The role of land market and contextual characteristics in shaping farmland abandonment patterns

Maxim Gorgan

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences

Title:	The role of land market and contextual characteristics in shaping farmland abandonment patterns
Author:	Maxim Gorgan
Publisher:	Czech University of Life Sciences Prague Kamýcká 129 16500 Praha Suchdol Czech Republic
Authorized by:	Dean's Office of the Faculty of Tropical AgriSciences
Number of pages:	209
Edition:	First
Year of publication:	2024
ISBN:	978-80-213-3374-1

Copyright © 2024 by Maxim Gorgan and CZU. All rights reserved. No portion of this book may be reproduced in any form without written permission from the publisher or author.

Author: Maxim Gorgan

Supervisor: Dr. sc. habil., Dr. sc. agr., Ing. Miroslava Bavorová

Reviewers: Dr. Alexander Prishchepov, Department of Geosciences and Natural Resource Management, University of Copenhagen;

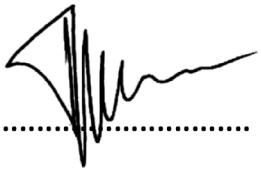
Prof. Jose Maria Garcia Alvarez-Coque, Department of Economics and Social Sciences, Universitat Politècnica de València;

Doc. Mgr. Zdeněk Opršal, Ph.D., Department of Development and Environmental Studies, Palacký University Olomouc.

Declaration

I hereby declare that I have completed this thesis entitled "The role of land market and contextual characteristics in shaping farmland abandonment patterns" independently, except for the jointly authored publications that are included. In the case of such publications, my specific contributions have been clearly stated at the start of the relevant publication chapter. Furthermore, I confirm that proper acknowledgement has been provided within this thesis for any references made to the works of others, I also ensure that this work has not been, nor is it currently submitted, for any other degree, to this or any other university. All information sources have been quoted and acknowledged by means of complete references.

18th April 2024



.....

Maxim Gorgan

Acknowledgments

I am very grateful to my supervisor, Dr. Miroslava Bavorova, Associate Professor, for her invaluable supervision, support and tutelage during the course of my PhD. Also, appreciation goes to the entire academic members of the Faculty of Tropical AgriScience, most especially those in the Department of Economics and Development, particularly Mustapha Yakubu Madaki and Ayat Ulla for their help with data analysis and understanding the statistical analysis and models.

Special thanks go to Dr. Morten Hartvigsen, my esteemed colleague and Land Tenure Officer at the Regional Office for Europe and Central Asia of the Food and Agriculture Organization of the United Nations. Dr. Hartvigsen inspired me to embark on my PhD journey, and provided extensive support through technical discussions, valuable comments, co-authorship on papers and encouragement.

I extend my appreciation to the Food and Agriculture Organization (FAO) for the opportunities to work on projects and for providing access to datasets crucial for my research. My gratitude also goes to Dr. Alexander Kandakov, International Relations Office of Charles University in Prague for his guidance and support during the initial stages of my studies and to three thesis opponents who helped finalize this thesis by providing constructive comments, including: Dr. Alexander Prishchepov, Department of Geosciences and Natural Resource Management, University of Copenhagen; prof. Jose Maria Garcia Alvarez-Coque, Department of Economics and Social Sciences, Universitat Politècnica de València; doc. Mgr. Zdeněk Opršal, Ph.D.,

Department of Development and Environmental Studies, Palacký University Olomouc.

Finally, I want to express my heartfelt thanks to my wife, Elena, and my children, Matei and Melisa, for their unwavering support during my long periods of absence and intense focus on the project. Their understanding and encouragement were indispensable.

Abstract

Despite the looming issues of land scarcity and competition for land resources, farmland abandonment is a widespread phenomenon globally. In Europe, recognized a global hotspot of abandonment, uncultivated agricultural land represents an opportunity to enhance local food production or reset the "land-use clocks" by offering diverse land use possibilities, including options for rewilding and alternative uses beyond traditional agriculture.

The abandonment of farmland is a complex issue driven by various often overlapping factors and drivers that differ across diverse regional contexts. Understanding the determinants of abandonment patterns, and especially how their influence varies across broad geographic extents, is crucial for designing sound, coherent and evidence-based policy responses. Most often mentioned groups of drivers and factors of abandonment are the bio-physical (or environmental), socio-economic and structural. While the connection between land tenure, land markets and land abandonment is often alluded to, it is seldom explored in detail.

Therefore, the aim of this thesis was to explore the problem of farmland abandonment from these perspectives. Using the example of post-Soviet Armenia, the study evaluated the role of land markets, land tenure, and contextual factors in the relationship to farmland abandonment. Additionally, through the example of North Macedonia, the study analysed the role of land consolidation as an instrument to overcoming the structural problems in agriculture and developing land markets. The applied behavioural economics

approach facilitated a better understand of the perspectives of landowners and farmers regarding land market, their interest and willingness to participate in land consolidation, suggesting ways to motivate and engage landowners.

Key words: land policy, land market, farmland abandonment, land consolidation, land management instruments

Contents

Chapter 1. Introduction

1.1. Introduction

This thesis explores the problem of farmland abandonment and the role of land policy instruments and land markets in addressing the structural land use inefficiencies in agriculture. The geographic focus of the thesis is on the region of Eastern Europe and Central Asia (EECA), and it uses two countries – Armenia and North Macedonia, as case studies to delve into land abandonment and land consolidation accordingly. The thesis is written as a collection of three articles, each with its own set of objectives contributing to the overall aim. The thesis aims to explore the problem of agricultural land abandonment as an extreme case of land use inefficiency and to discuss land markets, land consolidation and other land management solutions for improving farm structures, thereby enhancing land use efficiency and competitiveness of farmers.

The study applies a behavioural economics approach in investigating the interconnection between the root causes of land abandonment and the land market intentions, as well as landowners' decisions regarding the improvement of farm structures through land consolidation. The contribution of the thesis consists of the individual contributions of its constituent papers. Specifically, the paper in Chapter 2 provides for the first time an overview of the level of development of the agricultural land markets in the EECA countries. The paper in Chapter 3 explores the determinants of farmland

abandonment and links farmland abandonment with the land market intentions of the farmers, while the paper in Chapter 4 adopts a behavioural approach to explore land consolidation as a means to improve the farm structures and mitigate farmland abandonment.

The contribution of the thesis is also that it not only investigates the determinants and drivers of farmland abandonment, as most of the studies do, but also maintains a strong focus and proposes concrete market-based solutions to address abandonment and improve farm structures. An overarching contention of the thesis is that small, fragmented subsistence farming is a root cause of farmland abandonment and that land markets and other market-based land policy instruments can play a role in sustainably addressing the problem.

The overall context of the study lies with the current situation of multiple global risks, including economic, environmental, societal, technological, and geopolitical challenges that could become tomorrow's crisis (WEF, 2023). By 2050, the global population is expected to reach 9.6 billion people, necessitating a doubling of global food production to meet the rising consumer demand (FAO, 2017a; Tilman et al., 2011). This increased food production will place additional stress on already scarce resources like land, water and biodiversity, which are showing worrying signs of degradation. Climate change further exacerbates the difficulty of producing more food, with agriculture itself being a major source of greenhouse gas emissions.

Competition for land emerges as a key factor that will affect food and farming in the future (Smith et al., 2010). Competition for land resources among various land uses, such as land demands to satisfy

food production, urban growth, supply sustainable bioenergy, provide land-based solutions to counterbalance adverse impacts of climate change (Fayet et al., 2022; Van Zanten et al., 2014; Bodirsky et al., 2022). This competition extends beyond merely agricultural and non-agricultural uses and also includes conflicts between various agricultural land uses. Examples of such competition can be between crops directly consumed as food and those used as feed for animals, exported, used as raw materials, or for the production of crop-based biofuels (Ray et al., 2022).

Competition for land, in itself, is not a driver affecting food and farming in the future, but is an emergent property of other drivers and pressures. Future policy decisions in the agriculture, forestry, energy and conservation sectors could have profound effects, with different demands for land to supply multiple ecosystem services, usually intensifying competition for land in the future (Smith et al., 2010). This is particularly relevant in an increasingly urbanized world with reinforced urban-rural linkages and ongoing societal changes with a strong focus on quality-of-life issues (Seto et al., 2012, as quoted by Van Zanten et al., 2014). Different policy instruments and spatial planning measures impact agricultural landscapes and will, directly and indirectly, affect the supply, demand and market value of ecosystem services. Such policies are designed and implemented at different levels, from local permits and spatial planning to European agricultural policies (Van Zanten et al., 2014). Land markets and land management instruments, particularly in market economies, play a crucial role in accommodating evolving land uses. The willingness of landowners to sell or repurpose their land, the efficiency of land

markets, and the effectiveness of land use planning and regulations all influence the extent to which such changes can occur.

Although increasing crop yields, rather than clearing more land for food production, has been suggested as the most sustainable path for food security, achieving additional food supplies mainly through the intensification of existing farmland may not be entirely feasible. By 2050, an additional 100 million ha of land may be required for agricultural production (Ray et al., 2013), especially in the Global South (Giller et al., 2021). Both strategies, however, will continue to drive biodiversity decline, raising the challenge of meeting future food security and sustainability needs while reducing agriculture's environmental footprint (Foley et al., 2011). Various solutions are being discussed, including halting agricultural expansion, closing 'yield gaps' on underperforming lands, improving cropping efficiency through technology and innovations, promoting shifts in diets, reducing waste, and applying nature-based solutions to enhance soil productivity, among others (Bodirsky et al., 2022; Foley et al., 2011; Mrunalini et al., 2022).

Although the world population is growing and land is becoming an increasingly scarce resource, many regions around the globe experience farmland abandonment (Levers et al., 2018). In the European Union, for example, 30% of all agricultural land (or around 56 million ha) is at risk of abandonment by 2030 (Schuh et al., 2020). The already abandoned 4.8 million ha in the European Union will most likely remain unused in this time span (Perpina Castillo et al., 2018). Although the spatial extent of farmland abandonment globally, but also in Central and Eastern Europe, is debated widely, and estimates vary greatly, it is clearly an issue that countries need to be equipped to

tackle as it represents a valuable resource for bringing it back into agricultural production or converting to and satisfying other land uses. Land abandonment is also widespread in other regions of Europe, including in the Western Balkan countries, the Caucasus and, to a lesser extent, Central Asia. In North Macedonia, the estimated amount of farmland abandonment is 32%, with great variation between the regions (FAO, 2023). In Bosnia and Herzegovina, the figure is assessed as high as 45% of the arable agricultural land (Gorgan and Hartvigsen, 2022). About 10% of all privately owned agricultural land (excluding pastures and hayfields), or about 56,000 ha, is estimated to be abandoned in Albania. Türkiye has about 2 million ha of abandoned agricultural land. In Armenia, according to the 2014 Agricultural Census data, 33% of the land of family farms and 38% of the land of corporate farms was abandoned (FAO, 2017b). In Spain, in 2019, according to the Spanish Agrarian Guarantee Fund (FEGA), surfaces abandoned and without agricultural use are estimated at more than 2.32 million ha, representing 20% of all arable land area or 4.5% of the total agricultural area (Lasanta et al., 2021).

There is a wide range of definitions of farmland abandonment. However, in this PhD thesis, the author investigates the cessation of land-use activities associated with farming and the resulting evident transformation of land cover, for instance, from cropland to areas covered with grasslands and/or shrubs, while certain agricultural fields may experience underuse, thus incomplete abandonment (Gorgan et al., forthcoming). Farmland abandonment is a complex issue and can be terminal, incomplete or reoccurring. It can be driven by a variety of often overlapping factors and differ in diverse regional contexts. For this reason, farmland abandonment has often been

referred to as a wicked policy problem – a complex and highly challenging issue that is difficult to define, has no clear solution and is influenced by a multitude of interconnected factors (Schuh et al., 2020; Rittel and Webber, 1973). Since farmland abandonment has a variety of different causes, its potential solutions are also complex and require the synergy of political, legal, and technical tools as well as financial and human resources.

Abandonment of agricultural land is a 'place-specific phenomenon' with a complex set of drivers (FAO, 2023). Land abandonment may be more pronounced in areas with limited production capacity and productivity, for example, areas facing natural constraints and less favourable for agriculture (Schuh et al., 2020). Location in disadvantaged areas could add to these challenges and hamper integration into effective agricultural value chains and innovative, quality schemes of food supply. Near cities, farmland abandonment is frequently driven by development and urban sprawl, particularly when land ends up in non-farmers' hands for speculative reasons or when farmland owners opt for temporary farming practices until they can sell at their desired price (Vanwambeke et al., 2012; Zhou et al., 2020; Seto et al., 2012, Sinclair, 1967).

Land abandonment has major environmental, social and economic impacts, which differ starkly depending on the geographical context, as does its potential to serve as a "land reservoir" for re-cultivation (Levers et al., 2018). The literature on the consequences of land abandonment is multifaceted and often contentious. Reported impacts are positive, negative or variable and vary over time and space (Ustaoglu and Collier, 2018; Leal et al., 2016; Rey Benayas et al.., 2007). However, negative consequences were most frequently

reported compared to positive ones, especially for agrobiodiversity and livelihoods of rural households and communities (Subedi et al., 2022). The direction of impact will be defined by the integration of biophysical characteristics, natural ecological processes, and agricultural legacy (Ustaoglu and Collier, 2018).

From an agricultural standpoint, abandoned farmland represents a lost opportunity for local food production and diminished food security, and untapped potential for economic development in rural areas where there are generally few other opportunities than agriculture (FAO, 2023). Land abandonment is associated with disappearance of open spaces and proliferation of newly established vegetation, leading to the reduction of species adapted to human-made environments and loss of biodiversity (Pointereau et al., 2008; Uchida and Ushimaru, 2014), increases in fire frequency (Rey-Benayas et al., 2007; Filho et al., 2017), soil erosion and desertification (Rodrigo-Comino et al., 2017), reduction of water availability (Estel et al., 2015), and loss of cultural landscapes and aesthetic values associated with traditional management (Plieninger et al., 2015; Rey Benayas et al. 2007; Uchida and Ushimaru, 2015).

Conversely, abandoned landscapes offer many ecosystem services through the restoration of natural processes via rewilding and natural regeneration, such as carbon sequestration, biodiversity conservation, improved water cycle regulation, soil recovery and nutrient availability. Additionally, abandoned landscapes can contribute to the reduction of soil erosion through vegetation regeneration and protection while also fostering eco-tourism and hunting activities. In certain scenarios, the transition of agricultural land to abandoned land presents an opportunity to enhance the

habitats of species that were severely affected by landscape fragmentation in the past, thereby bolstering biodiversity through rewilding and habitat restoration (Plieninger et al., 2014; Gabarron-Galeote et al., 2015; Navarro and Pereira, 2015; Rey Benayas et al., 2007; Keenleyside and Tucker, 2010).

