i-SoMPE - WP 1

Preliminary inventory and framework for practice assessment

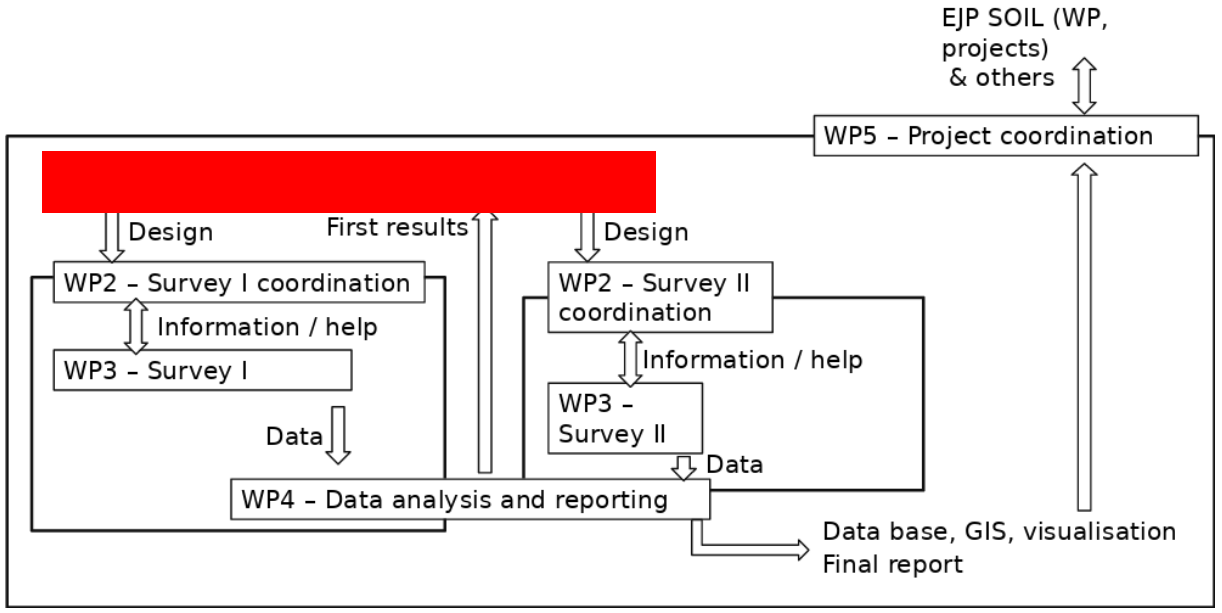
i-SoMPE – Final Meeting

Olivier Heller, 16.3.2022

EJP SOIL
European Joint Programme

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

Introduction



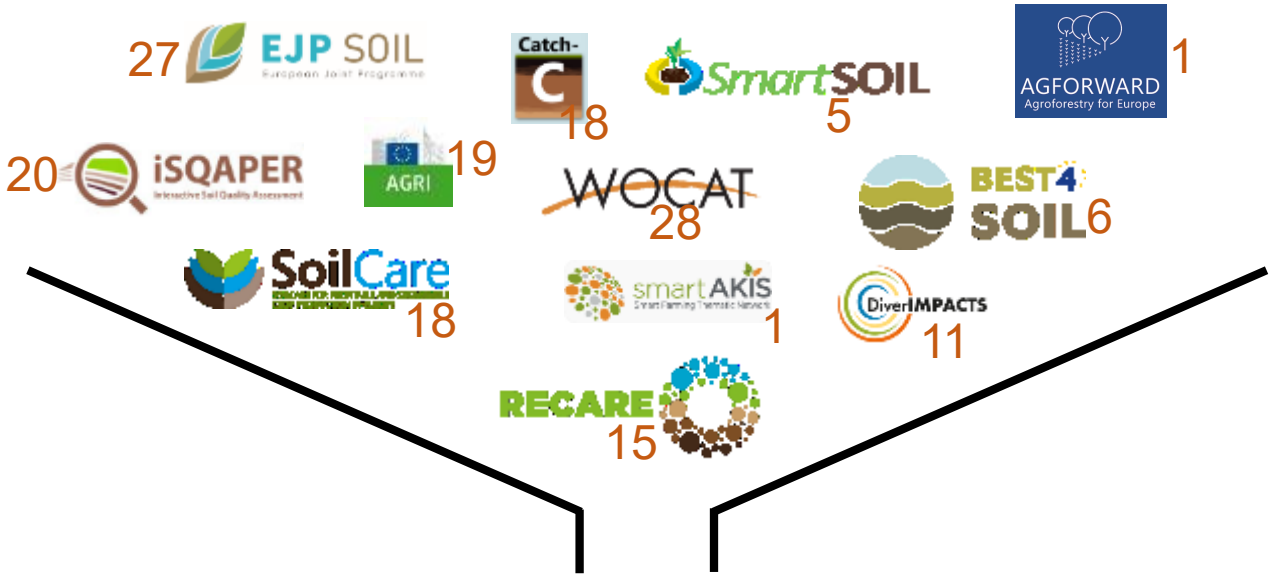
Goals of WP1

- EU Literature review:
  - Sustainable soil management practices (SMP)
  - Agro-ecological zonation (AEZ)
- Framework for survey and data analysis (WP 2-4)

Ressources

- 4.5 PM
  - AGS (2.5 PM)
  - CRAW (1.5 PM)
  - CREA (0.5 PM)

Inventory of well-documented SMP: Methods and Results



4	Agricultural systems
4	Buffer strips and small landscape elements
7	Crop protection
13	Crops and crop rotations
8	Organic matter and nutrient management
13	Tillage and traffic
7	Water management
2	Other
58	**Total**

Methods

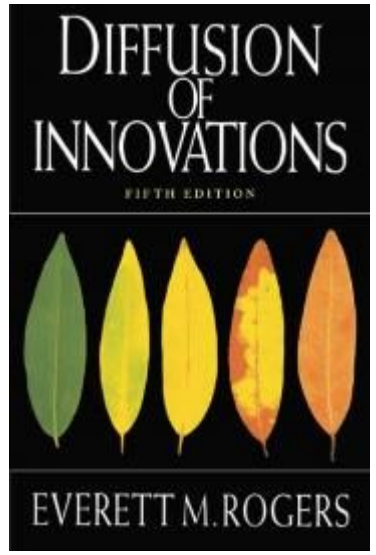
- Reviewing EU Projects
- Considering other sources
- Ignore double entries
- Land-management categories

Results

- 58 well-documented SMP (WDP)

Diffusion of Innovation

- Diffusion of innovations (Rogers, 2003)
- Diffusion may be limited by bio-physical and/or socio-economic factors
- i-SoMPE wants to assess current and potential diffusion, as well as limiting factors



Rogers (2003)

