

EU CAP Network Focus Group

Recovery of abandoned agricultural lands

Starting Paper - Report



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1. Introduction: setting the scene

Agricultural land abandonment represents one of the major land cover and land use changes in Europe since the 19th century, especially in mountainous areas and semiarid environments. In these marginal areas of Europe, agricultural land abandonment is an ongoing process which increases with globalisation in food systems, and has severe consequences in the short as well as in the long term. According to the Joint Research Centre, about 20 million hectares (11 %) of agricultural land in the European Union (EU) is under high risk of land abandonment. And around 30% of agricultural areas in the EU are under at least a moderate risk of land abandonment (Andronic et al. 2020). Such areas exist in almost half of EU Member States. The countries that are most severely affected by higher levels of land abandonment (nearing 30% of areas with high or very high risk) are Austria, Cyprus, Estonia, Finland, Greece, Latvia and Romania. Despite an encouraging trend since 2013 effective agricultural land abandonment in the EU-27 might total 5 million ha by 2030, or 2,9 % of the current Utilised Agricultural Area (173 million ha) (Andronic et al. 2020).



Remote areas, mountains, islands, coastal and sparsely populated areas are particularly affected by the phenomenon. The prevalence of low and high risk of agricultural land abandonment is not particularly dependent on the type of land cover, but rather on the geography, i. e. on the location as remote, mountain, island and sparsely populated areas. In contrast, heterogeneous small-scale agricultural areas where the mosaic of land cover types is prevalent, are affected by high risk irrespective of their location or geography- because production outcomes are typically less competitive in an increasingly globalized market.

Fig.1 – Remote rural area, Southern Portugal: high risk of land abandonment due to shallow soils, dry Mediterranean climate and remote location in a low populated area losing population every year
 Source: own authorship

Agricultural land abandonment is a term commonly used to describe uncultivated land, which means land was used for agricultural purposes until recent times but currently not anymore cultivated, with a noticeable cover of shrubs. It is commonly understood as land not subject to any cultivation practice nor intended for grazing, and often ends up being neglected land (Leal Filho et al. 2017; Pinto-Correia 1993, 2000; Verburg et al. 2010; Weissteiner et al. 2011). Agricultural land is abandoned as an economic resource when it ceases to generate any income flow for businesses or households and the opportunities for resource adjustment through changes in farming practices and farm structure are exhausted. Agricultural adjustment may be limited by traditional attitudes, inflexibility in production and fragmented



structures and if alternative, more profitable uses cannot be found (e.g. forestry, recreation) land is abandoned from productive use (Macdonald et al. 2000).

Agricultural land abandonment is one possible outcome of a process of marginalisation driven by a combination of socioeconomic, political, environmental and institutional factors, acting at different scales and by which certain areas of farmland cease to be viable under existing use and socio-economic structures. These factors play together, each one with more or less intensity and always intertwined (Dolton-Thornton 2021; T. Lasanta et al. 2017). The most visible consequence of land abandonment is the beginning of plant succession, leading to revegetation in vast areas, which provokes environmental, landscape and socioeconomic impacts. These impacts affect not only the abandoned area and its local population but also society as a whole, which feels the impact in the production of goods and services by agricultural land as they are threatened by the abandonment (Fisher, Turner, and Morling 2008; Godinho et al. 2016).

Agricultural abandoned land refers to land that was previously used for farming purposes and is now no longer managed. The soil stops being managed or used and vegetation cover is left to its own dynamics, often resulting in a certain degree of coverage with shrub. Land abandonment refers to land which has not been actively converted into forests or transformed for other uses, but instead is subject to a gradual natural process of transitioning from agricultural land to shrubs and eventually forests. *(definition of land abandonment adopted for the purpose of this FG)*

The causes of agricultural land abandonment are complex and often diverse environmental, agronomic, social and economic factors interact (Dolton-Thornton 2021). We can mention a few, from the most obvious to those which only occur in some regions. There are changes in the food system, mostly its globalisation, which leads to specialisation and rationalisation of land use – and as a consequence production is concentrated on the most fertile, well equipped and well-structured farmland, while less productive land may be abandoned. There are institutional factors, focusing on productivism and market globalization, resulting in pressures on less competitive farm systems in peripheries at multiple scales (Dolton-Thornton 2021). Policies as agri-environmental policies within the CAP (Common Agricultural Policy) are not enough to reverse this trend (Dolton-Thornton 2021).