A variety of underlying causes and factors are responsible for the phenomena of farmland abandonment, and there is a wide body of literature analysing the drivers of the land abandonment process (Schuh et al., 2020; Perpina Castillo et al., 2018; Leal Filho et al., 2016). Most often, these drivers are grouped into the bio-physical or environmental (e.g., soil properties, climate), socio-economic (or demographic) (e.g., ageing population, outmigration, market integration/access, value chain organization) and farm structures (e.g., the size of the farm, the number of land plots comprising the farm, property rights/ownership structure). Political, institutional and regional context drivers, along with weak agricultural land markets and a lack of efficient land-use policies, are also often mentioned. Landscape changes, including land abandonment, are highly dependent on specific political and institutional, economic, cultural, technological, and natural and spatial factors as drivers (Plieninger et al., 2016).

In Eastern Europe and Central Asia, the roots of farmland abandonment can be traced back to the reforms in the agricultural sector that shook these regions fundamentally after the collapse of the Soviet Union (Alcantara et al., 2013; Prishchepov et al., 2013; Hartvigsen, 2013). Land reforms were high on the political agenda and a key part of the overall agrarian reforms, together with the restructuring of large-scale socialist farms in most countries in Central

and Eastern Europe (Lerman et al., 2004). Different land reform approaches were applied in the different countries in the region, with the main methods being restitution of ownership to former owners and distribution of agricultural land to the rural population in either physical parcels or land shares (Hartvigsen, 2013). In most countries in Central Asia, land reforms followed a different path than the rest of the region by largely maintaining state ownership of agricultural land while distributing use rights to the rural population. Kyrgyzstan is the only Central Asian country where arable land was privatized, and ownership rights distributed to the rural population. At present, the countries in the post-Soviet space often have complex land tenure systems characterised by a mix of private, state, and collective ownership, each at varying stages of development (Gorgan and Hartvigsen, 2022).

Land reform and restructuring policies have completely changed the farm structures that existed during the socialist era and paved the way for a new system of land relations. The dismantling of collective farming systems led to shifts in land use patterns and increased abandonment of marginal farmland. A negative outcome of the land reforms was that the ownership of agricultural land has become fragmented to a medium or high extent in almost all the countries that opted for the privatization of agricultural land (Gorgan and Hartvigsen, 2022). At present, most countries in the region have farm structures that are either fully dominated by smallholders and family farms or dualistic farm structures with many small farms and few large, corporate farms. The prevalence of small and fragmented farm structures constitutes one of the primary underlying structural causes of farmland abandonment, making production sub-optimal and

inefficient and hindering investment and development. While most governments recognize the problem of flawed farm structures and seek solutions to bolster transformation and reach economies of scale, for example, through land consolidation or establishment of cooperatives, the role of land markets, namely that of distribution and redistribution of agricultural plots between title holders in a self-regulatory manner, is not always evident to policymakers. Land markets also have the potential to alleviate the problem of farmland abandonment, and this potential also remains unexplored. In most countries in EECA, with the existing land markets, its regulation is minimal. Very seldom is land market policy clearly articulated and linked with the higher objectives of general agricultural policies, for example, those to support smallholders and family farms (often absent as well). Lack of land market regulations and inefficient institutions, which fail to enforce scarce regulatory provisions, leads to phenomena such as overconcentration of land, land grabbing and speculation, among others.

The drivers and patterns of land abandonment in countries in transition may have peculiarities and differences rooted in land tenure systems and regulatory frameworks. Moreover, the transition context is marked by diverse economic, social, and environmental conditions, resulting in pronounced regional disparities in agricultural development and land utilisation. Enhancing our understanding of these distinctions and exploring available re-utilisation options can aid decision-making regarding the recultivation of abandoned lands or alternative land use trajectories.

1.2. Objectives and Propositions

The overall aim of the thesis was to study the problem of farmland abandonment as an extreme case of land use inefficiency and explore what role land markets and land consolidation could play in addressing it.

To achieve this general goal, the following specific objectives were proposed:

- **O1:** Establish an understanding of key land market mechanisms and the ways land markets can support addressing land abandonment.
- **O2:** Assess the level of development of the agricultural land markets in the EECA countries and analyse constraints hampering the functioning and development of the agricultural land markets.
- **O3:** Investigate determinants of farmland abandonment at the farm, parcel, household, and farmer's individual levels.
- **O4**: Investigate the relationship between farmland abandonment and landowners' land market intentions.
- **O5**: Analyse land consolidation instrument from a participatory perspective.
- **O6**: Explore factors influencing landowners' interest and willingness to participate in land consolidation and ways to motivate and engage landowners.

The propositions, which are directly related to the objectives set, are as follows:

- **P1**: Land markets are able to ensure sustainable development of the agricultural sector and offer a basis for many land management instruments.
- **P2**: Land markets in EECA countries are at different stages of development, however still weak and requiring support and guidance.
- **P3**: Farmland abandonment is driven by a set of social, economic and environmental factors, with inefficient farm structures being among its root causes.
- **P4**: There is a linkage between land market intentions (sell and lease out land) and farmland abandonment, and functional land markets may strongly leverage decisions about farmland abandonment.
- **P5**: Land consolidation is a well-established land management instrument that can improve farm efficiency and competitiveness and thus decrease the likelihood of land abandonment.
- **P6**: An interplay of different factors and behavioural drivers influence and inform landowners' decisions during the land consolidation process.

Table 1 below shows how specific objectives are linked with the articles that are part of the thesis.

Table 1: Specific objectives and propositions of each article that is part of the thesis.

Specific objectives	Specific propositions	Article	Main aims
O1 – Establish an understanding of key land market mechanisms and the ways land markets can support addressing land abandonment.	P1 – Land markets are able to ensure sustainable development of the agricultural sector and offer a basis for many land management instruments.	Development of agricultural land markets in countries in Eastern Europe and Central Asia.	Establish an understanding of agricultural land markets and its mechanisms.
O2 – Assess the level of development of the agricultural land markets in the EECA countries and analyse constraints that are hampering the functioning and development of the agricultural land markets.	P2 – Land markets in EECA countries are at different stages of development, however still weak and requiring support and guidance.		Provide an overview of the level of development of the agricultural land markets in the EECA countries.
O3 – Investigate determinants of farmland abandonment at the farm, parcel, household, and farmer's individual levels.	P3 – Farmland abandonment is driven by a set of social, economic and environmental factors, with inefficient farm structures being among its root causes.	The role of the land market in shaping farmland abandonment in post-soviet Armenia.	Establish an understanding of farmland abandonment and its driving factors.
O4 – Investigate the relationship between farmland abandonment and landowners' land market intentions.	P4 – There is a linkage between land market intentions (sell and lease out land) and farmland		Understand the relationship between farmland abandonment

Specific objectives	Specific propositions	Article	Main aims
	abandonment, and functional land markets may strongly leverage decisions about farmland abandonment.		and agricultural land market.
O5 – Analyse land consolidation instrument from a participatory perspective.	P5 – Land consolidation is a well-established land management instrument that can improve farm efficiency and competitiveness and thus decrease the likelihood of land abandonment.	How to increase landowners' participation in land consolidation: evidence from North Macedonia.	Establish an understanding of land consolidation approaches and participatory mechanisms.
O6 – Explore factors influencing landowners' interest and willingness to participate in land consolidation and ways to motivate and engage landowners.	P6 – An interplay of different factors and behavioural drivers influences and informs landowners' decisions during the land consolidation process.		What factors influence landowners' readiness to participate in land consolidation.

The research delves into interconnected themes such as land abandonment, land market development, and land policy and management instruments, which are intricately linked to broader subjects like land reform, land fragmentation, land administration, as well as agriculture and rural development.

Land reforms conducted in the 1990s in Eastern Europe and Central Asia played a crucial role in restructuring land ownership and land management, which existed during the socialist era. The way in which the land reforms were conducted largely defines the land governance system and the current status of the development of agricultural land markets in most countries. Land reform initiatives were often aligned with the concurrent establishment of reliable and up-to-date land administration systems comprised of land registration and cadastre (Törhönen, 2016). Land administration systems serve as foundational pillars in modern market economies, offering benefits such as security of tenure, support for formal land markets, and reinforcement of governance and the rule of law (Williamson et al., 2010). Small and fragmented farm structures emerged as a negative outcome of the land reforms and, in many countries, are the cause of low competitiveness and profitability in the farming sector, causing general depreciation of agriculture, outmigration from rural areas and even farmland abandonment.

The development of rural land markets and land consolidation are also closely related topics. Land consolidation can support the development of formal land markets in a number of ways, including by overcoming extreme fragmentation and making land parcels more attractive for potential buyers, by legally clearing and formalizing the ownership status and by unlocking the agricultural and rural

development potential of the rural areas. In addition to reducing land fragmentation, land consolidation aims at enlarging the farm sizes, and being a market-based mechanism, it can also facilitate the buying and selling of land between the participants during the process.

Agriculture and rural development, including increased productivity and competitiveness of farms and improved living conditions for the rural population, is the goal of most countries in Central and Eastern Europe (CEE), as is elsewhere (Hartvigsen, 2019). Land management instruments such as land consolidation and land banking can be used as tools in the development process in rural areas, but agriculture and rural development also include numerous aspects where land consolidation is irrelevant. It has not been the aim of the research to study these related topics in detail, and research on these topics has only been included where relevant to the core study topics.

1.3. Structure

This thesis consists of five chapters. The present chapter, Chapter 1, serves as an introduction to the study and describes its structure and methodology. The following chapters (2, 3, and 4) present three papers, two of which were peer-reviewed and published in international academic journals, all indexed in the Journal Citations Report. The paper presented in Chapter 3 is a manuscript, which by the time of this thesis defence was in the process of publication in a high-profile academic journal (i.e. the peer review was completed, and the revised manuscript was re-submitted for publication). Lastly, Chapter 5 sets out the main conclusions of the thesis.

The focus of the thesis, as explained in Section 1.2, was to study the interconnection between land abandonment and land markets, with

a specific emphasis on market-based policy solutions in the following sequence. It seemed logical to first set the scene for the overall thesis by providing a broader perspective on the state and development of land markets in the EECA region during 30 years of transition to market-driven economies after the collapse of the Soviet Union (Chapter 2). This chapter establishes a conceptual framework for agricultural land markets' functioning and development, applying it to understand similarities and differences in land market transitions. The chapter also discusses land management and policy instruments that can address numerous land market imperfections and support its development. Chapter 3 then scrutinizes the topic of farmland abandonment to identify its main determinants and impacts and investigates whether there is an interconnection between farmland abandonment and land market intentions. Finally, based on the contributions of the previous two chapters, Chapter 4 delves into more details on land consolidation as a powerful market-based instrument for farm restructuring, which can both facilitate the functioning and development of agricultural land markets and greatly mitigate farmland abandonment.

The first article is "Development of agricultural land markets in countries in Eastern Europe and Central Asia" (Chapter 2). This article assesses the current development stage of land markets in countries in EECA and systematizes the main constraints to its functioning and development, including informalities, absent owners, technical errors, and complicated and costly land transaction procedures. It reveals that most countries have farm structures characterized by excessive land fragmentation and small average farm sizes and argues for the need for coherent national land policies and land management

instruments, such as land consolidation and land banking, that can also contribute to land market development.

The second article presented in the thesis is "The role of the land market in shaping farmland abandonment in post-soviet Armenia" (Chapter 3). The article aims to understand the patterns and drivers of farmland abandonment by using the case of Armenia and to evaluate the role of land markets, land tenure, and contextual factors in the relationship to farmland abandonment. The study reveals an important connection between farmland abandonment and land market behavioural intentions and provides evidence of other risk factors leading to farmland abandonment, such as the aging of farmers and a lack of successors to continue farming. Small-scale, fragmented farm structures and the absence of irrigation increase the likelihood of farmland abandonment, along with weak agricultural land markets and a lack of efficient land-use policies.

The third article is "How to increase landowners' participation in land consolidation: evidence from North Macedonia" (Chapter 4). This article focuses in detail on the land consolidation instrument as one of the modalities of addressing farm structure inefficiencies and, thus, also mobilizing abandoned farmland. By adopting a participatory and behavioural perspective, it examines individual factors influencing landowners' readiness to participate in land consolidation and behavioural factors at both the individual and social levels determining negative attitudes towards land consolidation. The article further identifies possible incentives, techniques, and nudges to increase landowners' participation in land consolidation.

In each of the three contributing papers, the generic structure was to first present the theoretical framework, including the main theoretical

contributions and the theoretical model, along with the objectives. Then, follows a description of the sample, the instruments used, and the analysis conducted. Finally, the results, discussion, limitations, and future directions are detailed.

1.4. Methodology

This section describes the research methodology and work process applied during the PhD research. Figure 1 below visualizes the framework of the thesis, including key theoretical concepts applied in the case studies. The research problem and basis of this dissertation is the issue of farmland abandonment. The central figure illustrates a vicious circle of proximate drivers of farmland abandonment framed by broader policy, macroeconomic, institutional, regional, and global contextual factors. Proximate drivers such as low profitability, aging rural population, outmigration, dependence on irrigation, and inefficient farm structures reinforce each other, leading to a decline in agricultural land use and eventual land abandonment.

The lower part of the figure depicts a range of positive, varied, and negative impacts of land abandonment, as well as agricultural and non-agricultural opportunities that abandoned farmland can offer. Abandoned farmland represents a valuable land resource that can offer both agricultural and non-agricultural land use opportunities and be used to address global food security, environmental, climate change and other societal challenges.

The lack of social capital and trust is among the possible behavioural factors that may influence decisions and actions related to land use (Grootaert et al., 2004; Lewicki et al., 2006; Prishchepov et al., 2022b). Socio-economic background and individual characteristics are

important drivers of interest and attitude, eventually influencing decision-making (Petit, 2019, as quoted in Gorgan and Bavorova, 2022). Personal characteristics involve a wide set of physiological and socio-demographic determinants such as age, gender, ethnicity, life-cycle stage, education level, social status, and others. Additionally, decisions may be influenced by various behavioural biases, uncertainty and information.

The schema also depicts a framework of solutions both inside and outside the land policy domain. Solutions within the land policy domain are land market-based, such as land consolidation and land banking, as well as regulations governing the land market itself. This might seem counter-intuitive at first, but abandonment can create opportunities for land consolidation. For example, abandoned farmland could be a source for the enlargement of existing farms, potentially leading to more efficient use of the land for agriculture.

