



Replicability potential assessment of the BIKE case studies in Europe

08/06/2023

BIKE final event

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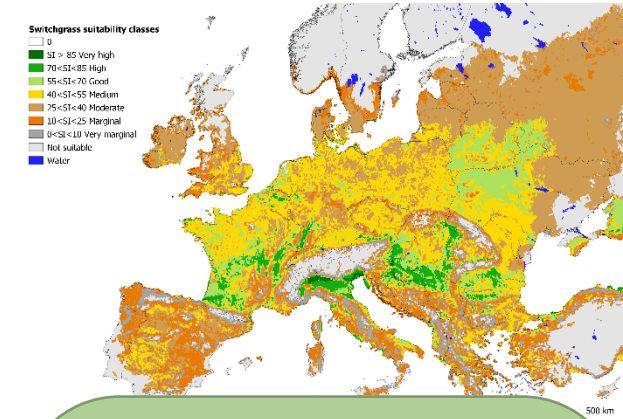
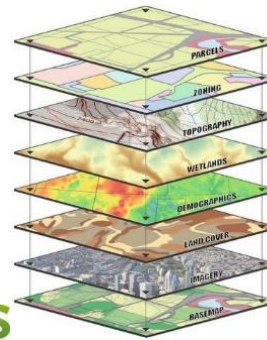


*This project has received funding from the European Union's
Horizon 2020 Research and Innovation Programme under Grant
Agreement No. 952872.*



Methodology

Regional Units	Common wheat	Durum wheat	Barley	U.M.	Year
Rodopi	3298.7	5582	2734.4	Hectares	2019
Drama	4721	5050.8	2801.6	Hectares	2019
Evros	4881.9	17462.1	2023.2	Hectares	2019
Thasos, Kavala	1066.8	298.4	626.1	Hectares	2019
Xanthi	7224.8	581.3	1299.8	Hectares	2019
Thessaloniki	10795.1	20767.4	10038.9	Hectares	2019
Imathia	1279.2	1490.3	486.9	Hectares	2019
Kilkis	12795.7	22835.8	4634.9	Hectares	2019
Pella	3291.2	4813.9	2438	Hectares	2019
Pieria	5325.5	8900.5	3275.9	Hectares	2019
Serres	4930.5	21808	6845	Hectares	2019
Chalkidiki				Hectares	2019
Kozani, Grece				Hectares	2019
Kastoria				Hectares	2019



Data collection

- Position of biorefineries;
- Position and extension of underutilized lands;
- Position and extension of cultivated lands;
- Crop rotation schemes.

Data elaboration

- Crop yields modelling;
- Calculation of:
 - Potential biomass production;
 - Potential biofuel production.

Identification of most promising case studies



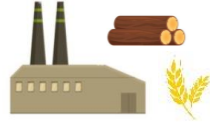
This methodology was applied to each of the four case studies of the BIKE project.

Cultivation in unused, abandoned or severely degraded lands

Perennial grasses for bioethanol (European area)



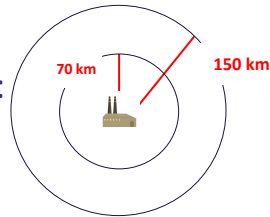
Target biorefineries:
1G and 2G bioethanol plants



Yield modelling:
GAEZ v. 4.0



Supply distances:
70km, 150 km



Castor oil for renewable diesel (Mediterranean area)



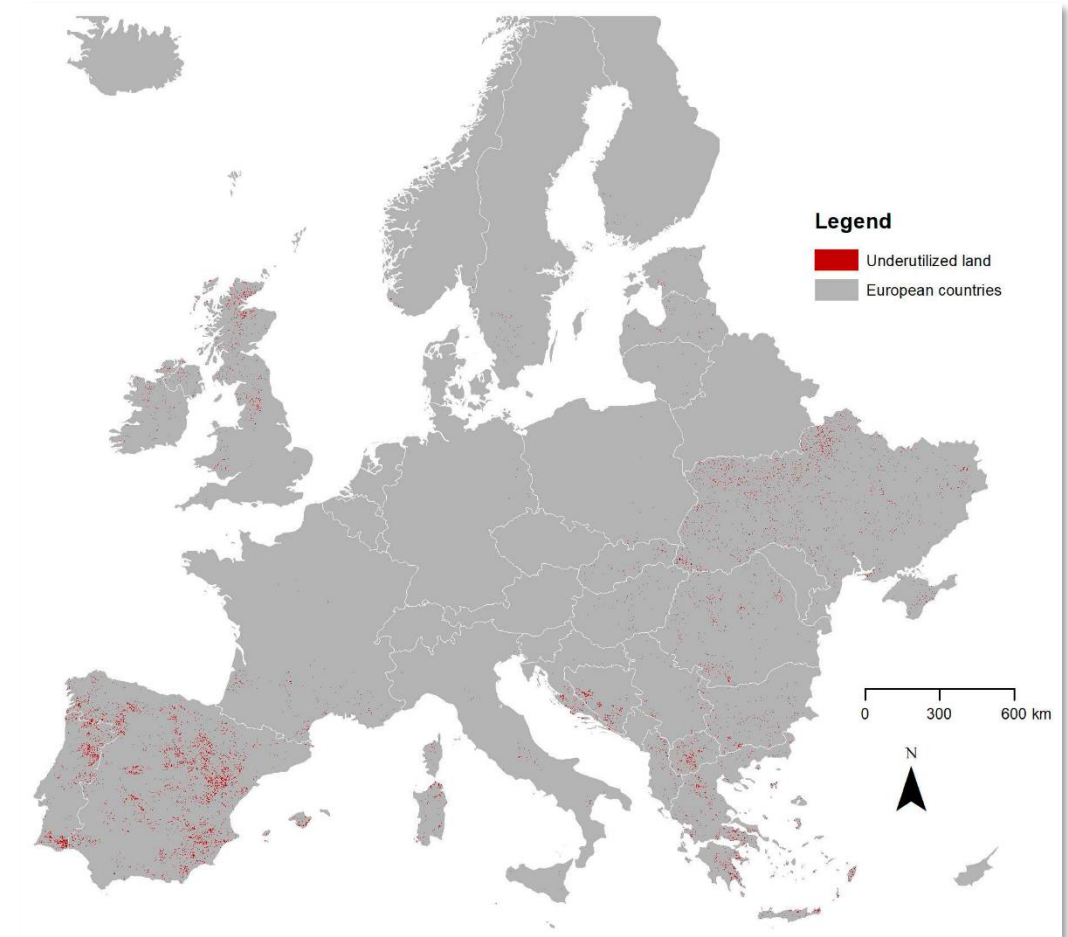
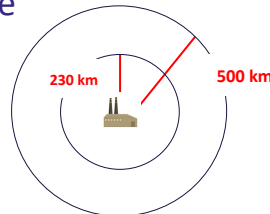
Target biorefineries:
HVO and biodiesel



Yield estimation:
Available literature



Supply distances:
230 km, 500 km



- Underutilized lands defined as “all land that does not show any signs of human use for the past five years”.
- **5.3 million ha of underutilized land** potentially available in EU.

Brassica carinata for renewable diesel (Mediterranean area)



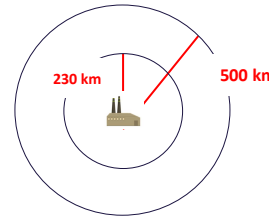
Target biorefineries:
HVO and biodiesel



Yield modelling:
GAEZ v. 4.0



Supply distances:
230 km, 500 km



Crop rotation schemes:
Consultations with expert agronomists and BIKE partners



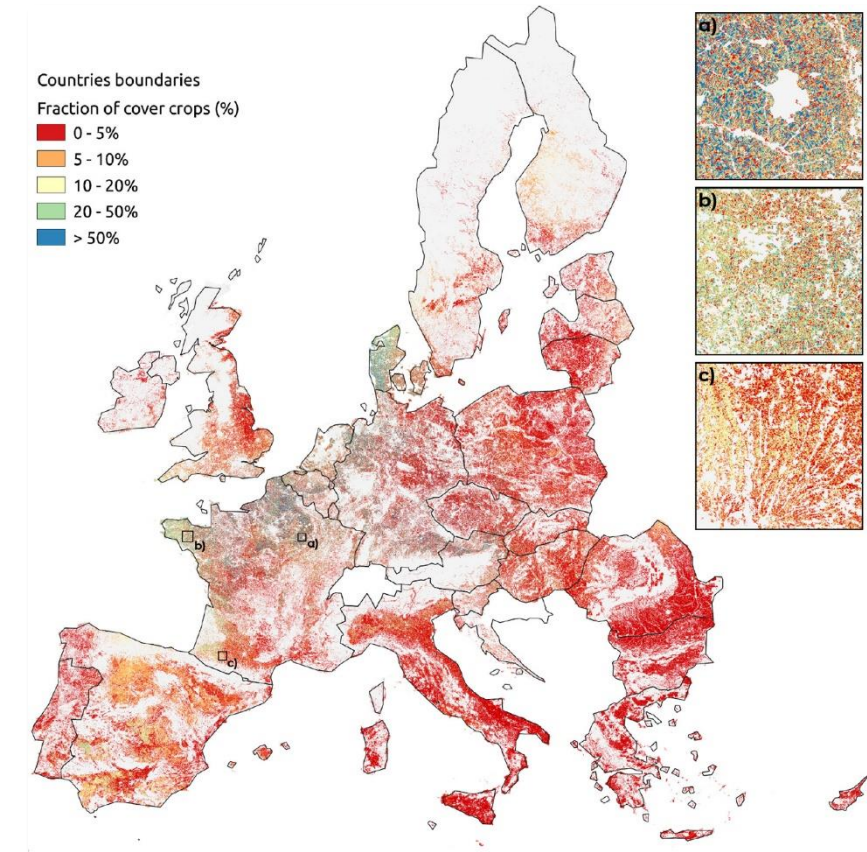
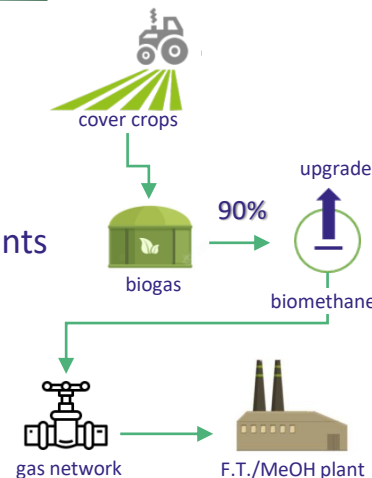
Biogas Done Right (BDR) model (European area)



Biomethane potential from cover crops:
[A GAS FOR CLIMATE REPORT, 2022](#)

Target biorefineries:
Decentralized biogas and biomethane plants
Centralized F.T. or MeOH plants

Natural gas grid level of development:
[SYSTEM DEVELOPMENT MAP, 2023](#)



- The use of cover crops represents a small percentage of total European cropland (**8.9% in 2016**).

BIKE case study 1

Perennial grasses for bioethanol production



Miscanthus



Switchgrass

Selected biorefineries

Key numbers:

- ✓ Second-generation bioethanol plants:
 - ✓ **13** operational;
 - ✓ **12** planned/under construction.



- ✓ First-generation bioethanol plants:
 - ✓ **118** operational;
 - ✓ **47** with possibility of upgrade (2040).

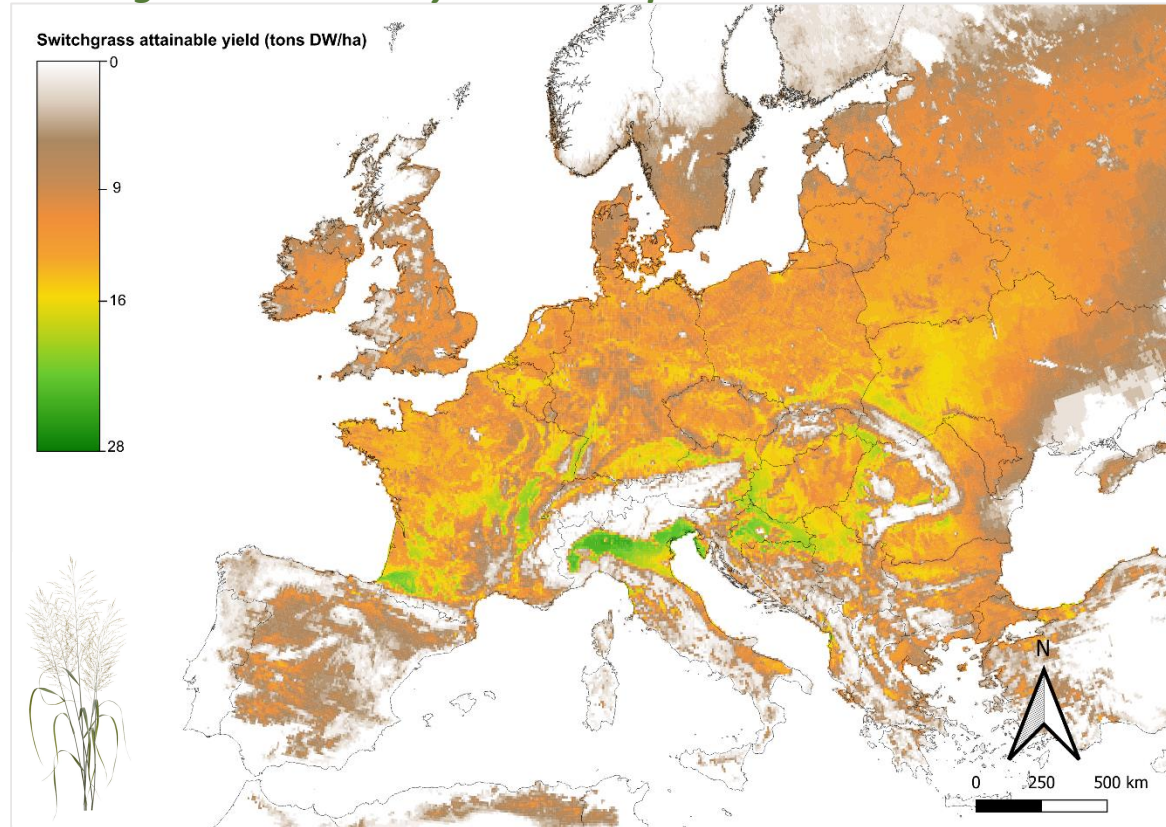


Map of European bioethanol plants

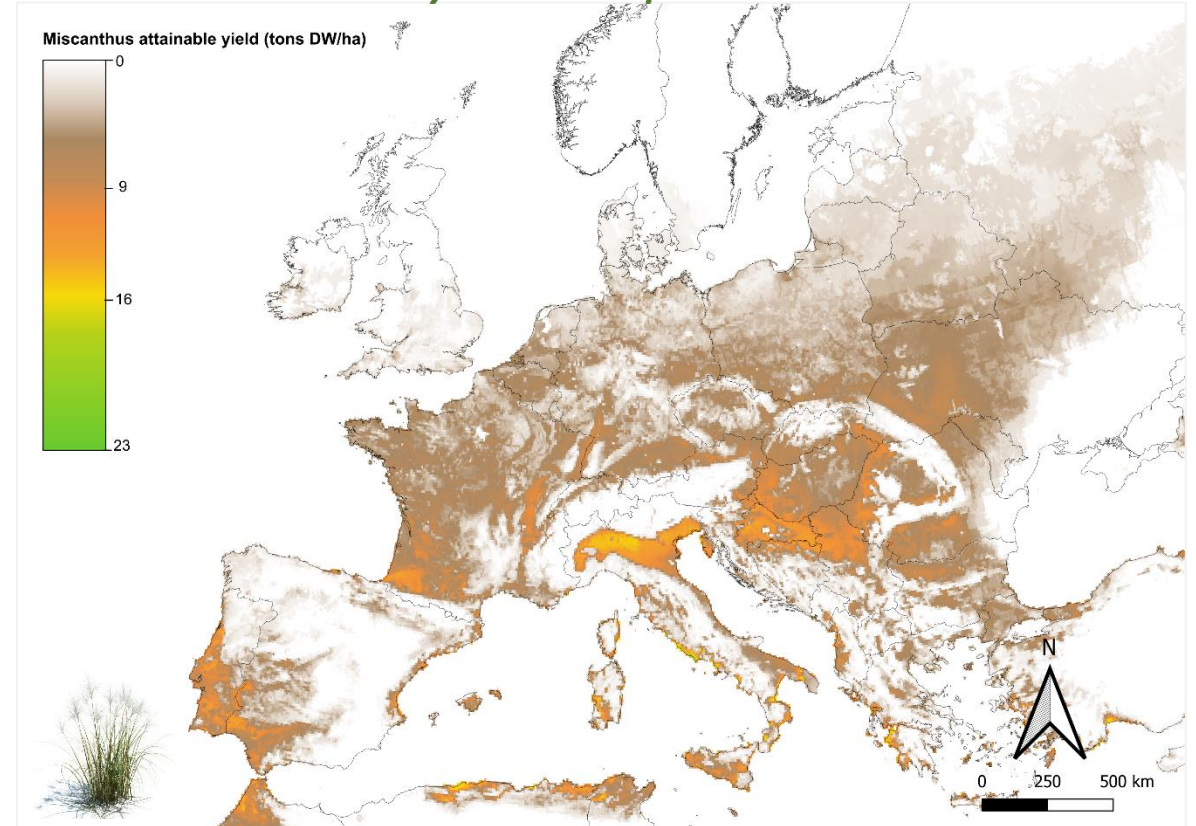


Simulated yield

Switchgrass attainable yield in Europe



Miscanthus attainable yield in Europe



Key numbers:

