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 (*ENER/C2/2018-440*)

Final Event

18 November 2020

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Outline

1. Introduction to the study, trends in land abandonment, key drivers and options for cultivating crops for non-food purposes sustainably on these types of land - Berien Elbersen, WUR
2. The role of policy in bringing land back into agricultural production - Kaley Hart, IEEP
3. The potential of non-agricultural land for growing crops for non-food purposes - Michèle Koper, Navigant
4. Recommendations

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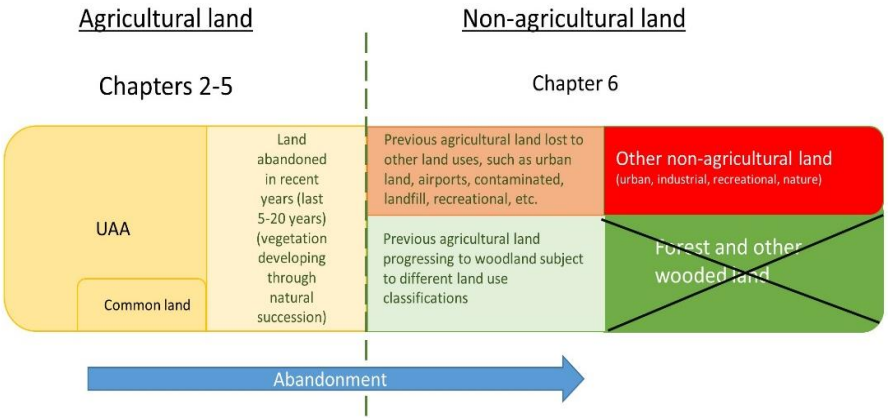
Overall structure and objectives of the study

This study examines the potential availability of land (excluding forest areas) to be used for the sustainable production of cropped biomass for energy or other non-food purposes through:

- Providing data on the trends in the **utilised agricultural area (UAA)** since 1975, current UAA and reasons why agricultural land has become unused, abandoned and degraded.
- Proposing policy measures that can reverse this trend towards unused, abandoned and degraded agricultural land and that can encourage their use for biomass production for energy and other non-food uses.
- Identifying types of non-agricultural land that could be used for biomass production for energy and other non-food uses, alongside policy measures to stimulate this.



Overview of types of land included in the report

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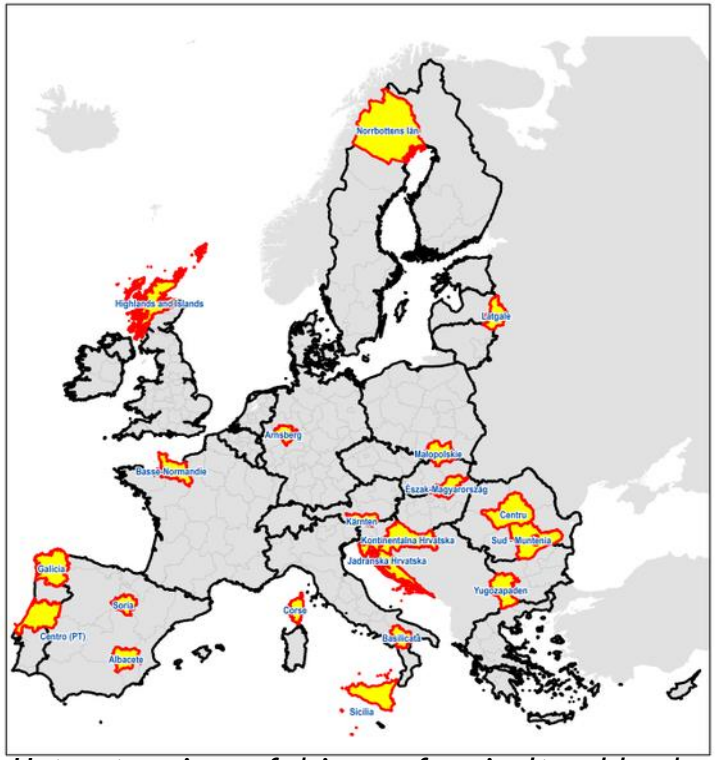
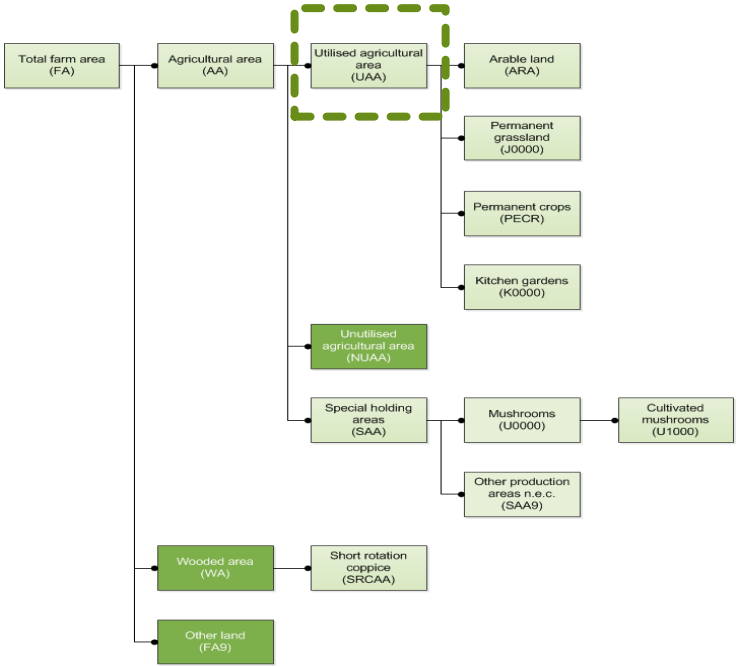
Methodology