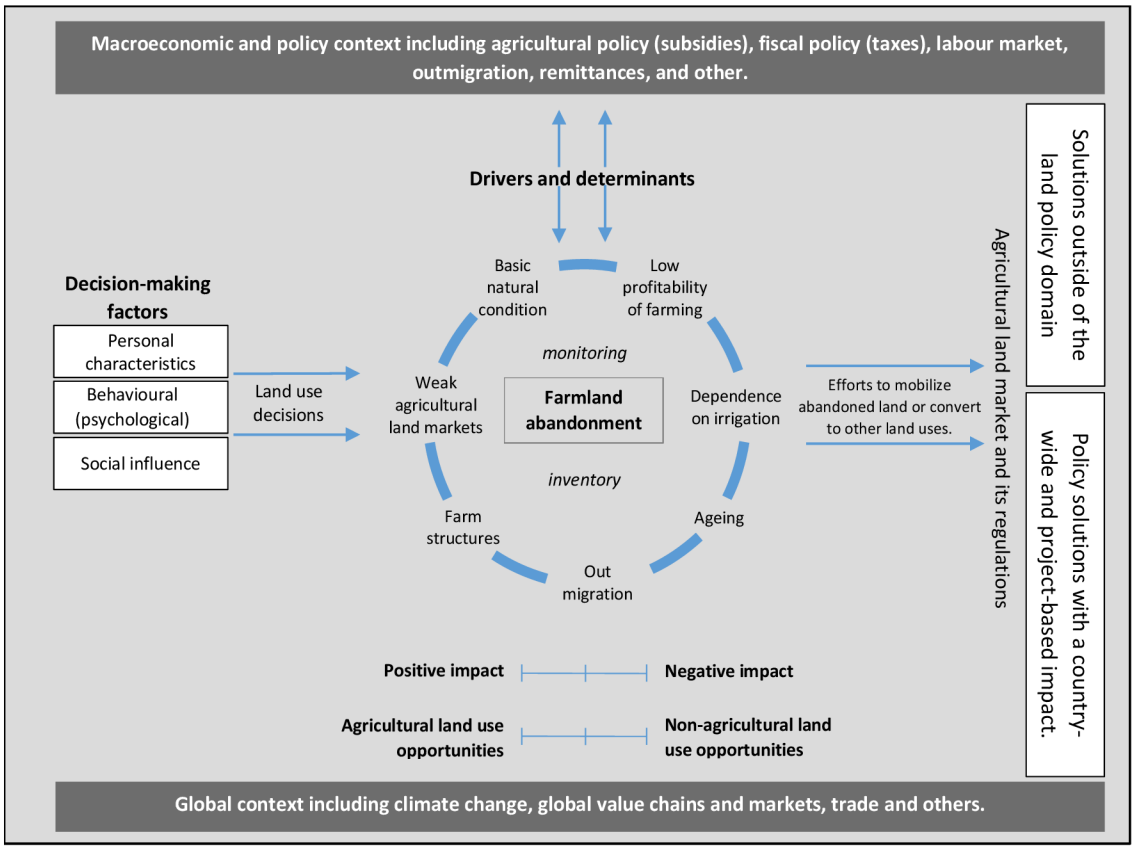


Figure 1: Thesis framework explaining the interconnectivity between land abandonment proximate and underlying (contextual) causes, personal, behavioural (psychological), and social influence factors that influence the decision-making process, and a framework of land policy solutions.

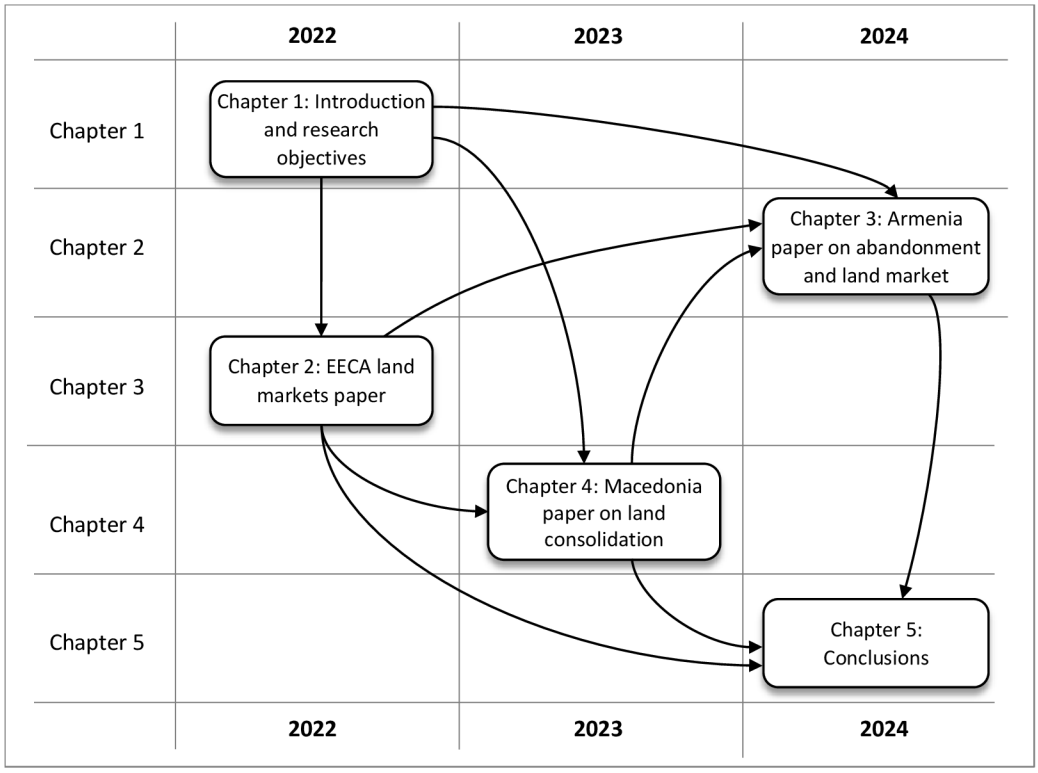


Figure 2: Research process and main coherence between thesis chapters.

The methodologies and work processes used in the different parts of the study are further explained in detail in the subsequent chapters. Different research methodologies and work processes have been applied in the research reported in the different chapters (papers). However, in all chapters, a mix of quantitative and qualitative methods were used depending on the research questions concerned and the availability of data.

For the article "Development of agricultural land markets in countries in Eastern Europe and Central Asia", a semi-systematic review of literature was conducted to synthesize research on the topic and explore how land markets have been studied in different fields (Snyder, 2019). A five-stage evolutionary model of formal land markets development by Williamson et al. (2010) was then applied to

assess the land market development in 18 countries in EECA. The study draws upon the project experiences of the authors with the implementation of land tenure projects of the Food and Agriculture Organization of the United Nations (FAO) in the EECA countries and analysis of other data sources, including data on land market activity from the studied countries.

The second article, "The role of the land market in shaping farmland abandonment in post-Soviet Armenia" evaluates the factors that are hypothesized to influence the probability of the decision of farmland abandonment with the logistic regression model. The analysis is conducted at the parcel level using 1,163 structured face-to-face interviews in three communities in the Armavir province of Armenia from November 2020 to March 2021 as part of the FAO technical assistance project TCP/ARM/3705[1].

Finally, the article "How to increase landowners' participation in land consolidation: evidence from North Macedonia" is written based on a dataset of 4,335 face-to-face interviews conducted in 2019 with landowners in 10 municipalities in North Macedonia as part of the FAO technical assistance project GCP/MCD/002/EC[2]. Data analysis employed a mix of a logistic regression model to test individual-level factors influencing the general interest of landowners to participate in land consolidation and content analysis to understand behavioural factors underlying the negative attitude.

[1] The thesis author was involved in the design and implementaiton of the FAO project, and guided external collaborators who conducted interviews and participatory GIS mapping of abandoned farmland.

[2] The thesis author was involved in the design and implementaiton of the FAO project.

Armenia and North Macedonia were selected as study countries because of their similarities in terms of the farm structures, which are small and fragmented with an average farm size of around 1.5 ha divided into 3-5 plots and in terms of farmland abandonment, which in both countries is about 1/3 of all arable land. Both countries are mountainous and have comparable economies and agricultural sectors. Furthermore, both countries recognize the issues of farm structures and land abandonment and requested technical support in addressing these structural problems through land policies from FAO and other international organizations and donors. Since 2014, thanks to the extensive technical support, North Macedonia has developed into the flagship country for FAO support to land consolidation in Europe and Central Asia (Hartvigsen et al., 2023). In Armenia, during 2004-2006, FAO provided technical assistance with the implementation of a land consolidation pilot project and the development of a draft land consolidation strategy, and during 2019-2021, a project to address land abandonment through land management instruments and the establishment of a legal and institutional framework.

The sequence of the articles in shown in Figure 2.

1.5. Other related contributions

Through the research carried out for this thesis, other contributions that are not presented in this document have been made. These are conference papers, reports and publications prepared for and published by FAO, presentations in conferences, workshops and seminars, and share in science and research activities, among others. The preliminary results of the thesis and other research advances presented are detailed below.

Share in science and research activities:

- Member of the FTZ CZU Behavioural Studies in the Agri-Food Sector.
  https://www.ftz.czu.cz/cs/r-6856-katedry-a-soucasti/r-13883-vyzkumne-tymy-ftz/r-14419-behavioral-studies-in-agri-food-sector
- EU CAP Network[3] Focus Groupon Recovery of abandoned agricultural lands.
  https://eu-cap-network.ec.europa.eu/recovery-abandoned-agricultural-lands_en

Lectures:

- Guest lecture at the Kazakh Agro Technical Research University after S. Seifullin on "Promoting the development of agricultural land markets and supporting the development of small family farms", 23 November 2023
- Guest lecture at the National University of Life and Environmental Sciences of Ukraine (NUBiP) on "FAO land consolidation programme and the work conducted in Ukraine", 19 December 2018
- Lectures (presentations) on topics of property rights, land tenure, land reforms, land policies and land consolidation at the FTZ CZU as part of the PhD study program delivered on 24/04/2019, 20/11/2019, 15/10/2020, 25/11/2021, 1/12/2022, and 14/12/2023.

[3] Former EIP-AGRI

Attendance at conferences and seminars:

- 14th LANDNET International Conference. Istanbul, Turkey. September 2023. Oral presentations:
- "Analysis of land abandonment and development of agricultural land markets in North Macedonia". https://www.fao.org/3/cc7427en/cc7427en.pdf
- "Presentation of a Curriculum for Master Course on land consolidation and land banking"
    - FIG Congress 2022. Warsaw. September 2022. Moderation of a session: "Leveraging the potential of multi-purpose land consolidation in Eastern Europe". https://www.fao.org/fileadmin/user_upload/reu/europe/documents/Events_2022/CNA14Sep.pdf
- 13th LANDNET International Conference. Skopje, North Macedonia. May 2022. Oral presentations:
- "An overview of land banking instruments in ECA" https://www.fao.org/fileadmin/user_upload/reu/europe/documents/Events_2022/landnet13presentation/2.2_MG.pdf
- "Capacity development needs for land consolidation and land banking" https://www.fao.org/fileadmin/user_upload/reu/europe/documents/Events_2022/landnet13presentation/4.1_MG.pdf
- FIG e-Working Week 2021. 23 June 2021. Oral keynote presentation: "Outcome of a survey conducted by FAO in early 2021 on the application of land banking and land consolidation instruments".

https://fig.net/resources/proceedings/fig_proceedings/fig2021/techprog.htm

- International Land Reform Conference in Armenia in November 2021. Oral presentation.
- 12th LANDNET International Conference/International Conference of Rural Development and tourism. Galicia, Spain, 5-8 November 2019. Oral presentation: "Policy response to the problem of land abandonment in Armenia". https://agader.xunta.gal/sites/w_pagade/files/documentacion/Xornadas/06-11_s5a_01_gorgan_land_abandonment_armenia.pdf
- 11th LANDNET International Conference. 28 November 2018, Tallinn, Estonia. Oral presentation: "Implementation of VGGT in Tajikistan and Kyrgyzstan" https://www.fao.org/fileadmin/user_upload/reu/europe/documents/events2018/landnet11/7.3.pdf

Publications:

- FAO, 2023. Analysis of land abandonment and development of agricultural land markets in the Republic of North Macedonia – Conclusions and policy recommendations. https://www.fao.org/3/cc4778en/cc4778en.pdf
- FAO, 2023. Generic master's course curriculum on land consolidation and land banking – Study and recommendations. Budapest. https://doi.org/10.4060/cc8495en
- FAO, 2020. Legal guide on land consolidation: Based on regulatory practices in Europe. FAO Legal Guide, No. 3. Rome, FAO. https://doi.org/10.4060/ca9520en

- Gorgan, M., Bergounioux, F., Gatsiou, A., 2023. Ownership, farm structure and behavioural aspects of land abandonment. EU CAP Network. https://eu-cap-network.ec.europa.eu/sites/default/files/2023-09/MP3_FG_Abandoned_Lands_Owneship-Farm-Structure-behavioural-aspects-land-abandonment.pdf
- Hartvigsen, M., Mitic-Arsova, K., Gorgan, M., Georgievski, K., 2023. Lessons learned from the introduction of land consolidation in North Macedonia during 2014–2023. Budapest, FAO. https://doi.org/10.4060/cc7573en
- Hartvigsen, M., Versinskas, T., Gorgan, M., 2022. European good practices on land banking. FAO Study and recommendations. Budapest, FAO. DOI: https://doi.org/10.4060/cb8307en
- Hartvigsen, M., Versinskas, T., Gorgan, M., 2021. European good practices on land banking and its application in Eastern Europe and Central Asia. Conference paper. FIG 2021. https://fig.net/resources/proceedings/fig_proceedings/fig2021/papers/FAO_banking/Hartvigsen_etal_paper.pdf
- Hartvigsen, M., Ismaylov, A., Gorgan, M., 2020. Development of a land consolidation instrument in the Republic of Azerbaijan. Conference paper. FIG 2020.
- https://www.fig.net/resources/proceedings/fig_proceedings/fig2020/papers/ts01i/TS01I_hartvigsen_ismayilov_et_al_10385_abs.pdf
- Hartvigsen, M., Gorgan, M., 2020. FAO experiences with land market development and land management instruments in Eastern Europe and Central Asia. Journal of Agricultural and Environmental Law. https://doi.org/10.21029/JAEL.2020.29.85

- Hartvigsen, M., Versinskas, T., Vidar, M., Mitic-Arsova, K., Van Holst, F., Gorgan. M., 2019. FAO recommendations on land consolidation legislation. World Bank Conference on Land and Poverty. 2019. The World Bank, Washington DC, 25-29 March, 2019.
  https://www.researchgate.net/publication/340917971_FAO_Recommendations_on_Land_Consolidation_Legislation

1.6. References

Alcantara, C., Kuemmerle, T., Baumann, M., Bragina, E., Griffiths, P., Hostert, P., Knorn, J., Müller, D., Prishchepov, A., Schierhorn, F., Sieber, A., Radeloff, V., 2013. Mapping the extent of abandoned farmland in Central and Eastern Europe using MODIS time series satellite data. Environmental Research Letters, Volume 8, Number 3. DOI 10.1088/1748-9326/8/3/035035

Bodirsky, B.L., Chen, D.MC., Weindl, I. et al., 2022. Integrating degrowth and efficiency perspectives enables an emission-neutral food system by 2100. Nat Food 3, 341–348 (2022). https://doi.org/10.1038/s43016-022-00500-3

FAO, 2017a. The future of food and agriculture – Trends and challenges. Rome.