- ✓ Switchgrass yield : 0 – 28 tons DW/ha
- ✓ Miscanthus yield : 0 – 23 tons DW/ha

Potential biomass production: 2G plants, 70 km

Potential production for operational 2G biorefinery

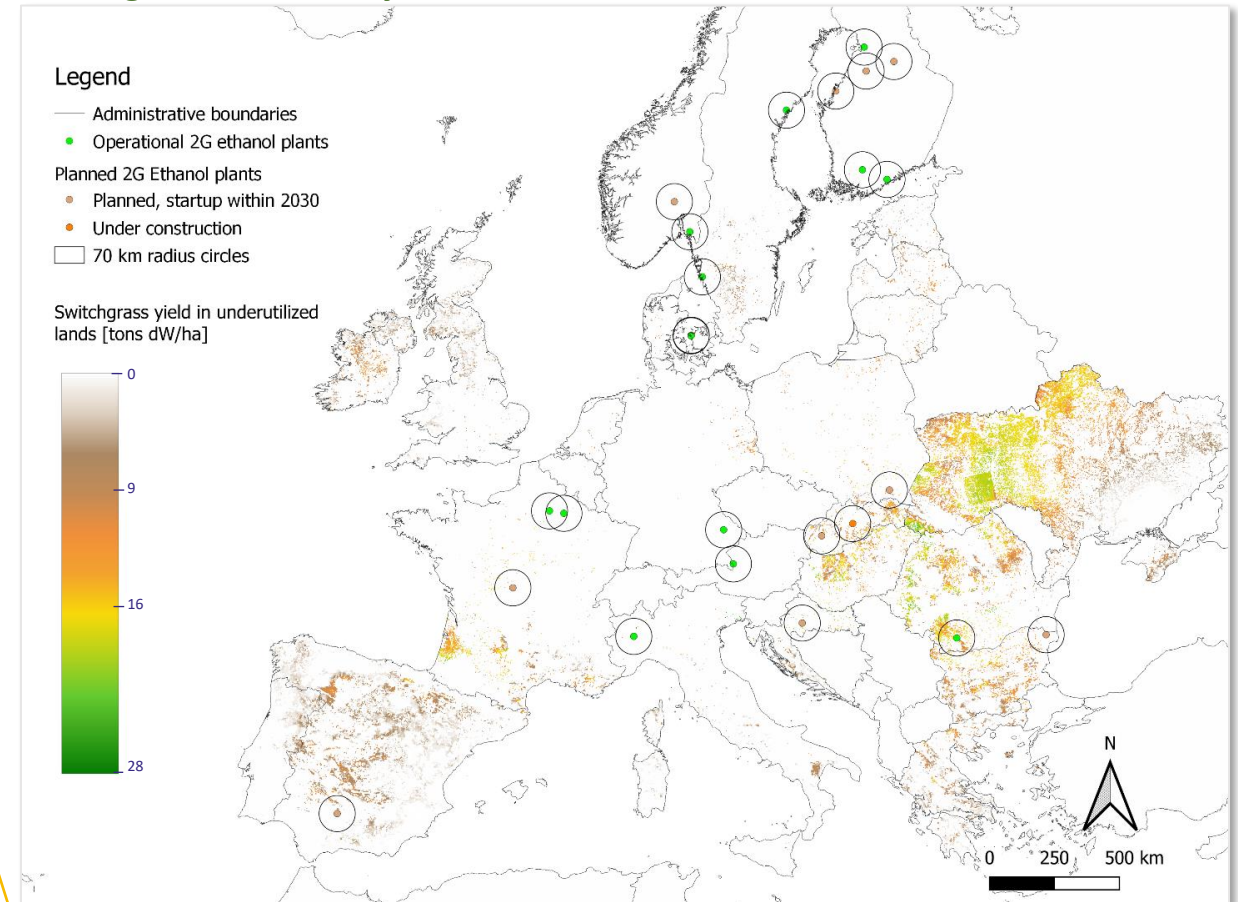
Name of the plant	Country	Marginal lands [hectares]	Switchgrass [t DW/year]	Miscanthus [t DW/year]
Crescentino Bioethanol Plant	Italy	257	5,789	3,191
AustroCel Hallein	Austria	49	123	25
FuturoL ARD	France	29	322	114
FuturoL IFP	France	66	926	343
Clariant AG	Germany	0	0	0
Clariant Products RO	Romania	38615	498,623	200,287
Inibicon	Denmark	0	0	0
Gothenburg Ethanol Plant	Sweden	573	1,831	0
Borregaard Industries AS	Norway	44	144	0
Ornskoldsvik SEKAB	Sweden	0	0	0
St 1 Bionolix	Finland	1249	1,929	0
Chemopolis Oy	Finland	0	0	0
Etanolix Vantaa	Finland	10	10	0
tot			509,697	203,960

Potential production for planned 2G biorefinery

Name of the plant	Country	Marginal lands [hectares]	Switchgrass [t DW/year]	Miscanthus [t DW/year]
Sainc Energy Limited	Spain	8910	46,066	37,147
RYAM	France	143	1639	731
Bioskoh	Slovakia	4451	50,789	21,192
Envirals Leopoldov	Slovakia	6959	76,819	29,099
Jedlicze Site	Poland	5594	76,312	27,197
Clariant Technology	Bulgaria	350	4,248	614
INA Ethanol	Croatia	685	12,898	8,844
RE Energy	Denmark	0	0	0
Cellulonix Pietrarsaari	Finland	144	72	0
St1 Cellulonix	Finland	0	0	0
Nordfuel biorefinery	Finland	0	0	0
Cellulonix Follum	Norway	0	0	0

tot 268844 124826

Switchgrass attainable yield in underutilized lands



A minimum production of **100,000 tons of dry biomass** per year per biorefinery was set as **requirement** for identification of most promising case studies.

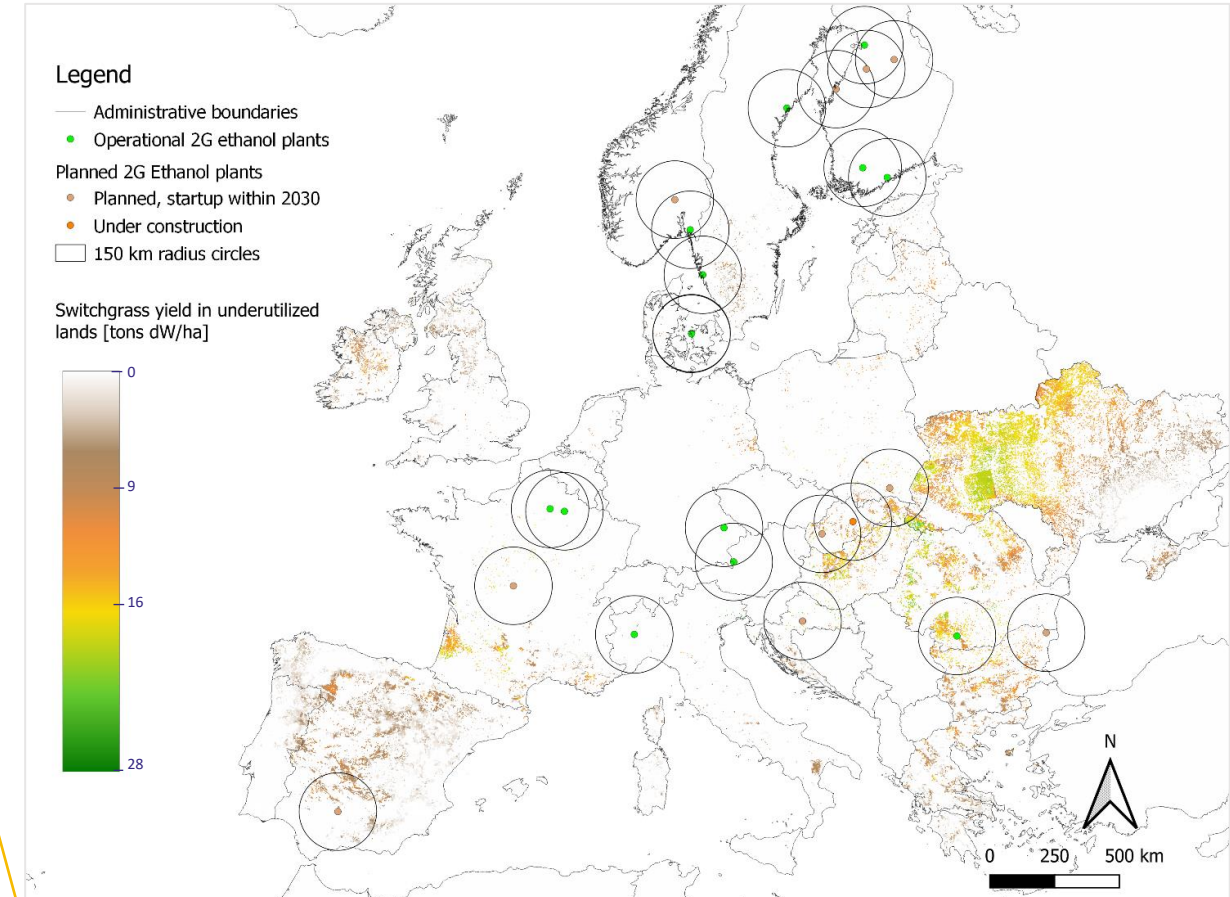
Potential biomass production: 2G plants, 150 km



Potential production for operational 2G biorefinery				
Name of the plant	Country	Marginal lands [hectares]	Switchgrass [t DW/year]	Miscanthus [t DW/year]
Crescentino Bioethanol Plant	Italy	495	7,617	4,097
AustroCel Hallein	Austria	160	261	83
Futurol ARD	France	182	2071	738
Futurol IFP	France	324	4,197	1,753
Clariant AG	Germany	49	123	25
Clariant Products RO	Romania	79,901	1,131,775	500,168
Inibicon	Denmark	53	700	42
Gothenburg Ethanol Plant	Sweden	3,243	17,110	12
Borregaard Industries AS	Norway	1,278	3,769	0
Ornskoldsvik SEKAB	Sweden	0	0	0
St 1 Bionolix	Finland	3,476	6,284	0
Chemopolis Oy	Finland	0	0	0
Etanolix Vantaa	Finland	1,099	4,749	0
tot			1,178,656	506,918

Potential production for planned 2G biorefinery				
Name of the plant	Country	Marginal lands [hectares]	Switchgrass [t DW/year]	Miscanthus [t DW/year]
Sainc Energy Limited	Spain	105,049	630,856	269,461
RYAM	France	1,708	27,685	9,999
Bioskoh	Slovakia	28,739	341,731	120,733
Envirals Leopoldov	Slovakia	20,966	240,042	106,548
Jedlicze Site	Poland	42,496	544,118	229,692
Clariant Technology	Bulgaria	5,799	59,268	16,270
INA Ethanol	Croatia	15,635	89,815	42,739
RE Energy	Denmark	53	700	42
Cellulonix Pietrarsaari	Finland	848	512	0
St1 Cellulonix	Finland	0	0	0
Nordfuel biorefinery	Finland	0	0	0
Cellulonix Follum	Norway	0	0	0
tot			1,934,727	795,484

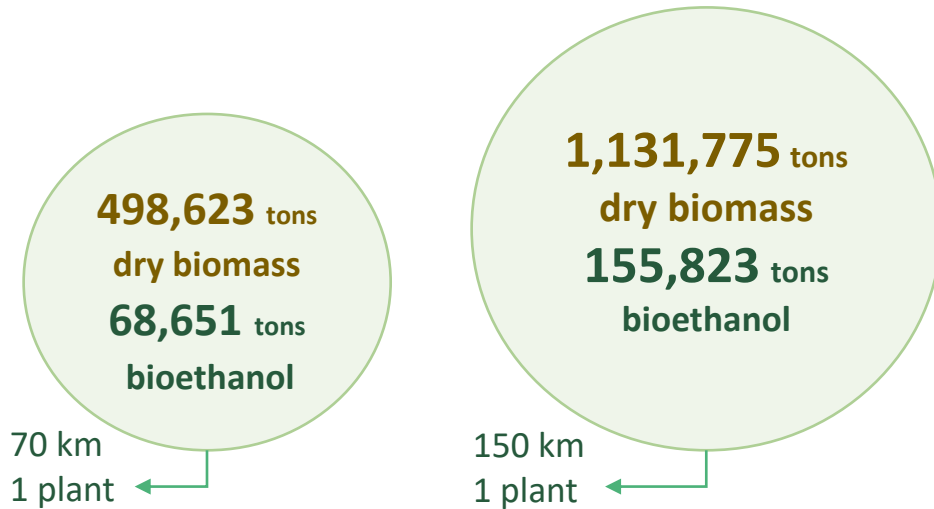
Switchgrass attainable yield in underutilized lands



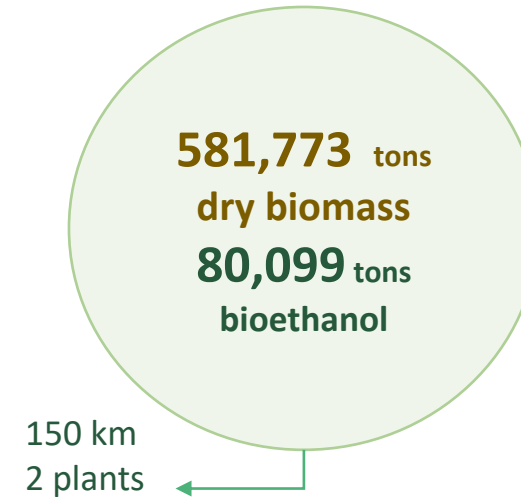
A minimum production of **100,000 tons of dry biomass** per year per biorefinery was set as **requirement** for identification of most promising case studies.

