highest biomass yields were recorded in the plots received **Mycorrhiza x fulvic/humic acids.**
- The yields of switchgrass in 2023 were double compared to the establishment year, while for miscanthus were more than 4 times higher.

CERESiS

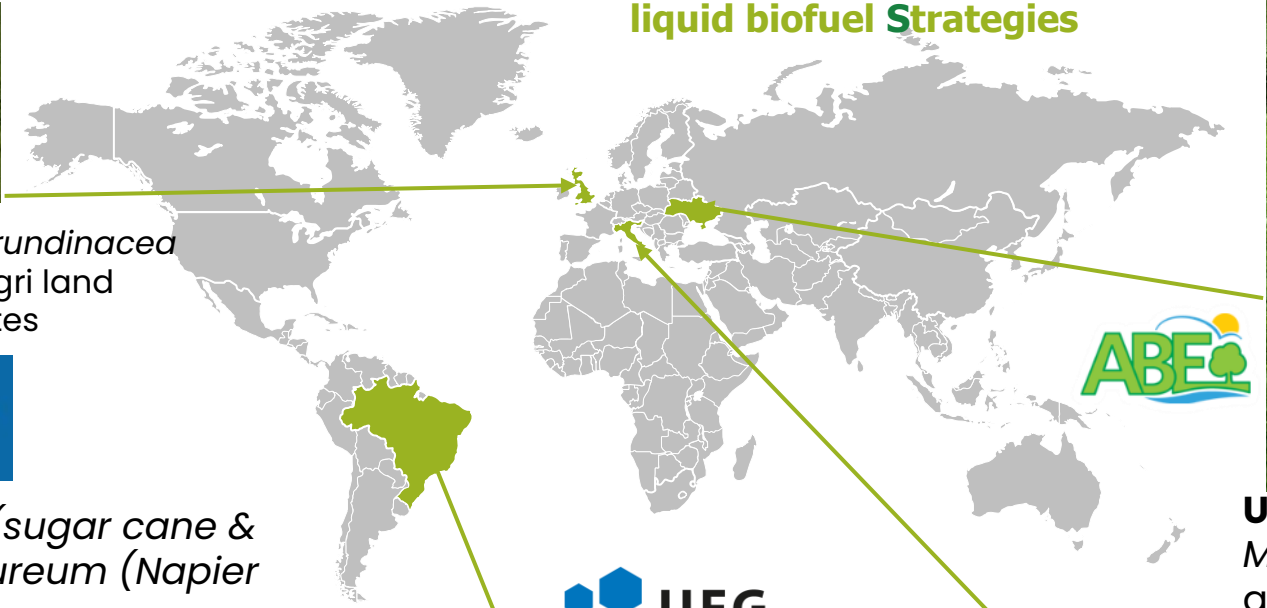
ContaminatEd land Remediation through Energy crops for Soil improvement to liquid biofuel Strategies





UK: *Phalaris arundinacea*
Abandoned agri land
Pb-Zn mine sites

University of Strathclyde Glasgow







Ukraine: *Phalaris arundinacea* & *Miscanthus giganteous* on agricultural land with pesticides & petroleum spills

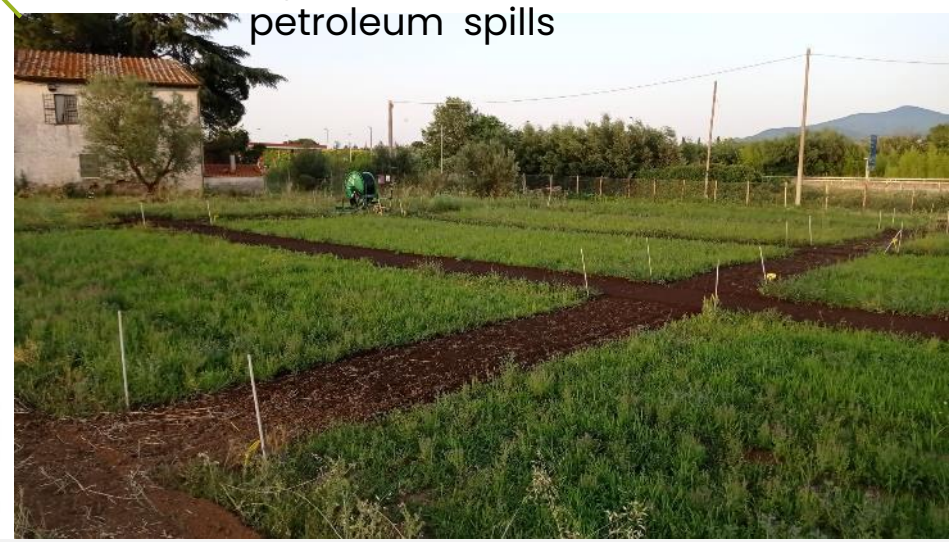
Brazil (Goiás): *Saccharum spp. (sugar cane & energy cane), Pennisetum purpureum (Napier & Capiaçu grasses)*
Cr from tannery residues, Cr & Ni mine & explosives sites

UFG UNIVERSIDADE FEDERAL DE GOIÁS



Italy: *Phalaris arundinacea*
Geogenic As contamination in groundwater & agricultural land from irrigation

UNIVERSITÀ DEGLI STUDI DELLA TUSCIA



FAPEG

Fonds de recherche Société et culture Québec

Presentation of IASIS project

Key elements of IASIS

Crops optimization and phytoremediation strategies

- > 16 microbial consortia to be applied in C&S soils as biofertilizers
- >4 improved genotypes

High yielding industrial crops



Field Case Studies on C&S soils; farmers co-creation

- Contaminated and Saline soils (C&S); 4 sites each
- 8 FCSs on C&S soils
- 8 high-yielding industrial crops (oilseeds and lignocellulosic ones)
- 8 FGs (>15 farmers each/FCS) for co-creation solutions
- >1 lighthouse/FCS



Curing contaminated and / or saline soils by growing industrial crops and getting low ILUC feedstock to support the biobased industry

Biobased products



Added value biobased products

- From oilseeds: 3 intermediate (dicarboxylic acids, active ingredient, proteins) and 4 end-products (monomers for bioplastics, coatings, resins).
- From lignocellulosic crops: 4 intermediate (proteins, phenolics, cellulose, nanocellulose) and 3 end products (resins, particle boards, adhesives). From bast fibre crops (hemp and nettle): 3 intermediate (long and short fibers, chips) and 3 final products (particle boards, biocomposites and molding biomaterials).