- Review of existing data and literature
- For information on agricultural land abandonment and policy options:
  - **9 regional case studies**. Selection based on hotspot mapping of drivers for agricultural land abandonment, representation of the diversity in biogeographical environments and historical and political contexts in the EU
- For information on non-agricultural land options with a potential for dedicated cropping:
  - **Three thematic case studies (closed landfills, PV farms, airports)**

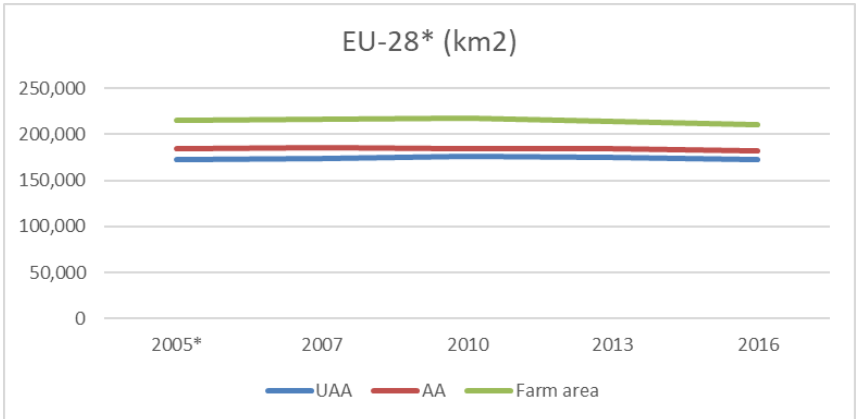


Hotspot regions of drivers of agricultural land abandonment

Definition and recent development in Utilised Agricultural Area (UAA)