Promising case studies identified

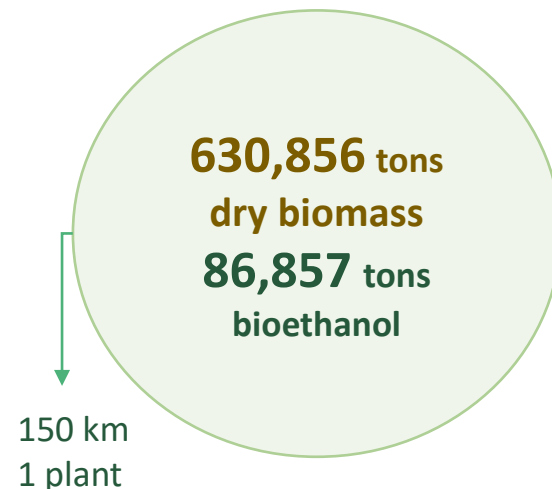
1) ROMANIA



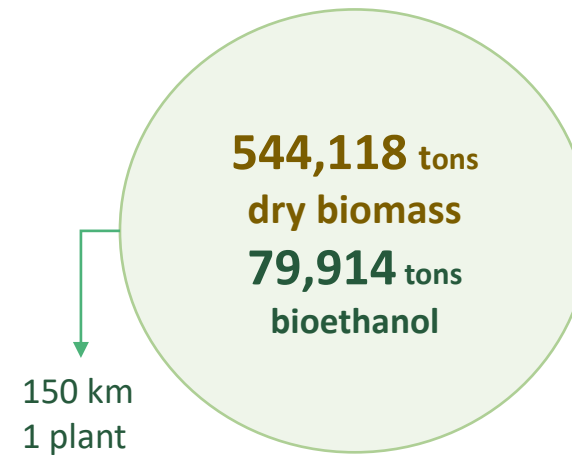
3) SLOVAKIA



2) SPAIN



4) POLAND



LEGEND

 2G Bioethanol,
Simulated data

Conversion factor:
174.5 L EtOH/t dry biomass

BIKE case study 2

Castor oil for renewable diesel production



Selected biorefineries

Key numbers:

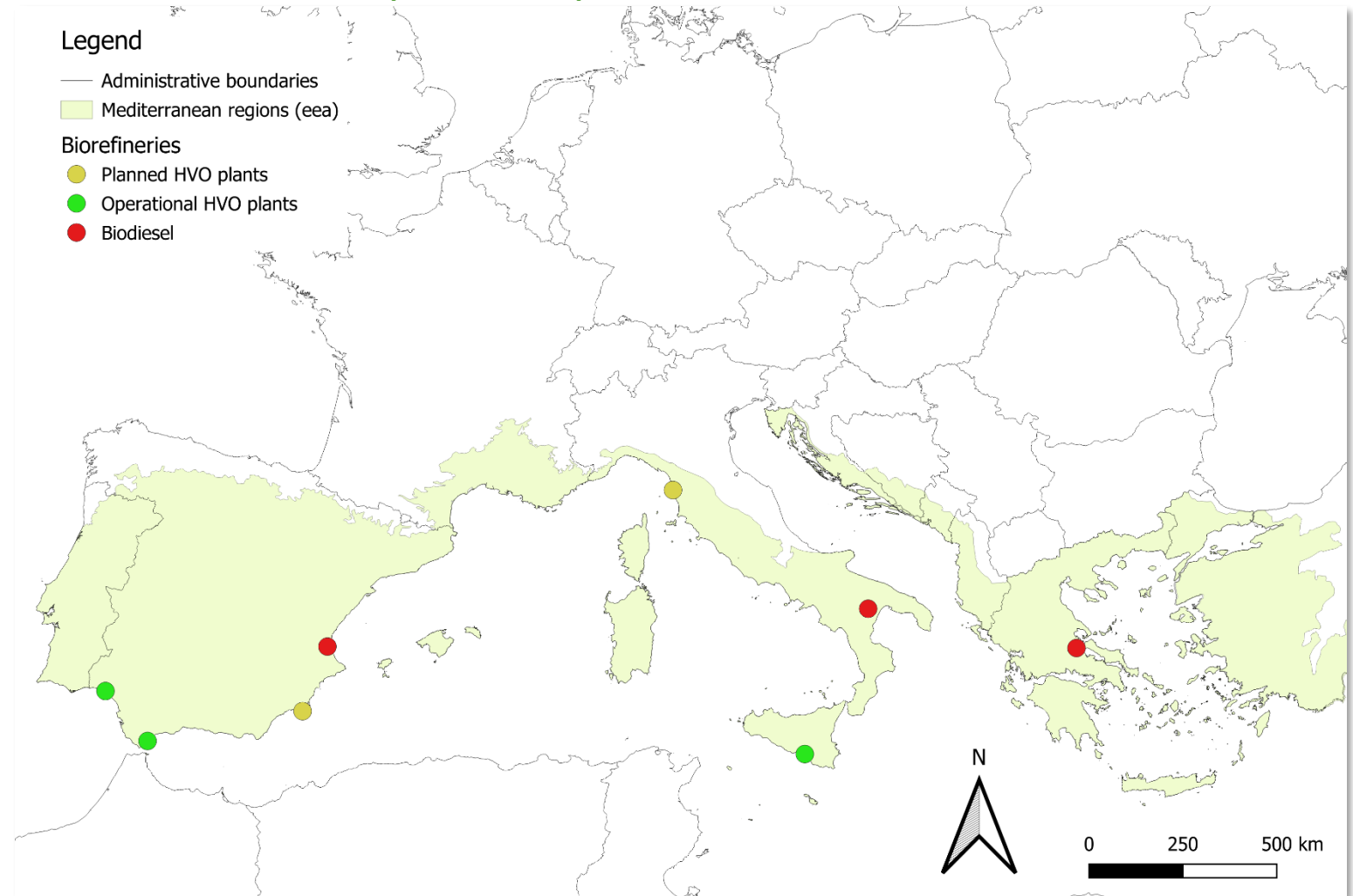
- ✓ HVO plants:
 - ✓ 3 operational;
 - ✓ 2 planned.

- ✓ Biodiesel plants:
 - ✓ 3 operational.



Three biodiesel plants were selected in **Greece, eastern Spain, south-eastern Italy**, where HVO technology is not established yet.

Selected HVO and biodiesel plants in European mediterranean countries.



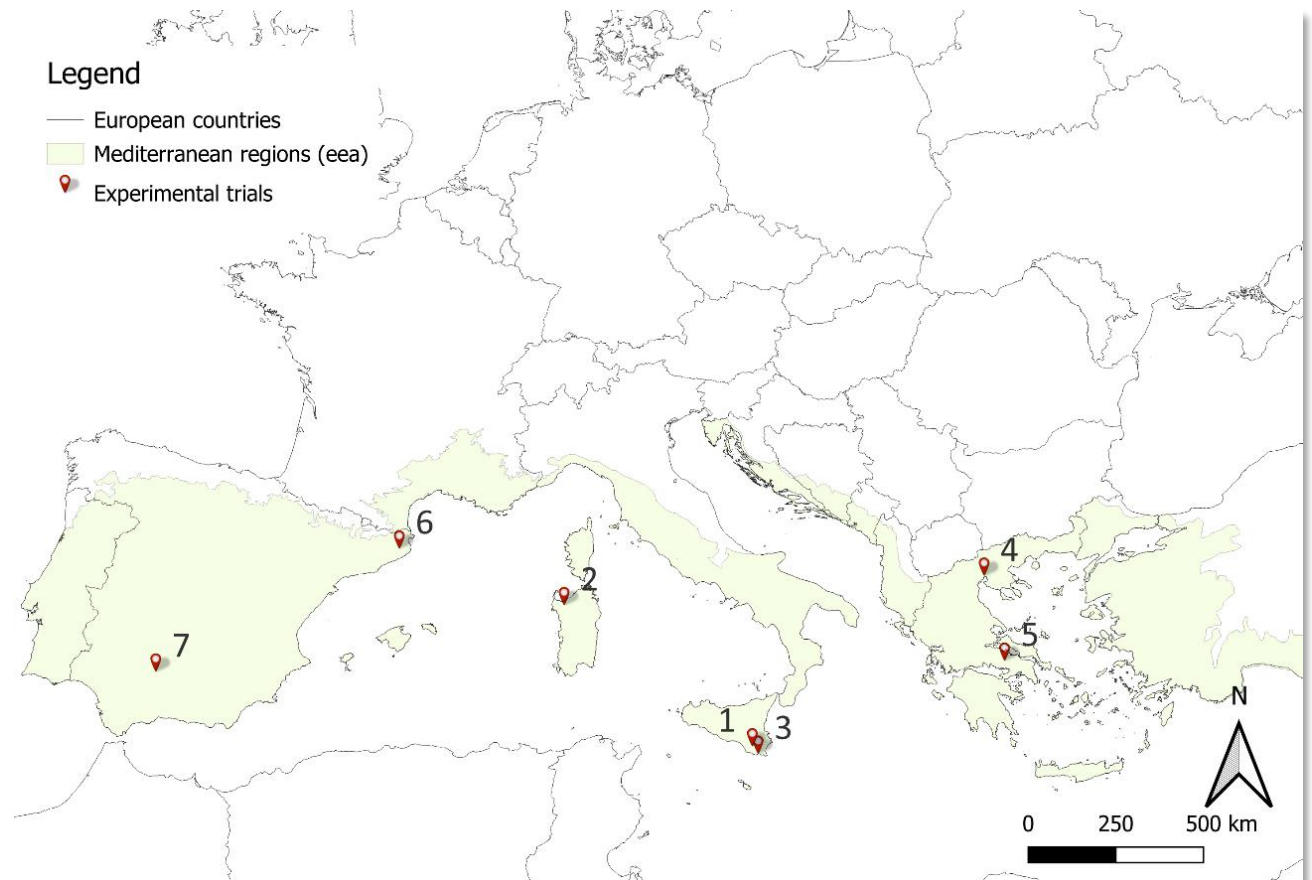
Estimated yield

Nr.	Country	City	Seed yield (t/ha)	Oil content (%)	Source
1	Italy	Ragusa	3.4	47	<i>Anastasi et al., 2015</i>
2	Italy	Sassari	1.8	47	<i>Laureti et al., 1998</i>
3	Italy	Pozzallo	3.1	N.R.	<i>Patanè et al., 2019</i>
4	Greece	Thessaloniki	3.3	51	<i>Koutroubas et al., 1999</i>
5	Greece	Aliartos	2.2	55	<i>Zanetti et al., 2017</i>
6	Spain	Gerona	1.3	N.R.	<i>Capuano, 2008</i>
7	Spain	Cordoba	2.8	47	<i>Cabrales et al., 2014</i>



Conservative scenario: lowest yield values for each country

Experimental trials of castor bean cultivation in European mediterranean countries



Key numbers:

- ✓ **Italy:** 1.8 tons seeds/ha
- ✓ **Greece:** 2.2 tons seeds/ha
- ✓ **Spain:** 1.3 tons seeds/ha

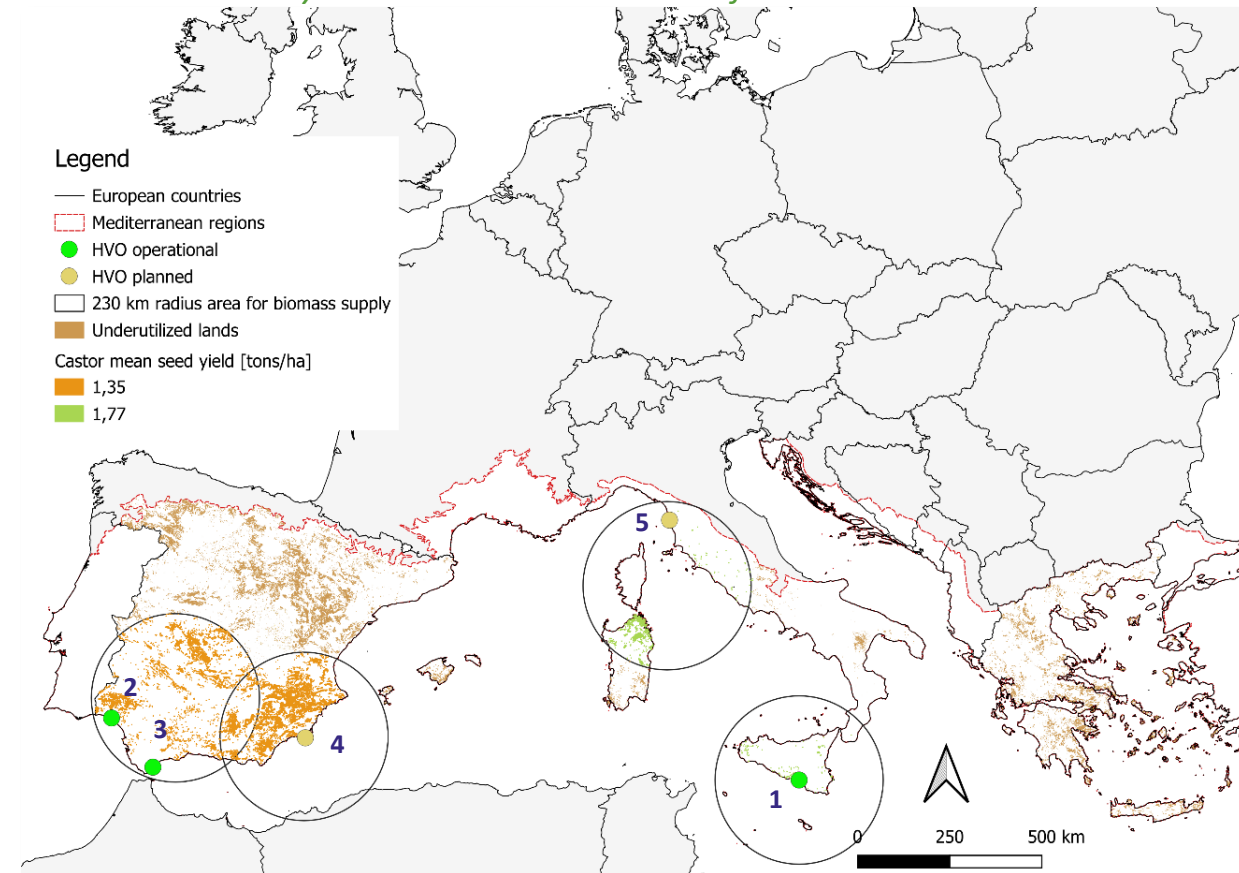
Potential oil production: HVO plants, 230 km

Potential oil production per HVO refinery

Nr.	Name of the plant	Country	Underutilized lands (ha)	Seed yield (tons/ha)	Oil content (%)	Oil production (tons/year)
1	Eni raffineria di Gela Spa	Italy	3,243	1.77	47.2	2,709
2	La Ribida Energy Park (CEPSA)	Spain	217,477	1.35	46.6	136,815
3	Abengoa Biofuel Plant (CEPSA)	Spain				
4	Complejo Industrial de Cartagena de Repsol	Spain	305,001	1.35	46.6	191,876
5	Eni raffineria di Livorno	Italy	35,204	1.77	47.2	29,411
tot						360,811

A **minimum production** of **20,000 tons of oil per year** per biorefinery was set as **requirement** for identification of most promising case studies.

Castor estimated yield in underutilized lands of EU mediterranean countries.