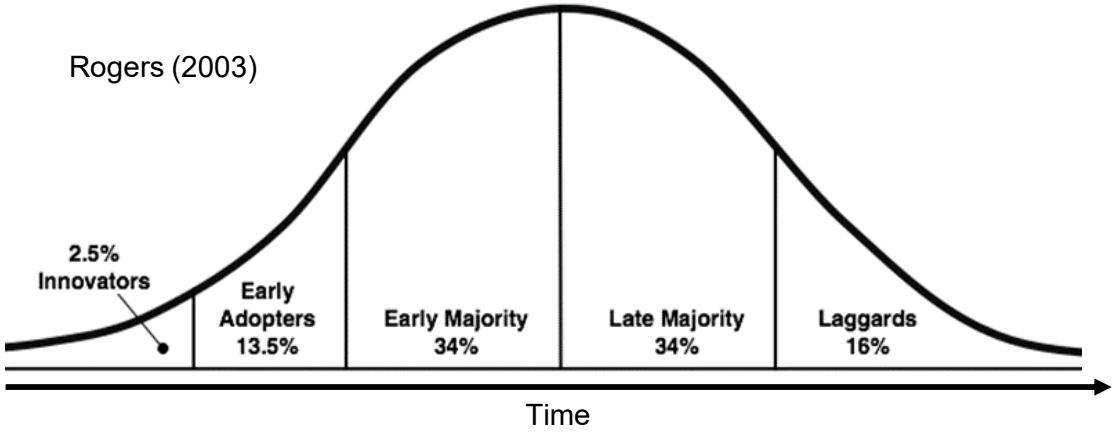
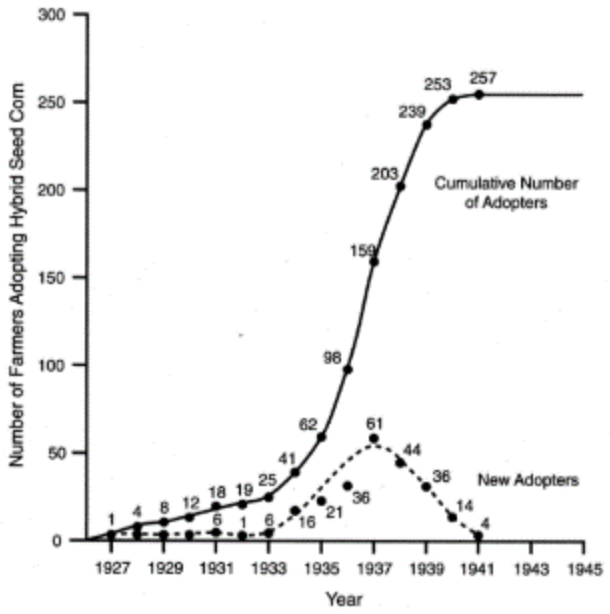


Figure 7-1. The Number of New Adopters Each Year, and the Cumulative Number of Adopters, of Hybrid Seed Corn in Two Iowa Communities

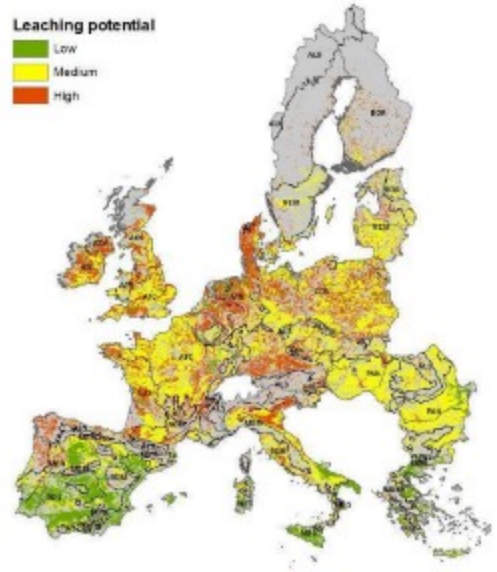


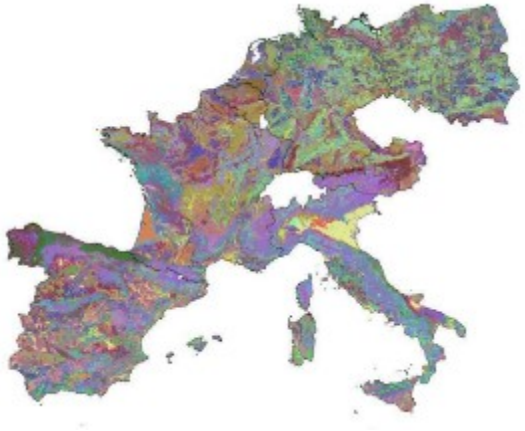
Socio-economic factors limiting the diffusion

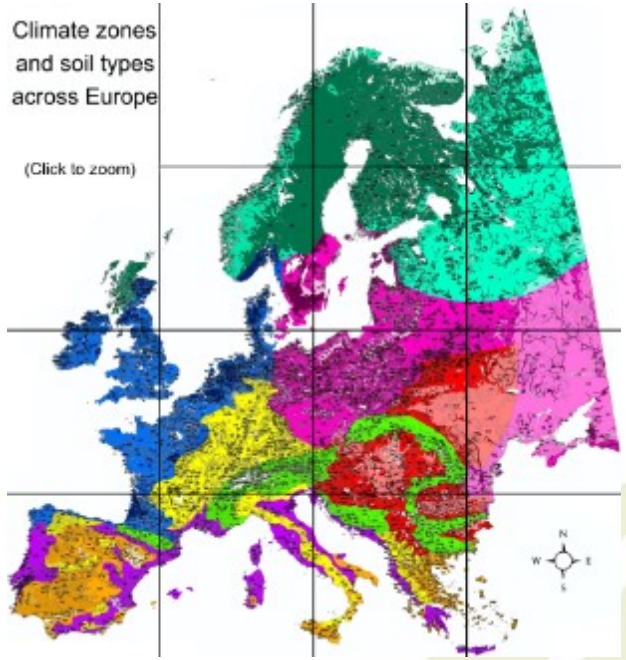
- Not compatible with farming system, e.g. (Meyer et al., 2013):
  - Extensive small-scale, semi-subsistence farming
  - Extensive farming in less favoured areas
  - Medium intensive, mixed farming systems
  - Intensive, larger-scale crop farming
  - Large-scale corporate farming
- Not economically viable, policy restrictions, knowledge and technology not available, …
- More from Fred → Here, we focus on bio-physical limitations

- How to describe the bio-physical limitations?

Agro-ecological zonation of Europe: Definition and Characterization







seamless

Nitrate Directive
DG ENV (2011)

Catch-C

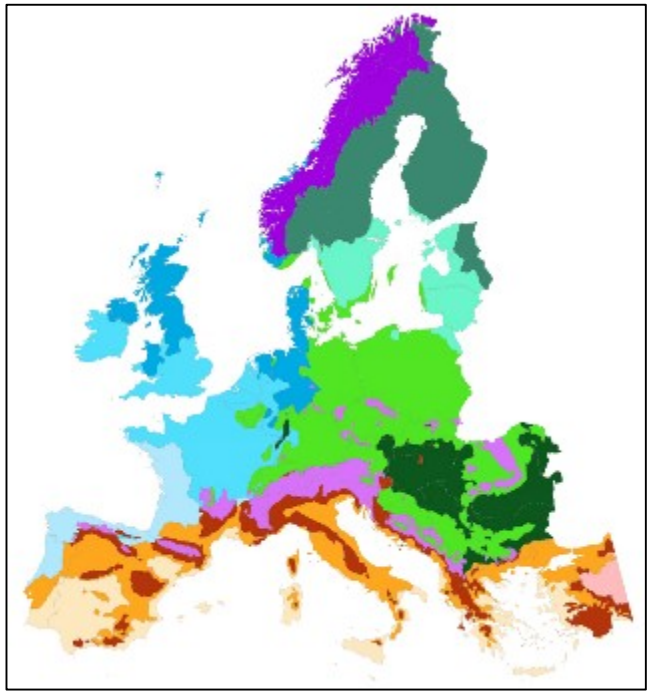
iSQAPER
Interactive Soil Quality Assessment