FAO, 2017b. Policy Note on Land Abandonment and Recommendations for Policy Advice on Introduction of a Land Consolidation Instrument in Armenia. Unpublished project report prepared under the "ENPARD Technical Assistance to the Ministry of Agriculture of the Republic of Armenia" (GCP/ARM/006/EC).

FAO, 2023. Analysis of land abandonment and development of agricultural land markets in the Republic of North Macedonia – Conclusions and policy recommendations.
https://www.fao.org/3/cc4778en/cc4778en.pdf

Foley, J., Ramankutty, N., Brauman, K. et al., 2011. Solutions for a cultivated planet. Nature 478, 337–342 (2011).
https://doi.org/10.1038/nature10452

Gabarron-Galeote, M.A., Trigalet, S., van Wesemael, B., 2015. Soil organic carbon evolution after land abandonment along a precipitation gradient in southern Spain. Agric., Ecosyst. Environ. 199: 114–123. doi:10.1016/j.agee.2014.08.027

Giller, K.E., Delaune, T., Silva, J.V., et al., 2021. Small farms and development in sub-Saharan Africa: Farming for food, for income or for lack of better options? Food Sec. 13, 1431–1454 (2021). https://doi.org/10.1007/s12571-021-01209-0

Gorgan, M., Bavorova, M., 2022. How to increase landowners' participation in land consolidation: Evidence from North Macedonia. Land Use Policy 123 (2022) 106424.
https://doi.org/10.1016/j.landusepol.2022.106424

Gorgan, M., Hartvigsen, M., 2022. Development of agricultural land markets in countries in Eastern Europe and Central Asia. Land Use Policy 120 (2022) 106257.
https://doi.org/10.1016/j.landusepol.2022.106257

Grootaert, C., Narayan, D., Nyhan Jones, V., Woolcock, M., 2004. Measuring Social Capital: An integrated questionnaire. Washington, D.C., The World Bank. http://hdl.handle.net/10986/15033

Hartvigsen, M. 2019. FAO Support to land consolidation in Europe and Central Asia during 2002-2018 - Experiences and way forward. Land Tenure Journal 1/2019.
http://www.fao.org/3/CA3184EN/ca3184en.pdf

Hartvigsen, M., 2013. Land reform and land fragmentation in Central and Eastern Europe. Land Use Policy 36, 330-341.
https://doi.org/10.1016/j.landusepol.2013.08.016

Hartvigsen, M., 2015. Experience with land consolidation and land banking in Central and Eastern Europe after 1989. Land Tenure Working Paper No. 26.

Hartvigsen, M., Mitic-Arsova, K., Gorgan, M., Georgievski, K., 2023. Lessons learned from the introduction of land consolidation in North Macedonia during 2014–2023. Budapest, FAO.
https://doi.org/10.4060/cc7573en

Keenleyside, C., Tucker, G., 2010. Farmland abandonment in the EU: an assessment of trends and prospects. Report prepared for WWF. Institute of European Environmental Policy, London.

Lasanta, T., Nadal-Romero, E., Khorchani, M., Romero-Díaz, A. 2021. A review of abandoned lands in Spain: from local landscapes to global management strategies. DOI: https://doi.org/10.18172/cig.4755.

Leal, F.W., Mandel, M., Al-Amin, A.Q., Feher, A., Jabbour, C., 2016. An assessment of the causes and consequences of agricultural land abandonment in Europe, International Journal of Sustainable Development & World Ecology.
doiI:10.1080/13504509.2016.1240113

Lerman, Z., Csaki, C., Feder, G., 2004. Agriculture in Transition – Land Policies and Evolving Farm Structures in Post-Soviet Countries. Lexington Books.

Levers, C., Schneider, M., Prishchepov, A.V., Estel, S., Kuemmerle, T., 2018. Spatial variation in determinants of agricultural land abandonment in Europe. Sci. Total Environ. 644, 95–111. https://doi.org/10.1016/j.scitotenv.2018.06.326

Lewicki, R.J., Tomlinson, E.C., Gillespie, N., 2006. Models of interpersonal trust development: theoretical approaches, empirical evidence, and future directions. J. Manag. 32 (6), 991–1022. https://doi.org/10.1177/0149206306294405.

Mrunalini, K., Behera, B., Jayaraman, S., Abhilash, P. C., Dubey, P. K., Swamy, G. N., Prasad, J. V. N. S., Rao, K. V., Krishnan, P., Pratibha, G., Srinivasa Rao, C., 2022. Nature-based solutions in soil restoration for improving agricultural productivity. Land Degradation & Development, 33(8), 1269– 1289. https://doi.org/10.1002/ldr.4207

Navarro, L., Pereira, H., 2015. Rewilding abandoned landscapes in Europe. In Rewilding European landscapes. Edited by H. Pereira and L. Navarro. Springer, Cham.
https://link.springer.com/book/10.1007/978-3-319-12039-3

Perpina Castillo C., Kavalov B., Diogo V., Jacobs-Crisioni C., Batista e Silva F., Lavalle C., 2018. Agricultural Land Abandonment in the EU within 2015-2030. European Commission. https://joint-research-centre.ec.europa.eu/document/download/fd756a75-5aba-4051-9aaa-e1c21485f34d_en?filename=jrc113718.pdf

Petit, V., 2019. Behav. Driv. Model.: A Concept. Framew. Soc. Behav. Change Program.
https://www.unicef.org/mena/reports/behavioural-drivers-model

Plieninger, T., Draux, H., Fagerholm, N., Bieling, C., Bürgi, M., Kizos, T., Verburg, P., 2016. The driving forces of landscape change in Europe: a systematic review of the evidence. Land Use Policy 57:204–214.

Plieninger, T., Hartel, T., Martin-Lopez, B., Beaufoy, G., Bergmeier, E., Kirby, K., et al., 2015. Wood-pastures of Europe: geographic coverage, social–ecological values, conservation management, and policy implications. Biol. Conserv. 190: 70–79. doi:10.1016/j.biocon.2015.05.014.

Pointereau, P., Coulon, F., Girard, P., Lambotte, M., Stuczynski, T., S´anchez Ortega, V., Del Rio, A., 2008. Analysis of the driving forces behind farmland abandonment and the extent and location of agricultural areas that are actually abandoned or are in risk to be abandoned. In: Anguiano, E., Bamps, C., Terres, J.-M. (Eds.), JRC Scientific and Technical Reports. EUR 23411 EN.

Prishchepov, A., Müller, D., Dubinin, M., Baumann, M., Radeloff, V., 2013. Determinants of agricultural land abandonment in post-Soviet European Russia. Land Use Policy 30, 873–884.
https://doi.org/10.1016/j.landusepol.2012.06.011

Prishchepov, A., Ponkina, E., Sun, Z., Bavorova, M., Yekimovskaja, O., 2021b. Revealing the intentions of farmers to recultivate abandoned farmland: A case study of the Buryat Republic in Russia. Land Use Policy 107, 105513.
https://doi.org/10.1016/j.landusepol.2021.105513

Prishchepov, A., Schierhorn, F., Löw, F., 2021a. Unraveling the Diversity of Trajectories and Drivers of Global Agricultural Land Abandonment. Land 10, no. 2 (22 January 2021): 97. https://doi.org/10.3390/land10020097

Ray, D.K., Mueller, N.D., West, P.C., Foley, J.A., 2013. Yield Trends Are Insufficient to Double Global Crop Production by 2050. PLoS ONE 8, no. 6 (19 June 19 2013): e66428. https://doi.org/10.1371/journal.pone.0066428.

Ray, D.K., Sloat, L.L., Garcia, A.S., et al., 2022. Crop Harvests for Direct Food Use Insufficient to Meet the UN's Food Security Goal. Nature Food 3, no. 5 (May 2022): 367–74. https://doi.org/10.1038/s43016-022-00504-z.

Rey Benayas, J.M., Martins, A., Nicolau, J.M., Schulz, J.J., 2007. Abandonment of agricultural land: an overview of drivers and consequences. CAB Rev. 2(057): 14. doi:10.1079/PAVSNNR20072057.

Rittel, H., Webber, M., 1973. Dilemmas in general theory of planning. Policy Sciences, Vol. 4, No. 2 (June 1973), pp. 155-169. http://www.jstor.org/stable/4531523.

Schuh, B. et al., 2020. Research for AGRI Committee – The challenge of land abandonment after 2020 and options for mitigating measures, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels. https://www.europarl.europa.eu/thinktank/en/document/IPOL_STU(2020)652238.

Seto K.C., Reenberg, A., Boone, C.G. et al., 2012. Urban land teleconnections and sustainability. Proc Natl Acad Sci U S A 109:7687–7692. doi:10.1073/pnas.1117622109

Sinclair, R., 1967. Von Thünen and urban sprawl. Ann Assoc Am Geogr 57(1):72–87. Retrieved from https://cooperative-individualism.org/sinclair-robert_von-thunen-and-urban-sprawl-1967-mar.pdf.

Smith, P., Gregory, P.J., van Vuuren, D., Obersteiner, M., Havlík P., Rounsevell, M., Woods, J., Stehfest, E., Bellarby, J., 2010. Competition for land. Phil. Trans. R. Soc. B3652941–2957. http://doi.org/10.1098/rstb.2010.0127.

Snyder, H., 2019. Literature review as a research methodology: an overview and guidelines. J. Bus. Res. 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039.

Subedi, Y., Kristiansen, P., Cacho, O., 2022. Drivers and consequences of agricultural land abandonment and its reutilisation pathways: A systematic review. Environmental Development 42 (2022) 100681. https://doi.org/10.1016/j.envdev.2021.100681.

Tilman, D., Balzer, C., Hill, J., Befort, B.L., 2011. Global food demand and the sustainable intensification of agriculture. Proc Natl Acad Sci USA 108: 20260– 20264. https://doi.org/10.1073/pnas.1116437108.

Törhönen, M., 2016. Keys to Successful Land Administration. Lessons Learned in 20 Years of ECA Land Projects. Washington, D.C.: World Bank. https://doi.org/10.1596/24623.

Uchida, K., Ushimaru, A., 2014. Biodiversity declines due to abandonment and intensification of agricultural lands: patterns and mechanisms. Ecol. Monogr. 84: 637–658. doi:10.1890/13-2170.1.

Uchida, K., Ushimaru, A., 2015. Land abandonment and intensification diminish spatial and temporal _-diversity of grassland plants and herbivorous insects within paddy terraces. J. Appl. Ecol. 52: 1033–1043. doi:10.1111/1365-2664.12443.

Ustaoglu, E., Collier, M.J., 2018. Farmland abandonment in Europe: an overview of drivers, consequences, and assessment of the sustainability implications. Environ. Rev. 26, 396–416. https://doi.org/10.1139/er-2018-0001.

Vanwambeke, S.O., Meyfroidt, P., and Nikodemus, O., 2012. From USSR to EU: 20 years of rural landscape changes in Vidzeme, Latvia. Landscape Urban Plann. 105: 241–249. DOI: 10.1016/j.landurbplan.2011.12.009.

WEF, 2023. The Global Risks Report 2023. 18th Edition. https://www3.weforum.org/docs/WEF_Global_Risks_Report_d2023.pdf.

Williamson, I., Enemark, S., Wallace, J., Rajabifard, A. 2010. Land Administration for Sustainable Development. Redlands, California: ESRI Press Academic. https://eng.unimelb.edu.au/__data/assets/pdf_file/0004/3929728/land-admin-for-sustainable-development.pdf.

Zhou, T., Koomen, E., Ke, X., 2020. Determinants of farmland abandonment on the urban-rural fringe. Environ. Manag. 65, 369–384. https://doi.org/10.1007/ s00267-020-01258-9.

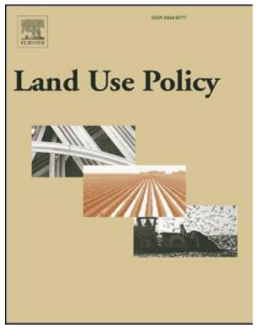
Chapter 2. Development of agricultural land markets in countries in Eastern Europe and Central Asia

Authors: Maxim Gorgan, Morten Hartvigsen

Published in: Land Use Policy 120 (2022) 106257

Available online: 28 June 2022

DOI: https://doi.org/10.1016/j.landusepol.2022.106257



Abstract

Well-functioning agricultural land markets are a precondition for agricultural and rural development in general. However, agricultural land markets remain weak and still face many constraints in Eastern Europe and Central Asia. By applying a conceptual framework for agricultural land market development in five stages, the paper assesses the current development stage of land markets in countries in Eastern Europe and Central Asia and discusses the main constraints including informalities, absent owners, technical errors and complicated and costly land transaction procedures. Most of the countries have farm structures characterized by excessive land fragmentation and small average farm sizes. The need for coherent national land policies is argued. Furthermore, land management instruments such as land consolidation and land banking in addition to facilitating agricultural and rural development also contribute to land market development.

Key words: land market, agricultural land market development, land market constraints, land management instruments, land consolidation, land banking, Eastern Europe and Central Asia.

2.1. Introduction

Well-functioning agricultural land markets are in general among the basic preconditions for sustainable agricultural and rural development. Despite the many efforts since the beginning of transition in 1990 from both governments and donors throughout the countries in Eastern Europe and Central Asia (EECA), the agricultural land markets are in general still weak with multiple and inter-related constraints hampering their development.

The aim of this paper is to (i) provide for the first time an overview of the level of development of the agricultural land markets in the EECA countries, (ii) analyse and systematize the main constraints that are hampering further development of the agricultural land markets, and (iii) suggest how land management instruments such as land consolidation and land banking in addition to their primary objectives of facilitating agricultural and rural development also can strongly contribute to land market development. Land market development is assessed by applying the conceptual framework (model) proposed by Williamson et al. (2010). This is the first time that the model has been used to assess the level of development of agricultural land markets in EECA. The study is drawing upon the project experiences of the authors with the implementation of land tenure projects of the Food and Agriculture Organization of the United Nations (FAO) in the EECA countries and analysis of other data sources, including data on land market activity from the studied countries. The countries and territories studied in this paper are Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kosovo[4], Kyrgyz Republic, Republic of Moldova, Montenegro, North Macedonia, Serbia, Tajikistan, Turkey, Turkmenistan, Ukraine and Uzbekistan[5]. A semi-systematic review of literature was conducted to synthesize research on the topic and explore how land markets have been studied in different fields (Snyder, 2019). Although both are important for agricultural development, the paper is mostly concerned with the markets of ownership rights, while markets of use rights are discussed in less detail. The interconnection between rural

4 References to Kosovo shall be understood to be in the context of UN Security Council Resolution 1244 (1999).

5 These countries are the program countries of the FAO Regional Office for Europe and Central Asia.

and urban land markets is only partially addressed in the paper, mainly in the context of distortions and pressure caused on rural land markets by urban and peri-urban development.