REFERENCES:

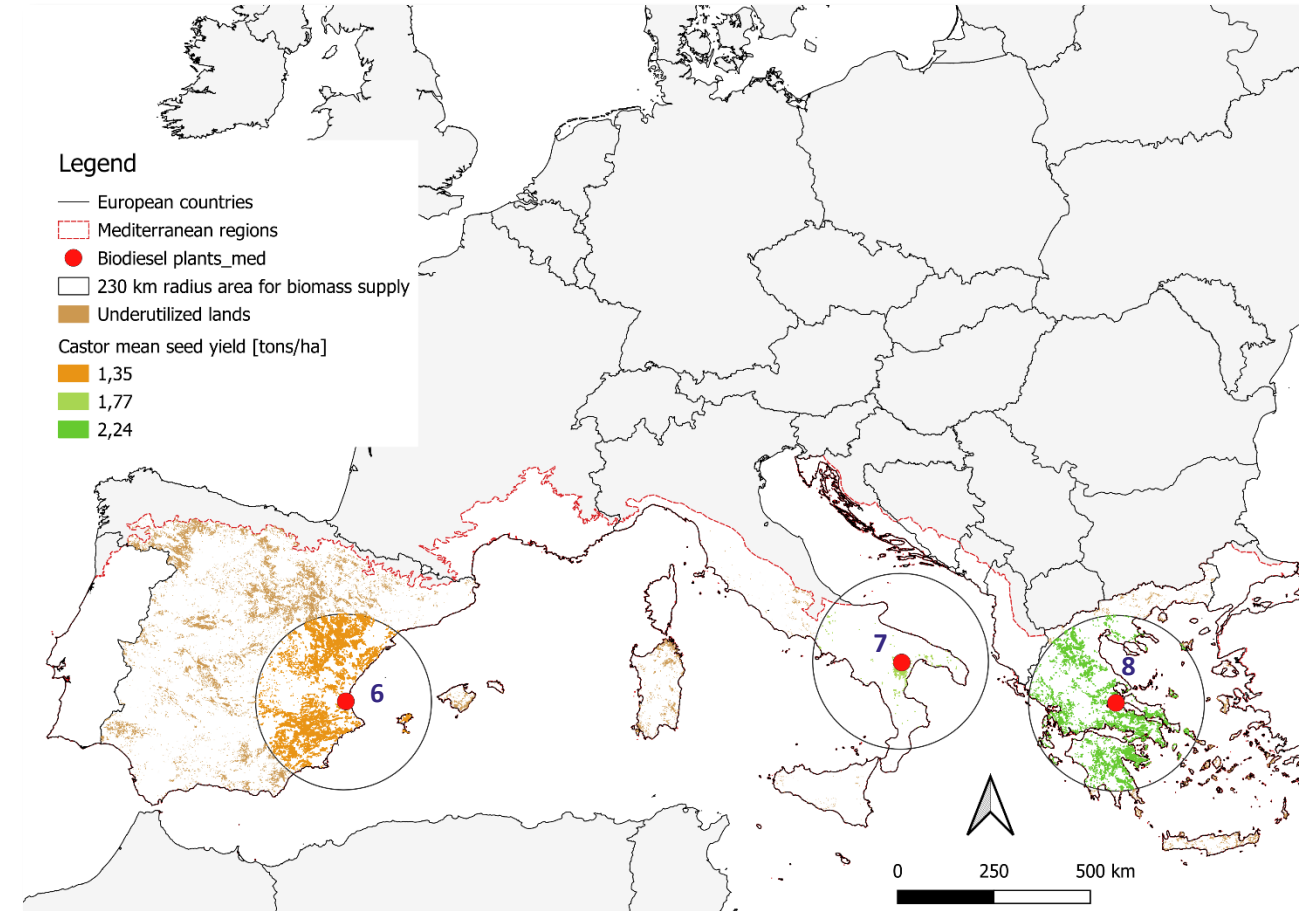
<https://bioplat.eu/about>
<https://demoplants.best-research.eu/>

Potential oil production: biodiesel plants, 230 km

Potential oil production per HVO refinery						
Nr.	Name of the plant	Country	Underutilized lands (ha)	Seed yield (tons/ha)	Oil content (%)	Oil production (t/y)
6	Biocom energia	Spain	534,462	1.35	46.6	336,230
7	Greenswitch	Italy	7,727	1.77	47.2	6,455
8	Agroinvest s.a.	Greece	216,857	2.24	55.0	267,168
tot						609,853

A **minimum production** of 20,000 tons of oil per year per biorefinery was set as **requirement** for identification of most interesting case studies.

Castor estimated yield in underutilized lands of EU mediterranean countries.



REFERENCES:

<https://ebb-eu.org/our-members/>

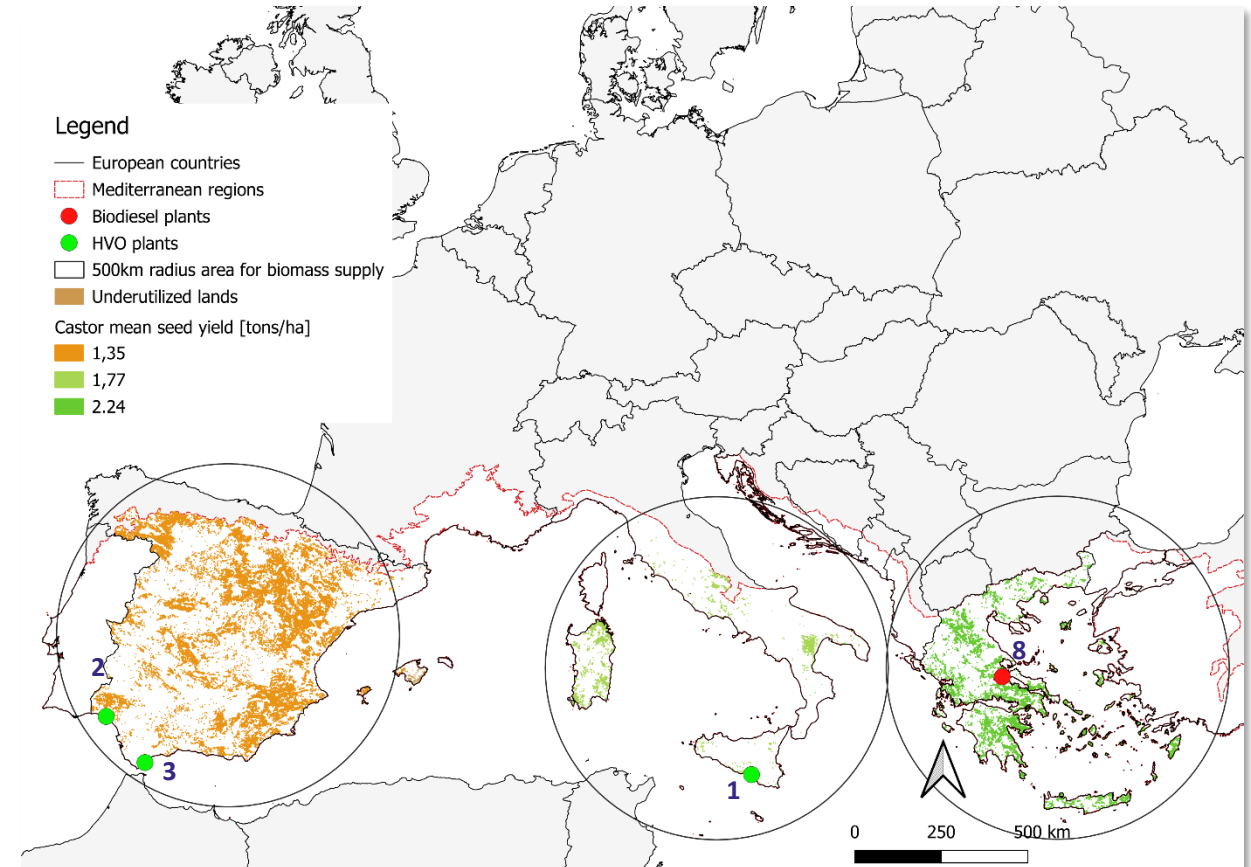
Potential oil production: HVO and biodiesel, 500 km



Potential oil production per HVO/biodiesel refinery						
Nr.	Name of the plant	Country	Underutilized lands (ha)	Mean seed yield (tons/ha)	Mean oil content (%)	Oil production (t/y)
1	Eni raffineria di Gela	Italy	75,533	1.77	47.2	63,103
2	La Ribida Energy Park (CEPSA)	Spain	1,474,638	1.35	46.6	927,695
3	Abengoa biofuel plant (CEPSA)					
8	Agroinvest s.a.	Greece	1,550,171	2.24	55.0	990,798
tot						1,081,596

A **minimum production** of 20,000 tons of oil per year per biorefinery was set as **condition** for identification of most promising case studies.

Castor estimated yield in underutilized lands of EU mediterranean countries.



REFERENCES:

<https://bioplat.eu/about>

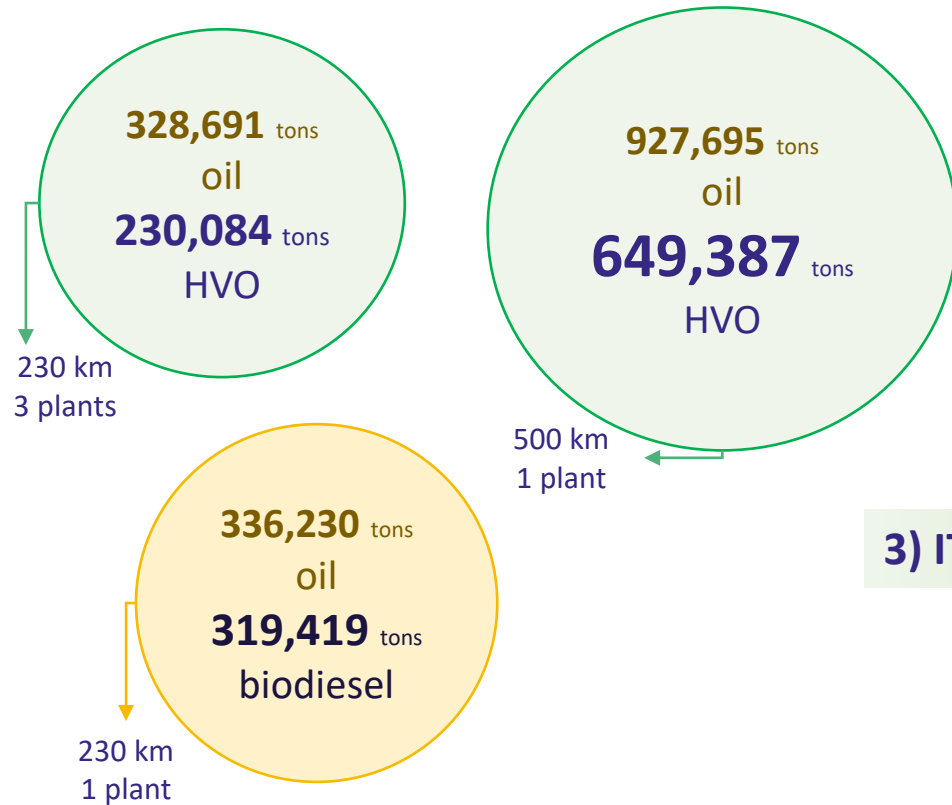
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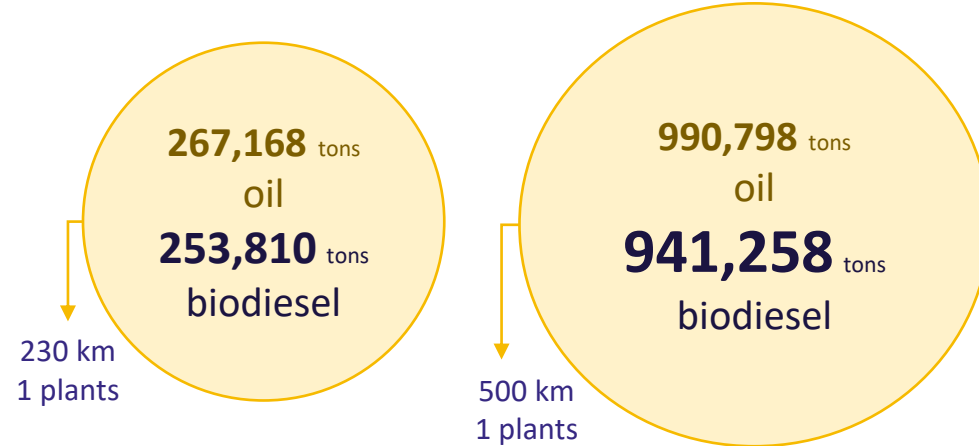
Promising case studies identified



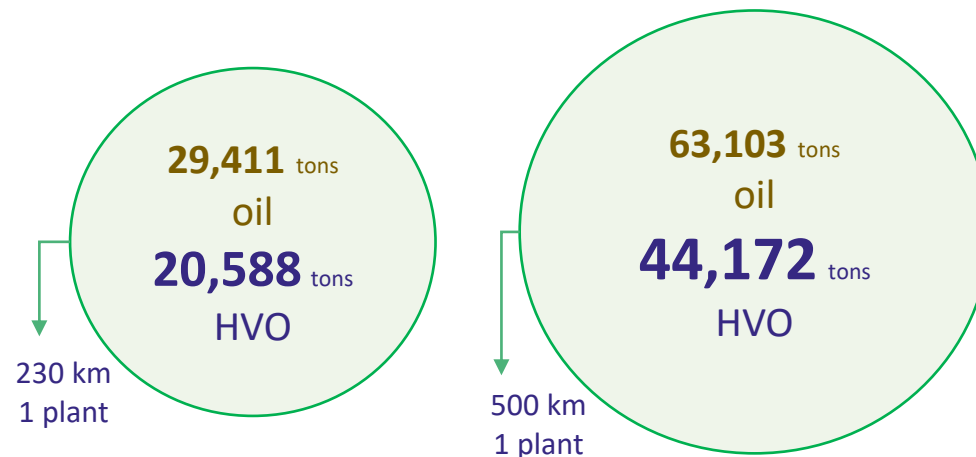
1) SPAIN



2) GREECE



3) ITALY



LEGEND



HVO



Biodiesel

Conversion factors:

0.7 t HVO/ t oil

0.95 t biodiesel/t oil

BIKE case study 3

Brassica Carinata for renewable diesel production



Selected biorefineries

Key numbers:

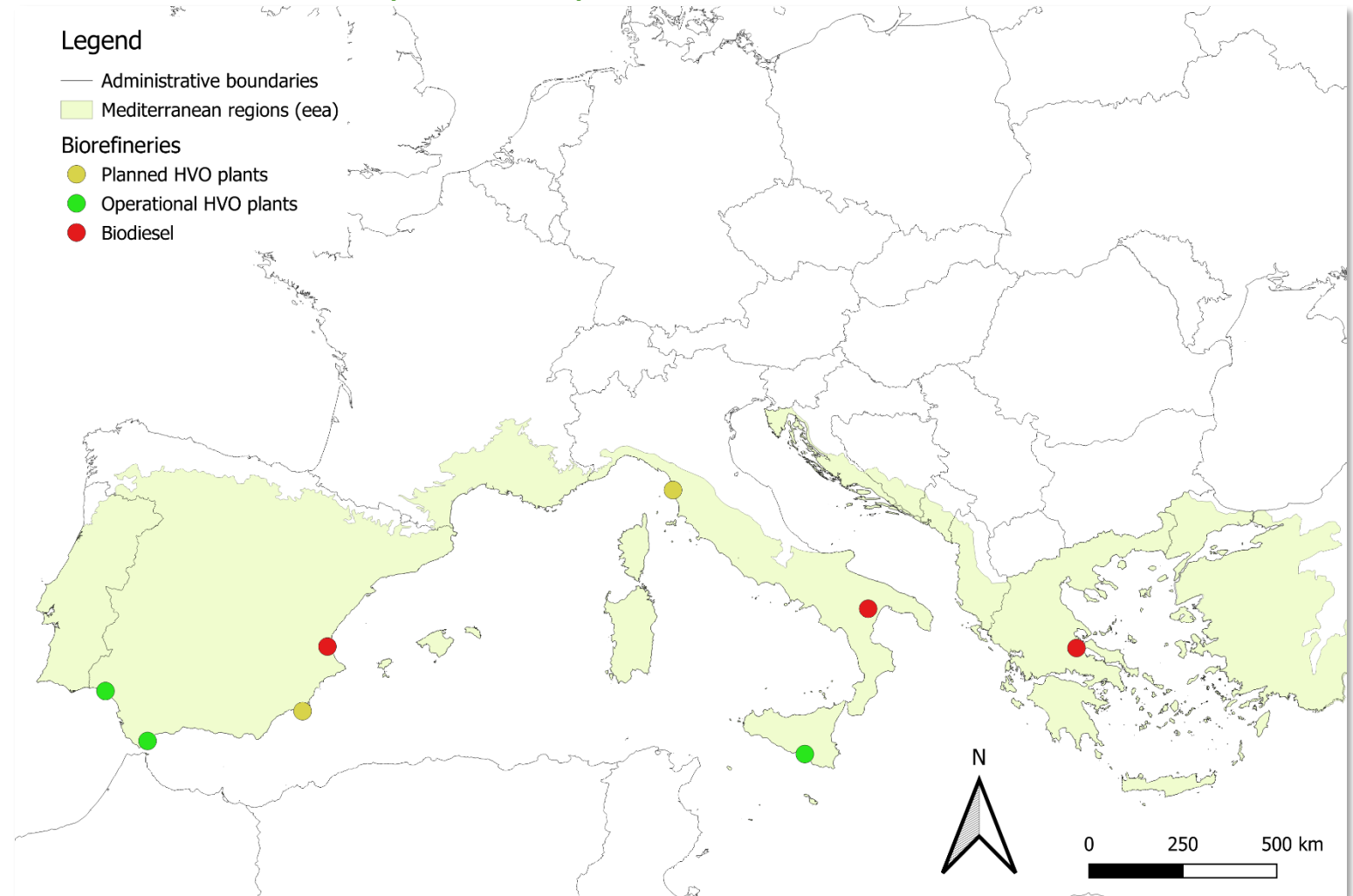
- ✓ HVO plants:
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- ✓ Biodiesel plants:
 - ✓ 3 operational.