There are processes of expansion of urban or touristic areas, , that result in pressure for urbanization of additional former agricultural land, even though planning efforts aim to limit urbanization areas; as a result, the former agricultural areas may be abandoned while expecting urbanization. Depopulation of remote rural areas results from rising urbanisation of our societies and changes in labour market, which reduces demand for land use in these places and, as a result, the consequent land abandonment. Cultural models are becoming more globalized, s which has decreased the appeal and increased the difficulty of the lifestyle associated with extensive farming systems in remote (isolated) farm areas, – leading to abandonment of these marginal areas. The recent back to the rural movements of urban people in search of a new life who are (re)discovering these areas, does not fully occupy the areas left over by those who depart.



At the local level, the start of the agricultural land abandonment process may be caused by structural or institutional factors, as parcel size, shape, location and accessibility, slope, and property structure overall. Or other factors hampering competitiveness, like on-site soil degradation processes such as extreme compaction, soil erosion, soil organic carbon depletion, or salinisation.

Agricultural land abandonment has many different dimensions and the **process and speed can vary a lot in different regions**. There is also an issue of **scale**: in some regions land abandonment may affect large shares of the agricultural land, while in others it only concerns small areas of marginal land. This makes quite a difference in terms of impact of the land abandonment.

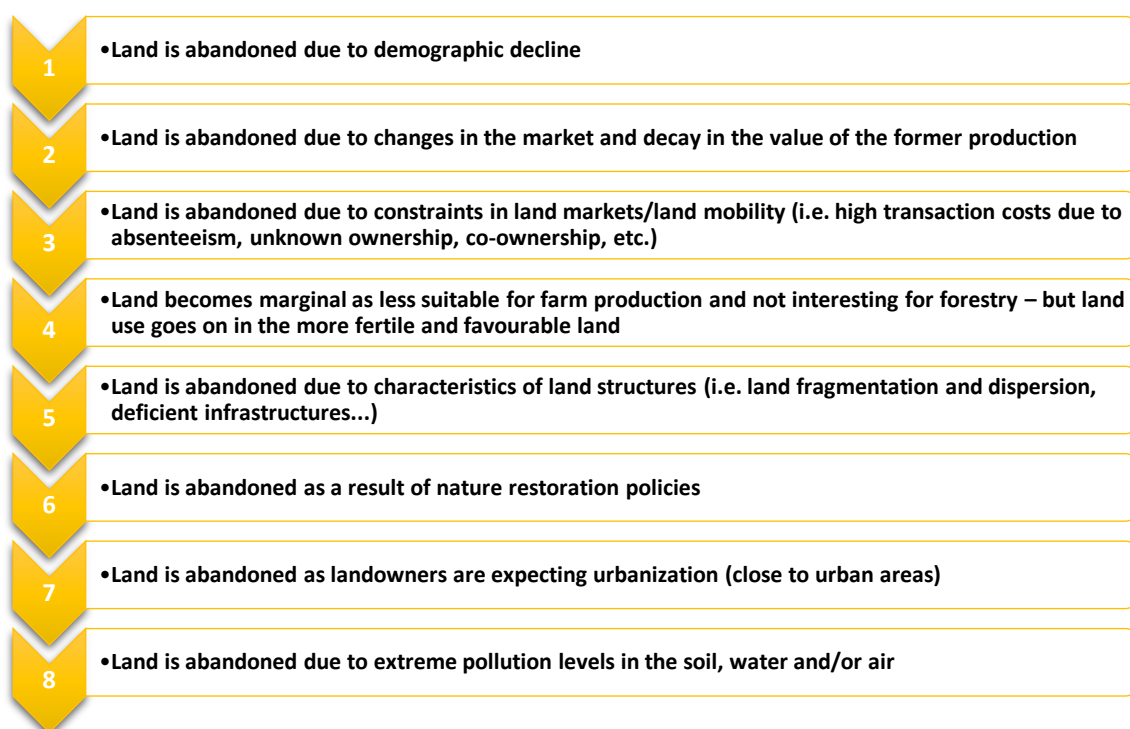


Fig.2: The most important reasons of land abandonment identified by FG experts, by order of importance, being 1 the most cited and 8 the less. In agreement with literature, the fundamental reason identified by experts is related to demographic decline.

Source: processed data from the questionnaire

As for impacts, they are also multiple (Dolton-Thornton 2021; Lomba et al. 2020; Terres et al. 2015). Rigid assessments of land abandonment as negative or positive, often found in literature, are to be avoided.