Eurostat overview of what is included in UAA, AA and FA



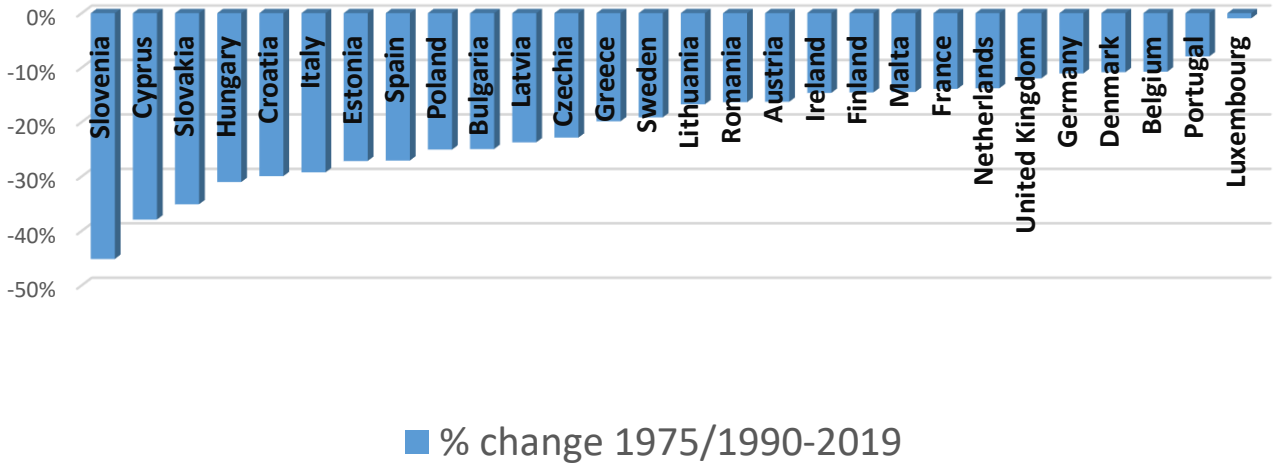
	2005*	2007	2010	2013	2016	% change since 2005
FA	215,746	216,472	217,391	213,446	210,741	**-2**
AA	184,479	185,403	183,960	184,290	182,422	**-1**
UAA	171,996	173,376	175,815	174,358	173,052	**1**
Arable land	*104,717*	*105,072*	*103,923*	*104,203*	*103,142*	***-2***
Permanent grassland	*55,984*	*56,897*	*60,840*	*59,566*	*59,194*	***6***
Permanent crops	*10,872*	*11,015*	*10,703*	*10,303*	*10,505*	***-3***
Kitchen gardens	*426*	*393*	*350*	*286*	*247*	***-42***

Long term development in Utilised Agricultural Area (UAA)

- **Total decline** in UAA for all EU-28 is 36,000 km² (=18% of the UAA in 1975)
- **Large declines in UAA in** Bulgaria (-25%), Czechia (-23%), Estonia (-27%), Greece (-20%), Spain (-27%), Croatia (-30%), Italy (-29%), Cyprus (-38%), Latvia (-24%), Hungary (-31%), Poland (-25%), Slovenia (-45%) and Slovakia (-35%).
- **Small declines in UAA** in Luxembourg and Portugal.

Change in UAA 1975-2016

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



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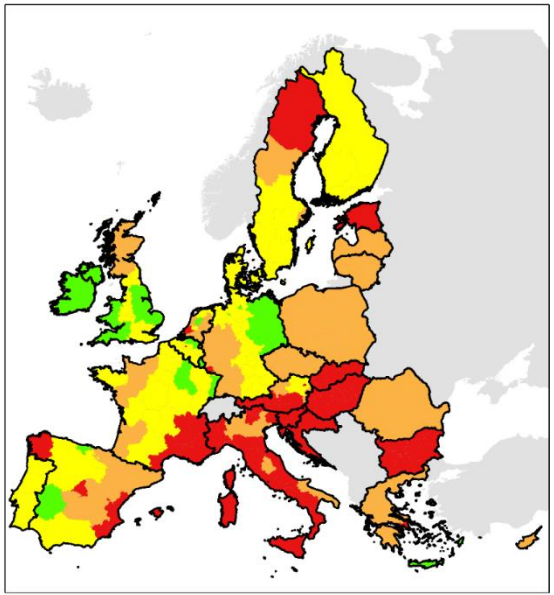
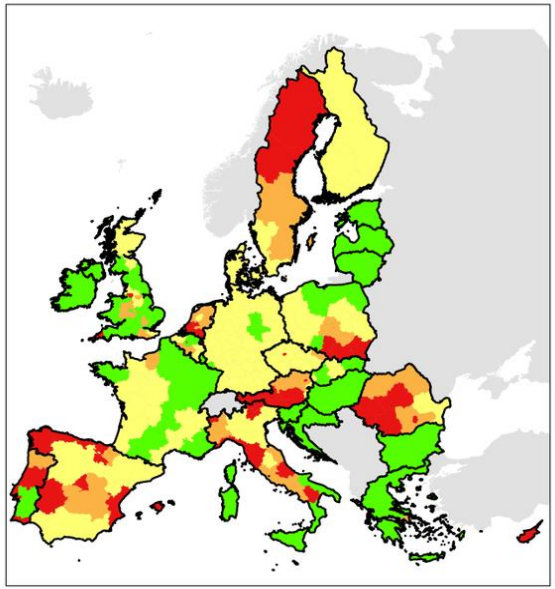
Change in UAA at regional level