The paper is structured as follows. Section 2 provides a conceptual framework to understand, support and facilitate development of formal agricultural land markets, including the five-stage development model of Williamson et al. (2010). In Section 3, the current farm structures in the countries are discussed, focusing on the structural problems in many countries with excessive land fragmentation and small average farms sizes. In Section 4, the conceptual framework for land market development is applied to assess broadly and systematically the state of development of the formal agricultural land markets in the 18 studied EECA countries and territories. Section 5 systematizes and discusses the main constraints hampering the functionality of agricultural land markets in the same countries. In Section 6, the need for coherent land policies is discussed together with land management instruments available to address the structural problems with land fragmentation and small farms sizes and at the same time addressing also many of the other identified constraints for land market development. The final Section 7 provides the conclusions and perspectives.

2.2. Conceptual framework for agricultural land market development

A conceptual framework to understand the development of agricultural land markets is based upon different economic theories, land administration theory and related disciplines, and a combination

of policy, legal and institutional frameworks setting-up the land market regulatory environment.

A simple definition of a land market is that it is an abstract place where buyers and sellers of land rights meet (FAO, 2003). Broadly speaking, the land market includes a range of possible transactions transferring full or partial property rights, such as sales, exchanges, leases, mortgages or servitudes. Most often, a distinction is made between the sales (ownership) land market and the rental (use) market. Both sales and rental markets are important for agricultural and rural development by their ability to improve farm structures and the efficiency of land use, and by providing access to land for enlargement of farms including for new entrants (e.g. young farmers).

Another common distinction is made between formal and informal land markets. A market is more or less formal according to the level its activities are serviced by the public land administration system provided by, or at least organized through, the government (Williamson et al., 2010). Informal land markets usually, to some degree, always operate in countries in parallel with formal market systems in order to reduce the human and financial overhead of doing business and avoid expensive formalities. Although informal land markets can be quite effective in carrying out simple land transactions such as short-term lease agreements, they fail to attract formal capital at competitive rates and develop into complex commodity markets. However, in case of long-term lease agreements and transfers of ownership, formally registered transactions will arguably have higher levels of tenure security and judicial recognition.

The land market is in essence about transferring property rights over land between various holders. The land market by means of its

transfer function is fundamental in addressing the problems of farm structures, land abandonment, provision of land for public objective projects, implementation of redistributive land reforms, and is a precondition for the application of several land management instruments such as land banking and land consolidation.

The theoretical expectation is that land markets can provide a low-cost means to carry out transactions that would bring the land in its most productive use (Deininger and Feder, 1998). Thus, the land market can transform land ownership and use patterns by shifting land to more efficient users / uses or from landowners who are not interested in cultivating land, to active farmers interested in acquisition of more land.

Another expectation attached to the functionality of land markets and private property rights, in general, is related to the value of land. The value of land in private hands delivers significant wealth to landowners and users, and it is the anticipation that markets will release value inherent in land into the general economy and raise overall living standards (Williamson et al., 2010).

Land values are, in theory, determined by demand and supply. Factors that shift the demand for and supply of agricultural land relate to competing uses for land, changes in agricultural productivity, speculative forces, the potential of land to hedge against inflation and its amenity values (Ciaian et al., 2012). However, a meaningful analysis of how rural land markets work cannot be done by applying the simple laws of market supply and demand since property rights and interests over land represent also a social construction or a system of relationship (Feder and Feeny, 1991).

The institutions governing the functioning of land markets will affect the transaction cost associated with land exchanges, the magnitude and distribution of the benefits generated by them, and the incentives for rational economic agents to undertake efficiency, enhancing transfers and facilitating investments (Deininger and Feder, 1998).

Agricultural land markets have their specific characteristics leading to multiple imperfections. The rural economic environment in general, especially in developing countries, is characterized by imperfect markets, asymmetric information and uncertainty (Vogelgesang, 1998). Information asymmetry can be described as uneven access to information of different actors on the land market, which creates imbalances of power in transactions. The sellers are not aware of all the potential buyers, while the buyers are not aware of all the potential sellers. Comprehensive information about market prices is usually not available and the availability of land on the market is often only announced through relatives and social networks. One of the main reasons for land market imperfections is that agricultural land is not a commodity in its conventional sense because it is linked to a specific location and because it is not infinitely reproducible over time in the way that labor and capital are. Agricultural land is clearly heterogeneous and may be categorized according to location, agricultural use category such as arable, pasture or perennials, fertility, and ownership structure. Other market imperfections result from nonmaterial values attached to land such as social, emotional, cultural, or even religious values. Furthermore, only a limited amount of land is offered on the market every year because individuals often hold land rights for many other reasons than only agricultural production, including prestige value, lifestyle value and family

traditions, and for storing wealth if confidence in money as a repository of value is low. If agricultural land is sold on the market, it is often for such reasons as the retirement or death of the owner (Ciaian et al., 2012).

The functionality of agricultural land markets are also affected by imperfections in input, product, credit and insurance markets. Credit or capital market imperfections play a particularly important role, and even more so for land sales transactions (Swinnen and Vranken, 2010).

Given that land markets are not perfect markets, the question is how should land markets be guided towards the desired policy objectives in a manner that alleviates these imperfections and leads to optimal land allocation and use.

The land market development in a certain country will be inextricably linked with the prevailing systems of property rights and land administration in that country.

In very general terms, a formal land market exists in countries with private ownership for agricultural land. However, long-term and secure use rights that are fully transferable and formally registered can become virtually undistinguishable from private ownership (Deininger, 2003).

In order to be able to understand, support and facilitate the development of agricultural land markets, it is important to have in place a conceptual framework (Hartvigsen and Gorgan, 2020). Land market operations need to be supported by three regulated sectors: i) land registration and cadastre, ii) valuation services, and iii) financial services (Dale and Baldwin, 2000) supplemented by a fourth pillar, the

cognitive capacity of the society to think of land as a commodity (Wallace and Williamson, 2006). The efficient functioning of these elements is essential if the land market is to operate smoothly and formally. These supports may be regarded as the regulatory pillars that stand on the base of the land policy (Dale and Baldwin, 2000). "An efficient and effective land market can then be characterized in terms of the effectiveness of the regulatory pillars, the land policy, the regulatory framework, and the dynamism of the market itself". In this context, Williamson et al. (2010) present a five-stage evolutionary model to understand the development of formal land markets in a specific country. The five development stages are: (i) existence of land, (ii) land rights, (iii) land trading, (iv) land market, and (v) developed land market (see Fig. 1).

The model can be understood in the way that for a land market to develop, a community not only needs land as a territorial imperative (Stage 1), but also a number of preconditions to drive the evolutionary process such as individualization of property rights. In Stage 2, formal land rights are established and recorded in a land registry. The first two stages of the model can be seen as the preliminary stages of the market.

In Stage 3 of the development model, land trading is beginning to take place but often only between community members who know each other (e.g. relatives and neighbors) and the land market activity (number of transactions) is still relatively limited. The commoditization of agricultural land is slowly beginning and starts offering a wide range of rights, powers and opportunities. The better these are organized and understood, the better the market will operate.

With Stage 4, the land market becomes more mature, and the scale of operations is fundamentally different from the previous stage. Trading takes also place between parties that are not well connected in advance. Also in Stage 4, credit mechanisms begin to be available. Land rights are beginning to be converted into tradable commodities. The point of differentiation between simple land trading (Stage 3) and land markets (Stage 4) lies also within the mature cognitive capacity of the society at large to conceptualize rights themselves as commodities (derive abstractions of rights from land) and to build different opportunity sets out of these abstractions.

In Stage 5, the land market is fully developed and fully integrated into the economy, and land is accepted as collateral and leverages its potential wealth acceleration role. The system relies heavily on the cognitive capacity of the society to understand and use tradable commodities, the rule of law, government capacity, and national ability to compete for capital in international marketplaces. Most countries will experience more than one development stage at a time and find that a smooth transition from simple to developed markets is difficult to manage. This means that a country, according to the annual land turnover, could be assessed in Stage 4, while according to the level of informalities and land registration problems only in Stage 3 (also the other way around).

While land rights can exist without a market, markets cannot exist without land rights. Robust land rights and effective land administration systems to record these rights are necessary, though not sufficient preconditions for the formal land market to function. Two main instruments used for land administration are a registry that handles information about land ownership as well as third-party rights

(e.g., mortgages, servitudes, leases and pre-emption) and a cadastre in form of maps showing the physical location and boundaries of land parcels and buildings being part of the property. Thus, the land administration system is an important infrastructure for the formal land market, which also facilitates the implementation of land policies (Enemark, 2009).

As mentioned earlier, the land market framework can be conceptualized as based on several regulatory pillars standing on the policy and institutional frameworks. Within market-driven economies, agricultural land markets have to be supported by clear and coherent policy and regulation aligned and contributing to broader agricultural and rural development goals. The policies should address specific development issues, such as improvement of farm structures, facilitation of access to land of small family farms or of young farmers. There needs to be a political will and a vision for active development of the agricultural land markets from the simple towards the more advanced stages, including through specific support measures and when appropriate, this can also be supported through the application of land management instruments.

Regulations of agricultural land markets in a given jurisdiction further define the framework of ownership, use and transfer of land (e. g., who can be owners of agricultural land, maximum area owned by natural and legal persons, pre-emption rights, etc.). One of the common objectives of regulations of the agricultural land markets is in many countries to avoid speculation in agricultural land and overconcentration in a few hands. Land management instruments such as land consolidation and land banking require functional and formal land market in order to be operational and can, as discussed in

Section 6, also strongly support land market development in project areas.

Finally, the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT) is promoting secure tenure rights and the responsible governance of all forms of tenure and sets in Part 4, Section 11 certain standards and principles for the organization and functioning of land markets (CFS, 2012). The VGGT particularly gives guidance to States with regards to the organization of fair and transparent land markets, with efficient and simple administrative procedures, measures to prevent potential negative impacts on local communities, indigenous peoples, and vulnerable groups, policies and regulations protecting tenure rights in general and those of small-scale producers in particular.

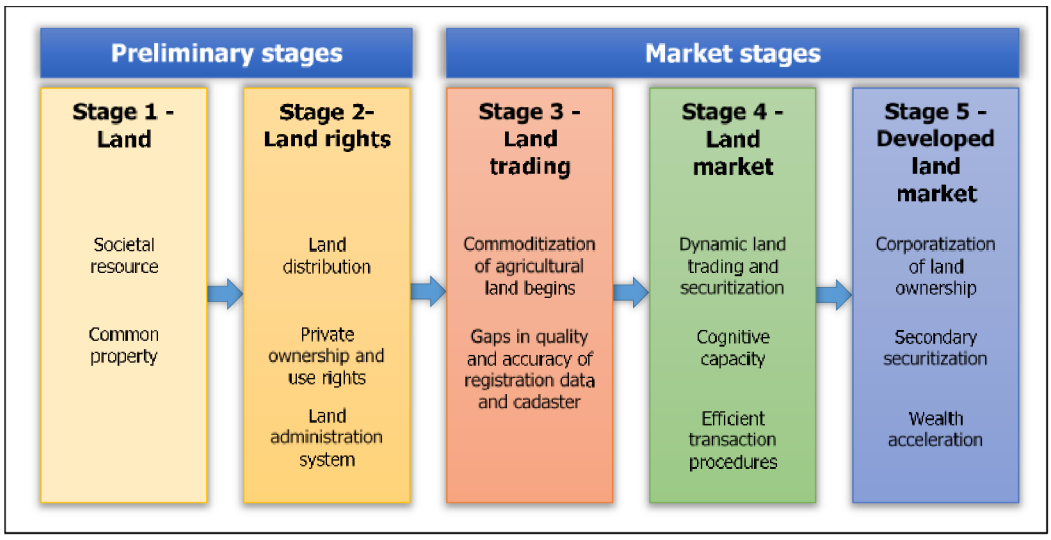


Figure 1: Five evolutionary stages of agricultural land market development.

Source: Author's elaboration based on Williamson et al. (2010), p. 151.

2.3. Farm structures in Eastern Europe and Central Asia

Land reforms were high on the political agenda and a key part of the overall agrarian reforms together with the restructuring of large-scale socialist farms in most countries in Central and Eastern Europe and Central Asia at the beginning of the transition from centrally planned to market economy in the 1990s (Lerman et al., 2004).

Two fundamentally different overall approaches to land reform were applied: i) distribution of land rights to the population in rural areas at the time of privatization and ii) restitution of land rights to former owners who lost their rights during the collectivization process (Hartvigsen, 2013a). Many and often contradictory factors such as historical background, land ownership situation at the time of collectivization and ethnicity have been important while designing the land reform process in each country. In Albania, Armenia, Georgia, Azerbaijan, Moldova, Ukraine and Kyrgyzstan, the former state owned agricultural land was during the land reform process equally divided and distributed into the ownership of the rural population.

In contrast, in all Central Asian countries except Kyrgyzstan land use rights were allocated to the rural population while the state retained formal ownership over all agricultural land. Belarus is the only country in the region where there was no land reform implemented and neither use nor ownership rights to agricultural land were allocated to the rural population. The farm structures in Belarus are still dominated by publicly owned agricultural enterprises, the successors of the former collective farms. In the Western Balkan countries during the Yugoslavia era, the majority of the agricultural land (in average around

80%) was in private ownership as well as use. Thus, land reforms in the post- Yugoslav countries have not changed significantly the farm structures (Hartvigsen, 2013b).

The way in which the land reforms were conducted largely defines in many (but not all) of the countries the status of development of agricultural land markets today.

In most of the EECA countries, except in the former Yugoslavia countries, the land reforms after 1989 have completely changed the farm structures that existed during the socialist era. With the exception of Belarus, Kazakhstan and Ukraine, the farm structures in the EECA countries are dominated by smallholders, small family farms and households practicing agriculture mainly for subsistence and semi-commercial purposes. In countries such as Albania, Armenia, Bosnia and Herzegovina, Georgia, North Macedonia and Kyrgyzstan the average farm sizes are between one and three hectares and between 95% and 99% of all farms are smaller than 5 ha (FAO, 2020a). Small family farms have also become the backbone of the post transition farm structures in Central Asia (Lerman and Sedik, 2018). Other countries such as Serbia, Moldova and Kazakhstan have dualistic farm structures with many small family farms, some larger commercial family farms and few large-scale corporate farms.

Building on Hartvigsen (2013b), the level of fragmentation of both land ownership and land use in the 18 studied countries is assessed in Fig. 2 on a scale ranking the fragmentation in the countries in three simple categories; low, medium and high.

Small average farm sizes and excessive land fragmentation represents a long-term handicap of farm structures and is in general a limiting

factor for agricultural and rural development. This structural problem in agriculture is not just causing low productivity and competitiveness of the farms but is also creating bottlenecks limiting the impact of other development programs and initiatives. There is a number of typical reasons why farm structures only develop very slowly. Common among many countries is the low income-generating capacity of the sector, which makes investments, including investment in purchasing or renting additional land, less attractive. Investments in purchase of additional land are also hampered by lack of access to credit and finance for the small family farms, outdated production technologies, lack of access to markets, weather-induced and climate change risks, etc.