On the one hand, land abandonment has long-term **positive effects**: halting soil erosion, decreasing soil salinisation levels and regenerating the formation of soil horizons and so increasing soil functioning and ecosystem services. Therefore, abandoned agricultural lands can potentially contribute substantially to dealing with farming challenges such as climate change, biodiversity loss or deforestation (Barnaud et al. 2021). However, to speed up these processes, different innovative restoration strategies and methods are needed. Such benefits



will be registered in the long term, mostly in regions dominated by specialised farming and other land uses, where abandonment is not a large-scale process (Andronic et al. 2020).

On the other hand, agricultural land abandonment can have **negative effects**. This impact is often context-specific, e.g., wildfire frequency and intensity, nutrient cycling, carbon sequestration, cultural landscape values, and water balance (Terres et al. 2015). In the most fragile soils, it can accelerate soil degradation and compaction. Shrub encroachment can also exponentially increase the risk of extreme fire events – not only in Southern Europe where summer fires are well known, but also in other parts of Europe where climate change has led to drier summers and forest fires which were not common before. These fires in turn increase soil degradation, reduce soil organic matter and soil CO₂ storage capacity.

The EU Mission: A Soil Deal for Europe, highlights the need for innovative ways to prevent and remediate soil degradation in abandoned land. Furthermore, climate change does reinforce the negative impacts of land abandonment, in what relates to fire risks. Climate change creates global risks and it is one of the key challenges for humanity, in terms of impacts and likelihood of backdrop of worrying geopolitical and environmental tensions (World Economic Forum 2019). 2021 and 2022 have registered previously unseen climate phenomena in



Fig.3: Shrub encroachment in former high-altitude pastures in a mountain landscape, and summer wildfires in the same mountain – wildfires grow in magnitude, as the available biomass increases with shrub encroachment and forest fragmentation by open areas, disappears (Serra da Estrela, Portugal)

Source: own authorship

Europe, which should act as an outstanding alarm for the urgency of a paradigm shift to occur in the way we use the natural resources, including land.

Examples from different places in Europe show how former agricultural land with decaying production interest, which has been abandoned or faces high risk of becoming abandoned, has been used already since the end of the 20th century, for tree production by afforestation. And more recently for energy production, with the installation of large scale photovoltaic power plants. Both approaches, despite their benefits, may also involve some risks. Afforestation of marginal agricultural land is often monospecific and results in a simplification of the landscape, a loss of biodiversity and cultural values and increased fire risks – with higher intensity with progressing climate changes. Afforestation of former agricultural land has also shown frequently to be unsuccessful in terms of tree growth rates, due to the limitations created by poor and degraded soils quality. The photovoltaic power plants have spread in



recent years in Southern Europe, with no or little control by planning instruments. They result not only in a simplification of the landscape, but also in a sudden artificialization of the land cover, decay in landscape customary user rights, and severe impacts on the wellbeing of those who live in the villages surrounded by the energy producing panels. These are trends which reinforce the negative impacts of land abandonment and make recovery impossible, and therefore are far from being a solution to be generalised.

2. Focus Group main question and tasks

This Focus Group aims to promote innovative and sustainable maintenance and restoration strategies and showcase best management practices for reclaiming abandoned agricultural land. It will also discuss how to overcome barriers that hinder the re-use or regeneration of abandoned land.

As Focus Groups are to provide new and useful ideas to solve practical problems, catalyse innovation and spread knowledge on existing good practices, this FG will not focus on policy instruments or their implementation.



Fig.4: Member State where FG experts come from, covering EU from South to North and East to West;

Source: own data processed by <https://www.mapchart.net/>

The Focus Group will carry out the following tasks:

- Collect and highlight best practices, approaches and methods in the process of reversion of land abandonment.
- Identify different types of land abandonment and the challenges and opportunities for those dealing with land abandonment in each type of context.
- Bring innovative approaches and solutions to the regeneration process and re-use of abandoned land.
- Suggest adequate socioeconomic and environmental management practices for abandoned land to decrease the risk of soil degradation.
- Identify further research needs from practice and possible gaps in knowledge.
- Suggest innovative solutions and provide ideas for EIP-AGRI Operational Groups and other innovative projects.