Sustainability assessment of the under study value chains

- > 20 pathways (biomass-to-products) will be studied
- A DSS will be developed
- >2 business models
- Regulatory framework

iasis and added value bio-products

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Selected industrial crops for IASIS

Oilseeds



***Crambe abyssinica* L. (crambe)**
Annual oil crop (cover/catch crop)
1-2.5 t/ha seeds (35-40% oil)
It is highly tolerant to heavy metals.
Accumulator of Pb and Zn
Similar tolerance to salinity with wheat.

***Carthamus tinctorius* L. (safflower)**
Annual oil crop (winter crop)
1.5-3 t/ha seeds (~30% oil)
Accumulator of Cd, Pb, Ni, Zn
Low tolerance to Zn
Similar tolerance to salinity with barley.





***Brassica carinata* L. (carinata)**
Annual oil crop (cover/catch crop)
1.5-3.5 t/ha seeds (~40% oil)
Accumulator of Pb, Ni, Zn
Low tolerance to Cb, Pb, Ni, Zn
Salt tolerant crop

***Camelina sativa* L. (camelina)**
Annual oil crop (cover/catch crop)
1-2.5 t/ha seeds (>40% oil)
accumulator of Pb, Ni, Zn
Not Zn excluder
Salt tolerant crop



Lignocellulosic / Fibre



***Cannabis sativa* L. (hemp)**
Annual fibre crop (spring crop)
10-20 t/ha dry matter yields
Accumulator of Cd, Cu, Pb, Zn, Cr, Ni, Hg
Tolerant to Cd and Pb
Moderate tolerant to saline soils

***Sorghum bicolor* L. (sorghum)**
Annual herbaceous summer crop
15-20 t/ha dry matter yields
Accumulator of Cd, Pb, Zn
Tolerant to tolerant to Cd and Pb.
Tolerant to saline soils.





***Salicornia spp.* L. (Salicornia)**
Annual fibre spring crop
Source of seeds and fibres
Halophyte; with high tolerance to saline soils.
Tolerant to contaminated soils with As, Cd, Cu, Ni, Pb, and Zn

***Urtica dioica* L. (nettle)**
Perennial fibre crop
Dry stem yields up to 15 t/ha
Accumulator of Pb, Ni, Zn, Zn, Pb, Cd, Hg, Cr
Moderate sensitive to salinity





BIP Europe
Biomethane Industrial Partnership

Presentation of Horizon Europe projects (MAGIC, BIKE, MIDAS)

Berien Elbersen

Senior Researcher

Wageningen University

WAGENINGEN
UNIVERSITY & RESEARCH

Degraded lands in horizon projects MAGIC, BIKE, MIDAS and CINEA project Drop-in fuels

26 June 2024, BIB-EUBCE Marseille





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Land degradation process and degradated lands

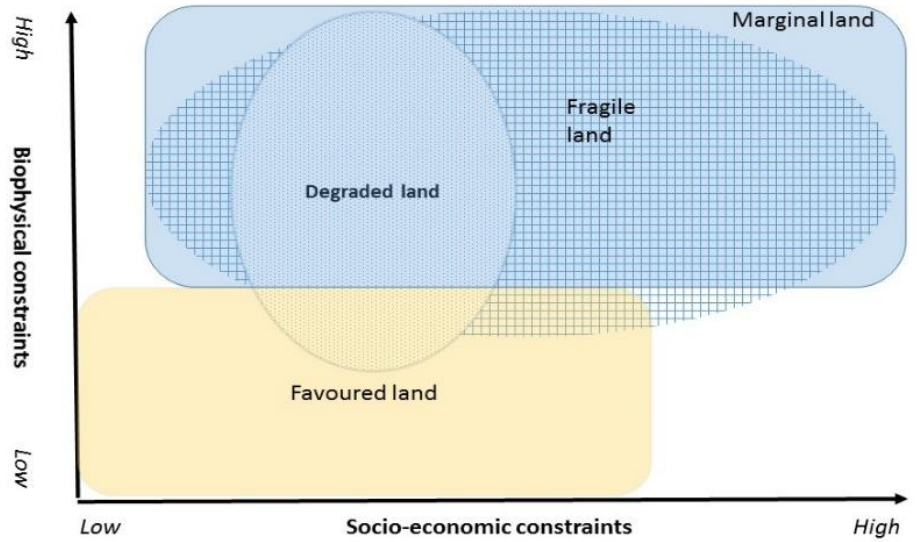
Land degradation: *Wiegman et al. (2008) identified 2 definitions:*

i. is a long-term loss of ecosystem function and services, caused by disturbances from which the system cannot recover unaided (UNEP 2007).

ii. is the decline of natural land resources, commonly caused by improper use of the land (Bergsma et al. 1996).