Land fragmentation and small farm sizes are also among the root causes of out-migration from rural areas and in several countries in the region a main reason for arable agricultural land being abandoned. In particular, the young generation is leaving resulting in an ageing rural population in many countries. In Armenia, according to the 2014 Agricultural Census, 33% of the land of family farms and 38% of the land of corporate farms is abandoned (FAO, 2017b). Land abandonment is widespread in most Western Balkan countries. In North Macedonia, also around one-third of all arable agricultural land is unutilized. In Bosnia and Herzegovina, the similar figure is as high as 45%.

Country	Level of fragmentation of ownership in agricultural land	Level of fragmentation of land use in agricultural land
Albania	High	High
Armenia	High	High
Azerbaijan	High	High

Country	Level of fragmentation of ownership in agricultural land	Level of fragmentation of land use in agricultural land
Belarus	Low	Low
Bosnia-Herzegovina	High	High
FYR Macedonia	High	High
Georgia	High	High
Kazakhstan	Low	Low
Kosovo	High	High
Kyrgyzstan	Low	Low
Moldova	High	Medium-high
Montenegro	High	High
Serbia	High	High
Tajikistan	Low	Low
Turkey	High	High
Turkmenistan	Low	Low
Ukraine	Low-medium	Low
Uzbekistan	Low	Low

Figure 2: Level of land fragmentation in countries in Eastern Europe and Central Asia.

Source: Hartvigsen, (2019).

This has created an unutilized potential for local economic growth by strengthening local food production. This has been further reinforced during the COVID-19 pandemic from the beginning of 2020.

2.4. Status of agricultural land markets development in Eastern Europe and Central Asia

By applying the conceptual framework for land market development (model) proposed by Williamson et al. (2010) (discussed in Section 2), the level of development of the agricultural land markets in each of the countries has been assessed, and the countries can be classified as

displayed in Fig. 3. The basis for land market development is the existence of agricultural land. All countries have default reached this stage. It is also relatively simple to assess if countries have reached Stage 2 and 3. They are, according to the model, in Stage 2 if individual formal land rights exist and in Stage 3 if trading of land rights is allowed according to the legal framework in the country and if the system is operational.

It is more complex to assess whether a country is in Stage 3, 4 or 5 (market stages) when agricultural land markets have started to function. To distinguish between the three market stages, the level of activity in the market is crucial. A key indicator for the level of activity is the land turnover in the market. The land turnover is usually measured as the percentage of all (arable) agricultural land in the country that is changing owner in a certain year through sale-purchase transactions. In comparison, during 1997–2007, between 1% and 2% of the total utilized agricultural area was traded annually in Belgium, Italy, France and Finland, while the same figure for the Netherlands in the same period varied between 2% and 4% (Ciaian et al., 2012). In Lithuania, the annual land turnover of private owned agricultural land was around 3% in the period 2000–2003, while it dramatically increased to 5–7% after becoming an EU member country in 2004. In the Czech Republic, the annual turnover of private purchased land amounted to about 0.3% of the total agricultural area in average during the period of 1993–2001. However, from 2002 to 2004, the annual turnover of private land increased to 1.5% and to 3.3% in 2005 after EU accession (Swinnen and Vranken, 2010). One of the drivers for such an increase can be the expectations of higher profitability under the CAP direct support to farmers. Agricultural support

schemes will usually be capitalized in sales and rental prices of land (Swinnen et al., 2008).

However, not only the percentage of agricultural land entering the market is important. It also depends on the farm structures in the country. When the average farm and parcel size is very small as in most of the 18 assessed countries, a relatively high number of e.g. sales transactions may still result in a small land turnover percentage. The assessment displayed in Fig. 3 has been conducted using the available data on land market activity in the countries combined with the author's own experiences with the implementation of FAO project related to land tenure and supporting smallholders and family farms in the countries in the region.

As mentioned, the second stage of land market development – the existence of land rights - was reached by the countries where agricultural land was distributed through land reforms to the rural population through the allocation of land rights, and these were formally registered. In the former Yugoslavia countries, private ownership to agricultural land continued during the collectivization era and, hence, these countries were before the beginning of transition in Stage 2. As mentioned in Section 3, Belarus is the only exception in the region where agricultural land still remains in both state property and use. In Belarus, no land reform was so far implemented and the economy including the agricultural sector is still largely centrally planned and managed. In the rest of the countries, a varying percentage of the agricultural land was not privatized and retained in public ownership.

As mentioned in Section 2, countries reach Stage 3 of land market development when simple land trading has started, often between

community members, e.g., relatives and neighbors, and the land market activity is still relatively limited. Most of the studied countries have reached this stage. The exceptions are Belarus (as already discussed, still in Stage 1) and Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan (still in Stage 2).

Out of five countries in Central Asia, only in Kyrgyzstan arable agricultural land is in private ownership and transactions with agricultural land are allowed and facilitated by the legal framework and land administration system. In Kazakhstan, private ownership of agricultural land is also recognized, however the formal trading in the land market is negligent since only a little more than 1% of the land used by farmers is in private ownership.

In four of the five countries in Central Asia - Kazakhstan, Tajikistan, Uzbekistan, and Turkmenistan – the state retains formal ownership over agricultural land, while the use rights were distributed to the rural population and small family farms during the land reforms at the end of 1990 s. The amendments to the Land Code of Kazakhstan operated in June 2021 enable the transfer of the use rights and thus open up the agricultural land market of use rights. The Land Code of Tajikistan also provides for alienation of use rights, but there is no secondary legislation in place to fully enable the functionality of agricultural land markets (Lerman, Z. and Sedik, D. 2018; FAO, 2018).

In Stage 3 (land trading stage) are currently the countries where transfer of property rights is possible, but where land markets are still not functioning well, and the scale of land market activities is limited. Nine of the 18 countries are assessed to be in Stage 3: Albania, Azerbaijan, Bosnia and Herzegovina, Georgia, Kosovo, Kyrgyzstan, Montenegro, North Macedonia, and Ukraine. Land administration

systems in these countries are generally in place but there are often serious gaps related to the quality and accuracy of registration data and cadastre, institutional set-up, and operational efficiency (see Section 5). The use of agricultural land to obtain access to credit through mortgage is problematic and limited and the mature cognitive capacity of the society to perceive land as a commodity is in general not yet well developed.

Ukraine, in spite of the distribution of private property rights over agricultural land to the rural population, was until July 2021 still in Stage 2 of land market development. Land reform in Ukraine was implemented in two stages. First, land shares were distributed to employees and pensioners of the collective and state farms from 1990 to 1999 and subsequent a large-scale conversion from land shares to physical parcels from 1999 onwards (Hartvigsen, 2013a). In 2002, a new Land Code was adopted and a moratorium on sale of agricultural land was introduced. Initially intended as a temporary measure, the moratorium was extended numerous times, thus, effectively disabling the function of the land market. Over the years, the ban has had several harmful effects on the agricultural sector and suppressed the development of smallholders and family farms. The ban prevented landowners from exercising their legitimate tenure rights and agriculture based on the tenancy of land has discouraged long-term investments and kept the competition limited and the rental rates very low. It has also resulted in the appearance of an informal "gray" land market and in an overall lack of transparency (Kvartiuk and Herzfeld, 2019; Lytvyn, 2019). Assessments made by the World Bank and others showed that lifting the ban on the agricultural

land market would have very positive effects on the economy in the country in general (Deininger and Nivievskyi, 2019).

Of the Caucasus countries, Georgia and Azerbaijan have reached the land trading stage. In Georgia, however, the functionality of agricultural land markets is hampered by low rates of primary registration of agricultural land in the land registry (only around 30% of land parcels in rural areas), while in Azerbaijan by expensive and complex transaction procedures.

The Western Balkan countries and territories, Albania, Bosnia and Herzegovina, Kosovo, North Macedonia, and Montenegro, are also assessed to be in Stage 3 of the development model (Fig. 3), mainly because of still limited and weak land market activity. For example, only about 3600 land transactions (parcels) involving 830 ha of agricultural land were recorded in Albania during 2010 (Cela et al., 2018).

	Country	Stage 1 - Land	Stage 2 - Land rights	Stage 3 - Land trading	Stage 4 – Land market	Stage 5 – Developed land market
1	Albania					
2	Armenia					
3	Azerbaijan					
4	Belarus					
5	Bosnia-Herzegovina					
6	Georgia					
7	Kazakhstan					
8	Kosovo					
9	Kyrgyz Republic					
10	Republic of Moldova					
11	Montenegro					
12	North Macedonia					
13	Serbia					
14	Tajikistan					
15	Turkey					
16	Turkmenistan					
17	Ukraine					
18	Uzbekistan					

Figure 3: Assessment of the agricultural land markets in the 18 countries and territories according to level of development applying the model of Williamson et al. (2010) (see Figure 1).

This comprises an annual land turnover of only 0.1%. In North Macedonia, during 2017–2020, the annual land market turnover was around 0.5% of the total agricultural land in private ownership. In average, around 1700 ha were transferred annually in this period, while the parcel size traded was around 0.3 ha[6]. In Kosovo, the annual land market turnover during 2017–2021 was in average 1.1%. However, despite such relatively high turnover, Kosovo is still assessed somewhere between Stage 3 and 4 because of the issues of extensive informality in property rights, as discussed in Section 5.

6 Author's calculations based on the official Data of the Agency for Real Estate Cadastre of North Macedonia

There is a lack of reliable data related to agricultural land sales in Bosnia and Herzegovina and in Montenegro. However, there is in place legal and institutional infrastructure for the functionality of the agricultural land markets, and many transactions with agricultural land are carried out for non-agricultural purposes. Therefore, both countries are assessed to be in Stage 3.

In Central Asia, Kyrgyzstan is the only country that has reached Stage 3. It stands out compared with the other Central Asian countries since the land reform implemented during 1997–1999 has distributed arable agricultural land into the ownership of the rural households (FAO, 2020c). Today, 90% of all arable land belongs to the private sector, and the land registration services generally function well. However, there are issues with the quality of the cadastre and registration data. The land market turnover in Kyrgyzstan during 2011–2021 was, in average, 0.38% per year[7]. The area transacted per year was relatively stable and only in 2021 the turnover increased to almost 0.5%. Around 80% of all sale-purchase transactions were carried out in the Chui region – the most endowed region with agricultural land where also the capital city of Bishkek is located.

In many countries in the third stage of the model, transactions with agricultural land are often carried out with a non-agricultural purpose. For example, in Kyrgyzstan and Albania, land market activity is often related to urban sprawl and housing (Cela et al., 2018; FAO, 2018). Because of weak capacity to enforce spatial planning regulations and unregulated land market activity, agricultural land peripheral to towns and villages is often partitioned and used for illegal construction of

7 Author's calculations based on the official Data of the State Agency for Land Resources of Kyrgyzstan

houses or purchased with the expectation of future transfer to residential area and is thus representing small-scale speculation in agricultural land, where the market price is not in any way determined by the agricultural production value. Characteristic factors constraining the development of the formal agricultural land markets include the perception of land as a social safety net.

To sum up, it is the assessment of the authors that four of the 18 countries are currently in Stage 4 (land market stage), while none of the countries have yet reached Stage 5 (developed land market). The four countries currently in Stage 4 are Armenia, the Republic of Moldova, Serbia and Turkey. The land markets in these countries are, in general, functioning relatively well. Compared with the countries in Stage 3, the extent of transactions, including those carried out for an agricultural purpose, is higher. In Armenia in 2016, the land turnover was around 1% (4535 ha of agricultural land in the private property transferred through sale-purchase transactions out of 455,249 ha of privately owned agricultural land) (FAO, 2017). In Moldova, in 2014, the market of agricultural land experienced a turnover of around 0.8%. In Serbia, in 2015, a total of 4115 sale-purchase transactions with privately owned agricultural land have been registered involving some 43,278 ha or a turnover of 1.3% of the total utilized agricultural area.

The land administration systems in the Stage 4 countries offer in general efficient and inexpensive transaction procedures, although the quality and accuracy of registration data and cadastre maps often require further improvements. The use of land to obtain mortgage loan is becoming more common and there is a growing general

perception in the society of land as commodity and as the basis for further agricultural and rural development.

Cognitive and social capacity to think of land as a commodity, secure tenure rights, enabling legal and institutional environment, and a developed land administration system are arguably key factors that will define the country's stage of development of the agricultural land markets. The indicator of *Annual land turnover* makes it possible to compare land market activity in different countries relative to its total stock of agricultural land. Because of the different average parcel sizes (usually the unit of a transaction), the number of transactions necessary to transfer a conventional 100 ha of land will differ between the countries. Thus, by looking at an absolute number of transactions carried out, the market can be assessed from the institutional capacity, cost recovery and financial sustainability, and fiscal perspectives. In using land turnover as a proxy indicator to farm structure transformation, it has to be noted as already mentioned that not all transactions with agricultural land are for the purpose of agriculture. An unknown number of transactions, especially in developing markets in Stage 3 and 4 will pursue non-agricultural purposes, such as urban development, speculation or various socially-driven transfers. The share of non-agricultural transactions varies from country to country and has to do with how land markets are regulated, how spatial planning is conducted, and in particular how it is enforced.

The market turnover will depend on a number of factors, including the countries endowment with agricultural land in general, distribution of agricultural land into different categories (e.g., arable, perennial, pastures, hayfields), the amount of land allocated into private

property (both hectares and number of plots), the average parcel size. For example, with a turnover of around 1% in both Moldova and Armenia, the average number of sale-purchase transactions in the period 2005–2014 in Moldova was 55,000, while in Armenia only 7500 transactions.

In addition to the discussed numbers of land transactions and land turnover, land markets can also be looked at through land prices and their development, credit markets, land market participants, and how they are regulated. Access to credit secured by agricultural land even in the countries in Stage 4 is still limited. A detailed analysis of the mortgage markets is beyond the scope of this paper. However, agricultural land largely remains unattractive collateral for the banks in most of the analysed countries mainly because of small average parcel size, low profitability in agriculture in general, legal restrictions for banks to own land, practical and legal difficulties with foreclosure on the land of smallholders, and issues of valuation. This contributes in general to under-investment in agriculture, and limits development opportunities in particular for small family farms as they need to purchase additional land from own savings.

2.5. Constraints for development of agricultural land markets in Eastern Europe and Central Asia

In this section, we emphasize the role of the land administration systems for the development of formal agricultural land markets in the EECA countries. The assessment of the countries according to their current land market development stage, as presented in Section 4, is

supported by examples of specific problems and constraints hampering normal functioning of the markets. The section also explores the issue of informality in land markets and its reasons.

2.5.1. Land administration systems and formal registration of land rights

Following the land reforms from 1990 onwards, land administration systems including cadastre agencies and land registries were built up or renovated in the EECA countries with large-scale donor support (Torhonen, 2016).