Agro-ecological zonation of Europe: Definition and Characterization

Project	Climate	Topography	Soil	Land-Use	Coverage	# of zones
SeamLess (2010)	EnZ	Slope, Elevation GTOPO30 (1996)	SOC (OCTOP)	3 suitability classes	EU27, NO, CH	252
Nitrate directive (2011)	EnZ, Worldclim, CRU TS 2.0 (1901 – 2000)	Slope GTOPO30 (1996)	Texture, SOC, Rooting depth (ESDB)	CLC 2000	EU27	52
Catch-C (2013)	EnZ	Slope GTOPO30 (1996)	Texture (ESDB)	FADN	AT, BE, DE, ES, FR, IT, NL, PL	23
i-SQUAPER (2017)	Env. Zones (Hartwich et al., 2005)		Reference soil groups (ESDB)		Europe west of Ural, excl. Turkey	133
i-SoMPE (2021)	**EnZ**, **Agri4Cast LTA** (1990 – 2020)	**Slope** EU-DEM 1.0 (2013)	**Organic soils**, (Tanneberger et al., 2017) **reference soil groups** (+) (ESDB)	**CLC** 2018	45 European Countries	146 (EnZ x Countries)

EnZ: Environmental Zonation by Metzger et al. (2005); CLC: Corinne Land Cover

AEZ of i-SoMPE: Definition



13 EnZ
by Metzger et al. (2005)

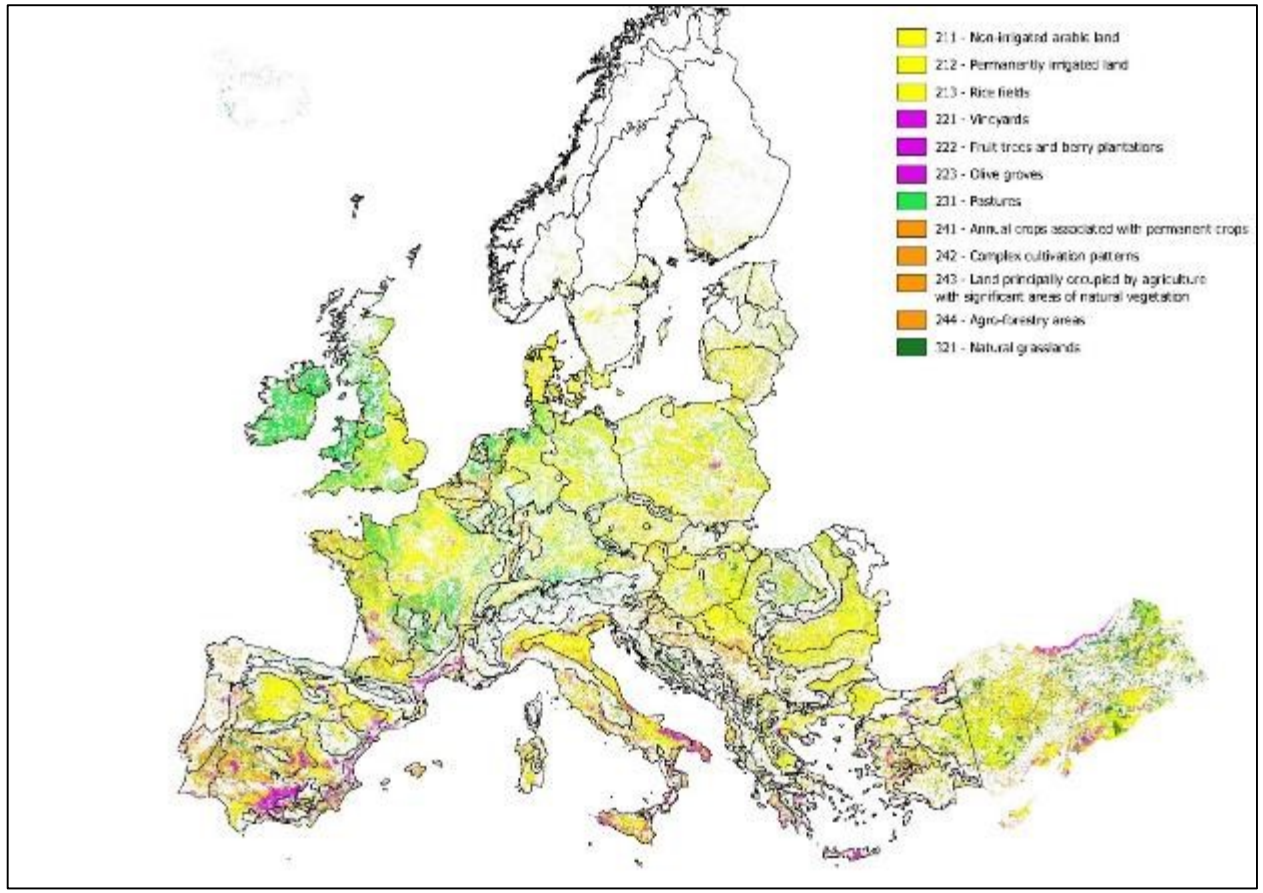
X

46 Countries
(incl. 2 BE regions)

→

146 AEZ

AEZ of i-SoMPE: Characterization



Land-use data (Source)

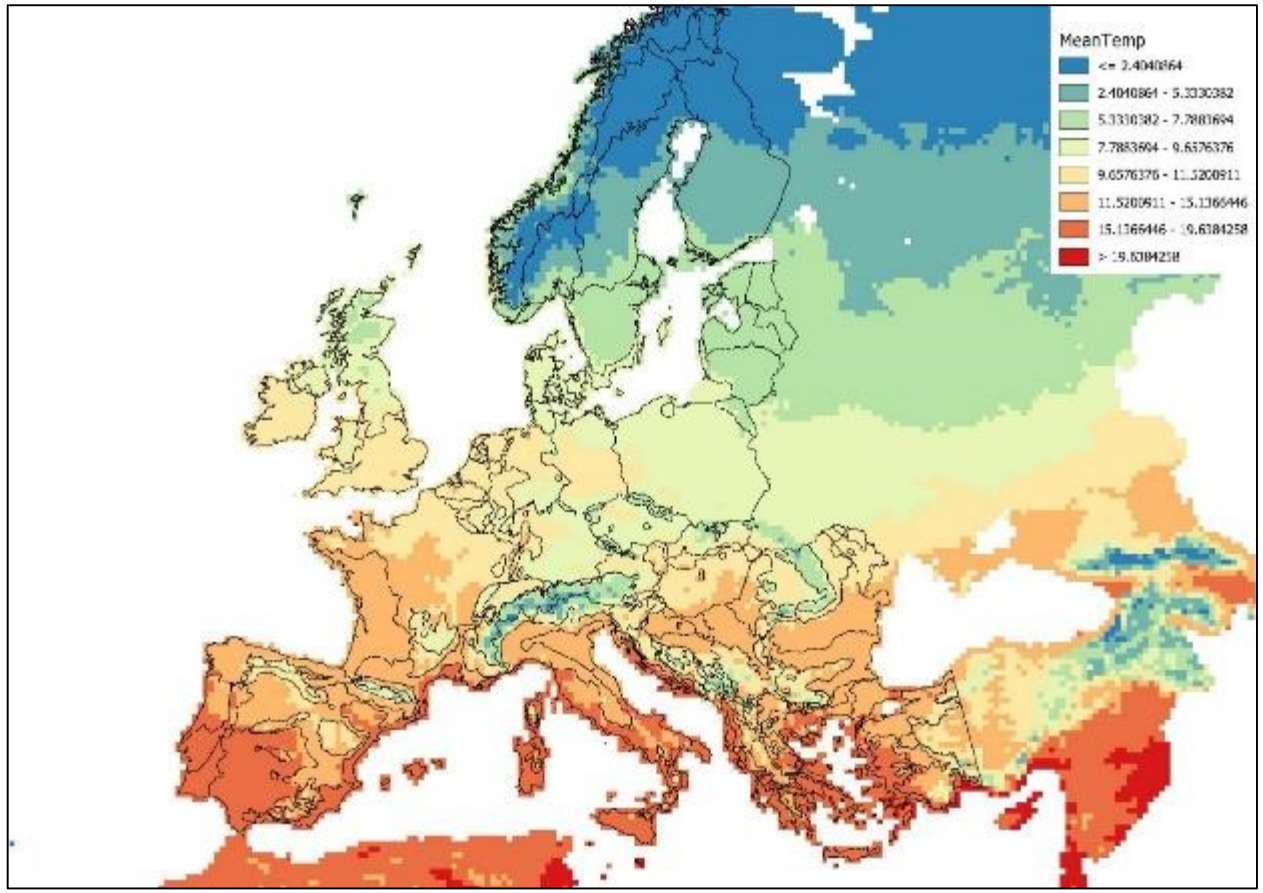
- CLC 2018
- Minimum mapping unit: 25 ha