'severely degraded land' is defined as 'land that for a significant period of time has either been significantly salinated or presented significantly low organic matter content and has been severely eroded' *(Delegated Regulation (EU) 2019/807 (REDII), point 9, Annex V, Part C)*

Marginal lands are having limitations which in aggregate are severe for sustained application of a given use. Increased inputs to maintain productivity or benefits will be only marginally justified. They have limited options for diversification without the use of inputs and with inappropriate management, risks exist of irreversible degradation (FAO-CGIAR, 1999)





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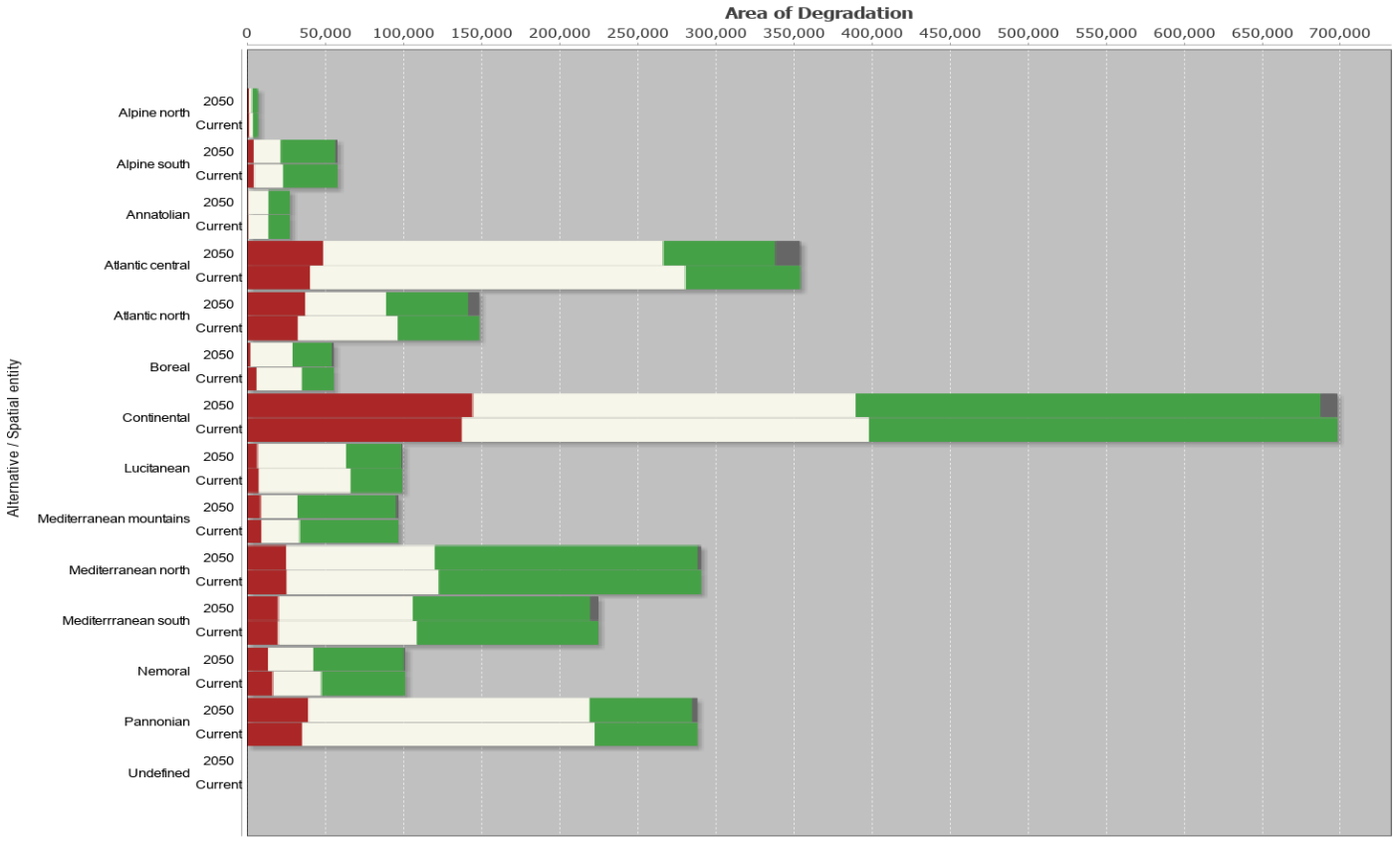
Proportion of land that is degraded over total land area (SDG indicator 15.3.1) 2020-2050

- Net degradation increases in Atlantic, Continental & Pannonian zone because of shift to more rotational cropping area
- In Mediterranean net stable because degraded area is compensated for by land abandonment + forest formation



Red = degrading
White= stable
Green= improving
Gray= From agriculture to urban

Significantly low carbon level

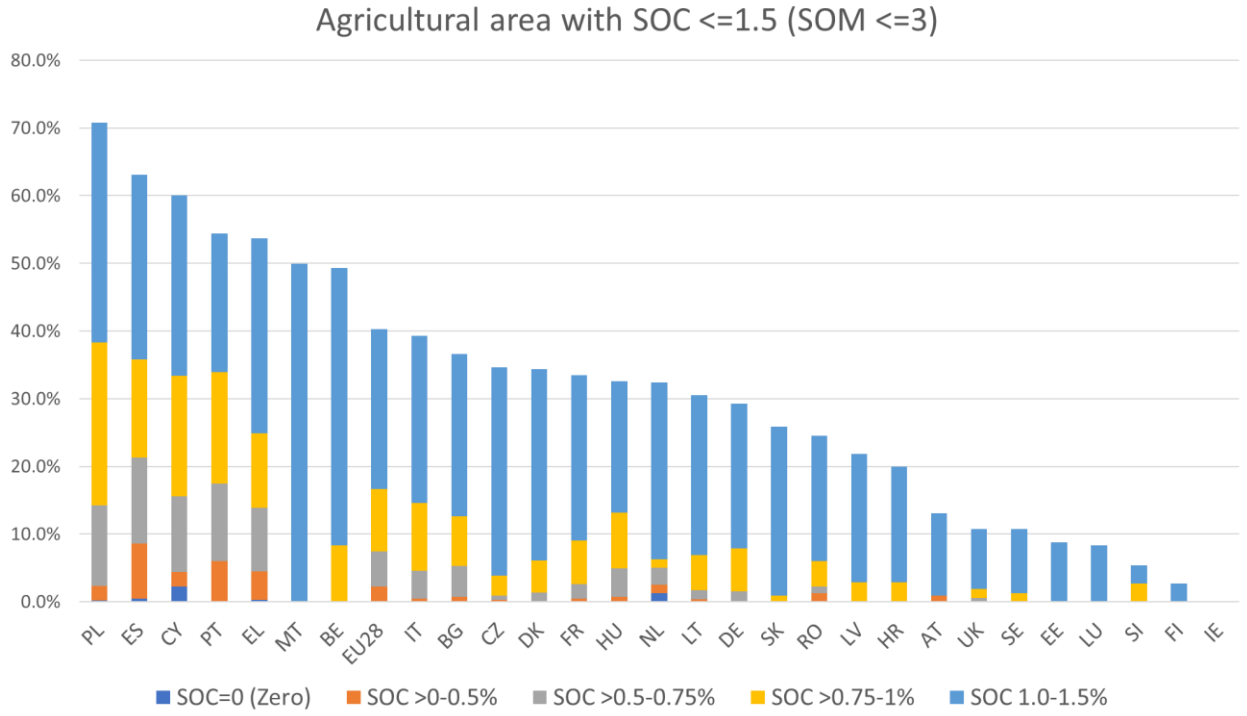
For threshold 1 which is the lowest SOM level representing the lowest 10th percentile of levels mentioned, the thresholds in the three climate zones always range between 1-2.8% SOM (0.5-1.4% SOC).