An efficiently functioning land administration system provides the groundwork for the protection of tenure rights, secure property transfers, and a functioning and secure mortgage market. It also contributes to reduction of conflicts and promotion of social stability. The effective operation of land administration systems is therefore fundamental in developing successful market economies (UNECE, 2014).

Furthermore, the formal land market cannot begin to function until the first registration of property rights over agricultural land is completed, including the preparation of cadastre maps. In most of the countries assessed in Section 4 (see Fig. 3), the first registration of formal land rights is largely complete, with only smaller or larger "pockets" of unregistered private land. In many countries, systematic registration was done as part of the finalization of the land reform process. Georgia is the only country in EECA where only around 30% of the privately-owned agricultural land is estimated to be officially registered (FAO, 2020b). Sporadic registration procedures have existed for several years in Georgia, but at a high cost, which is

increasing the overall transaction costs and is a disincentive to the formalization of land transactions. The Government of Georgia has in 2022 launched a program for the systematic registration of land rights in rural areas.

Of the 18 studied countries and territories assessed in Section 4, only Kosovo, Kyrgyzstan and Turkey report that all privately held land plots are fully registered in the immovable property registry and mapped (World Bank, 2019). In the Republic of Moldova, virtually all agricultural land in private ownership is registered (World Bank, 2014). However, only around 13% of public property lands (state and municipality) are registered and mapped. In Ukraine, out of 10.5 million hectares of state owned agricultural lands, 43.6% were in 2015 registered in the Cadastre and only 20.6% in the Registry of Property Rights (Nivyevsky et al., 2015 as quoted in Kvartiuk and Herzfeld, 2019).

Thus, the primary registration of property rights is a precondition for the existence and development of formal agricultural land markets.

2.5.2. Informalities in land markets and their reasons

Informality exists when land transactions take place but are not formally registered in the land registry and also when other events happen, e.g. the death of the registered owner, and the land registry is not updated accordingly. A high degree of informality is a general problem in most EECA countries. From the land administration perspective, informality is manifested in the situation when registration records stop corresponding with the situation on the ground and become outdated. This in turn undermines the sustainability of the formal land administration systems (Haldrup,

2011) and the high degree of informality in the land markets is then again leading to insecure land rights and risk of disputes and conflicts that are very difficult to solve in the court system after decades of informality (Hartvigsen, 2019). Informality is in this sense jeopardizing the huge investments made in formal land administration systems by development partners and Governments throughout the region.

There are several reasons why land transactions in the studied countries in EECA often remain informal, including high transaction costs (compared to the value of the land), lengthy and complicated registration procedures, transaction taxation, and widespread corruption. The mentioned hindrances are disinsentivising landowners and pushing land relations into the shadow, which, as mentioned, eventually leads to tenure insecurity, land conflicts and is in general hampering agricultural and rural development. Informality caused by the delayed or uninitiated inheritance procedures is discussed in Section 5.3.

Experiences from FAO land consolidation pilot projects in Albania and Azerbaijan show that most of the agricultural land sales in the pilot communities after the land reforms in the 1990 s have not been formally registered. In the land consolidation pilot in Shorsulu village in Azerbaijan, during 2016–2019, 17% of the interviewed agricultural holdings have reported an informal sale of agricultural land (8.5% of all land parcels in the village) (Hartvigsen et al., 2020). The assessments are that these figures should be even higher because the landowners are not always willing to report informal transactions or are not aware that the transaction did not follow all the required steps (e.g., was authenticated with the notary but not submitted for formal registration to avoid costly land surveying). In a similar land

consolidation project implemented in Albania during 2012–2014, around 6% of all plots in three pilot villages have been reported (by interviewed landowners) as informally transacted.

Kosovo is an example of extraordinary complexity and uncertainty in agricultural land relations. Informality has evolved in Kosovo since the late 1980s and had further aggravated after the armed conflict at the end of the 1990s. In addition to informal transactions and unsettled inheritance cases, informality was further reinforced by a range of legal issues due to separation from the Former Yugoslav Republic, while the armed conflict had boosted the number of displaced persons and absentee owners and made it even more complicated to clarify who are the rightful owners, e.g., was a land parcel informally sold before the war or was it unlawfully taken over by a neighbor. Kosovo is also an example where unfinished land consolidation projects initiated in the 1980s have created total informality on some 26,000 ha of good irrigated agricultural land (Hartvigsen, 2015).

Experiences show that in countries, which are in stage 2 of the development model (Fig. 3) with the tenure rights registered, but where legislation does not enable land transactions, unofficial land trading is still often taking place. As explained in Section 4, agricultural sales markets in Ukraine before lifting the moratorium and use rights markets in Kazakhstan and Tajikistan are legally restricted. However, a shadow market for agricultural land exists in the countries through a number of unofficial or semi-official ways allowing to circumvent legal restrictions. During the moratorium in Ukraine, agricultural land parcels were de facto sold in various ways, e.g., long-term lease agreements with a pre-emption right of tenants to buy the land or a

special type of lease contract called emphyteusis[8] or through pocket contracts already signed but waiting to be dated and formally registered (Amosov, 2019; Visser and Mamonova, 2019; Keyzer et al., 2013).

2.5.3. Constraints in the formal land markets

In this section, we present the main constraints preventing land parcels from accessing formal land markets and hence hampering development.

2.5.3.1. Absentee landowners

In the countries currently in land market development Stage 3 or 4, in total 13 of the 18 countries and territories, the development of agricultural land markets, both sale and rental markets, are hampered by a high degree of formally registered owners that are absent from the village where their land is located. Some of these owners out migrated from the country decades ago and often have little interest in their land. In completed and ongoing FAO supported land consolidation projects in North Macedonia[9], it was found that, in average, around 1/3 of all formally registered owners were absent from the region where their land is located.

2.5.3.2. Inheritance cases

One of the reasons for informality and the cause of another layer of complexity preventing agricultural land parcels from entering the

8 Emphyteusis is a special type of use right contract in the Land Code of Ukraine, which allows a temporary land user to get the opportunity to use land as an economic asset - to sell his right to use the asset or to use it as collateral.

9 Project website of the EU funded and FAO implemented MAINLAND land consolidation project: https://www.fao.org/in-action/mainstreaming-nationa l-land-consolidation-programme/en/.

formal land market is the delayed or uninitiated inheritance procedures after the formally registered landowner has passed away.

Unresolved inheritance is widespread in many countries in EECA. In the countries in ex-Yugoslavia, the formal land markets were very much restricted and land registration was largely neglected during the decades of collectivization (Hartvigsen, 2019). The situation has not changed much since Yugoslavia was dismantled and the new independent countries emerged. A large percentage of the formally registered owners have been deceased for decades, and inheritance remains unresolved in the families. The problem is even more complicated in the case of co-ownership and in the case of lack of agreement between heirs (or if some of them live abroad, which is common in many countries).

In Moldova, 24% of all land parcels involved in the World Bank funded land consolidation project in 40 villages, implemented during 2009–2010, had an unresolved inheritance. The inheritance of agricultural land after the death of the formally registered owner(s) remains unresolved, often due to lack of knowledge about the procedures and general juridical illiteracy, lack of finances, and not least because of the procedural complexity (ACSA, 2010).

Evidence from the FAO land consolidation pilot project in Azerbaijan during 2016–2019 indicates that unresolved inheritance cases affect around 30% of the agricultural holdings in the pilot area (Hartvigsen et al., 2020).

The formalization of one or more heirs to be registered as the new formal owner entails certain costs and can be a complex and lengthy process. The implicit costs in the process of formalization of

inheritance represent efforts in the families to discuss and agree on the future of the property, e.g., should the estate be divided equally among the heirs (if legally possible), or one of the heirs could buy out the shares of the other heirs uninterested in farming. Inheritance processes are often associated with a severe risk of conflicts in families.

2.5.3.3. Co-ownership

Without attempting to cover all legal nuances, co-ownership to agricultural land in various forms exists in all countries in the region. In enjoying property in co-ownership, each person has the same right to any part of the property (FAO, 2003).

In many countries where land reform had instituted private property over agricultural land, co-ownership has become widespread. In Azerbaijan and Albania, for example, agricultural land was distributed to families under a single property title, and it has implications on the land market functionality today. To enforce the co-ownership provisions in the legislation, all adult family members are required to be present in front of the notary or provide a power of attorney before any land transaction can take place. Now, two decades or more after the land reforms, children in the families grew up and got married, while parents have become older or passed away. Considering such family composition changes, it becomes difficult in practice and more expensive to conduct notary actions, especially if there are pending inheritance procedures. Fulfilling the inheritance procedures if there are many co-owners to the same property is also becoming more complicated and costly and may prevent the land from entering the formal land market.

In very general terms, in Western Balkan countries, co-ownership between far-away relatives is more widespread than in the rest of the countries in the region. For example, in average 25% of all agricultural land parcels in North Macedonia are typically jointly owned by remote relatives who in addition may be living abroad for several generations. The main cause of this situation is inheritance and legal prohibition to physically sub-divide land plots smaller than 2 ha. In addition, North Macedonia is an example of unusual co-ownership to agricultural land between the state and physical or legal persons. This is an outcome of the land reform process after the independence where land ownership rights have been restituted to persons, but the physical delineation of the parcels from bigger state-owned parcels could not take place because of the ban on subdivision into parcels smaller than 2 ha (FAO 2019a).

While designing land reform and distribution of state agricultural land, policy makers had different considerations, including preventing the physical fragmentation of land parcels. The efforts to avoid physical fragmentation of land parcels in many countries have led to what can be seen as *internal* fragmentation through co-ownership, which is as restraining for the land market development as physical land fragmentation. Finally, land in co-ownership is more likely to be used by less efficient farm organizations or to be left abandoned (Swinnen et al., 2014).

2.5.3.4. Quality and accuracy of registration data and cadastre maps

In addition to the previously discussed problems, also a number of more “technical” land registration problems exist in many countries,

which are also slowing down or even preventing formal land market activities.

Even if land rights are registered, subsequent transactions might be hampered because of the low quality of the recorded information. Some of these registration problems, such as misspelled names of owners or new name of the owner after marriage, are easy to resolve, while others, for example, inconsistencies between the property titles/cadastral maps and the situation on the ground, inaccuracies of boundaries etc., are more complicated and more costly to solve, also because they often require land surveying and the involvement of owners of neighboring parcels. Such situations exist with different frequencies in all the EECA countries with private ownership to agricultural land.

Some of the problems can be illustrated with the case of Albania. According to Probert and Kelm (2019), the issue of data quality in Albania is a serious problem. Cadastre and registration data for large areas of the country appear to be out of date, inaccurate, and of poor quality. Existing cadastral maps do not generally reflect the current situation on the ground. Data quality encumbrances can be expected to continue to limit the land market and economic development in Albania unless it is systematically corrected. In addition, only approximately 10% of the properties in Albania have both digital registration and the digital cadastre map (Probert and Kelm, 2019). Another 80% of properties in Albania have been registered (as part of First Registration activities during the period 1992–2001), but the graphic records for these properties are in paper form and often in poor and outdated condition. The remaining 10% of parcels have still

to be registered for the first time (mainly forest and pasture areas and part of the southern coastal area).

One of the most fundamental aspects of the current problem with data quality in Albania is the ongoing legal interpretation and principle that the original land allocation documents had accurate surface area calculations and that the existing legal registration should be taking precedence over the situation on the ground. Enforcement of such norms requires surveying of parcel boundaries and additional procedures associated often with informal payment to staff, which increases overall transaction costs and discourages formal actions of landowners. This is also the practice in Azerbaijan where the surveying of land parcels to eliminate discrepancies between the title and the physical parcel, is imposed before any transfer of the property can take place (e.g. sale-purchase or inheritance) (Hartvigsen et al., 2020). While the intention of the land administration authorities to improve the reliability and accuracy of cadastral information is understandable and necessary, such ad-hoc surveying for each individual land transaction entering the market is counterproductive to land market development. Furthermore, carrying out such corrections at the expense of the landowners is increasing transaction costs and pushing land relations and rights further into informality. When the level of informality reaches a certain share of the land parcels in a community, what used to be formally registered and thus secure, the land rights sink into a "swamp of informality", negatively affecting all agricultural and rural development in the community.

2.6. Development of agricultural land markets in Eastern Europe and Central Asia

In this section, we first elaborate on the need for a coherent land policy to, among other issues, also support the development of agricultural land markets. Next, we provide examples of land management instruments that can support land market development and enhance transparency and efficiency. These instruments include land consolidation, land banking, lease facilitation, active management of state-owned agricultural land, strengthening the regulation of land use and land ownership, improvements to land market information, and revisions of land policy to better align it with other policies that support smallholders and family farms. The introduction of operational land consolidation and land banking instruments and programs can contribute to the development of agricultural land markets by addressing the structural problem of land fragmentation and small farm sizes and contribute to solving the problems of informality and correcting several other land registration problems.

2.6.1. The need for a coherent national land policy and regulations in support of agricultural land market development

Land markets in any country should develop and function within a clearly formulated and coherent national policy. Land markets cannot be built in isolation from markets of labour, money, and agricultural products (Williamson et al., 2010). Therefore, policy objectives steering land market development should tap into the broader policy framework and the strategic agenda in the country.

Land policy as an integrated part of the overall agricultural and rural development policy in any country is recommended to be fully in line with the principles and guidance of the VGGTs (see Section 2). The tenure guidelines acknowledge the crucial role of smallholders and family farms for national food security and social stability and recommend that their tenure rights have to be carefully protected when facilitating land market operations. Considering that farm structures in the EECA countries are largely dominated by smallholders and family farms, it would be advisable to acknowledge and prioritize development of small family farms as a key policy objective. An active policy approach to land market development can support the needed farm structure transformation, provide access to land for small family farmers, young farmers, and new entrants on affordable conditions, protect and strengthen the domestic farmers. One other policy consideration is that with ageing farmers, as a common trend across Eastern Europe, millions of hectares will change hands in the coming decades. What happens to that land when it reaches the market is crucial to the future of our food and farming systems (Nyeleni, 2020).

As mentioned in Section 2, a system of regulations needs to be in place to cater to the policy objectives and priorities. Since agricultural land markets are imperfect markets, a system of regulations should ideally aim to alleviate these imperfections without slowing down too much the land market activity, e.g. avoid speculation, overconcentration of land and land grabbing. Depending on the prevailing land tenure arrangement underlying the farm structures, i.e. based on rent or ownership of land, either sales or rental market regulations will dominate (Swinnen et al., 2014).

Although regulations of agricultural land markets in the 18 countries were not systematically analysed, the countries in Stage 3 and 4 of land market development (assessed in Section 3), have minimal regulations of both land sales and rental markets. A general regulation among most of the countries in EECA is a ban for foreigners (foreign citizens and companies) to own agricultural land.