Land-use data (used)

- 5 Agricultural land-use classes
  - 12 sub-classes




AEZ of i-SoMPE: Characterization

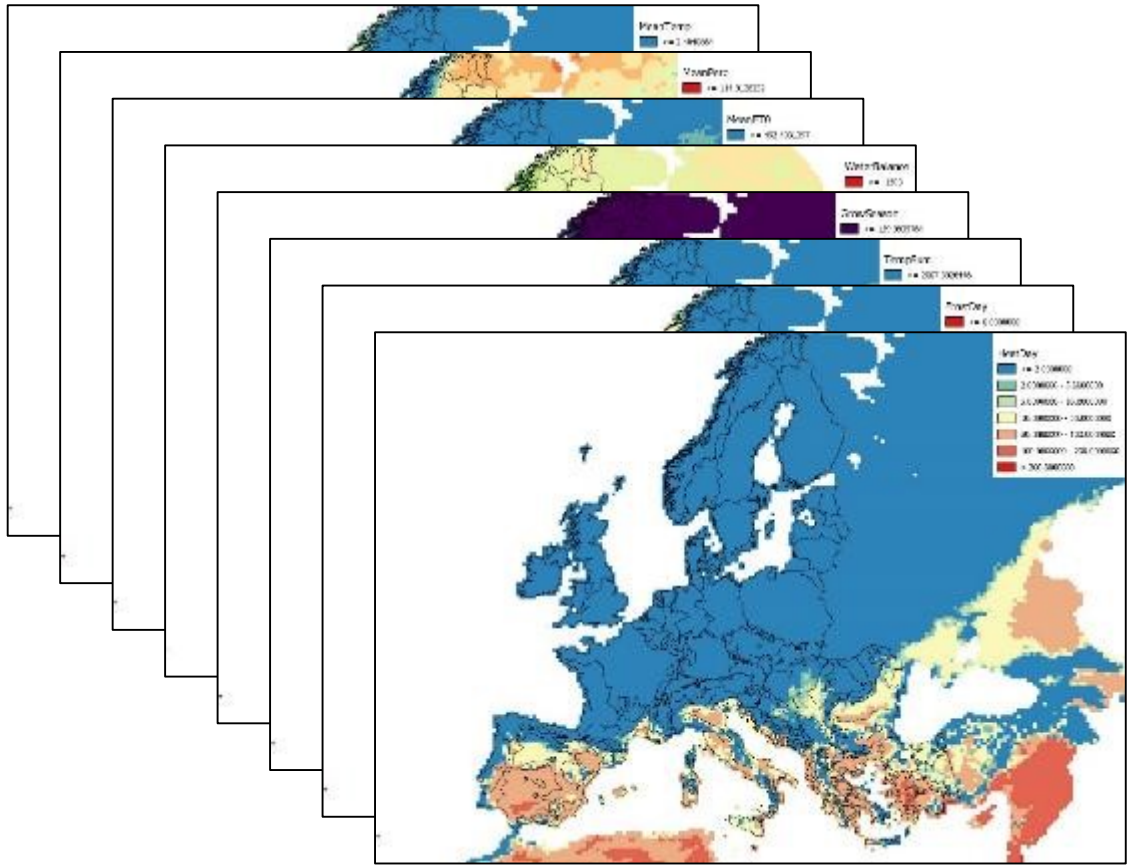


Climate data (Source)

- Agri4Cast long term averages (1990 – 2020)
- 25 x 25 km grid
- Daily values for:
  - Temperature (min, max, average)
  - Precipitation
  - Evapotranspiration (ET0)

JOINT RESEARCH CENTRE
AGRI4CAST RESOURCES PORTAL

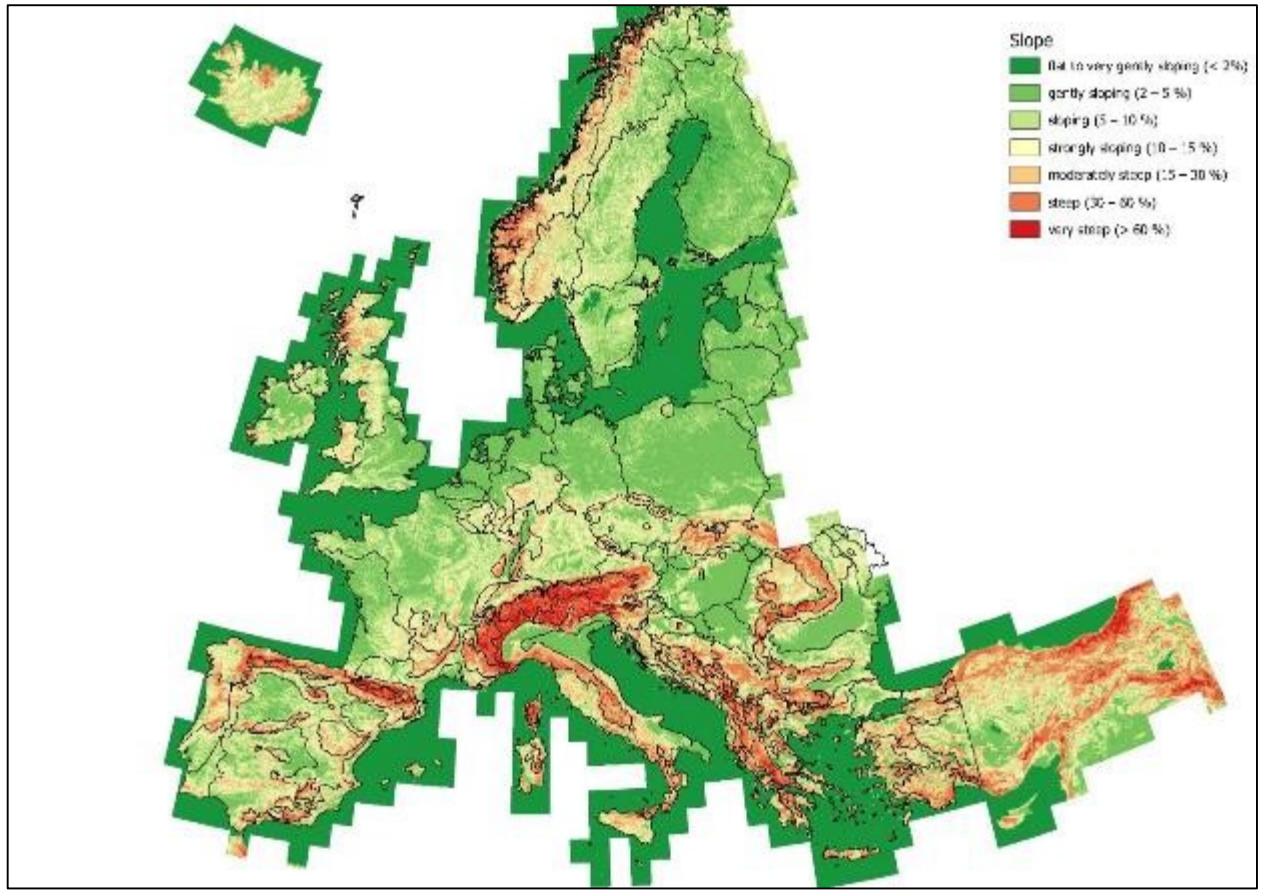
AEZ of i-SoMPE: Characterization



Climate data (Derivatives)