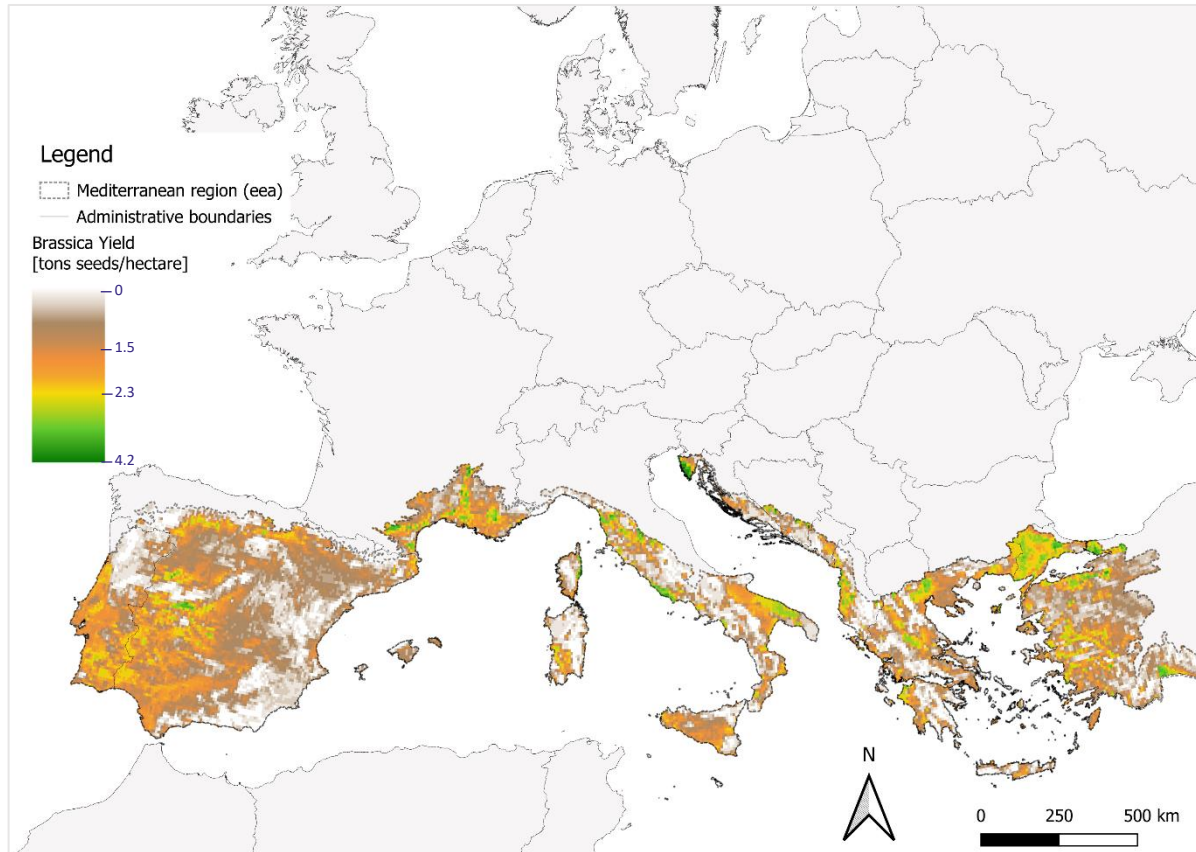
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Selected HVO and biodiesel plants in European mediterranean countries.

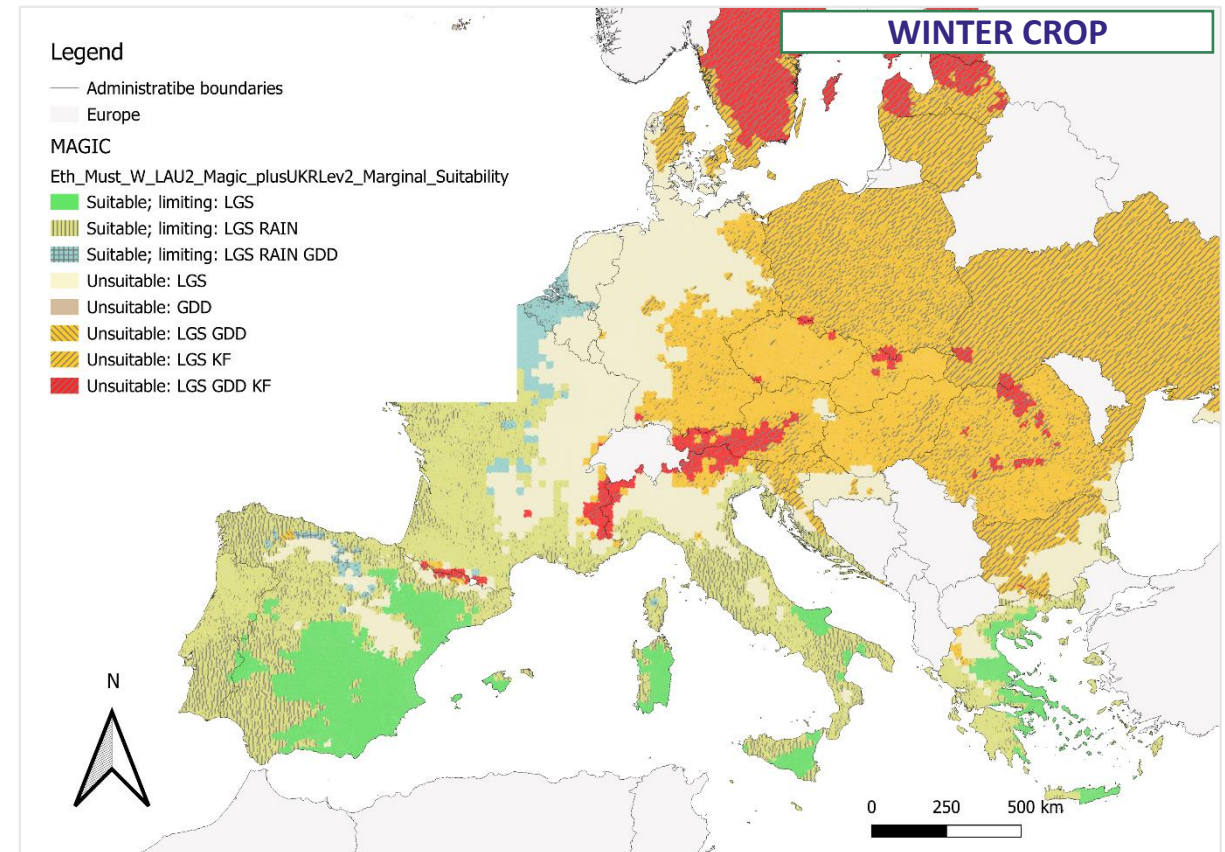


Simulated yield

*Brassica Napus attainable yield in European mediterranean countries
(retrieved from GAEZ)*



*Brassica Carinata Suitability in Europe
(retrieved from MAGIC)*



- Yield of Brassica Carinata was assimilated to that of rapeseed (Brassica Napus), available in GAEZ v.4.

- Only areas of suitability (green, blue) were considered for the assessment.

Key numbers:

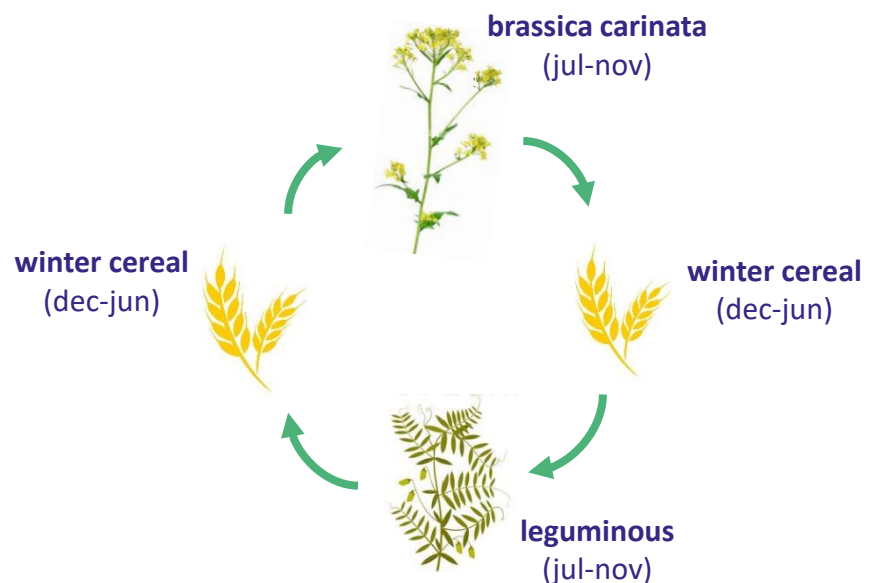
✓ Brassica yield : 0 – 4.2 tons seeds/ha

REFERENCES:

<https://gaez.fao.org/pages/data-access-download>
<https://magic-h2020.eu/>

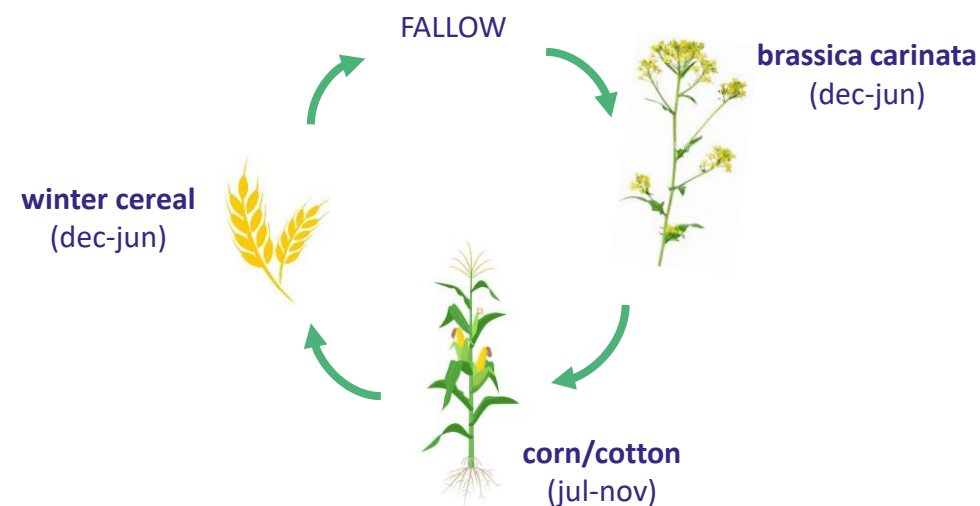
Identified rotation schemes

Scheme 1: Brassica summer crop (rainfed)



1° YEAR												2° YEAR											
dec	jen	feb	mar	apr	may	june	july	aug	sep	oct	nov	dec	jen	feb	mar	apr	may	june	july	aug	sep	oct	nov
winter cereal						brassica (biochar)						winter cereal						leguminous					
3° YEAR												4 °YEAR											
winter cereal						fallow						winter cereal						leguminous					

Scheme 2: Brassica winter crop (irrigated)



1° YEAR												2° YEAR											
dec	jen	feb	mar	apr	may	june	july	aug	sep	oct	nov	dec	jen	feb	mar	apr	may	june	july	aug	sep	oct	nov
winter cereal						fallow						brassica						corn/cotton					
3° YEAR												4° YEAR											
winter cereal						fallow						corn/cotton											

The cropping rotation schemes developed can be interpreted as general schemes whose boundaries can be adjusted according to local environmental and economic conditions.

Potential oil production: brassica summer crop, 230 km



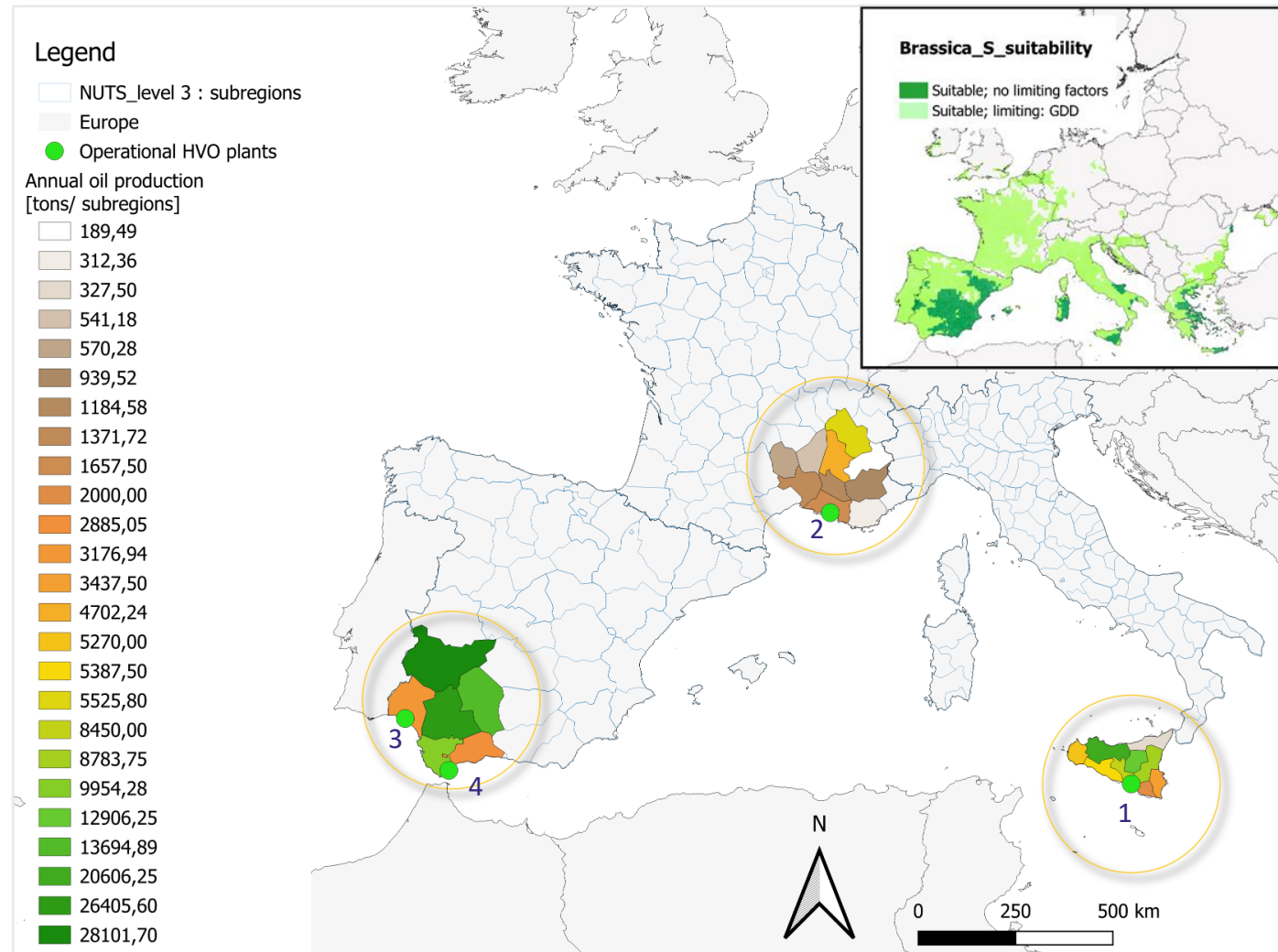
Operational HVO refineries

Potential oil production per HVO biorefinery					
Nr.	Name of the plant	Surface dedicated to winter cereals (ha)	Mean Brassica yield (tons seeds/ha)	Seeds (tons/year)	Oil* [tons/year]
1	Eni raffineria di Gela Spa	268,675	1.13	79,640	31,856
2	TOTAL La Mede Biorefinery	114,950	1.40	42,487	16,995
3	La Ribida Energy Park (CEPSA)	549,518	1.44	210,546	84,218
4	Abengoa Biofuel Plant (CEPSA)				
tot				332,673	133,069

*An oil content of 40% was assumed for calculation of oil production.