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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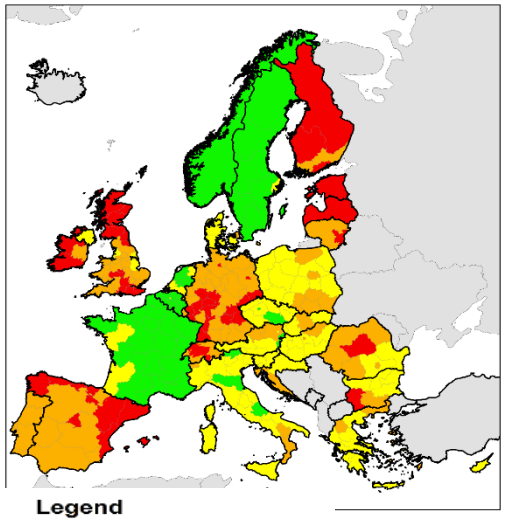
What happened with the agricultural land?

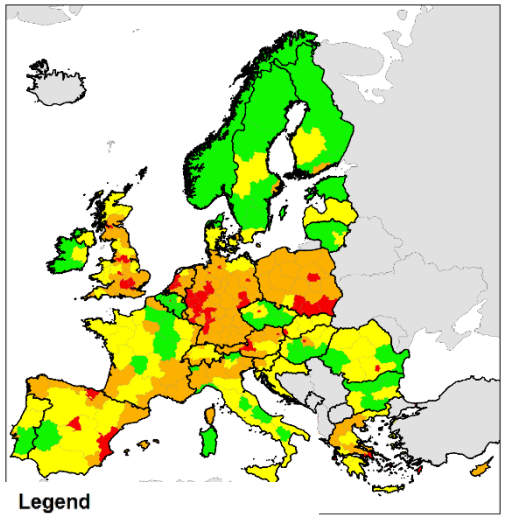
Land conversions until 2018 with reference to agricultural area in 2000

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

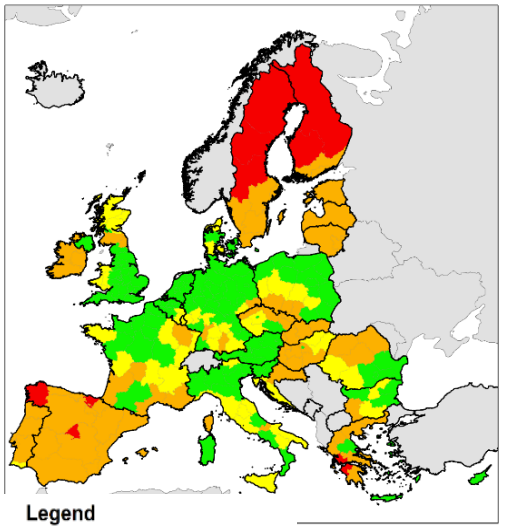
Agricultural to abandonment
(0.6% to N2000 & 2.5% no-N2000)



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



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



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Conclusions on data on UAA changes and data on unused and abandoned lands

Difficult to detect and quantify land becoming unused, abandoned or degraded.

- 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.

Unused a

Utilised Agricultural Area
UAA

Fallow land

in agricultural area, including fallow land which is part of
utine agricultural management and generally required to
maintain crop rotations and sound husbandry

andoned in recent years
ion developing through
atural succession

iously agricultural land
essing to woodland and
ct to different land use
sifications in transition



