Understanding the potential of marginal lands in Europe

Marginal, unused, abandoned and degraded lands: what are they, where are they, dynamics around them and new sustainable uses for biomass?

Berien Elbersen, 15 April 2021

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Outline

- Marginal, unused, abandoned and degraded lands what and where are they?
- Key drivers and options for cultivating crops for biofuels and other non-food purposes sustainably on these types of land
- The role of policies and markets in bringing land back into agricultural production
- Conclusions and recommendations

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Definition: Marginal lands

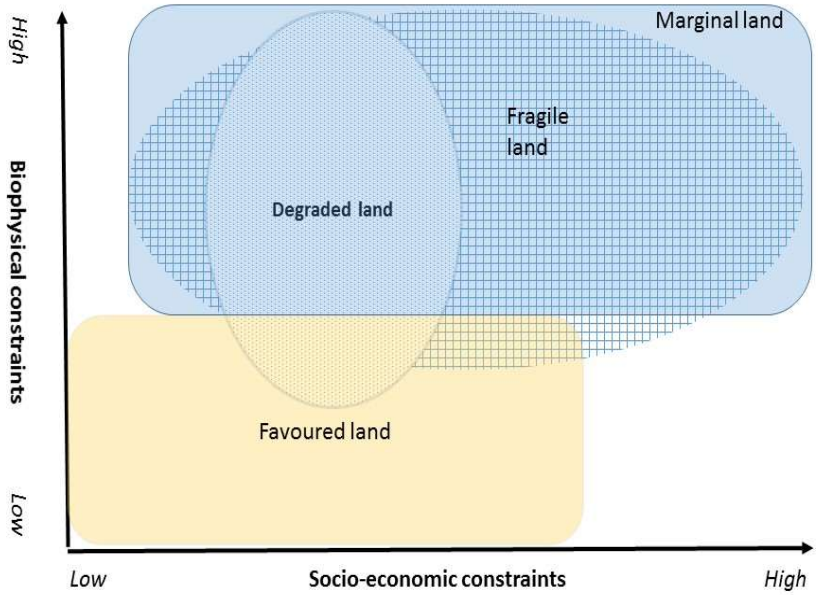
Lands having limitations which in aggregate are severe for sustained application of a given use and/or are sensitive to land degradation, as a result of inappropriate human intervention, and/or have lost already part or all of their productive capacity as a result of inappropriate human intervention (*FAO-CGIAR, 1999*).

1) Areas with natural constraints

2) Fragile lands

3) Degraded lands

4) Polluted lands/contaminated sites



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MagiC
Marginal lands for Growing Industrial Crops

Biophysical limitations for identification of marginal lands

1. Adverse climate
2. Excessive wetness
3. Low soil fertility
4. Adverse chemical conditions
5. Poor rooting conditions
6. Adverse terrain conditions

Starting point: JRC guidelines to identify **Areas of Natural Constraints (ANC) in CAP** (Van Oorschoven et al., 2014 and Terres et al., 2014)

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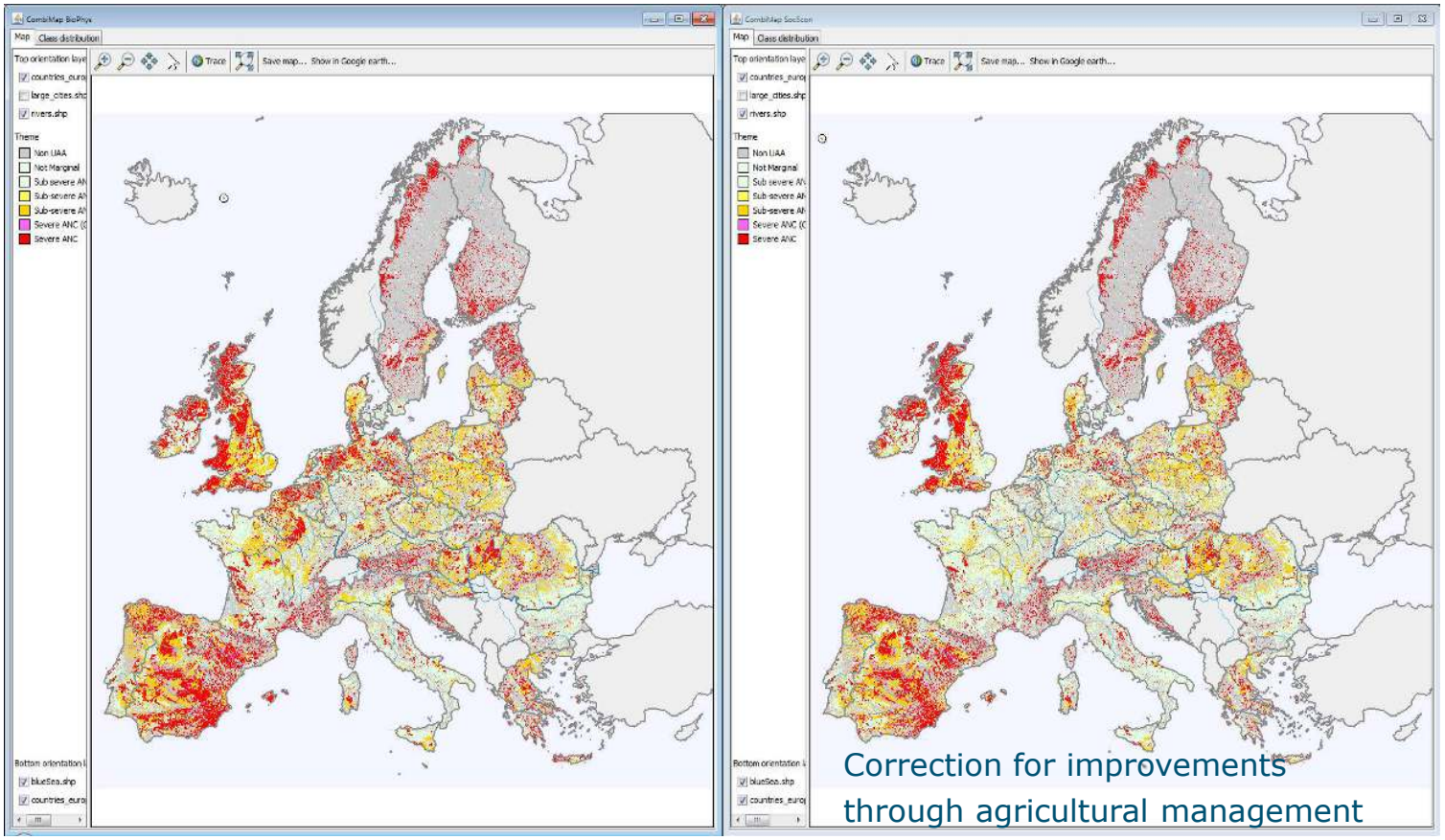
Marginal lands final maps EU