- Average temperature
- Average precipitation
- Average ET0
- Annual water balance
- Length of the growing season
- Temperature sum
- Number of days with frost
- Number of hot days
- …

AEZ of i-SoMPE: Characterization

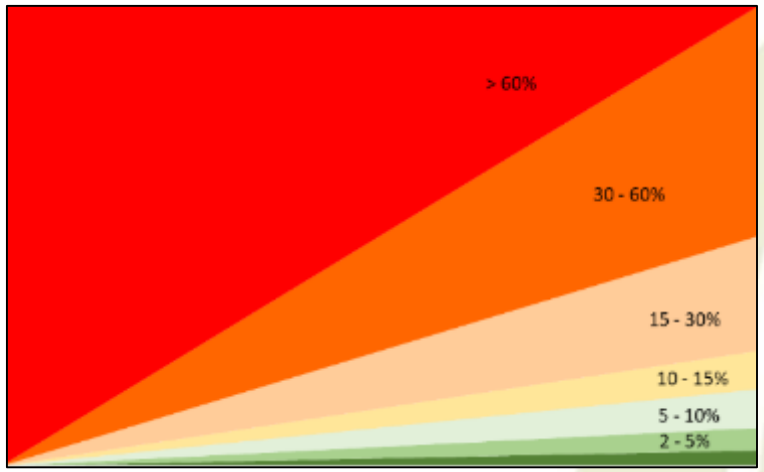


Topography data (Source)

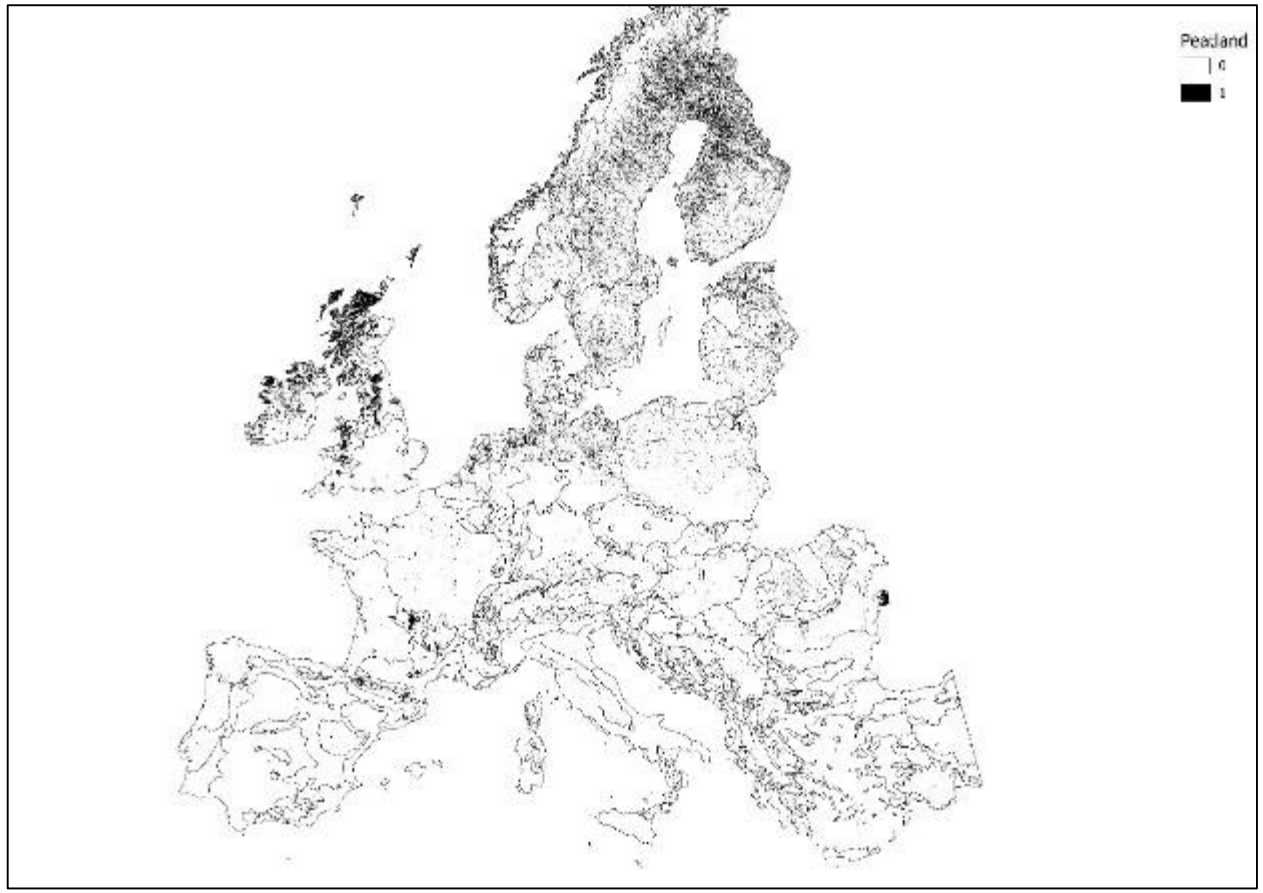
- EU-DEM v1.0
- 25 x 25 m grid

Topography data (Derivatives)