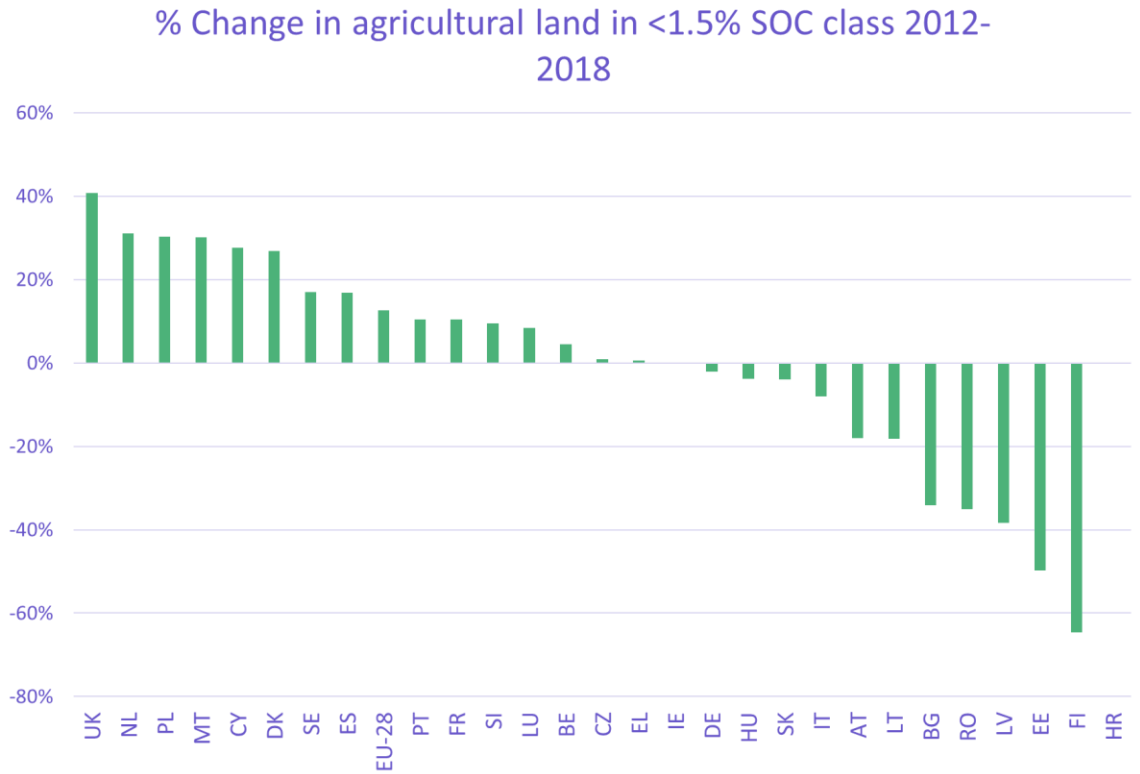
Table 2-10: SOM thresholds for cropland based on a farmer's questionnaire

Climate	Texture	Threshold 1	Threshold 2
Atlantic	Coarse	2.1	3.5
	Medium	1.7	2.6
	Medium fine	2.8[(1)]	n.a.
Continental	Coarse	1.8	2.1
	Medium	2.3	3.2*)
	Medium fine	2.0	2.4*)
Mediterranean	Coarse	1.7[(1) (2)]	1.1[(1) (2)]
	Medium	1.0	2.0
	Medium fine	1.3	1.4[(3)]

Note: [(1)] high uncertainty
[(2)] effect of different groups of farmers in the questionnaire and their perceptions about the SOC level on their farms

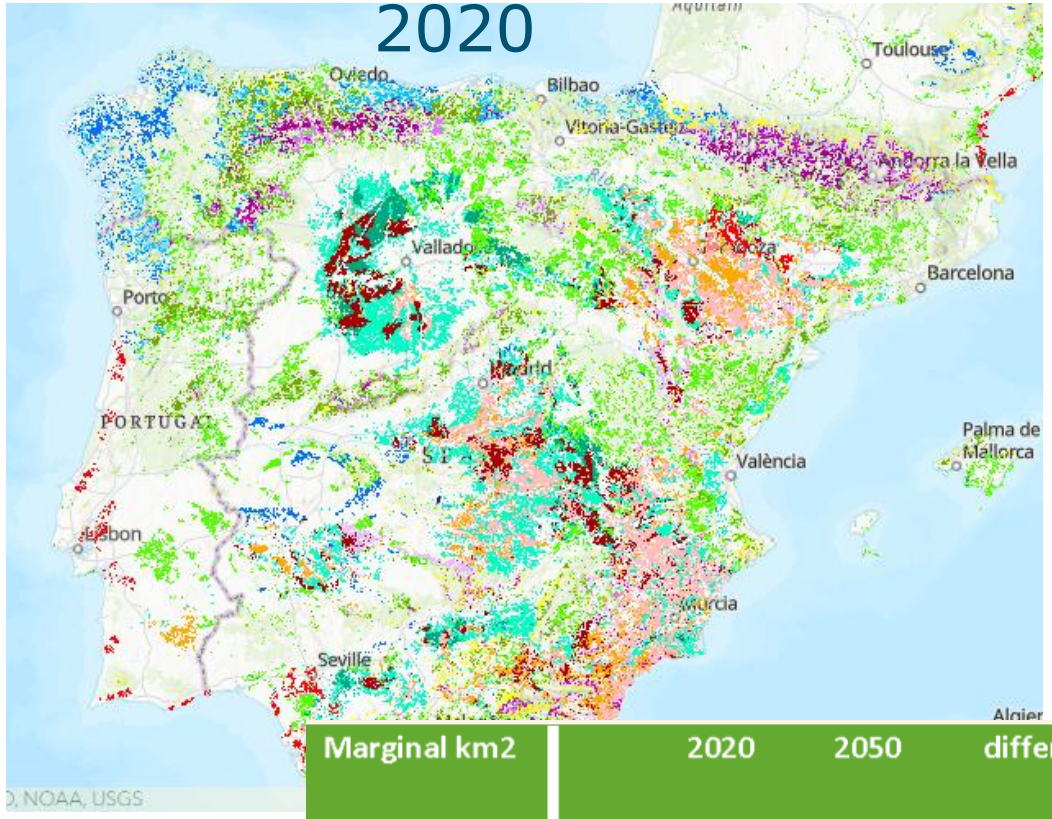
Distribution of farmland < 1.5 %SOC (<3 %SOM)