The main question of this FG is
**How to foster new, practical
ways for better management
of abandoned agricultural land
in a sustainable way?**

In this line, the expected outcomes are:

- a) Selection of best practices in different contexts, with adequate socioeconomic and environmental management practices for reversion of land abandonment.
- b) Identification of challenges and opportunities in the different contexts of land abandonment in the European Union, considering local contextual differences (mountain areas, peri-urban areas, remote areas) as well as possible macro-regional differences (ex. Mediterranean, Eastern Europe, Scandinavia).
- c) Innovative solutions to the regeneration or re-use of land abandoned considering the decrease in soil degradation risk.
- d) List of connected research needed to enforce the design and implementation of solutions.

3. Agricultural land abandonment across EU: different challenges in different contexts

The most known process of land abandonment can be seen as one particular branch of the **large and multifaceted challenge of rural depopulation in Europe** (Dolton-Thornton 2021), and therefore regions mostly affected by depopulation are those where land abandonment is more prone to happen, affecting significant parts of the former agricultural land. Abandonment affecting land in regions affected by rural depopulation and ageing is also the abandonment occurring at larger scales, both spatial and temporal. The literature shows the particular vulnerability to marginalisation and abandonment, on one side, **of small scale farms, and on the other, of extensive farming systems** (Macdonald et al. 2000; Pinto-Correia, Barroso, and Menezes 2010). These types of farming systems dominate in mountain zones, where extremes of remoteness and physical disadvantage reduce competitiveness and place severe limits on technical and structural adaptation. Furthermore, socio-economic and demographic conditions play in the same sense: depopulation and migration has been ongoing for decades; access to basic services as healthcare and schools can be difficult; and mountain people may be less adaptable due to age, constraints on skills, and ingrained tradition. Extensive and large-scale systems, as livestock grazing with low levels of productivity and harsh working conditions, are found also in marginal land outside mountains such as parts of Ireland or Iberia, and can be subject to abandonment, with slightly different characteristics than mountain areas. Extreme remoteness does also affect other regions of



Europe, the margins, as Scandinavia, parts of Eastern Europe and some islands (Pinto-Correia 1993; Primdahl, Pinto-Correia, and Pedrolí 2019).

Since the last decades of the 20th century, abandonment driven by the **end of the communist regime in Central and Eastern Europe** has taken place. The dismantling of state-controlled economies, the withdrawal of governmental support, and the implementation of open markets has drastically changed socio-economic conditions in post-Soviet countries, leading to the abandonment of large areas formerly in use as state farms (Prishchepov et al. 2013). These are also large-scale processes, affecting one particular macro region of Europe.

In this Focus Group, one of the expected goals is the differentiation of the agricultural land abandonment processes that have occurred or are occurring in Europe today, at different spatial and temporal scales and in different contexts – and if and how such differences require differentiated recovery strategies and tools.

Semiarid areas in Southern Europe have also seen an important extent of abandoned land over the last few decades – in this case due to the poor competitiveness of the extensive farming systems, in an increasingly globalized

food system (Primdahl et al. 2019). The macro regional context plays a role, in the time and spatial scale of the land abandonment process (Carvalho-Ribeiro et al. 2016; Guiomar et al. 2018; Terres et al. 2015) and different characteristics of land abandonment need to be considered if well targeted solutions are to be designed.

The literature is much less fertile in cases showing the land abandonment close to urban zones and as an effect of **real estate pressure**. In any case this type of land abandonment affects relatively small areas, in relation to those affected by large scale trends described above. The real dimension of this process is not described in literature and a more precise estimate at this stage requires expert assessment.

4. Valuing gains and losses in ecosystem services

Besides its influence on biodiversity, land abandonment has a range of consequences for ecosystem functions and the provision of ecosystem services (Barnaud et al. 2021; Bouma, Pinto-Correia, and Veerman 2021).

The implications of land abandonment on **ecosystem services** depends on one side, on the extension and range of the land abandonment itself, and on the other, on the conservation status of the area, agro-climatic conditions, and local factors.

Lasanta et al. (2015) summarize the negative impacts: (i) uniform landscapes through the loss of farmland; (ii) a higher risk of starting and propagating fires because of increased plant biomass from plant succession; (iii) reduced biodiversity in the medium and long term, at the same time as open spaces disappear with the advance of scrub and forest, causing the disappearance of species adapted to man-made environments; (iv) a reduction in river flows and less water in basins, relating to lower runoff coefficients due to increased vegetation (higher interception and consumption), which is very important in Mediterranean areas where water is a scarce resource; (v) the loss of cultural landscapes and management techniques required for their conservation, as they constitute an almost perfect symbiosis between



nature and human management; (vi) the loss of arable land and pastures, which could be essential for the sustainable development of mountain communities.