- Slope in %
- 7 slope classes



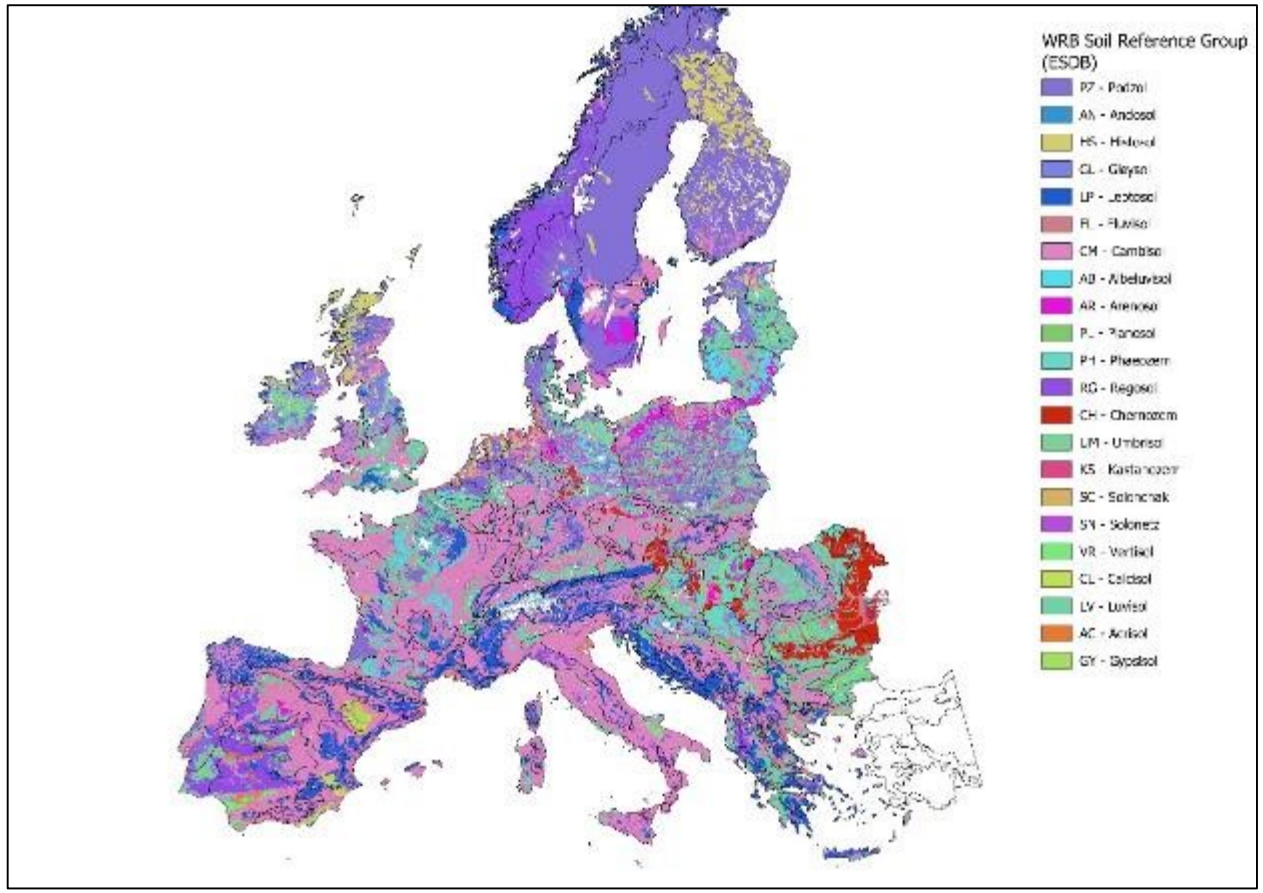
AEZ of i-SoMPE: Characterization



Organic soils (Source)

- Peatland map of Europe (Tanneberger et al., 2017)
- 1 x 1 km grid

AEZ of i-SoMPE: Characterization



Organic soils (Source)

- Peatland map of Europe (Tanneberger et al., 2017)
- 1 x 1 km grid

Other soil data (Source)

- European soil database derived
- 2001 / 2006 / 2013
- 1 x 1 km grid / 1:1’000’000
- Data on:
  - Dominant WRB reference group
  - Dominant texture
  - Dominant rooting depth
  - Dominant gravel content
  - Dominant water regime
  - …

AEZ of i-SoMPE: Characterization

EnZ	Country	CLC_Code	Area_km2	Peat_km2	SoilType_k	SoilType_k	SoilType_k
ALS	CH	211	116	0	0	0	39
ALS	CH	221	62	0	0	0	35
ALS	CH	222	38	0	0	0	18
ALS	CH	231	1336	26	0	0	17
ALS	CH	242	47	2	0	0	6
ALS	CH	243	249	5	0	0	14
ALS	CH	321	3757	83	0	0	6
ATC	CH	211	172	1	0	0	1
ATC	CH	221	13	0	0	0	0
ATC	CH	222	7	0	0	0	1
ATC	CH	231	6	0	0	0	0
ATC	CH	242	24	0	0	0	0
ATC	CH	243	8	0	0	0	0
CON	CH	211	5640	306	114	0	10
CON	CH	221	68	0	1	0	0

Example of L4 data

4 Levels of AEZ description

- **L1**: EnZ (13 zones)
- **L2**: AEZ (146 zones)
- **L3**: AEZ (agri. only, 146 zones)
- **L4**: AEZ x land-use (1006 zones)

Variables of AEZ description

- Area
- Land-use information
- Climate data (mean, SD)
- Soil information
  - Area of organic soils
  - Area of WRB reference group
- Area per slope classes
- Max. 70 variables

AEZ of i-SoMPE: Characterization (Example)

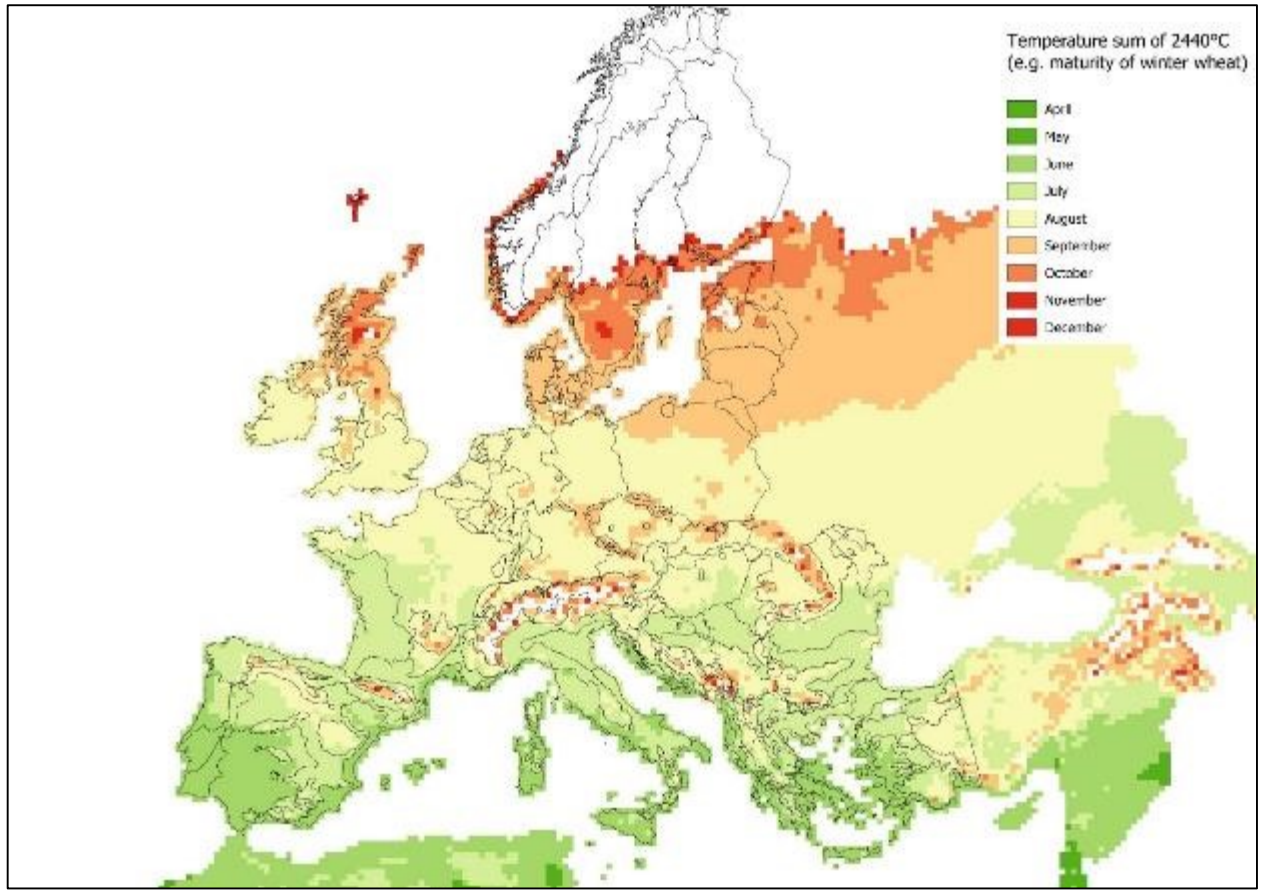
EnZ	Area [km2]	Agri. [km2]	Share
ALN	324'564	7'669	2%
ALS	286'579	80'969	28%
ANA	43'298	27'232	63%
ATC	512'055	354'552	69%
ATN	294'911	161'095	55%
BOR	646'110	54'353	8%
CON	974'733	518'081	53%
LUS	194'565	100'319	52%
MDM	338'477	119'534	35%
MDN	527'125	309'172	59%
MDS	380'739	242'044	64%
NEM	266'781	95'982	36%
PAN	380'488	252'704	66%