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Marginal lands: % of agricultural area

	1. Adverse climate	2. Excessive soil moisture	3. Adverse chemical composition	4. Low soil fertility	5. Adverse rooting conditions	6. Adverse terrain	Marginal	Not marginal
Alpine	40%	21%	0%	2%	45%	47%	**61%**	39%
Atlantic	4%	14%	1%	1%	12%	5%	**26%**	74%
Continental	1%	5%	2%	1%	5%	2%	**14%**	86%
Mediterranean	13%	1%	1%	6%	18%	9%	**34%**	66%
North	62%	14%	0%	3%	13%	3%	**71%**	29%
Grand Total	**11%**	**8%**	**1%**	**2%**	**12%**	**6%**	**29%**	**71%**

% calculated as share of agricultural area. **Agricultural area** is land classified as agricultural in Corine Land Cover in at least 1 of the 4 CLC versions 1990, 2000, 2006 & 2012.

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Unused, abandoned in REDII

- ‘ **unused land**’ means areas which, for a consecutive period of at least 5 years were neither used for the cultivation of food and feed crops, other energy crops nor any substantial amount of fodder for grazing animals;
- ‘**abandoned land**’ means unused land, which was used in the past for the cultivation of food and feed crops but where the cultivation of food and feed crops was stopped due to biophysical or socioeconomic constraints;

However: Abandonment is a complex process of reduced farming over a continuum ranging from land temporarily unused to entirely abandoned.

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Abandonment according to Keenleyside & Tucker (2010)

- **Temporarily unused lands**: This refers to land that is likely to be temporarily unused and includes fallow and former compulsory set-aside (under CAP until 2008) but also semi-abandonment or hidden abandonment.
    - **Short (2 yr) and long term (>=3) fallow**: in principle rotational in combination with arable crops
    - **Semi or hidden abandonment:** land with a very low level of management, but land is not (yet) formally abandoned, subject to some form of management, which might be simply to keep it available for future use, for example for agriculture or recreation and/or tourism.

Fallow and cereals every 2/3 years, Soria, (Spain)

Long term fallow, Soria, (Spain)

Abandonment according to Keenleyside & Tucker (2010)

- **Abandoned lands**: 'lands that are entirely abandoned for production, and management is withdrawn completely.

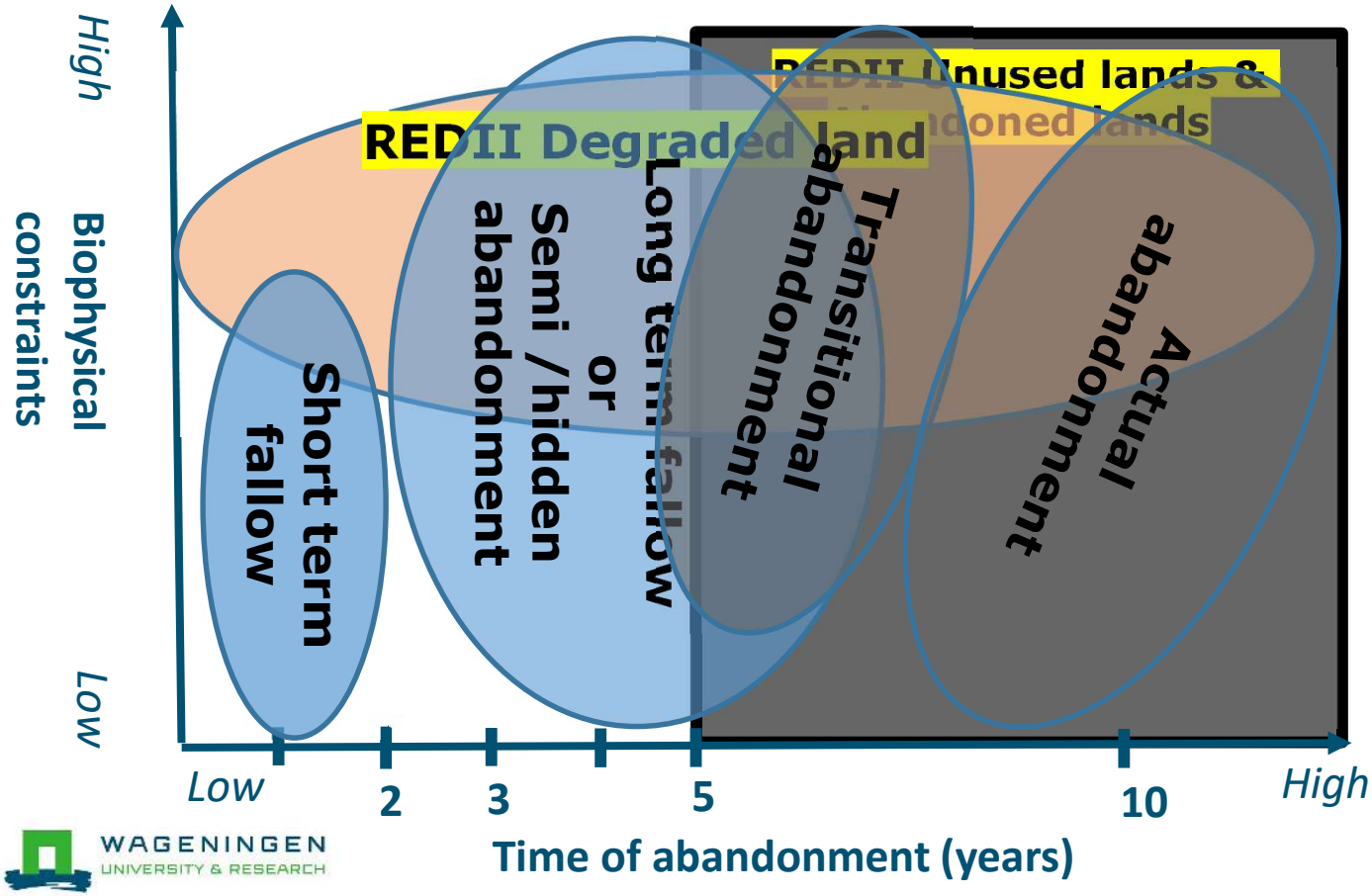
  This includes:

  - **Transitional abandonment:** in CEE as a result of restructuring and land reforms, and in other Member States as a result of compulsory set-aside, or land use change. Often in areas that are economically & biophysically marginal and can move in and out of agricultural use depending on market price developments.
  - **Actual abandonment:** Where the farmland is not used at all. The vegetation may change through natural succession into tall herb, bush and forest ecosystems after a period, depending on climatic and soil conditions.

Transitional abandonment, *Kontinentalna Hrvatska region, Croatia*

Actual abandonment, *Emilia-Romagna, Italy*

Actual abandonment, *Soria, Spain*


High
Biophysical constraints
Low
REDII Degraded land
REDII Unused lands &
Short term fallow
Semi /hidden abandonment
or
Long term fallow
Transitional abandonment
Actual abandonment
Low
2
3
5
10
High
Time of abandonment (years)
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Degraded lands REDII

‘Severely degraded land’ that means 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.

However:

- There are many other types of land degradation not covered by this definition
- ‘unused’ and ‘abandoned land’ can also be degraded
- Degraded lands can still be used.
- No thresholds for when degradation starts as it is a gradual process

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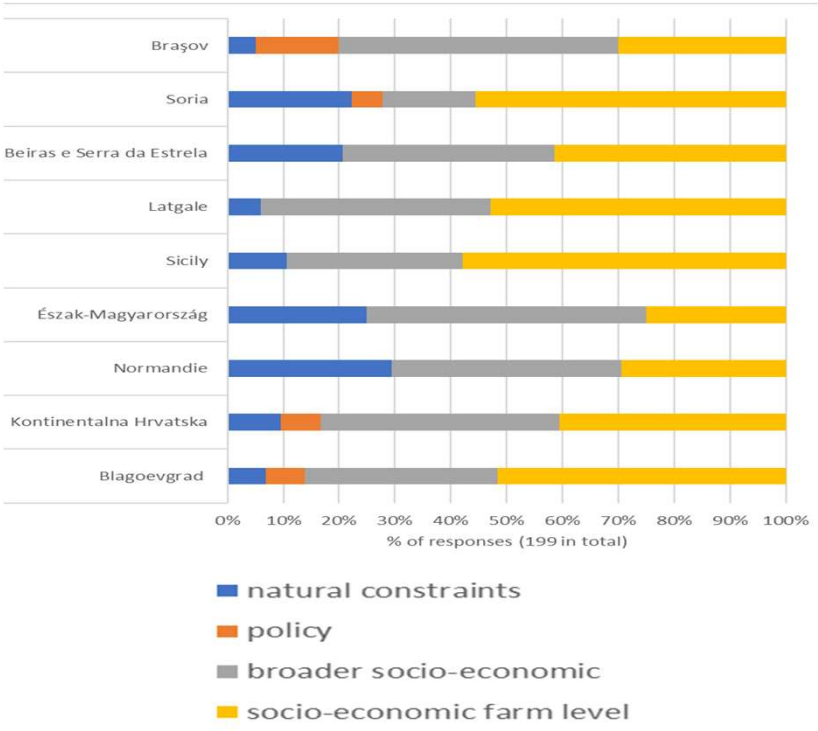
Land degradation is a negative trend in land condition, caused by direct or indirect human-induced processes including anthropogenic climate change, expressed as long-term reduction or loss of at least one of the following: biological productivity, ecological integrity or value to humans. *Montanarella et al. (2018)*

Drivers for land becoming unused, abandoned & degraded

Land type	Sub-type	Natural constraints limiting the suitability for agricultural uses	Socio-economic drivers at farm level	Broader socio-economic drivers	Drivers from policies
Temporarily unused land	a. Fallow (short-term: 1-2 years)	X	X		XX
	b. Fallow (long-term: >=3 years)	X	XX	X	XX
	c. Semi- or hidden abandonment	X	XX	XX	X
Abandoned land (>5=years) (REDII)	a. Transitional abandonment	X	XX	XX	X
	b. Actual abandonment	X	XX	XX	X
Degraded lands (REDII)	Degraded lands	XX	XX	X	X