Positive impacts relate to rewilding, meaning increased natural vegetation and therefore enhanced biodiversity, when land is abandoned in some specific areas, included in a context of large scale intensive and specialised agriculture (Pinto-Correia and Primdahl 2012; Primdahl et al. 2019). Prevention of soil erosion and increase in organic matter may also be results of land abandonment that can be positive in certain contexts (Bouma 2021).

The scope and extent of environmental impacts vary over time and location. The ecosystem services framework can help assessing which are these impacts and comparing across cases and types of land abandonment. Proper indicators, scientifically sound and easily applicable with the existing data sources, are needed (Wiget, Muller, and Hilbeck 2020). The indicators that are used to assess ecosystem services related to land abandonment need to be systematically identified.

The CICES (<https://cices.eu/>) is the **Common International Classification of Ecosystem Services** developed from the work on environmental accounting undertaken by the European Environment Agency (EEA). From the CICES a list of ecosystem services can be drawn, considering the different categories already widely accepted by the scientific and policy spheres: a) Provisioning; b) Regulation and Maintenance; c) Cultural. However, as identification and quantification of impacts is not a priority of this Focus Group, this approach is not expected to be further explored. The **Ecosystem Services framework** stays as a possible supporting tool for future analytical approaches for assessing impacts of land abandonment.

5. Examples of good practices

In the questionnaire sent prior to the first meeting experts of this FG have identified a wide range of good practices to refrain or recover land abandonment:

- Changing power and income distribution in the value chain of products based on endogenous resources, including certification of origin, returning higher value to the areas prone to be abandoned and both land managers and processors;
- Regroupment of land from small parcels to larger areas, to facilitate mechanization and management, for example grazing by larger collective flocks in relation to grazing with small individual flocks;
- Land banks for easier access to land, for more rationality of production of those who stay in farming or attracting return-to-the-land;
- Training and knowledge transfer to those managing the land aiming for new innovative practices and value chain integration;
- Acknowledgment of the intrinsic values and ecosystem services supported by the communities who live and take care of marginal areas, increasing their self-esteem and business opportunities;
- Participatory processes involving all types of stakeholders and leading to shared strategies and initiatives and their follow up;



- Targeted public policies, at multiple scales, supporting land use systems and rural communities in areas sensitive to abandonment.



Fig.5: The most relevant conditions for recovery to be possible, as selected by FG experts through keywords. Higher income seems to be the most evident, but interesting is also that technology and societal appreciation are named as many times as political support or will and solving questions about land structure and availability.
Source: processed data from the questionnaire

More in detail, some examples of good practices already in place and where results, with success and drawbacks, can be identified and illustrate a future oriented discussion.

Overcoming barriers to keep production in small scale farming

Formalized co-operation between neighbouring farmers, encouraged by a special national policy to improve the economic situation of small farms, helps keeping in business small farmers therefore avoiding abandonment. The farms are located in a mountainous area meaning a shorter growing season, but good conditions for grass production. The farmers take pride in delivering everything to the national dairy and meat cooperatives, but these farmers have special attention of public policies as they keep important sites for traditional farming values, cultural landscapes and maintenance of agricultural soils.



Hedmark, Norway

Lesson learned: cooperation as a strategy, importance of public support

Enhancing value of small-scale farm products by territorial bindings



Territorial and ‘place-based’ approaches to food systems, with the reinforcement of territorial and local bounds in between production, processing, and consumption, reinforce the status and the economic viability of small farms – therefore preventing that these small farms are abandoned, or transformed into purely residential farms without production.



Romania, Portugal, Latvia

Lesson learned: enhancing local bindings and place based valorisation of practices and products as way to keep small farming active

Targeted policies that secure land is kept under farm management

Coupled payments have been in place for cattle/sheep/goats on alpine pastures, since 2014 as coupled payment of CAP with approx. 2 M€/year. 95% farmers with alpine pastures participate in this measure. Farmers do not receive the payment if they just possess/cultivate the alpine pasture, they have to put cattle/sheep/goats for at least 60 days per year on it which is an effective and economically attractive to prevent scrub encroachment etc. The main goal is therefore the continuation of appropriate cultivation of land (alpine pastures) that otherwise (without coupled CAP payments) would not be cultivated anymore.