Degraded lands in EU

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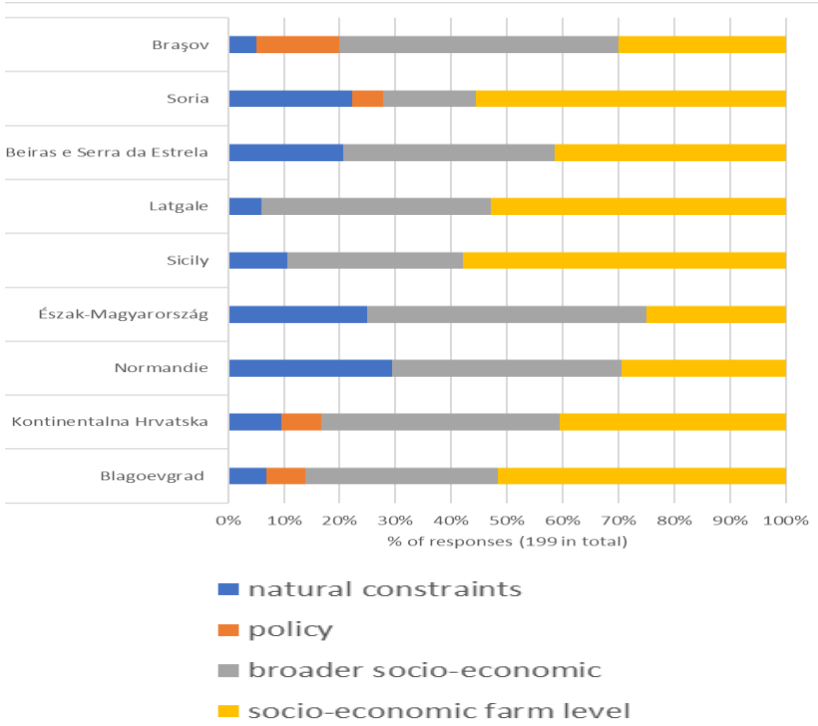
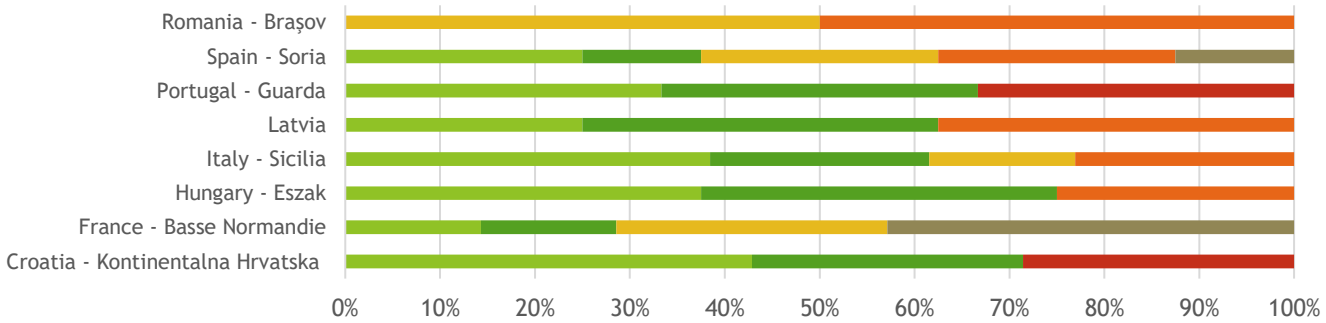
Drivers for land becoming unused, abandoned & degraded

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



Reasons why abandoned lands have not been brought back into production (yet) in 9 case study areas



- Lack of market demand, economic incentives in combination with low expected returns
- Unclear ownership, access to land
- Land fragmentation, small plots, no mechanisation possible
- Too many trees, shrubs, urbanuses, which makes bringing it back to agriculture impossible or not interesting anymore
- Depopulation, ageing and lack of interest and capital among young people to farm
- Not an issue, there is no land abandonment

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

Factor	Case studies *(with examples)*
Economic and financial	**(E)** Market demand, 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). **(H)** No market demand for new (non-food) crops
Technical	**(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	**(H)** Lack of trust and cooperation within supply chain (Hungary). Conflict over use of food crops for energy (France, Croatia). Not enough use of agricultural residues instead (France).
Regulatory	**(E)** Local policy to replace coal with new biomass power plant (Portugal) **(H)** Unclear government policy on non-food industrial crops (Croatia). **(H)** Unclear land ownership and land access, no complete cadaster (Portugal, Croatia, Bulgaria)

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 very effective in reducing soil erosion and building up soil carbon.
- There are several industrial oil crops (producing non-edible oils), that are drought tolerant.
- Non-food crops can be irrigated with waste water (but depending on end use)
- Deep rooting of perennial biomass crops and trees in agroforestry systems help building up of below ground biomass and facilitate access to water resources particularly in arid circumstances.
- 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.

Environmental barriers for bringing unused lands back into use

- Management in a crop, particularly an annual will imply more soil disturbance and therefore higher risk for loss of nutrients and carbon through wind and run-off erosion.
- Effect on soil carbon by crops very much dependent on the land use before. Clearing and tillage of grasslands, on long abandoned lands with dense shrub and/or forest vegetation or wetlands, for the purpose of crops results in serious declines in carbon (both above and below soil). Perennials are better able to compensate this, but still a challenge.
- In drought prone areas additional establishment of crops may increase unsustainable water use (irrigation, deep rooting systems)
- A shift from vegetated abandoned lands to rotational arable will diminish shelter and breeding opportunities for mammals and birds and will diminish the floristic diversity that was present in the abandoned land.
- Any shift from abandonment to cropping will generally lead to increases in input uses, more mechanisation and changes of landscape structure. This can have negative implications for habitat quality and landscape structure, but depends on crop and specific regional context.
- If degraded lands are exchanged with perennials, the effects for biodiversity could be beneficial.