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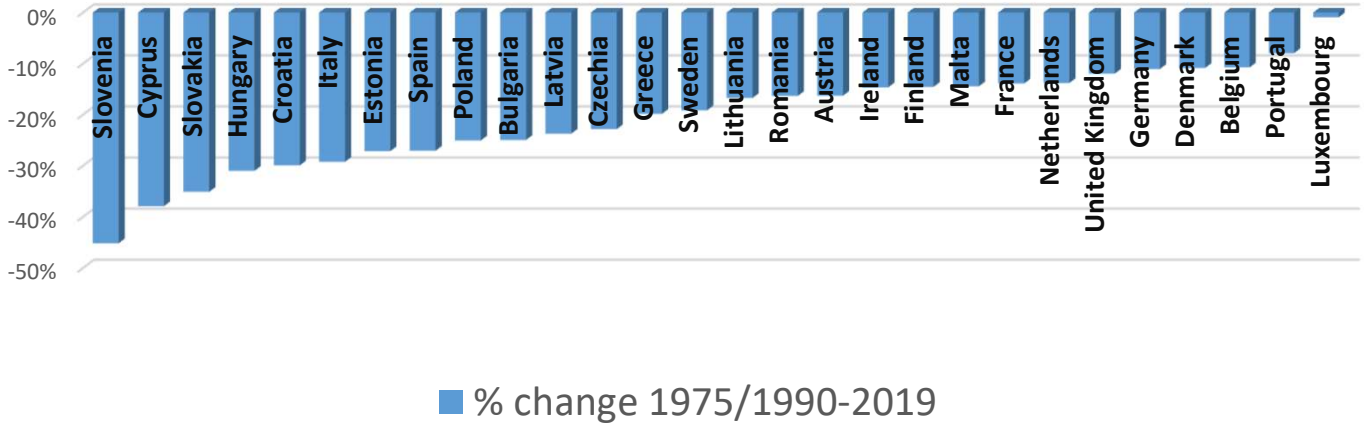
Data on abandonment are not available. Only indirect information: Development in Utilised Agricultural Area (UAA)

Change in UAA 1975-2016

Source: Eurostat FSS data 1975-2016. Where data missing, FAOSTAT data were used



Total decline in UAA for all EU-28 is 36 million hectares

This is 18% of the UAA in 1975

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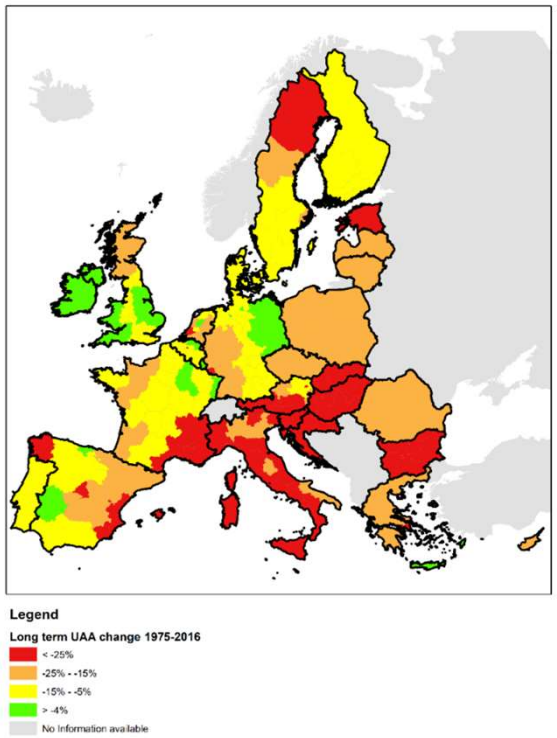
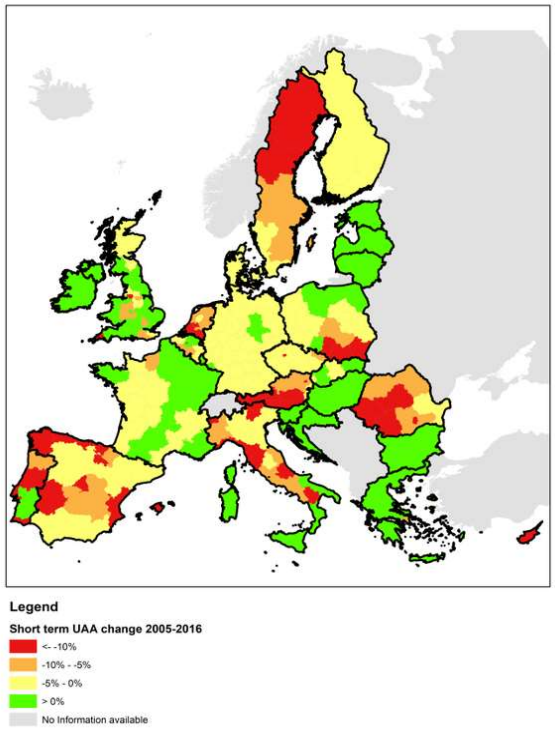
Change in UAA at regional level





In most CEE countries the decline was large between 1990-2005:

- conversion from communist to market economies
- large state farms ceased to exist
- agricultural production decreased
- land was partly claimed back by pre-communist owners
- several areas of land were left unused because legal rights remained unclear and/or production for the market became difficult.

After entry into the EU, agricultural production started to grow and more land was brought into use again.