Austria

Lesson learned: Importance of targeted policy tools designed to prevent abandonment under the local specific circumstances

Support to young entrepreneurs in marginal conditions

In Italy there is a non-profit program organized yearly by a foundation from Genova, the Garrone Foundation. The program is called "Restartapp", and it consists of a business incubator for young entrepreneurs with business ideas involving rural/marginal lands. The program offers a free 3-month business course (complete with paid accommodation) as well as a business competition with monetary prizes for the winners.



Italy

Lesson learned: (not indicated)

Land bank in Latvia

To reduce agricultural land that is not maintained, the Latvian Land Fund, managed by the "Development Financial Institution Altum" promotes the protection, availability and preservation of agricultural land resources, with efficient and sustainable use, at the national level. Altum offers several types of transactions related to agricultural land. Currently, 6,407 ha of agricultural



land have been leased for agricultural activities. All leased real estate, as well as those for which repurchase agreements have been concluded, are owned by the Latvian Land Fund. In addition, the Latvian Land Fund offers repurchase transactions and land exchange. The annual rental price of the property and the purchase price of the property are determined in the concluded contract.



Latvia

Lesson learned: Flexible land rights and land access can help preventing land from being abandoned

Land bank in Galicia

The Land Bank of Galicia, at regional scale, was created and managed by the regional government to connect owners and applicants for agricultural plots. There is a new legal instrument created by the regional government to recover abandoned farmland with the agreement of most of the owners (70% of the area), the possibility to carry out land consolidation, and the intermediation of the public administration to sell or rent the land to farmers. There is also a tool called Model Villages, through which local (municipality) and regional administrations and owners collaborate to rent the abandoned farmland surrounding a rural settlement to one or a few farmers.



Galicia, Spain

Lessons learned: Flexible land rights and land access can help preventing land from being abandoned

Result based agri-environmental payments to maintain farm practices

In the Burren, the recovery programme was initiated by the School of Agriculture in University College Dublin, motivated by concern for the loss of the internationally important high nature-value limestone grassland of the region. Every effort was expended in securing the genuine participation of the farmers. The project has launched a result-based payment in the agri-environmental scheme of the CAP, targeted payments by environmental results, in opposition to measures targeting practices. This has gathered farmers in taking care of their land and discussing practices and results. The project was small-scale at first, but has grown over time to become an essential element of farming in the region.



The Burren, Ireland

Lesson learned: Result based payments can have long term impacts on marginal farm systems resilience



Adding value to the product but not with a territorial linkage

In this mountain area, decrease in altitude grazing is due primarily to a decay in the number of shepherds and number of sheep and goats, leading to pastures abandonment and shrub encroachment. Transhumance as been reduced to a minimum. Accentuated by climate change, this also increases fire risk. In 2022 alone 26000 ha burned during fired season, 10 000 within the Natural Park of Serra da Estrela. There is a DOP (protected designation of origin) cheese made exclusively with raw milk from native, rustic sheep breeds, which is the most important territorial asset in this area. To obtain the DOP classification sheep must be produced under extensive and outdoor grazing – but no requirement is made as to the altitude of the pastures. Therefore, shepherds have opted for using improved pastures and fencing their land in the lowlands, closer to the settlements, where land has been made available by a decrease in the production of annual crops. But land abandonment in altitude continues – as the sheep are now grazing in the lowlands.



Serra da Estrela, Portugal

Lesson learned: If there is a mismatch between value chain policies and territorial policies then adding value to a regional product may not prevent or revert land abandonment.

Added value through marketing initiatives

ALMO, “Almochse” (in English ox from alpine pastures) is a successful food quality and production scheme for approx. 500 alpine farmers from the federal country of Styria. These farmers produce their oxen according to ALMO quality standards (from May to October on alpine pastures, born raised and slaughtered in the region, GMO-free, 2 to 3 years old) and receive in return a premium price for their products (oxen) as ALMO has contracts with different retailers and restaurants. Premium price via marketing added value of keeping alpine pastures cultivated.



Styria, Austria

Lesson learned: With dedicated marketing, change is possible. Each portion of ALMO meat save 50 m² alpine pastures from land abandonment

6. Concluding

This starting paper is to be read as both an inspiration to foster the debate in the first meeting of the Focus Group, and as shared information to establish the first links between all participants.