A **minimum production of 20,000 tons of oil per year** per biorefinery was set as **requirement** for identification of most promising case studies.

Brassica oil estimated production per sub-region



Potential oil production: brassica summer crop, 230 km



Operational biodiesel refineries

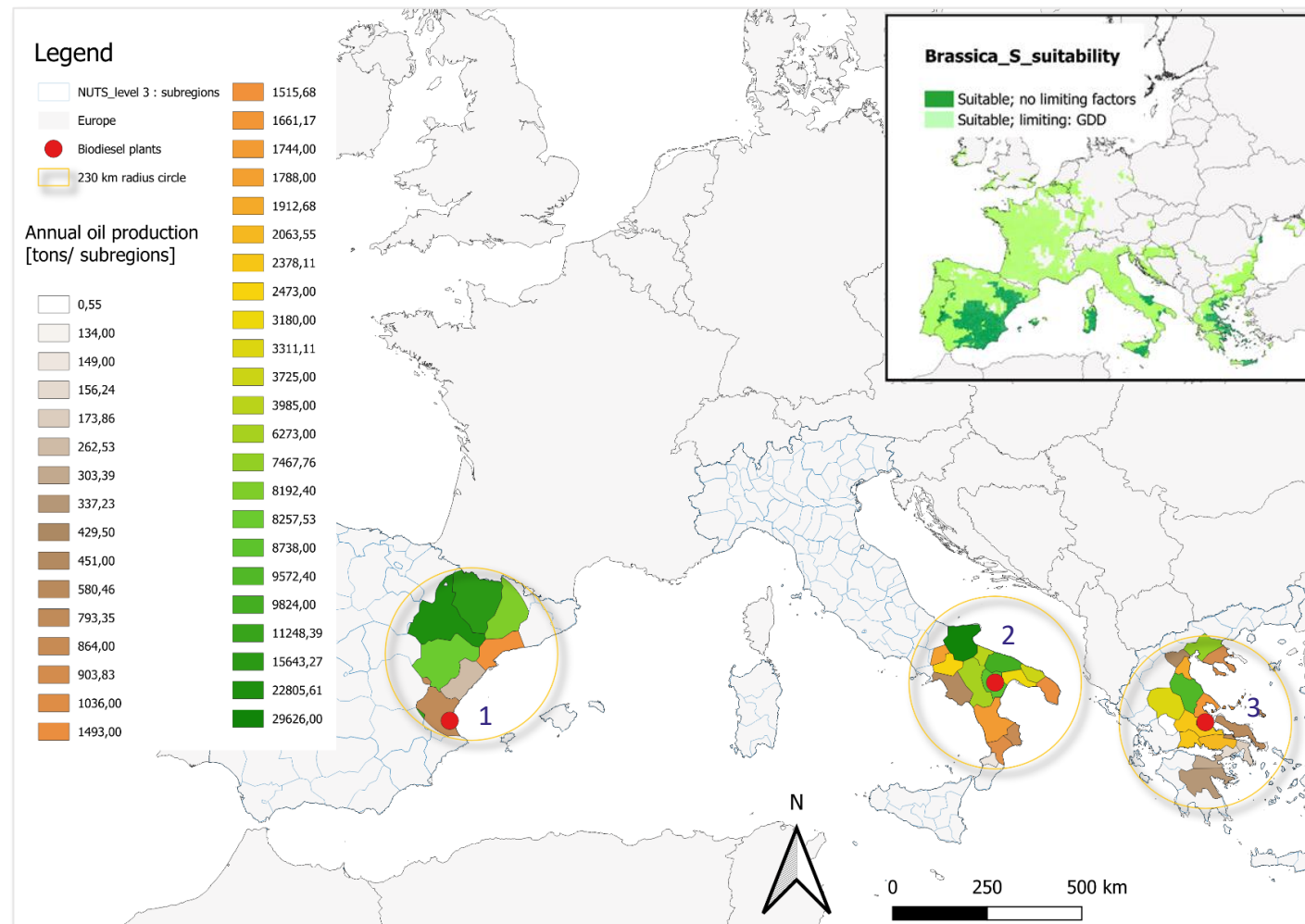
Potential oil production per biodiesel biorefinery

Nr.	Name of the plant	Surface dedicated to winter cereals (ha)	Mean Brassica yield (tons seeds/ha)	Seeds (tons/year)	Oil* (tons/year)
1	Biocom Energia	1,376,591	0.65	221,111	88,444
2	Greenswitch	632,139	1.16	188,707	75,483
3	Agroinvest	308,150	0.98	84,075	33,630
tot				493,893	197,557

*An oil content of 40% was assumed for calculation of oil production.

A **minimum production** of 20,000 tons of oil per year per biorefinery was set as **requirement** for identification of most promising case studies.

Brassica oil estimated production per sub-region



Potential oil production: brassica summer crop, 500 km

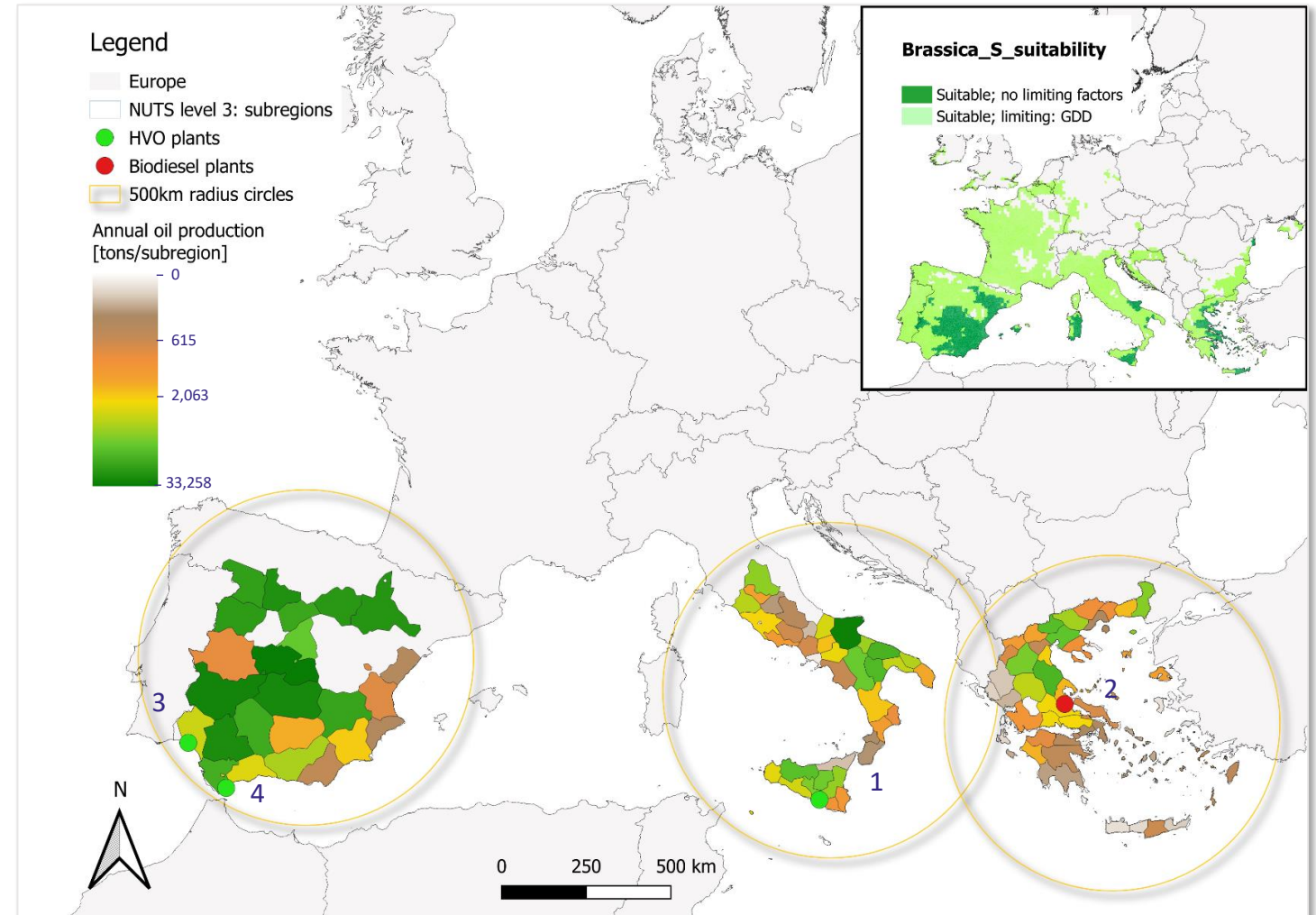


Potential oil production per biorefinery					
Nr.	Name of the plant	Surface dedicated to winter cereals (ha)	Mean Brassica yield (tons seeds/ha)	Seeds (tons/year)	Oil* [tons/year]
1	Eni raffineria di Gela Spa	1,095,879	1.04	285,194	123,733
2	Agroinvest	578,571	0.99	173,561	69,424
3	La Ribida Energy Park (CEPSA)	2,472,160	1.05	709,993	283,997
4	Abengoa Biofuel Plant (CEPSA)				
tot				1,168,748	477,154

*An oil content of 40% was assumed for calculation of oil production.

A **minimum production** of **20,000 tons of oil per year** per biorefinery was set as **requirement** for identification of most promising case studies.

Brassica oil estimated production per sub-region



Potential oil production: brassica winter crop, 230 km



Potential oil production per biodiesel biorefinery

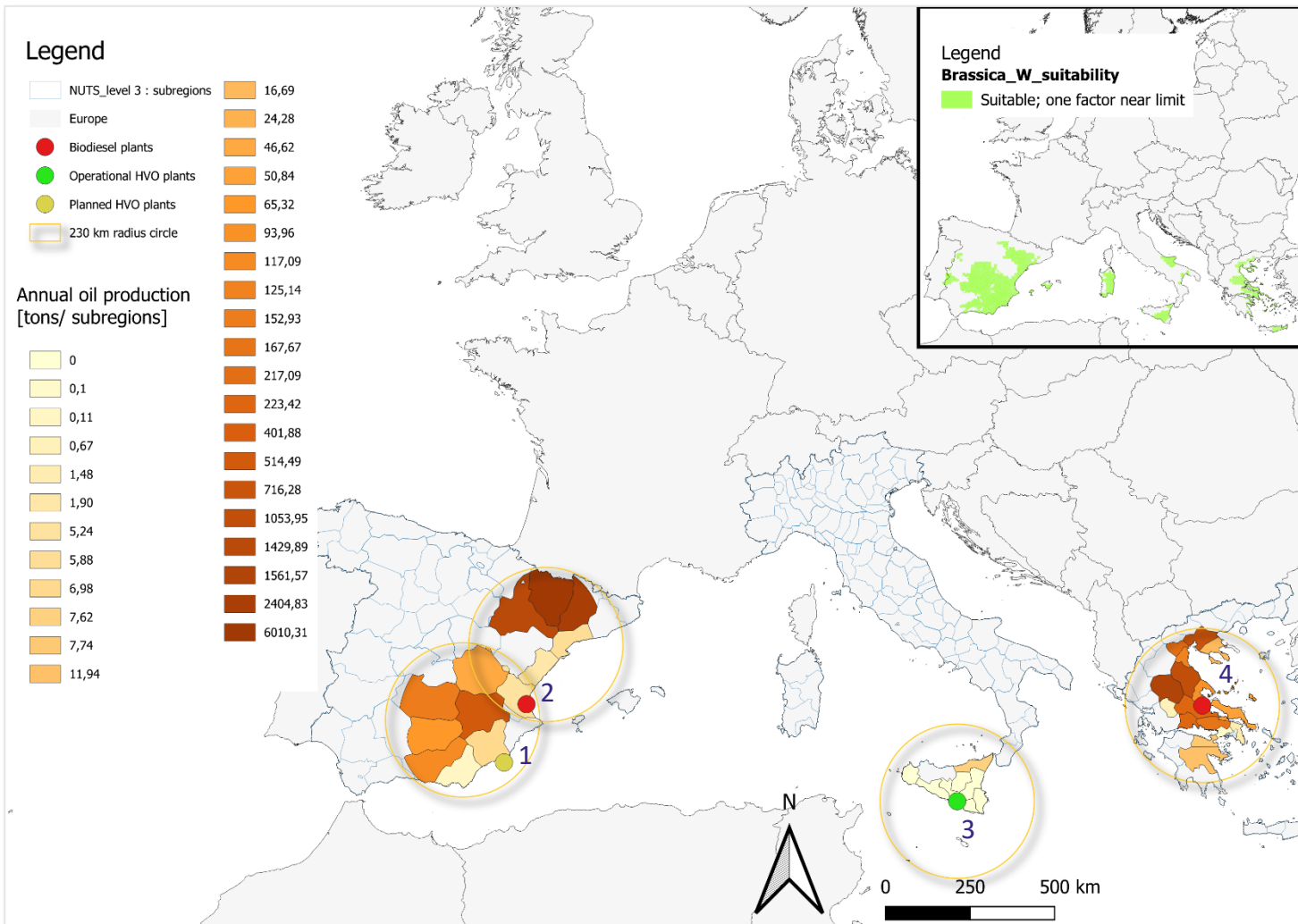
Nr.	Name of the plant	Surface dedicated to corn/cotton (ha)	Mean Brassica yield (tons seeds/ha)	Seeds (tons/year)	Oil* (tons/year)
1	Complejo Industrial de Cartagena de Repsol	4,614	0.73	2,258	903
2	Biocom Energia	123,352	0.68	25,711	10,284
3	Eni raffineria di Gela Spa	160	1.15	19	8
4	Agroinvest	207,763**	0.98	58,733	23,493
tot				86,721	34,688

*An oil content of 40% was assumed for calculation of oil production.

** Corn and cotton

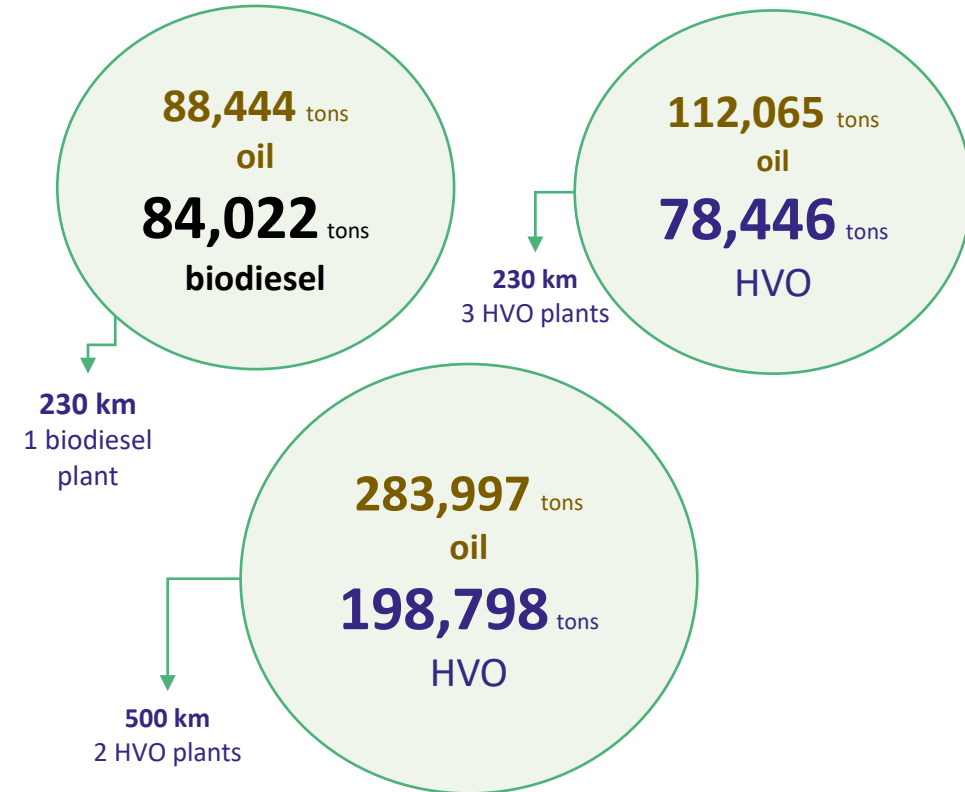
A **minimum production** of **20,000 tons of oil per year** per biorefinery was set as **requirement** for identification of most promising case studies.