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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 identified were:

EU	National
Common Agricultural Policy (CAP) Pillar 1 EAGF Pillar 2 EAFRD	Legislation to maintain agricultural land in active productive use Legislation addressing farm structure and land tenure issues Financial instruments, such as land taxes or preferential rates for loans Land use/development control and land zoning policies

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How does policy influence land abandonment?

- The focus of these policy instruments is rarely to address issues of land abandonment or land degradation OR at promoting the cultivation of crops for energy or non-food uses
- Therefore they are not generally targeted at hotspots of abandonment or at the cultivation of these types of crops
- Where they coincide they can help counter the drivers of land abandonment:
  - They tend to address these issues through supporting the viability of the agricultural sector and maintaining a diverse set of farm types and structures
  - A few focus on: maintaining particular types of production; generational renewal; land tenure
  - In some cases, specific efforts are made to bring land back into production via CAP and national measures, but fairly localised effects
- The sustainable management of agricultural land is not a key consideration of the majority of the relevant policy tools (with some exceptions)

The role of policy in incentivising biomas 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 and other non-food purposes
  - 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.

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In summary…

- 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
- It is not necessarily sustainable to bring land back into production:
  - Processes are limited for determining the climate and environmental implications of doing so
- 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

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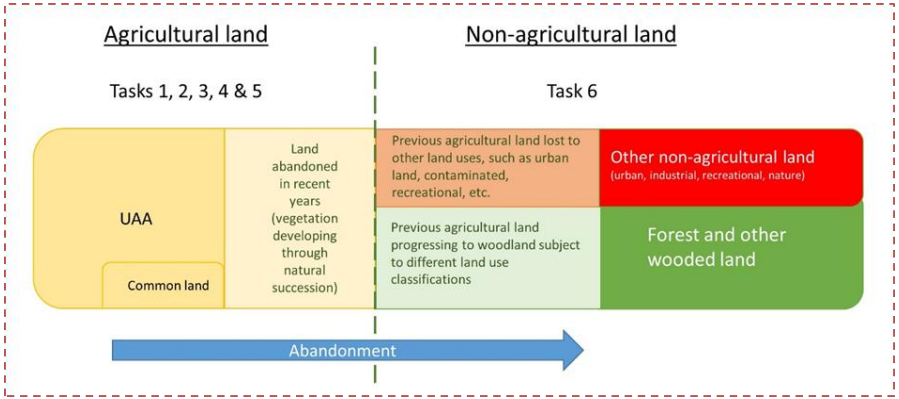
Potential of non-agricultural land for biomass production

- Brief assessment to identify potential for biomass production outside the current agricultural setting
- A range of categories of non-agricultural land reviewed to identify those potentially interesting for biomass production based on:
  - Order of magnitude
  - Barriers and opportunities (e.g. feasibility for conversion, financial viability, competing uses)
- For the three most interesting categories a case study was done to dive into barriers/opportunities and provide existing examples.



Results of inventory of potential non-agricultural land categories

Category group	Category	Description	Land availability	Most relevant regions	Economic	Policy and regulation	Ongoing initiatives	Environment	Public perception	Other
Brownfield	Closed landfills	Former landfills that are not operational	High	DE, IT, UK, GR	+	+	+/-	++/-	++	
	Closed coal mines	Former opencast coal mines that are not operational	Low	PL, DE, BG, RO	++/-		+	++/-	++	
	Closed quarries	Former aggregate mines that are not operational	Medium	PL, DE, FR, UK, IT	+/-		+/-	++/-		
	Closed mining waste facilities	Tailings and waste from extractive mining	High	CY, CZ, EE, EL, ES, FI	+/-	-	++	++/-	++	
	Brownfields general	Previously developed or derelict land, including contaminated land	High	EU-28	+/-		+	++/-	++	
Abandoned agricultural land	Desertified land	Degraded land in drylands, including former agricultural land	Medium	PT, ES, EL, IT	+/-		+/-	-		
	Saline land	Degraded land due to soil salinisation	High	FR, ES, HU	+/-		+	+/-		
Infrastructure landscaping	Roadside	Reserved area on the sides of paved roads	High	EU-28	- -		+/-			
	Railside	Reserved area on the sides of railroads	Medium	GE, FR, PO, IT, UK, ES	- -		+/-			
	Green city planning	Planned green spaces in urban areas	High	EU-28		+/-	+/-	+		
Combined business	PV farms	Agriphotovoltaics (combines biomass production with utility scale PV farms)	High	GE, IT, UK, FR, ES, NL, BE	+/-		++			-
	Airports	Reserved and uninhabitable area not needed for airport operations	Medium	EU-28	++	-	-	+		
	Military terrain	Land for military training not necessary for permanent operations	High	EU-28	++	-				+