Country	Agri. [km2]
AL	505
AT	15'338
BA	10'917
BE3	4'827
BG	11'214
CH	9'324
CZ	38'527
DE	130'032
DK	10'909
FR	8'353
HR	8'581
HU	3'875
LI	35
LT	976
LU	536
LV	772
MD	25
ME	1'197
MK	1'391
NL	482
NO	506
PL	172'531
RO	45'862
RS	18'052
SE	8'906
SI	414
SK	13'994

CLC_Code	CLC	Area [km2]	Peat [km2]	Cambisol [km2]	GrowSeason_M	SD
211	Non-irrigated arable land	5'640	306	4'297	253	3
221	Vineyards	68		46	252	11
222	Fruit trees and berry plantations	14	1	9	253	6
231	Pastures	1'885	59	934	250	7
242	Complex cultivation paterns	864	27	633	248	12
243	Land principaly occupied…	474	7	272	228	
321	Natural grasslands	379	24	6	248	

CLC_Code	CLC	Area [km2]	< 2%	2-5%	5-10%	10-15%	15-30%	30-60%	>60%
211	Non-irrigated arable land	126'483	62%	28%	8%	2%	1%	0%	0%
222	Fruit trees and berry plantations	1'732	64%	26%	7%	2%	1%	0%	0%
231	Pastures	25'823	66%	23%	7%	2%	1%	0%	0%
242	Complex cultivation paterns	7'692	47%	31%	13%	5%	4%	0%	0%
243	Land principaly occupied…	10'600	39%	34%	15%	6%	5%	0%	0%
321	Natural grasslands	201	64%	25%	6%	1%	2%	1%	0%

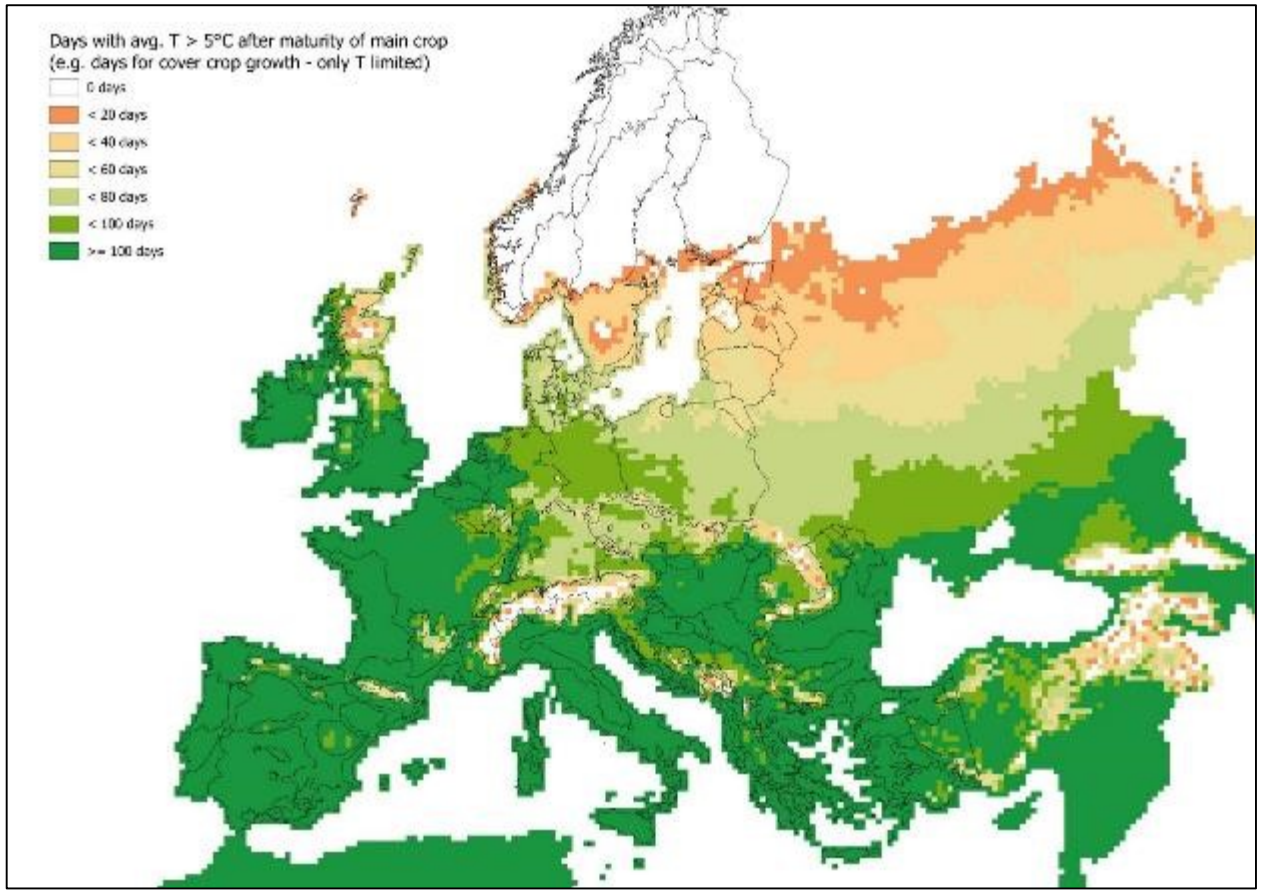
Exemplary application of the framework: cover crops