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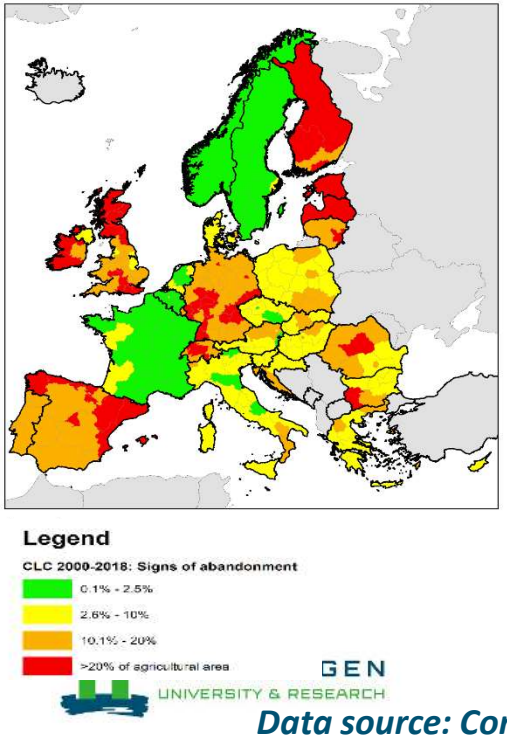
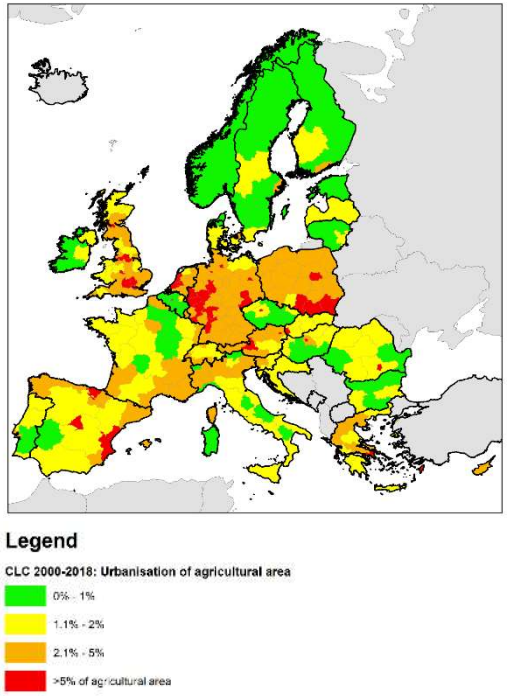
What happened with the agricultural land?

Land conversions until 2018 with reference to agricultural area in 2000 (8% decline in agricultural land)

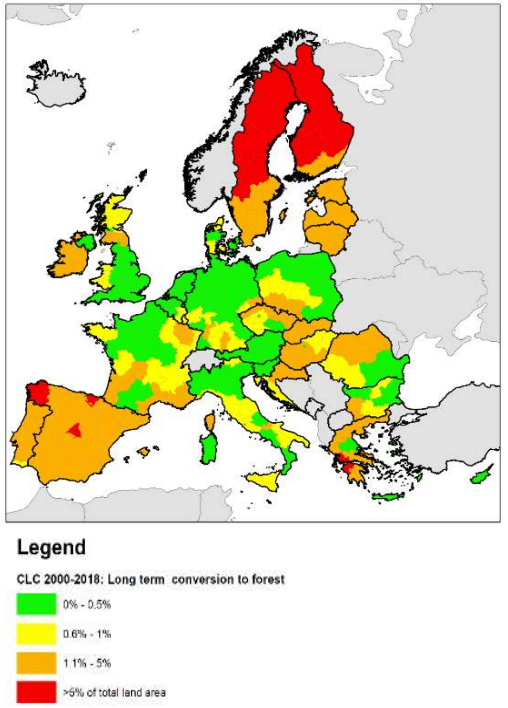
Agricultural to abandonment (0.6% to N2000 & 2.5% non-N2000)



Agricultural to urban (2% of agricultural area (2000))



Agricultural forest formation (long term abandonment) (3% of agricultural area (2000))



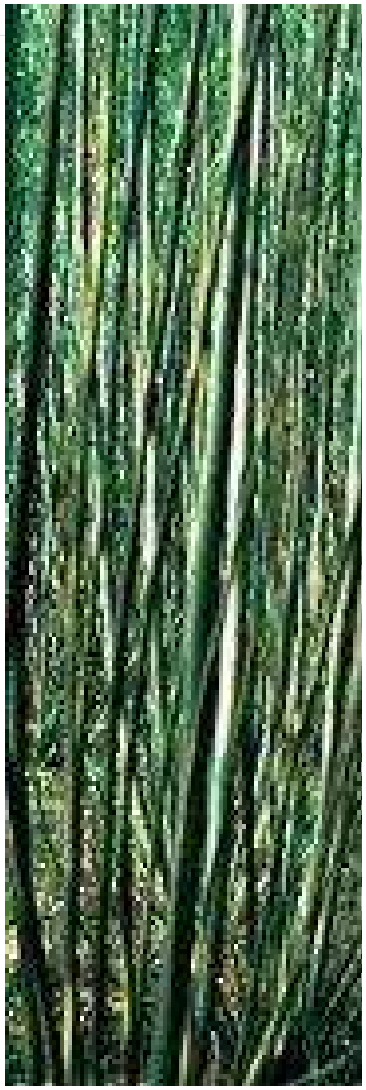
Data source: Corine Land Cover 2000 and Corine Land Cover 2018 in a land use flow analysis.