Brassica oil estimated production per sub-region

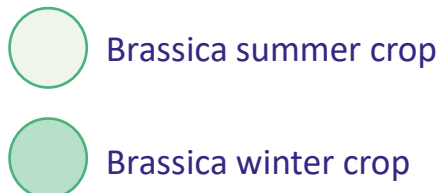


Promising case studies identified

1) SPAIN

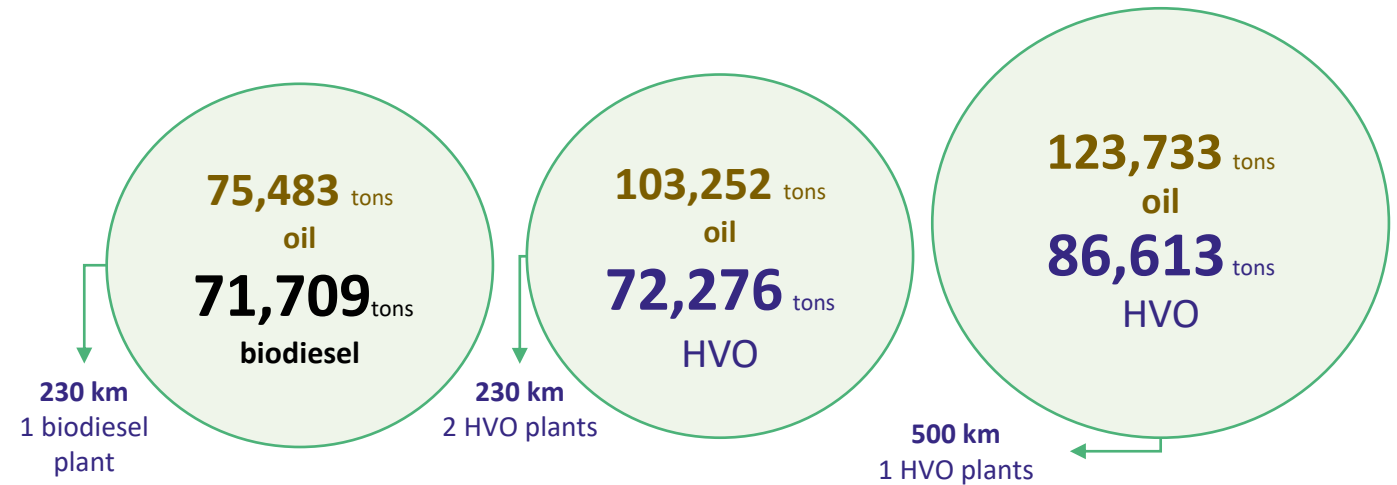


LEGEND

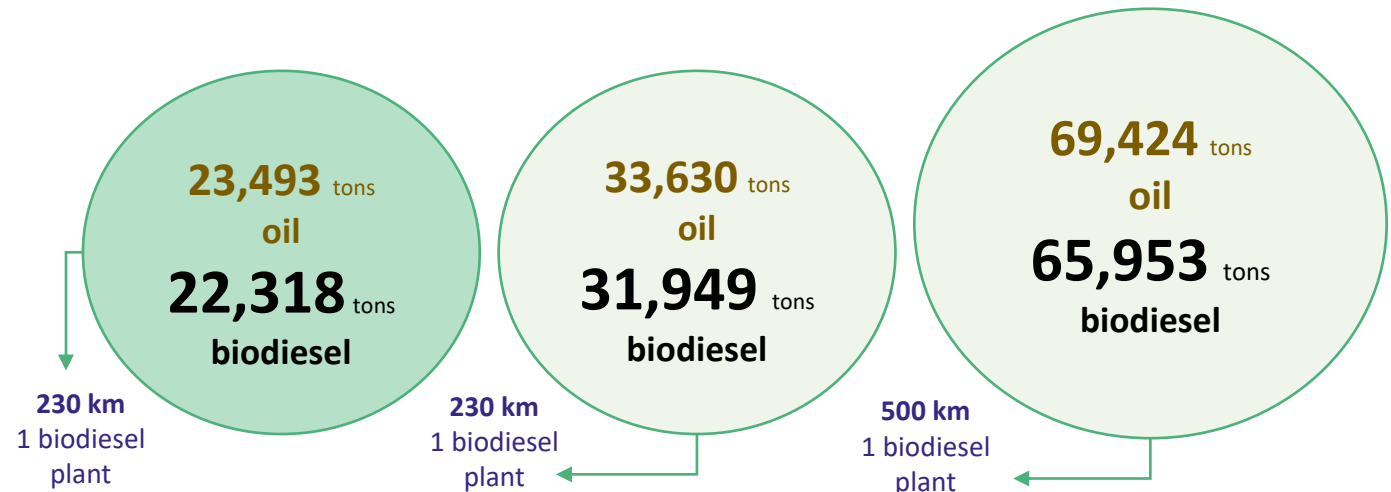


Conversion factors:
0.7 t HVO/ t oil
0.95 t biodiesel/t oil

2) ITALY

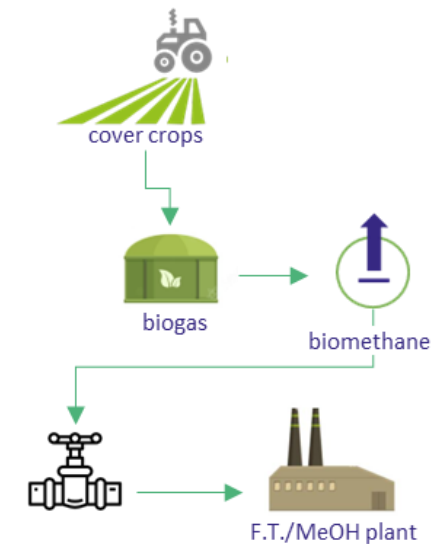


3) GREECE



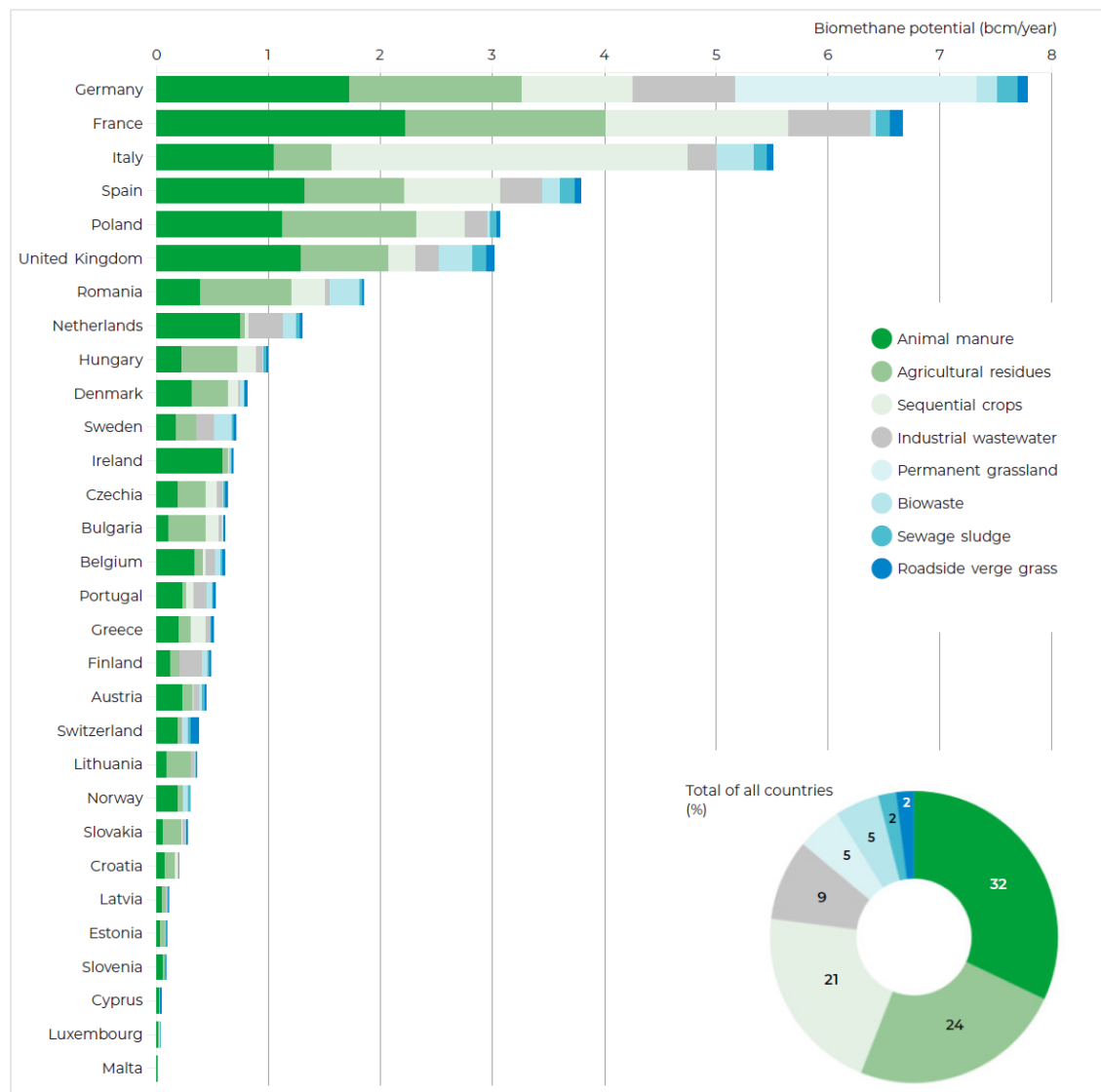
BIKE case study 4

Biogas Done Right model for biomethane-to-liquid production



Biomethane potential production from cover crops

Anaerobic digestion potential in 2030 per feedstock per country



Key assumptions:

- 20% of all arable lands dedicated to sequential cropping
- Biogas yield: 0.57 m³ per kg of dry feedstock
- Methane content in the biogas: 57%
- 10% of the theoretical potential realized by 2030 (conservative scenario)

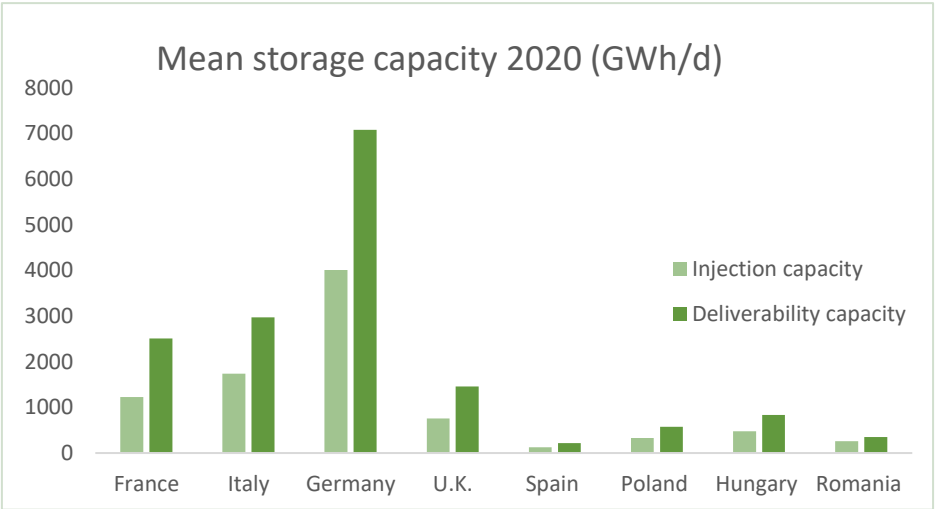
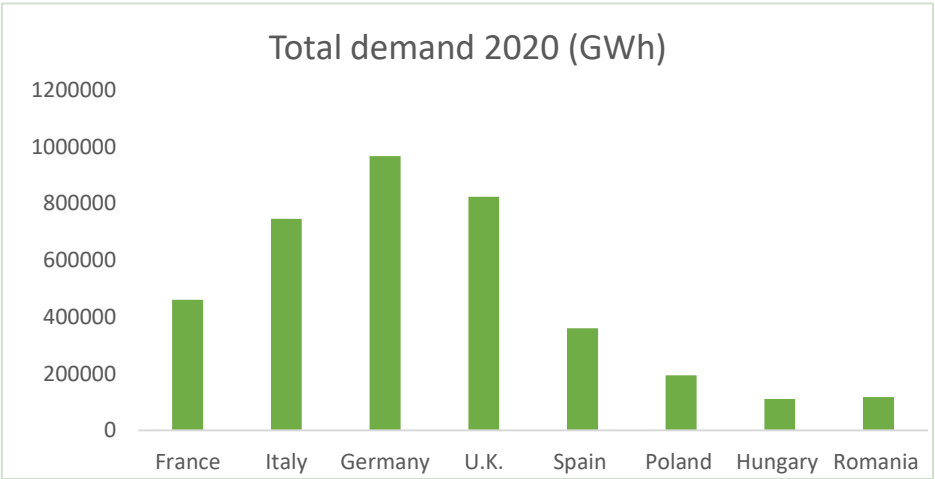
Potential production from sequential cropping (2030)¹

Nr.	Country	Biomethane potential [bcm/year]
1	Italy	3.2
2	France	1.65
3	Germany	1
4	Spain	0.85
5	Poland	0.45
6	Romania	0.25
7	UK	0.25
8	Hungary	0.15
9	Greece	0.15

REFERENCES:

¹ <https://gasforclimate2050.eu/gas-for-climate/>

Natural gas network in europe



1. Italy

Biomethane

- **23** biomethane plants connected to the grid
- **4** biomethane plants NOT connected to the grid
- **0.21 bcm/year** total production capacity