Main questions to reflect on in the first meeting of the Focus Group include:

- How accurate is the land abandonment definition as proposed in this starting paper?
- Is the differentiation of land abandonment scale and types identified accurate or which ones are missing?
- What are the main challenges and opportunities in different types and contexts of agricultural land abandonment?
- What are the best practices for recovery of abandoned land (or in high risk of abandonment), and requirements for their possible expansion, where and how?
- What are the research needs to support more informed strategies to prevent abandonment?

Teresa Pinto-Correia - Évora, January 2023



References

- Andronic, C., C. H. Hsiung, A. Münch, B. Schuh, T. Dax, I. Machold, K. Schroll, and S. Brkanovic. 2020. *The Challenge of Land Abandonment after 2020 and Options for Mitigating Measures*.
- Barnaud, Cécile, Anke Fischer, Sam Staddon, Kirsty Blackstock, Clémence Moreau, Esteve Corbera, Alison Hester, Raphaël Mathevet, Annie McKee, Joana Reyes, Clélia Sirami, and Antonia Eastwood. 2021. "Is Forest Regeneration Good for Biodiversity? Exploring the Social Dimensions of an Apparently Ecological Debate." *Environmental Science and Policy* 120(September 2020):63–72.
- Bouma, Johan. 2021. "How to Realize Multifunctional Land Use as a Contribution to Sustainable Development MULTIFUNCTIONALITY IN RELATION TO THE UN SUSTAINABLE." *Frontiers in Environmental Science* 9(February):9–12.
- Bouma, Johan, Teresa Pinto-correia, and Cees Veerman. 2021. "Assessing the Role of Soils When Developing Sustainable Agricultural Production Systems Focused on Achieving the UN-SDGs and the EU Green Deal." *Soil Systems* 5(56).
- Carvalho-Ribeiro, S., T. Pinto Correia, M. L. Paracchini, B. Schüpbach, A. Ode Sang, V. Vanderheyden, A. Southern, P. Jones, B. Contreras, and T. O’Riordan. 2016. "Assessing the Ability of Rural Agrarian Areas to Provide Cultural Ecosystem Services (CES): A Multi Scale Social Indicator Framework (MSIF)." *Land Use Policy* 53.
- Dolton-Thornton, Nathaniel. 2021. "Viewpoint: How Should Policy Respond to Land Abandonment in Europe?" *Land Use Policy* 102(January):105269.
- Fisher, Brendan, R. Kerry Turner, and Paul Morling. 2008. "Defining and Classifying Ecosystem Services for Decision Making." *Ecological Economics* 68(3):643–53.
- Galli, Francesca, Stefano Grando, Anda Adamsone-Fiskovica, Hilde Bj, Marta Czekaj, Dominic George, Henrik Almaas, Pavlos Karanikolas, Olga M. Moreno-p, Dionisio Ortiz-miranda, Teresa Pinto-Correia, Paolo Prospero, Mark Redman, María Rivera, Irina Toma, S. Pedro, Dariusz Zmija, and Gianluca Brunori. 2020. "How Do Small Farms Contribute to Food and Nutrition Security ? Linking European Small Farms , Strategies and Outcomes in Territorial Food Systems ~ U." *Global Food Security* 26(November 2019):100427.
- Godinho, S., N. Guimar, R. Machado, P. Santos, P. Sá-Sousa, J. P. Fernandes, N. Neves, and T. Pinto-Correia. 2016. "Assessment of Environment, Land Management, and Spatial Variables on Recent Changes in Montado Land Cover in Southern Portugal." *Agroforestry Systems* 90(1):177–92.
- Guimar, N., S. Godinho, T. Pinto-Correia, M. Almeida, F. Bartolini, P. Bezák, M. Biró, H. Bjørkhaug, Š. Bojnec, G. Brunori, M. Corazzin, M. Czekaj, S. Davidova, J. Kania, S. Kristensen, E. Marraccini, Z. Molnár, J. Niedermayr, E. O’Rourke, D. Ortiz-Miranda, M. Redman, T. Sipiläinen, H. Sooväli-Sepping, S. Šūmane, D. Surová, L. A. Sutherland, E. Tcherkezova, T. Tisenkopfs, T. Tsiligridis, M. M. Tudor, K. Wagner, and A. Wästfelt. 2018. "Typology and Distribution of Small Farms in Europe: Towards a Better Picture." *Land Use Policy* (75):784–98.