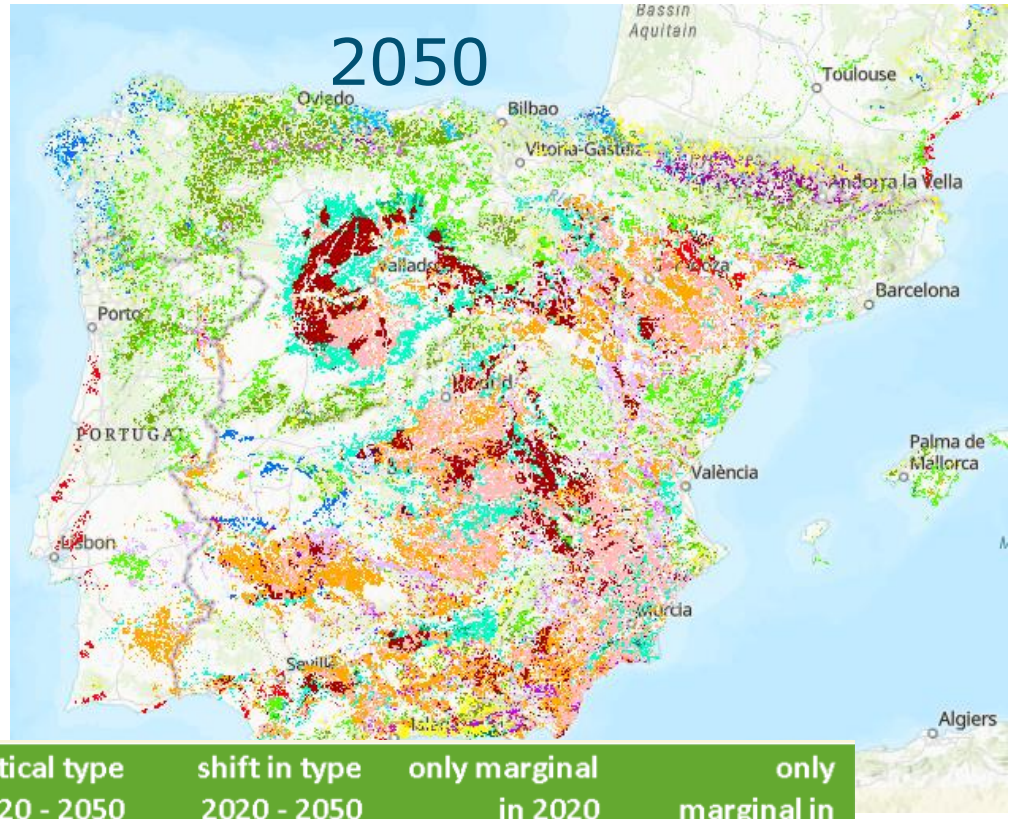




- < 1.5 %SOC (<3 %SOM) applies to 40% of the agricultural area
- < 0.75 %SOC (1.5 %SOM) applies to 7.4% of the agricultural area
- < 0.5 %SOC (1 %SOM) applies to 2.2 % of the agricultural area
- Agricultural area in the lowest SOC classes of <0.5% SOC (SOM <=1%) are mostly in Spain, Portugal, Greece, Poland, Netherlands, Romania and Bulgaria.

Climate change and land degradation





Marginal km2	2020	2050	difference	identical type 2020 - 2050	shift in type 2020 - 2050	only marginal in 2020	only marginal in 2050
EU-27+UK	513521	507136	-6385	376548	86269	50704	44319
North	71069	53210	-17859	29482	23728	17859	0
Alpine	21130	16745	-4385	11754	4948	4428	43
Continental	127333	132548	5215	118710	5677	2946	8161
Atlantic	136486	113105	-23381	95378	17469	23639	258
Mediterranean	157503	191528	34025	121224	34447	1832	35857