Conclusions on data on marginal lands, unused, abandoned and degraded lands (I)

- Marginal lands are defined well as Area of Natural Constraints (ANCs) and also mapped relatively well (in EU)
- Difficult to detect and quantify land becoming unused and abandoned:
    - Land out of use (<=5 years) disappears from statistics.
    - The only unused land categories for which data is collected systematically is fallow land.
    - The Corine Land Cover enables land use flow analysis in a precise location in time. The limitation of the CLC flow analysis is that it only identifies changes that are large in area coverage. Small changes are missed, because of the coarse spatial resolution of the satellite data that CLC uses
    - Abandonment of land involves a gradual process of transition from agricultural land to shrubs and eventually forest. Therefore, very difficult to determine when land has become abandoned completely. To detect abandonment a combination information on land use, land management and land cover from different time periods is needed.

Conclusions on data on marginal lands, unused, abandoned and degraded lands (II)

- Degraded lands:
  - No clear definition for land degradation
  - Particularly difficult to determine when land is 'degraded'
  - No EU wide accepted definitions on what is 'degraded lands'. Sofar the JRC illustrated the occurrence of it through ' changes in land productivity' (biomass/NDVI productivity).
  - Also IPBES and pay attention to land degradation. It is characterized as an important issue with especially antropogenic causes having many adverse effects on food security, but also climate change.
  - Most important land degradation type is soil degradation. The main process adversely affecting soils is soil erosion. Soil compaction, hardening, sealing and any other mechanism leading to the loss of porous space crucial for holding and exchanging air and water. Also salinization or permanent flooding are part of soil degradation processes.
- 2 DG-ENER projects proposing methods to determine detection of degraded land for Low ILUC biofuels



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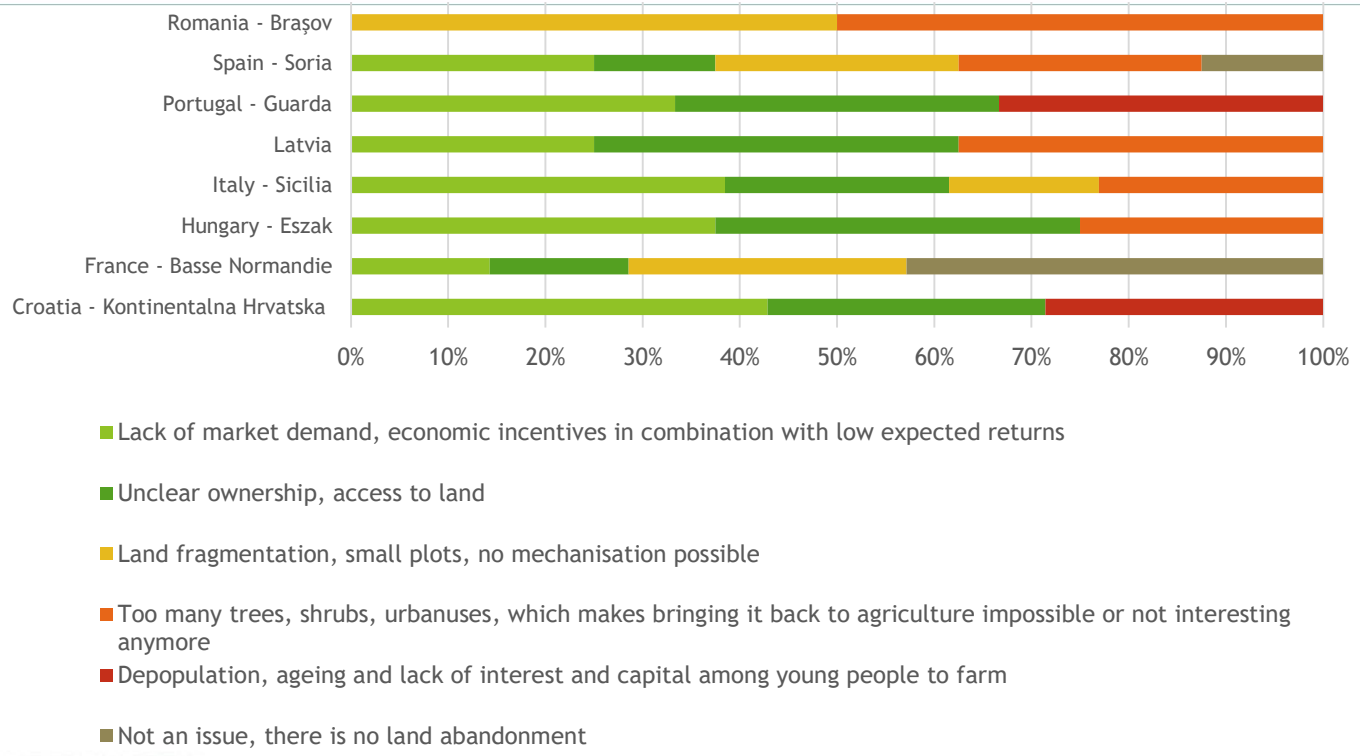
Reasons why abandoned lands have not been brought back into production (yet) *(Elbersen, 2020, study DG-ENER)*



Factors that enable (E) or hamper (H) the use of agricultural land for (Non-food)crops

Factor	EIP-Agri	Case studies *(with examples)*
Economic and financial	**(E)** Stable financial instruments and transparency; regional scale business models; collective approaches **(H)** High costs of equipment and financing.	**(E)** Market prices and diversification of income were key reasons for adoption of biomass cropping (All case studies). **(H)** High investment cost (Latvia, Croatia), unstable market (Spain, Hungary).
Technical	**(E)** Pre-treatment technologies and investment costs need further development. **(H)** Other outputs in chain also require multiple markets. (**H**) Complex to match seasonality of biomass to demand.	**(E)** Availability of biomass processing plants and supply chain (Romania). **(H)** Lack of biomass processing plants and supply chain (Hungary, Croatia). Absence of support for testing technologies (Latvia). Lack of technical knowledge and expert advice (Croatia).
Societal	**(E)** Social acceptance can be enhanced if benefits are demonstrated. Inclusive business models in regions can increase support. **(E/H)** Landscape impacts are of concern.	**(H)** Lack of trust and cooperation within supply chain (Hungary). (**H**) Lack of collaboration/not part of culture (all CEE cases) (**H**) Absent land owners (CEE, Portugal, Italy)