- Lasanta, T., J. Arnáez, N. Pascual, P. Ruiz-flaño, M. P. Errea, and N. Lana-renault. 2017. "Catena Space – Time Process and Drivers of Land Abandonment in Europe." *Catena* 149:810–23.
- Leal Filho, Walter, Merit Mandel, Abul Quasem Al-Amin, Alexander Feher, and Charbel José Chiappetta Jabbour. 2017. "An Assessment of the Causes and Consequences of Agricultural Land Abandonment in Europe." *International Journal of Sustainable Development and World Ecology* 24(6):554–60.
- Lomba, Angela, Francisco Moreira, Sebastian Klimek, Robert H. G. Jongman, Caroline Sullivan, James Moran, Xavier Poux, João P. Honrado, Teresa Pinto-Correia, Tobias Pliening, and David I. McCracken. 2020. "Back to the Future: Rethinking Socioecological Systems Underlying High Nature Value Farmlands." *Frontiers in Ecology and the Environment* 18(1):36–42.
- Macdonald, D., J. R. Crabtree, G. Wiesinger, T. Dax, N. Stamou, P. Fleury, J. Gutierrez Lazpita, and A. Gibon. 2000. "Agricultural Abandonment in Mountain Areas of Europe : Environmental Consequences and Policy Response." *Journal of Environmental Management* 59:47–69.
- Pinto-Correia, T. 1993. "Land Abandonment: Changes in the Land Use Patterns around the Mediterranean Basin." *Cahiers Options Méditerranéennes* 1(2):112.
- Pinto-Correia, T. 2000. "Future Development in Portuguese Rural Areas: How to Manage Agricultural Support for Landscape Conservation?" *Landscape and Urban Planning* 50(1–3).
- Pinto-Correia, T., F. Barroso, and H. Menezes. 2010. *The Changing Role of Farming in a Peripheric South European Area - The Challenge of the Landscape Amenities Demand*.
- Pinto-Correia, T. and J. Primdahl. 2012. *When Rural Landscapes Change Functionality: Examples from Contrasting Case Studies in Portugal and Denmark*.
- Primdahl, J., T. Pinto-Correia, and B. Pedroli. 2019. "European Landscapes in Transition: Implications for Policy Integration and Landscape Governance." *EuroChoices* 18(3).
- Prishchepov, Alexander V, Daniel Müller, Maxim Dubinin, Matthias Baumann, and Volker C. Radeloff. 2013. "Land Use Policy Determinants of Agricultural Land Abandonment in Post-Soviet European Russia." *Land Use Policy* 30(1):873–84.
- Renwick, Alan, Torbjorn Jansson, Peter H. Verburg, Cesar Revoredo-Giha, Wolfgang Britz, Alexander Gocht, and Davy McCracken. 2013. "Policy Reform and Agricultural Land Abandonment in the EU." *Land Use Policy* 30(1):446–57.
- Terres, Jean Michel, Luigi Nisini Scacchiafichi, Annett Wania, Margarida Ambar, Emeric Anguiano, Allan Buckwell, Adele Coppola, Alexander Gocht, Helena Nordström Källström, Philippe Pointereau, Dirk Strijker, Lukas Visek, Liesbet Vranken, and Aija Zobena. 2015. "Farmland Abandonment in Europe: Identification of Drivers and Indicators, and Development of a Composite Indicator of Risk." *Land Use Policy* 49:20–34.



- Tisenkopfs, Talis, Anda Adamsone-Fiskovica, Emils Kilis, Mikelis Sumane, SandraGrivins, Teresa Pinto-correia, and Hilde Bjorkhaug. 2020. "Territorial Fitting of Small Farms in Europe ~ U." *Global Food Security* 26(August):100425.
- Verburg, Peter H., Derek B. van Berkel, Anne M. van Doorn, Michiel van Eupen, and Harm A. R. M. van den Heiligenberg. 2010. "Trajectories of Land Use Change in Europe: A Model-Based Exploration of Rural Futures." *Landscape Ecology* 25(2):217–32.
- Weissteiner, Christof J., Mirco Boschetti, Kristin Böttcher, Paola Carrara, Gloria Bordogna, and Pietro Alessandro Brivio. 2011. "Spatial Explicit Assessment of Rural Land Abandonment in the Mediterranean Area." *Global and Planetary Change* 79(1–2):20–36.
- Wiget, Milena, Adrian Muller, and Angelika Hilbeck. 2020. "Main Challenges and Key Features of Indicator-Based Agroecological Assessment Frameworks in the Context of International Cooperation." *Ecology and Society* 25(3):25.
- World Economic Forum. 2019. *Global Risks Report 2019*. 1st ed. Geneva: World Economic Forum.