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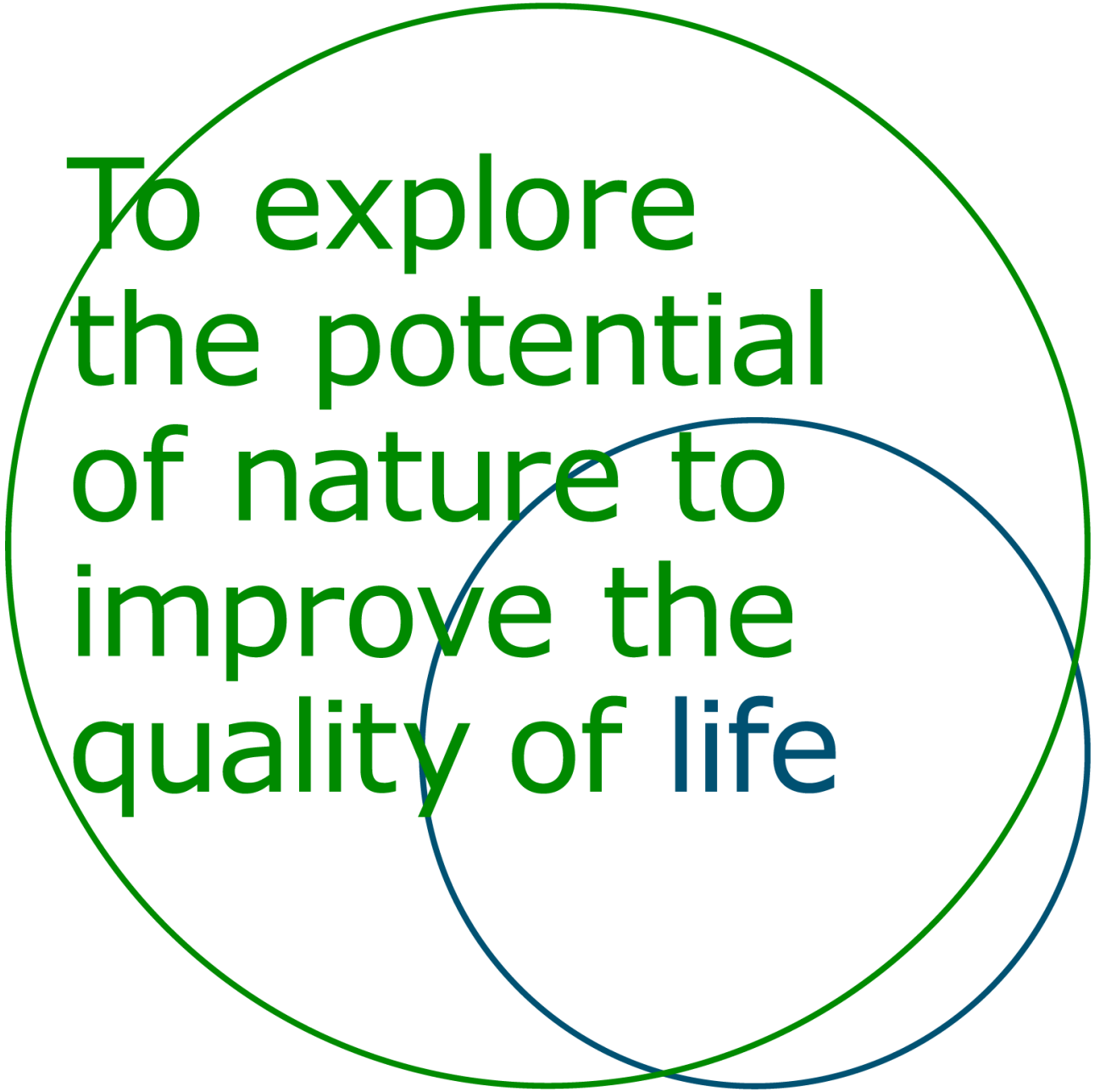
Conclusions

- Threshold for significantly low carbon needs to be soil and climate specific
- Significantly low carbon levels are difficult to measure. Better methods of measuring and monitoring are needed.
- Land degradation needs better definition and better guidance to identify it. Clearly a process that is increasing in certain places with continuation of conventional farming practices.
- Overall it is clear that the trend in soil carbon in agricultural lands is negative and will continue to decrease unless measures are taken to change land use and land management trends
- Climate change is an important factors to further enhance land becoming marginal and degraded, particularly in the Mediterranean with overall declines in land productivity because of lack of water and salinization challenges.

Thank you for your attention!



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BIP Europe
Biomethane Industrial Partnership