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Potential of non-agricultural land for biomass
Case 1: Airport land

- Large areas available around the operational aviation zone
- Effective wildlife management at airports is a minimum requirement.
- Consultation/review by European Aviation Safety Agency (EASA) would be required

Source: SA Water

Barriers	Opportunities
Airport farming poses an additional risk to aviation.	Airport farming could be financially attractive to airports due to several reasons.
Airport farming can attract wildlife to airport land which is a substantial threat for aviation due to wildlife collision damage.	Crops on airports could remediate several adverse effects of aviation operation, such as sound and chemical pollution.
	Available land on airports is comparatively large and easily accessible, which makes bioenergy production more feasible.
	Airport farming could dampen the negative effects of extreme weather events, reducing financial loss of delayed or cancelled aviation operations.

Potential of non-agricultural land for biomass
Case 2: Agrophotovoltaics (APV)

- Combining agricultural practices with photovoltaic electricity production on the same surface area
- Increasing future potential with more deployment of PV systems

Configuration of PV arrays in APV Research Plant in Heggelbach, Germany.

Raspberry farm with PV arrays as protective roof. Babberich, the Netherlands.

Barriers	Opportunities
The investment costs of APV costs are significantly higher than utility-scale PV systems.	APV systems show great potential to increase the value of land.
Electricity from APV systems is currently not price competitive due to higher installation cost.	The area potential for APV in EU-28 is large, around half a million hectares.
Uncertainty about the ownership of land can hinder the implementation of APV systems.	APV could be used to restore degraded soils, on arid or semi-arid land.
	PV arrays can protect crops from direct sunlight and from extreme drought, heat, hail and rain. APV systems could therefore reduce the farmer's risks of crop failure.
	Vegetation cooling the PV arrays from below improves PV efficiency.
	An APV system with energy crops could have a lower carbon footprint than a usual large PV system.

Potential of non-agricultural land for biomass
Case 3: Closed landfills

- European vision for closed landfills would be beneficial
- Large surface but scattered over Europe
- Sometimes only temporarily available

FCC Environment reaps energy from landfill sites

Barriers	Opportunities
Soil pollutants and poor soil quality could lead to low yields or biomass quality issues.	Energy crop production on closed landfills is an ideal temporarily use until more permanent solutions are found for remediation.
Operational costs are expected to be relatively high due to smaller and sub-optimal geometry of the patches and necessary soil fertility treatment.	The accessibility of closed landfills is a great benefit to their integration into supply chains.
	Energy crops could remediate the soil and prevent or decrease environmental risks associated with closed landfills like leakage.

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4. **Recommendations**

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Recommendations for data improvements

- Differences in definitions for agricultural, forest and agroforestry areas lead to inconsistencies in FSS data reported by Member States. Establishing greater uniformity in the rules on tree cover levels and clarifying the definition of agroforestry areas is needed.
- 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.
- Degradation both on agricultural and other land should be recorded in statistical or spatial data sources.

Recommendations for policies

- 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.
- The appropriate mix of CAP interventions to support the sustainable management of land in combination with addressing the wider societal issues (poverty, social exclusion) is needed. Integration of the CAP with funding from the Structural Funds could provide resources.
- Agroforestry systems have the potential to deliver multiple ecosystem services, including biomass provision. Support to agroforestry needs to be increased to make competitive with afforestation support.
- 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.
- Better coherence needed between the different policies of influence on biomass delivery chains, climate and CAP policy and Structural Funds.
- 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.

Thank you for your attention!

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