Factors that enable (E) or hamper (H) the use of agricultural land for (Non-food)crops

Factor	EIP-Agri	Case studies *(with examples)*
Regulatory	**(E)** Stability in regulatory frameworks is needed	**(E)** Local policy to replace coal with new biomass power plant (Portugal) **(H)** Unclear government policy on non-food industrial crops (Croatia). (**H**) Land eligibility for CAP payments making production on ineligible lands difficult (Croatia, Spain, Italy, Romania) (**H**) Keeping status of ' agricultural land' for CAP payments more important than sustainable production on the land (Italy, Spain). (**H**) Unused land often in state hands that do not take action to change it (Croatia, Romania) (**H**) Tax on and opportunity cost of agricultural or forest land drive choices of land owners (Latvia) (**H**) Registration of land/land ownership (CEE, Portugal, Italy)/false registration to claim CAP payments
Competition for natural resources	**(E/H)** Sustainability of increased feedstock production is a key issue, including how to avoid competition with food production.	(**H**) Conflict over use of food crops for energy (France, Croatia). Not enough use of agricultural residues instead (France). **(H)** No payments for other services delivered (e.g. carbon capture)

Environmental opportunities for bringing unused lands back into use

- On bare (black)unused, abandoned, degraded lands the establishment of any crop that will create a soil cover will help stabilising the soil
- Perennial crops and agroforestry systems are effective in reducing soil erosion, building up below and above soil carbon and deep rooting facilitate access to water resources particularly in arid circumstances.
- There are more non-food crops that are drought tolerant and non-food crops can be irrigated with waste water (but depending on end use).
- Some species (certain birds and small mammals) might profit from introduction of perennial crops and agroforestry where it brings improved structural diversity in the landscape
- In principle land management practices that are compatible with biodiversity conservation are to be applied. These include the use of domestic species and local varieties, avoiding monocultures and invasive species, preferring perennial crops (above rotational arable crops) and inter and double cropping, use of methods causing low erosion and machinery use, low fertilizer and pesticide use and avoiding active irrigation.
- It is not necessarily sustainable to bring long abandoned lands back into production: Processes are limited for determining the climate and environmental implications of doing so

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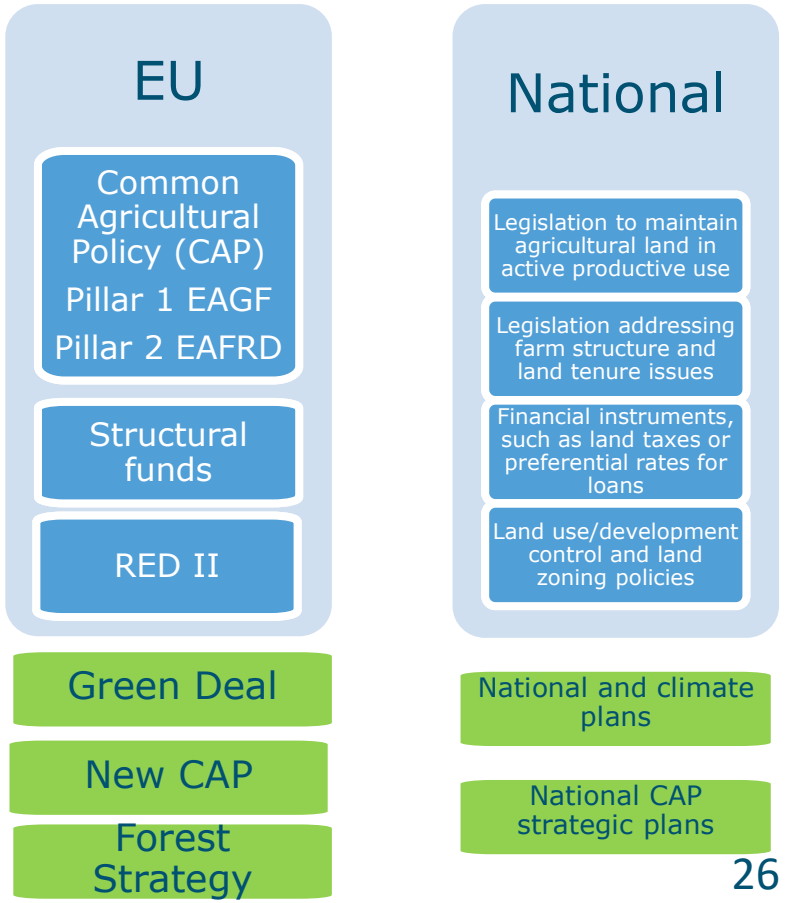
Role of policy

- Policy (EU and national) can play a role in:
  - maintaining land under agricultural production;
  - bringing it back into active use; and
  - stimulating biomass cropping for energy and other non-food purposes

- The key policies influencing on land use and biomass production for energy



The role of policy in incentivising biomass production for non-food purposes

- Bringing land back into agricultural production does not mean that it will necessarily be used for the production of crops for energy
    - The potential for growing crops for these purposes is largely determined by economic and market related factors, access to infrastructure, social factors and the institutional and policy context
- Policy support available includes:
    - CAP Pillar 1: SRC is eligible for direct payments, Voluntary Coupled Support and certain species can be used to contribute to Ecological Focus Areas
    - CAP Pillar 2
        - Cooperation measure supports cooperation amongst supply chain actors for the sustainable provision of biomass for use in food and energy production and industrial processes
        - Agro-forestry – establishment and initial maintenance of agro-forestry systems
    - Structural Funds: to support 'Key Enabling Technologies' – but few examples found
- Few 'pull' policies available that stimulate biomass markets for energy and non-food purposes.