Welcome and introduction

Report presentation *by BIP TF3*

Report presentation *by JRC*

Presentation of Horizon Europe projects

Q&A



BIP Europe
Biomethane Industrial Partnership

Panel discussion

Jean-Francois Delaitre

President of AAMF

Association Agriculteurs Méthaniseurs de France



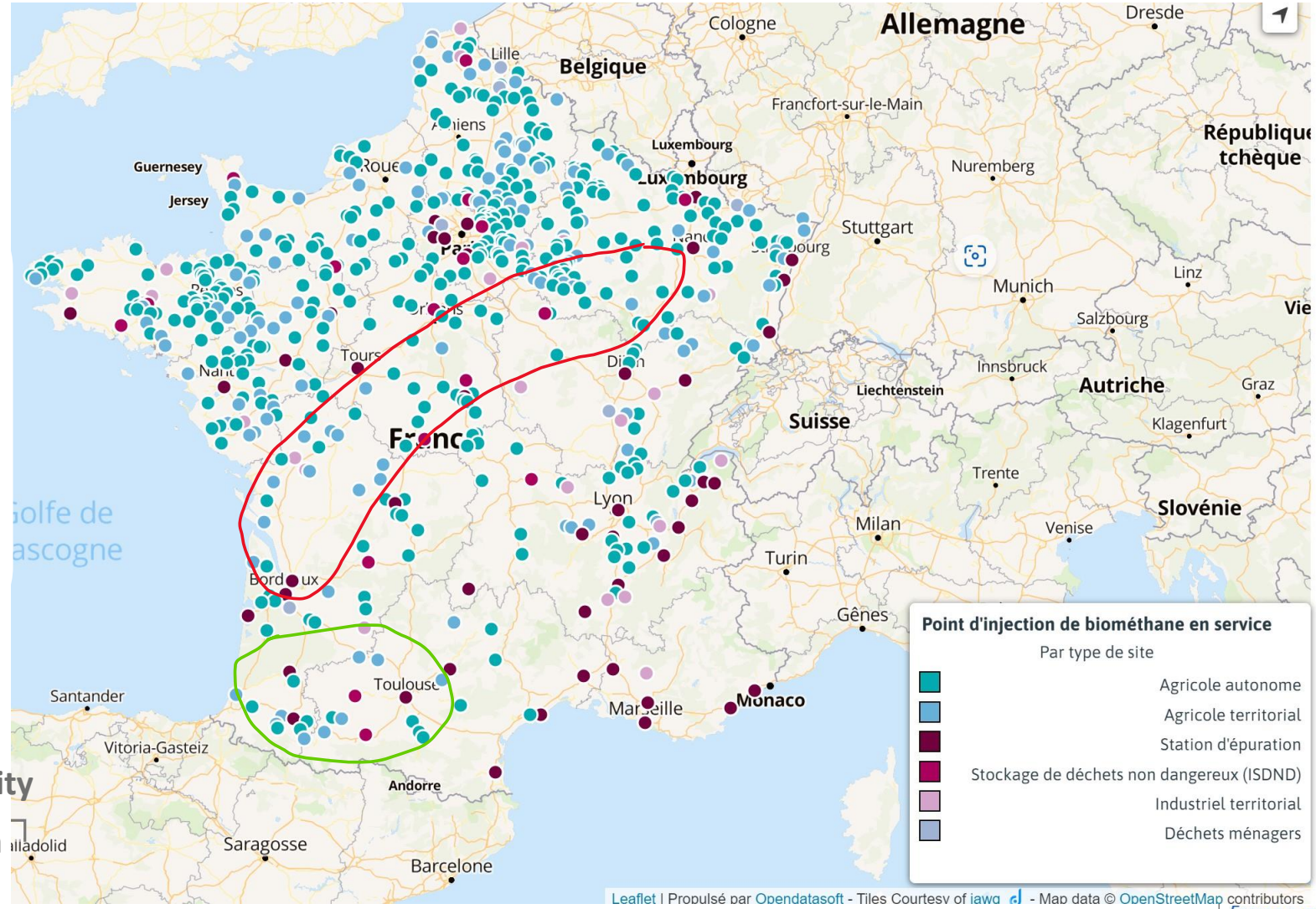
EUBCE June 26 th MARSEILLE

BIOMETHAN in France june 18th 2024

687 unit = 12,4 TWh in production + 14,4 TWh more waiting for grid connection.