Assumptions

- Cover crop after winter wheat
- WW needs a T_{sum} of 2440°C to maturity

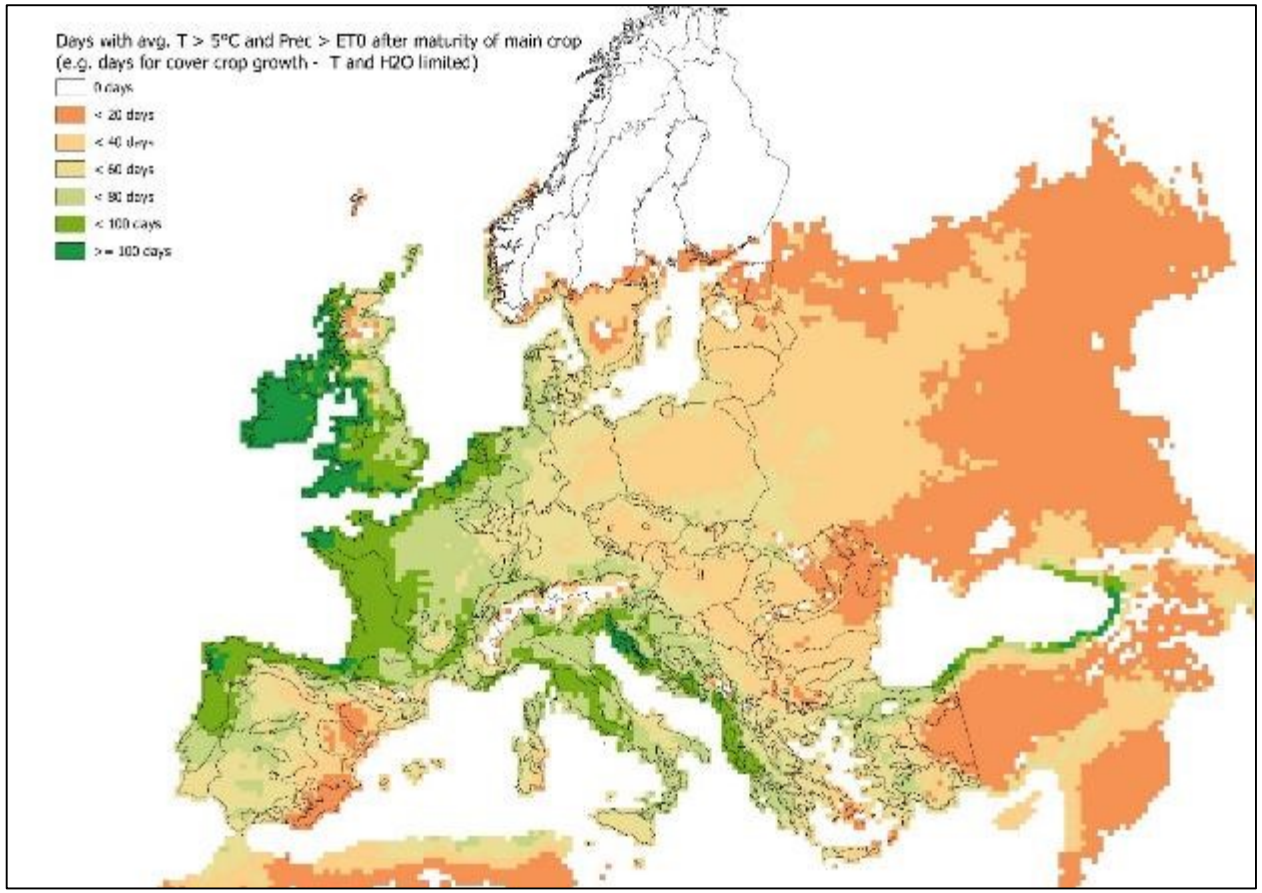
Exemplary application of the framework: cover crops



Assumptions

- Cover crop after winter wheat
- WW needs a T_{sum} of 2440°C to maturity -> calculate harvest date
- Cover crops need:
  - T_{AVG} > 5°C

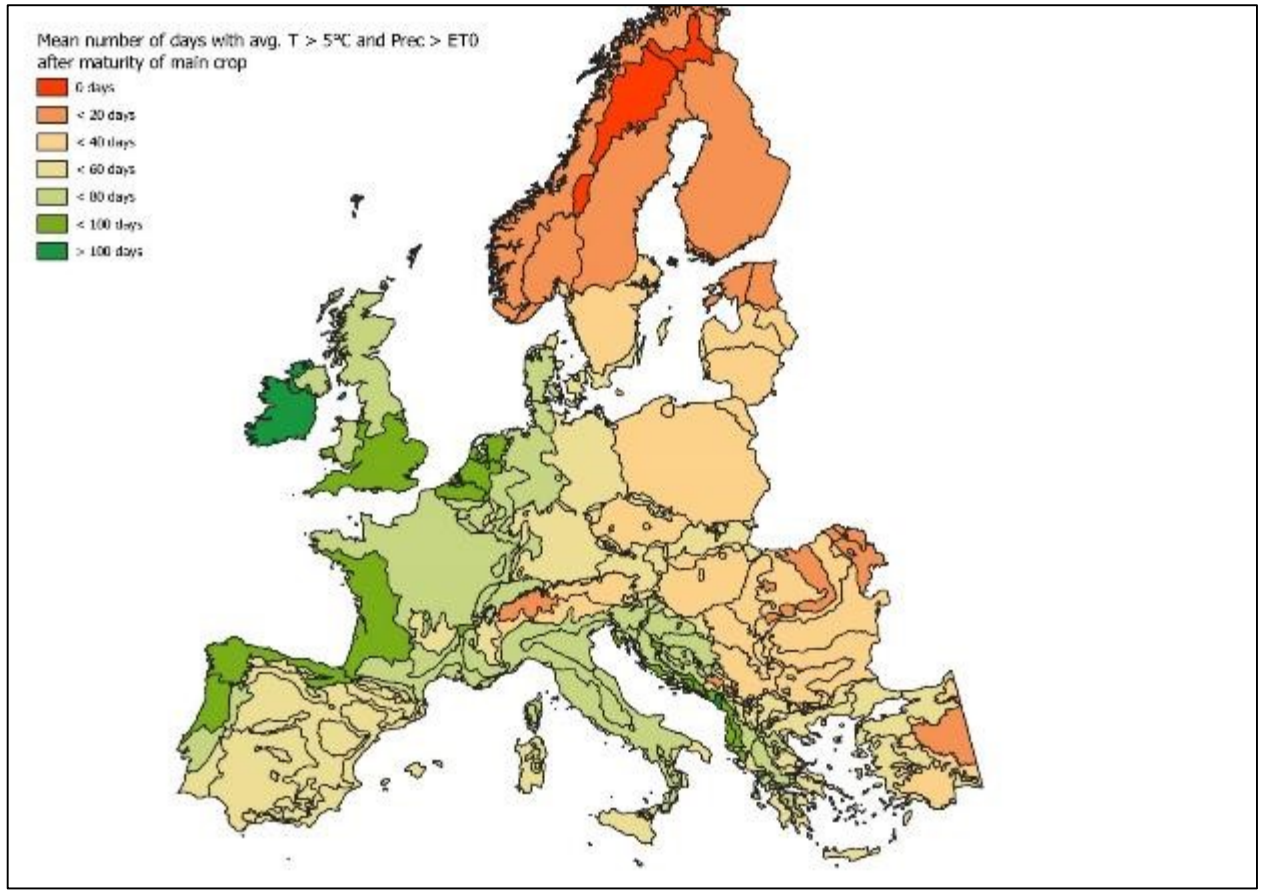
Exemplary application of the framework: cover crops



Assumptions

- Cover crop after winter wheat
- WW needs a T_{sum} of 2440°C to maturity
- Cover crops need:
  - T_{AVG} > 5°C
  - Prec > ET0

Exemplary application of the framework: cover crops



Assumptions

- Cover crop after winter wheat
- WW needs a T_{sum} of 2440°C to maturity
- Cover crops need:
  - T_{AVG} > 5°C
  - Prec > ET0

Cover crop growth	Arable land [km2]	Share
< 20 days	46'927	4%
20 - 40 days	413'918	37%
40 - 60 days	286'714	25%
60 - 80 days	281'704	25%
80 - 100 days	96'537	9%
> 100 days	3'225	0%
	1'129'025	100%

Outputs of WP1:

Framework for WP2-4

Report (i-SoMPE D2)

Compilation of GIS-data

- Land-Use
- Climate
- Topography
- Soil

R Projects, geoTiffs and data tables

- Climate data derivatives
- Data for AEZ Characterization (L1 to L4)

Thank you!

For more information contact isompe@cra.wallonie.be
or visit our blog : https://isompe.gitlab.io/blog/

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