Policy review main conclusions

- The current policy mix is often insufficient to counter the socio-economic drivers of land abandonment, e.g. those leading to rural depopulation
- Some CAP measures (e.g. ANC and direct payments) help maintain land in agricultural use that would otherwise move out of production, but they do not **secure the sustainable management of these areas**
- Policy can play only a limited role in decisions about whether or not to grow crops for energy or other non-food purposes on land brought back into production:
    - these decisions lie with the land manager and are influenced by a range of factors **– largely market** related
    - There may be a case for **increasing the role of policy in stimulating biomass markets**
    - The key role of **policy here should be to ensure that crops are grown sustainably** and in a way that delivers a mix of ecosystem services (not only avoiding indirect land use change)

Green Deal: Energy

- **Further adapted energy legislation (June 2021)**
- **Climate Law**: 2050 climate neutrality is anchored in legislation also at national level. This will increase the pressure also on countries to address decarbonisation of transport sector!
- Better coherence needed between the different policies of influence to reach climate targets: e.g. REDII, Circular Economy strategy, CAP policy, Forestry strategy, and Structural Funds etc..
- **Review** revised national energy and action plans (NCPs) (submitted end of 2019) by EC: In case the ambitions are too low and not in line with **the increased climate ambitions for 2030, member states are to be forced to reflect these higher energy and climate ambitions** in the National and Climate Plans (NCPs) (re-submitted in 2023, following the 2-yearly reporting obligation)
- A **Trans-European Networks – Energy Regulation** (TEN-E) (introduced in 2018) further strengthened: stimulates the cross-border cooperation to achieve the benefits of clean energy at affordable prices and deployment of innovative technologies and infrastructure that modernise and make the energy sector more renewable and efficient

Recommendations for policies for sustainable land use for biofuels

- New CAP:
  - Drivers of land abandonment should be covered in SWOT and needs analyses of CAP Strategic Plans to identify which areas are at risk and which need to be maintained in agricultural use.
  - Improving the land registration should be a priority so that it is clear who owns each parcel of land and that where issues of degradation, under-management and abandonment occur. Taxation is a reason for avoiding registration, but support payments for sustainable land uses can stimulate this.
  - REDII focus on low ILUC land (Unused, abandoned, degraded) and feedstock (Annex IX) should be integrated with new CAP policy.
- Policies enhancing sector collaboration would help the use of non-agricultural types of land for bioenergy and non-food purposes – e.g. financial benefits for consortia of companies from different sectors that cooperate to use land for multiple functions, legislative guidance for arranging (model) contracts for multiple uses of the same area.

Recommendations for data improvement

- Need to register in statistics the absence of management for several years in a row for land in agricultural domain (even when official agricultural land use status is lost).

- Detailed annual recording of yields per hectare at regional or field level is very informative. Helps to identify where marginalisation may lead to (further) abandonment and/or marginalisation land which is typically land 'on the edge of abandonment'.

- Degradation both on agricultural and other land should be recorded in statistical or spatial data sources.

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General recommendations

- Drivers for land becoming unused, abandoned and degraded are expected to continue. Policy measures preventing it in time or bringing land back into production in time will be most effective. Focus on those lands '**on the edge of abandonment**'.
- The trend of abandonment can decline through **development of markets** for more local self-sufficiency in food and biomass demand for non-food, including for biofuels.
- Rewarding not only for production but for **services delivered** such as for carbon capture, stabilisation of land degradation processes, improved green infrastructure contributing to biodiversity conservation, adaptation to climate change etc. win-wins needed!
- **Do not distinguish between food and non-food crops on marginal lands**. ILUC is a problem on good quality land only. On marginal land **sustainable land use** should be the main priority.
- The effect of annual, perennial and agroforestry systems for biomass production is dependent on the specific **environmental and landscape context**. A more **standardised environmental impact evaluation system linked to stimulation schemes and certification systems is needed.** This scheme should not distinguish between crops for food or non food, but rather focus on the most sustainable land use in a specific context. **Zoning** policies needed!

Thank you for your attention!

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Projects:

MAGIC: https://magic-h2020.eu/project-overview/

BECOOL: https://www.becoolproject.eu/

BIKE: https://new.etaflorence.it/projects/bike/

CeleBio: https://celebio.eu/

Power4Bio: https://power4bio.eu/

ANALYSIS OF ACTUAL LAND AVAILABILITY IN THE EU; TRENDS IN UNUSED, ABANDONED AND DEGRADED (NON-)AGRICULTURAL LAND AND USE FOR ENERGY AND OTHER NON-FOOD CROPS
Reference: ENER/C2/2018-440
Final report

Final Report:

ANALYSIS OF ACTUAL LAND AVAILABILITY IN THE EU; TRENDS IN UNUSED, ABANDONED AND DEGRADED (NON-)AGRICULTURAL LAND AND USE FOR ENERGY AND OTHER NON-FOOD CROPS

ANALYSE DE LA DISPONIBILITÉ RÉELLE DES TERRES DANS L'UE ; TENDANCES DES TERRES ABANDONNÉES OU DÉGRADÉES ET OPTIONS POUR L'UTILISATION DES CULTURES À FINS ÉNERGÉTIQUES ET AUTRES FINS NON-ALIMENTAIRES

Reference: ENER/C2/2018-440

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