590 agricoles
- 448 in autonomy

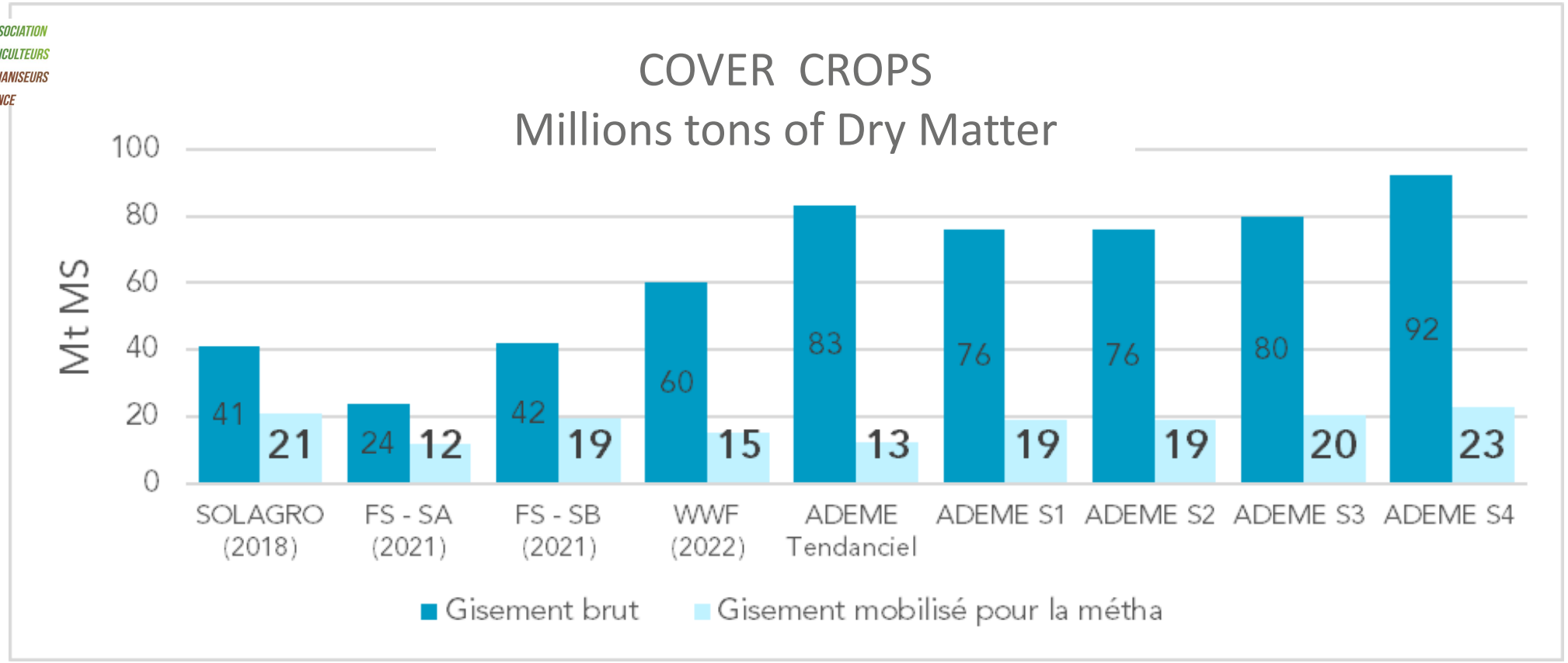
48 waste water treatment plants



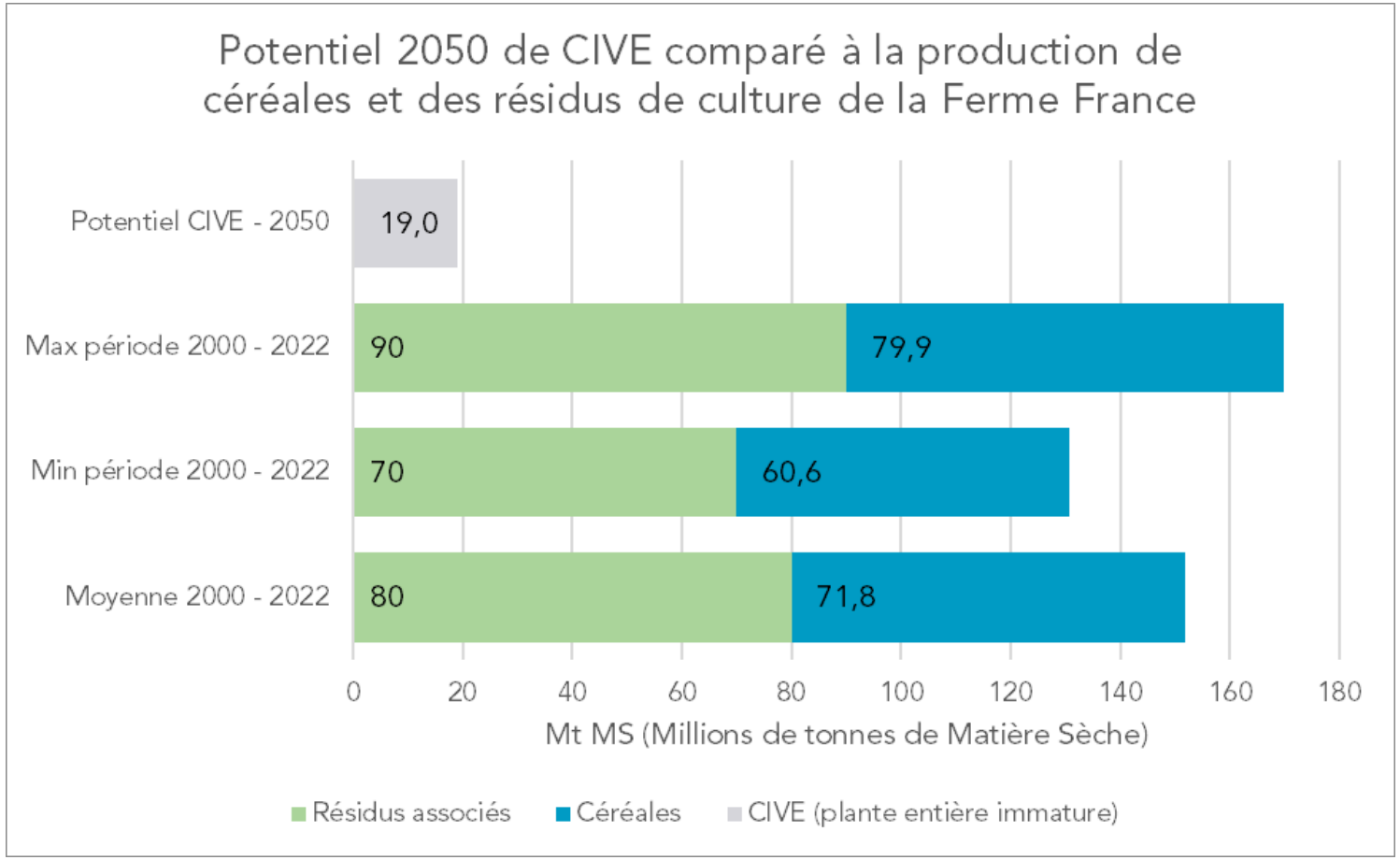
Biogas producing electricity

1 050 units for 1,6 TWh

2050 – Intermediate Energy Crop potential

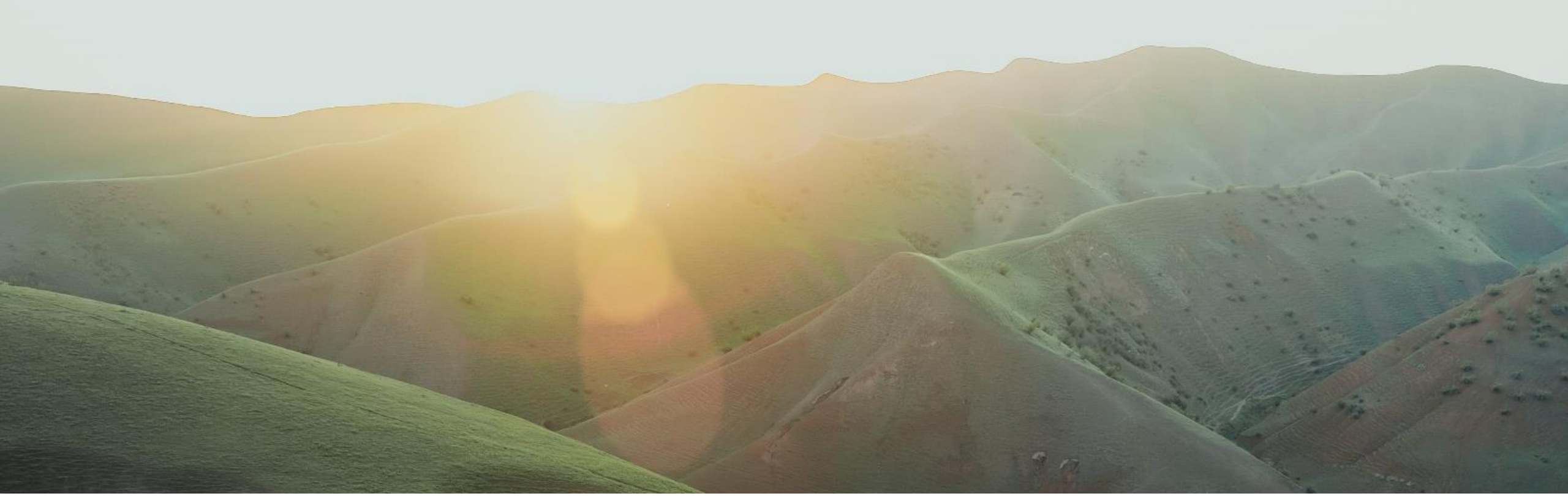


Novel Croppping potential regarding total production « made in France »



Source : Agreste

Around 12% of the average cereals production (including straw)



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