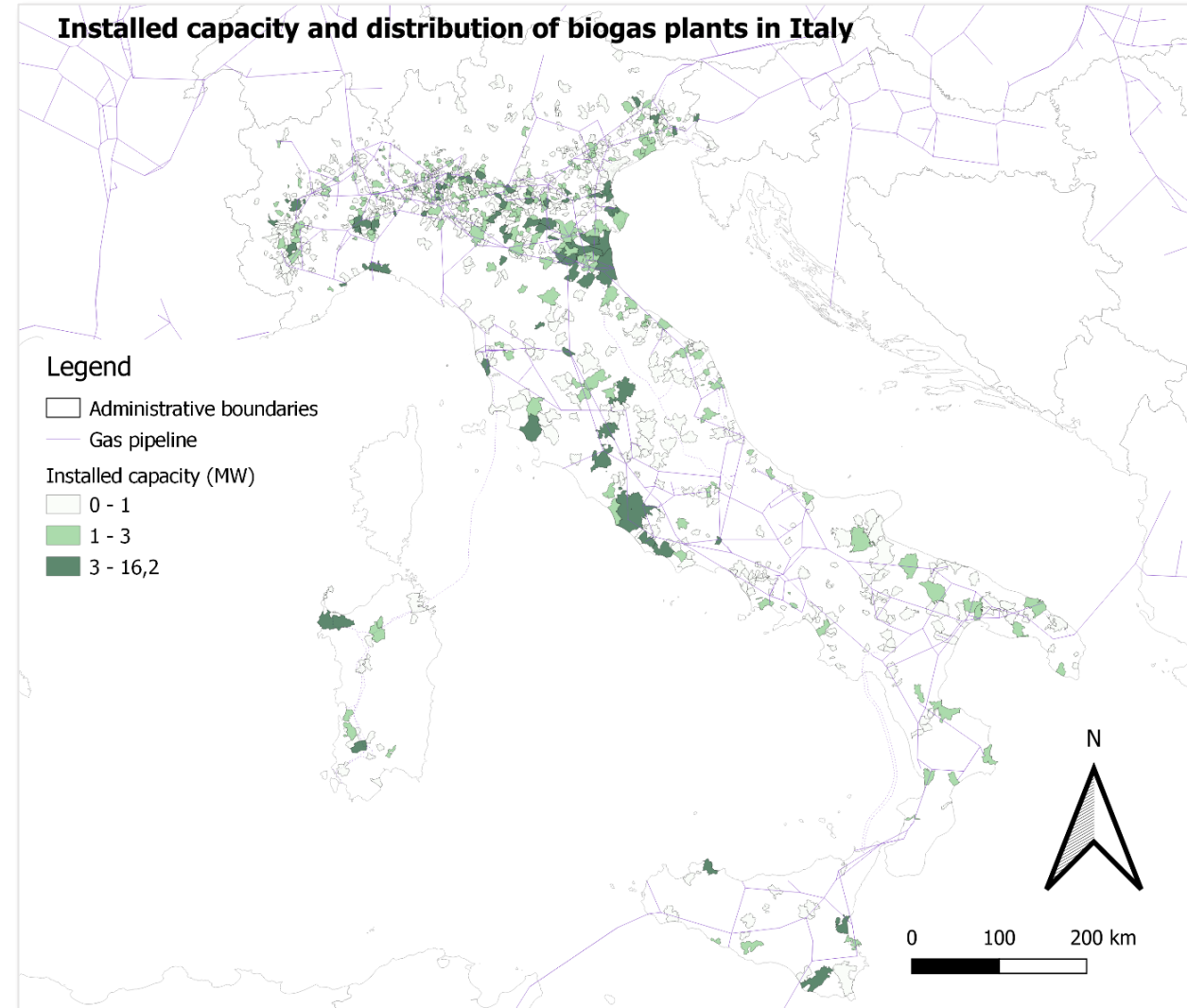
Biogas

- **2006** biogas plants
- **1339 MW** installed capacity

BIOMETHANE POTENTIAL PRODUCTION

Reference data	Biogas plants* (2017) ¹	Cover crop (2030) ²	
Parameter	Value	Value	U.M.
Installed capacity	1,338,879	-	kWe
Efficiency of a gas engine	35	-	%
Methane heating value	10	-	kWh/Nm ³
Methane content of the gas	57	-	%
Biomethane potential production	2.96	3.2	bcm/year
GTL conversion factor (FT)	0.82	0.82	m ³ /tCH ₄
GTL conversion factor (MeOH)	1.78	1.78	tMeOH/tCH ₄
Liquid potential production (FT)	1.62	1.87	mcm/year
Liquid potential production (MeOH)	3.53	3.80	mcm/year

*Calculation of potential biomethane production considered a 90% upgrading of the biogas plants and a development of the gas network within 2030.



REFERENCES: <https://www.entsog.eu/maps> , ¹Gestore dei Servizi Energetici (GSE)

²<https://gasforclimate2050.eu/gas-for-climate/>

2.France

Biomethane

- **337** biomethane plants connected to the grid
- **0.53 bcm/year** total production capacity

Biogas

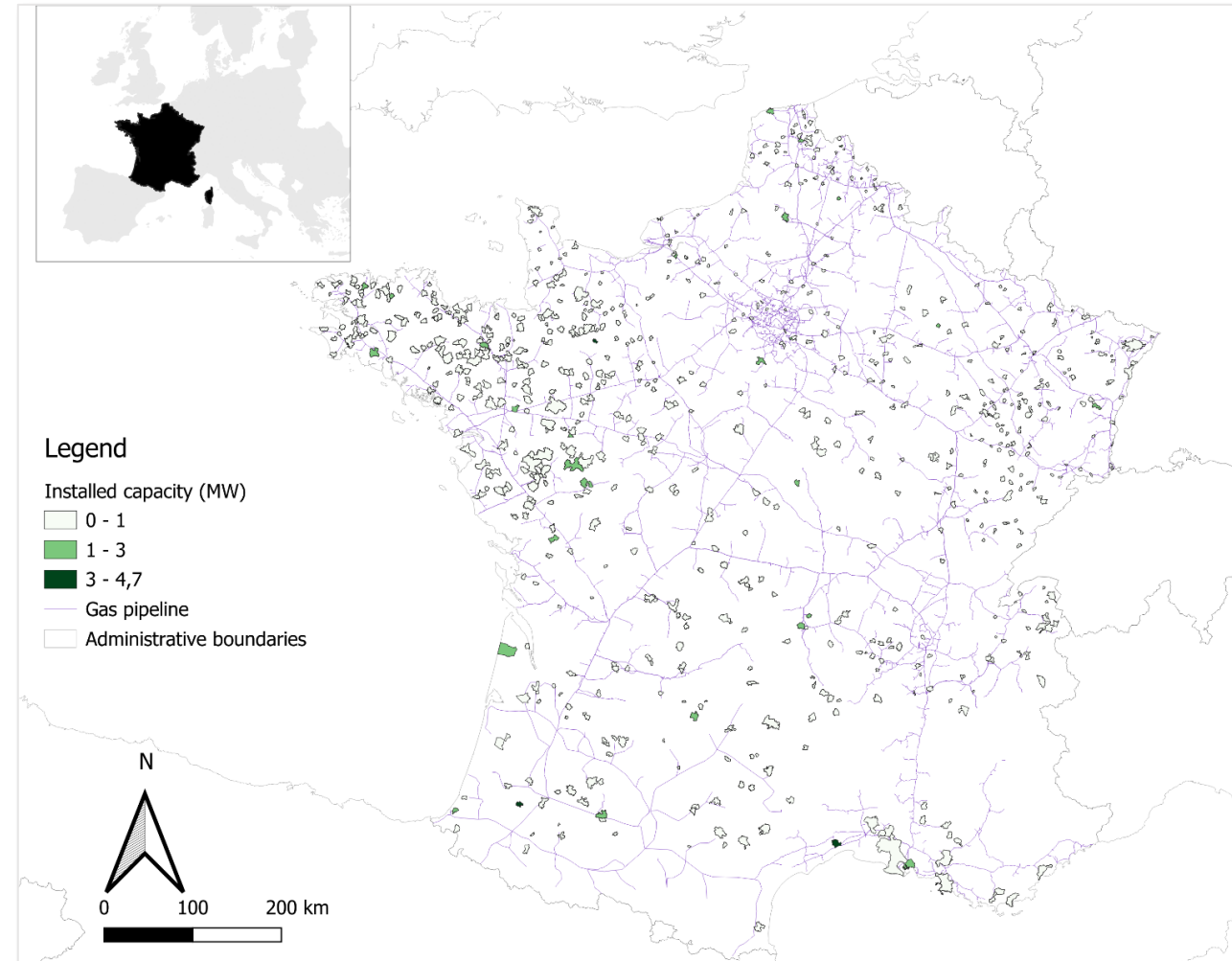
- **797** biogas plants
- **182 MW** installed capacity

BIOMETHANE POTENTIAL PRODUCTION

Reference data	Biogas plants* (2020) ¹	Cover crop (2030) ²	
Parameter	Value	Value	U.M.
Installed capacity	181,906	-	kWe
Efficiency of a gas engine	35	-	%
Methane heating value	10	-	kWh/Nm ³
Methane content of the gas	57	-	%
Biomethane potential production	0.9	1.65	bcm/year
GTL conversion factor (FT)	0.82	0.82	m ³ /tCH ₄
GTL conversion factor (MeOH)	1.78	1.78	tMeOH/tCH ₄
Liquid potential production (FT)	0.49	0.97	mcm/year
Liquid potential production (MeOH)	1.08	1.96	mcm/year

*Calculation of potential biomethane production considered an upgrading of all the biogas plants and a development of the gas network

Installed capacity and distribution of biogas plants in France



REFERENCES: <https://www.entsog.eu/maps> , ¹ Association technique energie environnement (ATEE)

² <https://gasforclimate2050.eu/gas-for-climate/>

3. Germany

Biomethane

- **198** biomethane plants connected to the grid
- **0.89 bcm/year** total production capacity

Biogas

- **9770** biogas plants
- **5926 MW** installed capacity

BIOMETHANE POTENTIAL PRODUCTION

Reference data	Biogas plants* (2022) ¹	Cover crop (2030) ²	
Parameter	Value	Value	U.M.
Installed capacity	5,926,000	-	kWe
Efficiency of a gas engine	35	-	%
Methane heating value	10	-	kWh/Nm ³
Methane content of the gas	57	-	%
Biomethane potential production	13.08	1	bcm/year
GTL conversion factor (FT)	0.82	0.82	m ³ /tCH ₄
GTL conversion factor (MeOH)	1.78	1.78	tMeOH/tCH ₄
Liquid potential production (FT)	7.14	0.59	mcm/year
Liquid potential production (MeOH)	15.56	1.19	mcm/year

*Calculation of potential biomethane production considered an upgrading of all the biogas plants and a development of the gas network

REFERENCES: <https://www.entsog.eu/maps> , ¹German Biogas Association

²<https://gasforclimate2050.eu/gas-for-climate/>

4.UK

Biomethane

- 98 biomethane plants connected to the grid
- 0.63 bcm/year total production capacity

Biogas

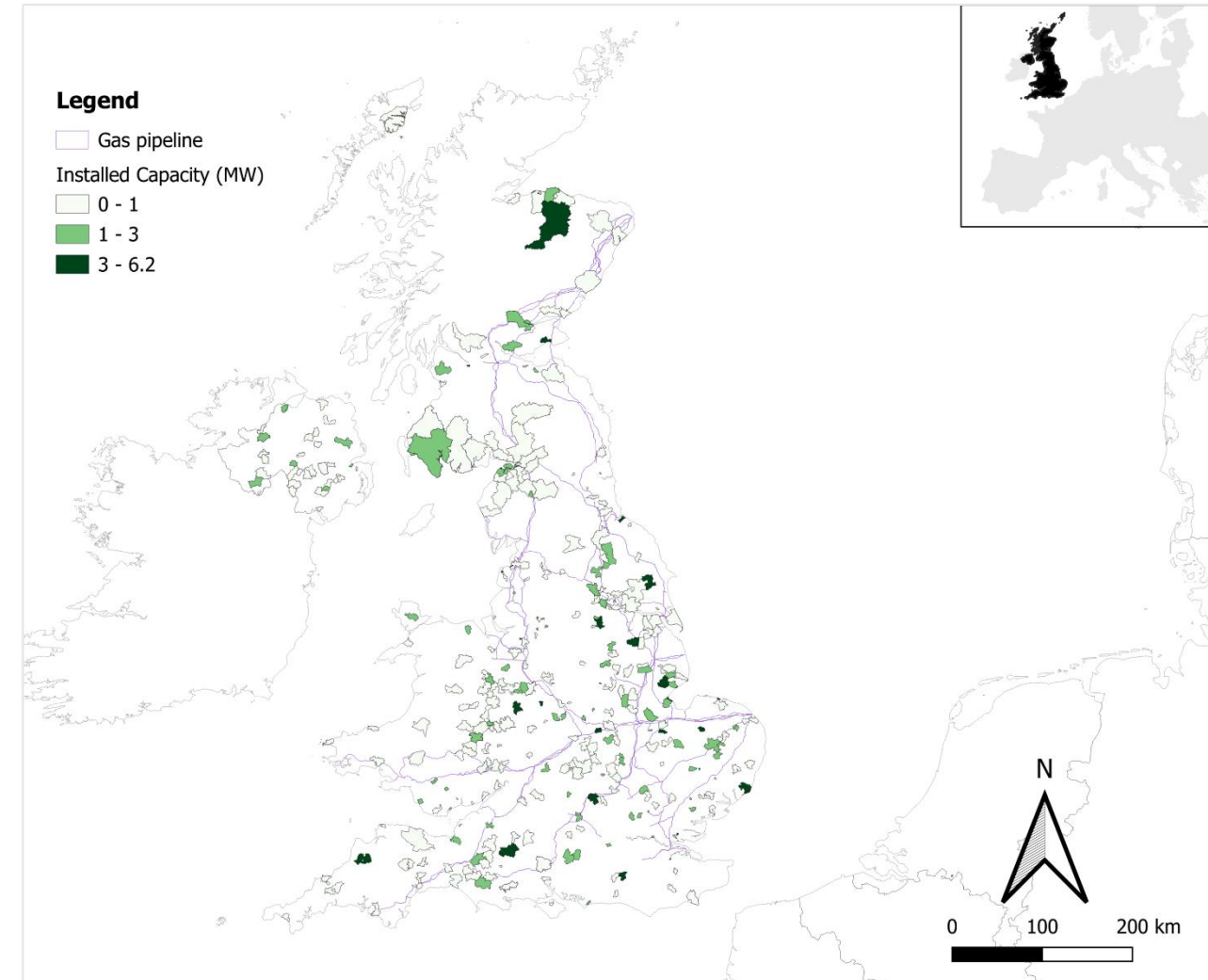
- 404 biogas plants
- 343 MW installed capacity

BIOMETHANE POTENTIAL PRODUCTION

Reference data	Biogas plants* (2019) ¹	Cover crop (2030) ²	
Parameter	Value	Value	U.M.
Installed capacity	342,798	-	kWe
Efficiency of a gas engine	35	-	%
Methane heating value	10	-	kWh/Nm ³
Methane content of the gas	57	-	%
Biomethane potential production	1.34	0.25	bcm/year
GTL conversion factor (FT)	0.82	0.82	m ³ /tCH ₄
GTL conversion factor (MeOH)	1.78	1.78	tMeOH/tCH ₄
Liquid potential production (FT)	0.73	0.15	mcm/year
Liquid potential production (MeOH)	1.59	0.30	mcm/year

*Calculation of potential biomethane production considered an upgrading of all the biogas plants and a development of the gas network

Installed capacity and distribution of biogas plants in UK



REFERENCES: <https://www.entsog.eu/maps>, ¹ REA (Renewable Energy Association)

² <https://gasforclimate2050.eu/gas-for-climate/>

Conclusions and follow-up

Conclusions

❖ Bioethanol production from perennial grasses

- ✓ 4 target countries identified;
- ✓ **402,693** tons per year (5 plants, 150 km).



❖ Renewable diesel production from castor bean

- ✓ 3 target countries identified;
- ✓ **693,559** tons per year of HVO (2 plants, 500 km)
- ✓ **941,258** tons per year of biodiesel (1 plant, 500 km)



❖ Renewable diesel production from brassica carinata

- ✓ 3 target countries identified;
- ✓ **285,411** tons per year of HVO (3 plants, 500 km)
- ✓ **65,953** tons per year of biodiesel (1 plant, 500 km)



❖ BDR model for biomethane-to-liquid production

- ✓ 4 target countries identified;
- ✓ **18.28** bcm of biomethane;
- ✓ **9.98** mcm of F.T. diesel or **21.78** mcm of MeOH.



Follow-up



❖ Castor bean case study

- ✓ new data about castor yield in mediterranean areas.

❖ Brassica Carinata case study

- ✓ new data about brassica yield in mediterranean areas;
- ✓ new data about brassica performance as a summer cover crop.

❖ BDR model case study

- ✓ Update of current status of biogas plants (number of operating plants, installed capacity).

❖ New definition of marginality

- ✓ Soil Organic Content as marginality driver.





Thank you for
your attention!



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