It is important to mention also taxes as an additional regulatory mechanism on the land market, e.g., land tax, transaction tax, income tax from renting out the land, capital gains tax. Tax or other fiscal measures can be especially efficient in achieving specific policy objectives (e.g., addressing agricultural land abandonment) in combination with other regulatory or market-based policy instruments.

Although land taxes are common in the region, they are often not enforced, and their potential to encourage more sustainable land-use patterns remains largely unexplored. In most such countries with low or unenforced land tax, it does not cost anything to own agricultural land, thus not creating any incentive to bring the land to the market. Moreover, because of the weak capacity to enforce land use regulations, it does also often not cost anything for landowners to abandon fertile agricultural land for several years. These two factors can be seen as encouraging to both small and large-scale land speculation. Enforced collection of land taxes will not only increase tax revenues, but will encourage more land to be transferred through the sales and rental markets, towards a more efficient land use. Alternatively, all land could be taxed, but tax be waivered if land is in full production.

Based on the assessment of agricultural land markets in the 18 countries and territories presented in Section 4, there is a clear need to mainstream and accelerate the development of the agricultural land markets in all the assessed countries, eventually reaching development Stage 5. It is recommended to more actively support and guide the agricultural land markets through comprehensive and integrated policies, targeted programs, sound regulatory framework, and by combined application of land management instruments.

Legal regulations should ensure that the development of the agricultural land markets will strongly contribute to achieving the overall development goals for agriculture and rural development and be in line with the guiding principles of the VGGTs.

2.6.2. Land consolidation

Land consolidation is in particular in Europe and South Asia a well-established land management instrument. In many countries in Western Europe, land consolidation goes back more than 100 years. The traditional objective has been to support agricultural development by reducing land fragmentation and facilitating on a voluntary basis farm enlargement and often linked with improvement of agricultural infrastructure such as irrigation, roads and drainage based on local needs. FAO has played a leading role in supporting the introduction of land consolidation and the development of national land consolidation programs in Central and Eastern Europe from 2000 on (Hartvigsen, 2019). The FAO regional land consolidation program contains of three main pillars: i) technical guidelines, ii) field projects in the program countries, and iii) the informal network of land tenure professionals interested in land consolidation, land banking, land market development, etc. (LANDNET). The FAO Legal Guide on Land

Consolidation is a recent flagship publication on land consolidation (Versinskas et al., 2020).

The Legal Guide, published in 2020, defines land consolidation as:

"Land consolidation is a legally regulated procedure led by a public authority and used to adjust the property structure in rural areas through a comprehensive reallocation of parcels, coordinated between landowners and users in order to reduce land fragmentation, facilitate farm enlargement and/or achieve other public objectives, including nature restoration and construction of infrastructure".

It is important that land consolidation is implemented fully in line with VGGT (CFS, 2012). The tenure guidelines have a section on land consolidation, where a key principle is that landowners and farmers participating in land consolidation projects should be at least as well off after the project compared with before.

In most Western European countries with ongoing national land consolidation programs, land consolidation has developed into a multi-purpose instrument, which allows to pursue different objectives in the same project, e.g. agricultural development in one part of the project area and public initiated nature restoration or climate change adaptation in another part of the area. The approach also allows, as an alternative to expropriation of private owned agricultural land, to compensate landowners and farmers in land instead of a monetary compensation and in this way refraining from destroying the local farm structures.

Implementation of land consolidation programs and projects can in a number of ways contribute also to the development of agricultural land markets. In undeveloped land markets, the price of small land

parcels will often be lower than the transaction costs involved in transferring them from one owner to another, and there will often be no interest in purchasing such parcels because of the high transaction costs. After land consolidation, the local land market will usually begin to function better and gradually become stronger as the process of enlargement continues through normal land market transactions. In general, land consolidation should not replace the land market but support its development.

This is illustrated in Fig. 4 with an example from a World Bank funded land consolidation pilot project in Moldova during 2007–2009 (Hartvigsen et al., 2013).

After the project in Moldova, the land market was un-blocked and started functioning. Together with the subsequent implementation of land consolidation projects in 40 villages, a significant stimulatory impact on the agricultural land market was seen. The number of transactions registered in total in the 40 land consolidation projects in 2009–2010 constitutes 14% of the total number of transactions with agricultural land concluded in the whole country in the same period. It is often seen that after land consolidation projects are implemented, the participating private landowners and farmers invest additionally in agricultural development, e.g. planting orchards or vineyards or investing in drip irrigation after access to water is provided through the improvement of agricultural infrastructure integrated in the land consolidation project. The example in Fig. 4 also illustrates how public investment in land consolidation often leads to private investment in agricultural development.

An important positive side-effect of land consolidation is also that the existing land administration and land registration problems (discussed

in Section 5) in the project area are largely cleaned up and solved with the registration of the new formal land rights as an outcome of the land consolidation in the project area.

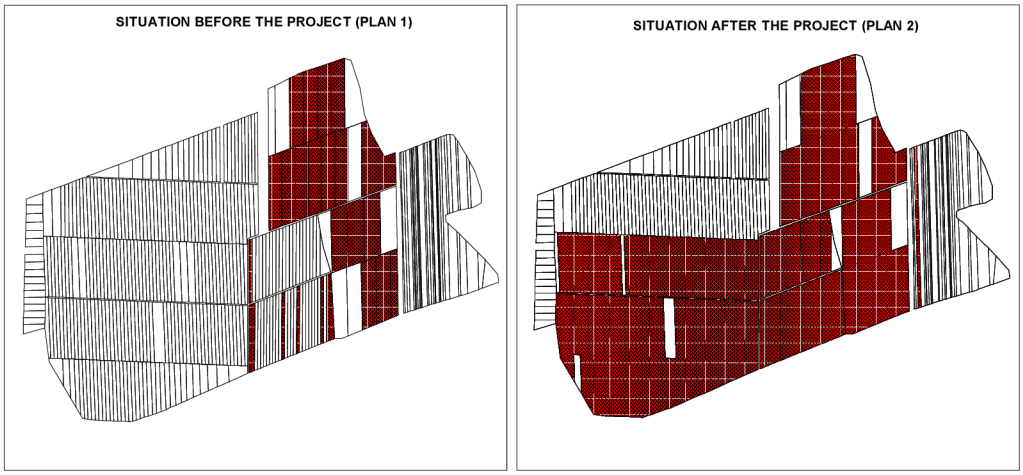


Figure 4: Land market development through land consolidation in Bolduresti village in Moldova.

Before the pilot project started (left map), a local farmer wanted to acquire about 30 ha of an old unproductive orchard to establish a new orchard. As the parcel sizes created for orchard areas during the land reform were small, the area identified had 124 individual owners. The farmer managed to acquire an area of about 10 ha by purchasing a number of parcels with an average size of about 0.7 ha. However, the remaining area comprised parcels as small as 0.14 ha, and the high transaction costs and time constraints of dealing with a large number of owners caused the farmer to give up. Through the land consolidation project (right map), the farmer was able to acquire and consolidate additional 15 ha in a relatively short period of time. This involved purchasing 10 parcels from 80 landowners. After purchasing the rest of the parcels in the block, in 2009, the farmer planted a new plum orchard on the consolidated land.

Source: Hartvigsen et al. (2013).

2.6.3. Land banking

Land banking is a land management instrument that has proven its effectiveness and importance in facilitating the implementation of land consolidation projects (Versinskas et al., 2020; FAO, 2022). Land banking is used broadly and combined with land consolidation in Western European countries like Denmark, Germany, Belgium, and the Netherlands as a tool to increase land mobility during the land consolidation planning (Hartvigsen, 2014). The instrument is also used to compensate landowners in land, instead of monetary compensation, when agricultural land is taken out of production for public-initiated projects and to facilitate on a voluntary basis farm size enlargement.

The possible synergies between land consolidation and land banking instruments in an EECA context have been discussed at several regional land consolidation conferences and workshops during the last two decades. However, an assessment conducted in 2015 found that land banking in connection with land consolidation projects had so far largely failed and the potential remained unused (Hartvigsen, 2015). There are a number of reasons for this, and some of them are country specific. A general explanation appears to be related to the organization of state land management (see Section 6.5) and land consolidation in the countries. Often different public institutions are responsible for the land consolidation programs and the management of the state land fund, and efforts are often not coordinated. However, FAO has recently seen an increased interest from EECA countries to engage in land banking activities and support the development of land banking instruments is ongoing (2022) or planned in Armenia, Azerbaijan, Turkey, and North Macedonia.

2.6.4. Facilitation of lease

In most of the 18 FAO program countries and territories in the region (see Fig. 3), where agricultural land markets are still weak, many of the formally registered landowners are not farming their land and are also often not living in the village where the land is located but have moved to city centers and often even abroad. In such a situation, on top of the structural problems with excessive land fragmentation, small farm sizes, and numerous land registration problems, suitable arable agricultural land is at high risk of ending up as unutilized.

Facilitation of lease is a land management instrument that supports the agricultural rental land market by facilitating rental agreements between owners of agricultural land, not farming their land, and active local farmers with demand for more land. Sometimes, the facilitation of lease instrument is seen as a variation of land banking (FAO, 2022). The Land Bank of Galicia (Spain) is a good example of facilitation of lease instrument. The land bank operates mainly with use rights and assumes the role of intermediary manager between landowners and tenants that often do not know each other because the registered owners have left the village where the land is located. By invoking contract assurances that both sides may rely on, it offers convincing guarantees to the owners of not losing ownership over land, being paid the rent according to the lease contract, as well as recovering the property in normal conditions for its use after the contract has ended. Tenants, on the other hand, may rely on a pre-set minimum period of rent of five years, an advantageous guarantee for farmers who wish to implement medium-to-long-term investments.

The key instrument in the process is a web-based information system with an updated and accurate database of land plots at the national

level available for rent and under which conditions. The web-based system allows interested farmers to see what is available for lease and request the lease, after which the agency in charge will facilitate the conclusion of the lease agreement between the parties.

2.6.5. Active management and privatization of state-owned agricultural land

Many countries in Central and Eastern Europe have large reserves of state-owned agricultural land after the finalization of land reforms. In Lithuania, 400,000 ha, and in North Macedonia, around 240,000 ha of agricultural land are in state ownership (Hartvigsen, 2015). This is around 40% of all arable agricultural land in the country.

State owned agricultural land represents a valuable asset that provides policy options if the Government wants to engage in an active land policy very similar to land banking (FAO, 2022). State land provides when it is entered into the agricultural rental and sale land markets, an excellent opportunity to support the development of target groups such as small family farms and young farmers. This often requires that state land is not automatically rented out or sold in auctions to the highest offer. It is also essential for the success of land consolidation projects that the existing state land in the land consolidation project areas is made available for the project, ideally both through re-allotment and privatization. In this way, the existing state land can have the same catalytic effect on the land consolidation process as land banking. The entire state land fund or parts of it can be an excellent starting point for a land bank.

2.7. Conclusions and perspective

Small family farms dominate, as discussed in this paper, the farm structures in most of the 18 FAO program countries and territories in the Western Balkans, Eastern Europe, Caucasus and Central Asia. In countries such as Albania, Armenia, Bosnia and Herzegovina, Georgia, North Macedonia, and Kyrgyzstan, the average farm sizes are between one and three hectares, and between 95% and 99% of all farms are smaller than 5 ha. The small farms are divided into several small and often badly shaped land parcels and have often problems with access to appropriate agricultural infrastructure such as roads, irrigation, and drainage.

In addition to the structural problem of inefficient farm structures, which are hampering both the development of agricultural land markets and agriculture and rural development in general, rural areas in most of the assessed countries typically face a wide range of challenges, including demographic changes, outmigration and availability of workforce, poor rural infrastructure, etc. Weak or even dysfunctional agricultural land markets are unable to facilitate the necessary transformational changes towards sustainable local food systems.

Formal land markets are constrained from a number of additional issues such as an often large degree of informality, mainly resulting from informal land transactions and unresolved inheritance, where the land registry is not updated. Furthermore, a long list of more "technical" land registration problems exist in many countries, including inconsistency between the property titles and the reality on the ground. The situation is becoming even more complex when different problems overlap, for example, inheritance with informal

land transactions. When the level of informality reaches a certain share of the land parcels, the entire community, as discussed, sinks into a "swamp of informality", negatively affecting all agricultural and rural development in the community.

The paper has provided for the first time an overview of the level of development of the agricultural land markets in the EECA countries. When the five-stage model for the development of land markets of Williamson et al. (2010) is applied on the EECA countries, it is clear that all countries except for Belarus, have reached development Stage 2, where land rights are established, either in the form of private ownership or use rights to state owned agricultural land (Fig. 3). Two-third of the countries (13) are assessed to be in Stage 3, where simple land trading has begun, but the sales market for agricultural land is still limited. Land markets in most countries in Stage 3 are usually characterized by a high degree of informality. So far, only four countries, Armenia, Moldova, Serbia, and Turkey, are assessed to be in Stage 4, the land market stage and no countries have yet reached Stage 5 (developed land market) or can be expected to do so in the foreseeable future. In these countries, the annual land turnover of private agricultural land has reached a level of 0.8–1.3% of the privately owned agricultural land. This is, however, still way below the market activity in most EU member countries.

There is a general need to support the development of agricultural land markets, both rental and ownership markets, in all countries in EECA. Strengthening the regulation of land sales and rental markets can leverage the necessary structural development of farms on a voluntary basis. Without regulations, land markets can easily become the means to such negative phenomena as overconcentration of land,

land speculation, and even land grabbing. When devising a system of land market regulations, it is important to find the right balance between steering its development in the right direction, preventing too much interference into its self-regulatory mechanisms (avoiding overregulation). Furthermore, land market regulations should serve the adopted land policy goals of the country, and land policy goals in its turn should support the broader goals of the agriculture and rural development policies in general.

The paper has analysed and systematized the main constraints that hamper the development of agricultural land markets in the EECA countries. Even though the land administration and land registration infrastructure is in place in most countries, several constraints were identified, such as absentee landowners, unresolved inheritance, informal land transactions, co-ownership and in many countries excessive problems with the quality and accuracy of registration data and cadastre maps.

Finally, we have illustrated also that land management instruments such as land consolidation, land banking, facilitation of lease, and active management and privatization of state-owned agricultural land can support the development of the agricultural land markets. The instruments are applied usually with the objective to reduce land fragmentation and facilitate farm enlargement on a voluntary basis. More consolidated and larger farms are positively contributing to further land market development. In addition, a positive side effect of land consolidation is that the land registry is “cleaned up” from informalities and land registration problems are solved integrated into the land consolidation process. At the same time these instruments have, when applied in a multi-purpose approach, a high potential not

only to contribute to agricultural development but also to nature restoration, environmental protection and climate adaptation and mitigation.

2.8. References

ACSA, 2010. Agricultural Land Re-Parcelling Project in 40 Villages. Final Project Report. National Agency for Rural Development (ACSA).

Amosov, M., 2019. The Land Question: Land Concentration and the Agricultural Land Moratorium in Ukraine. Trans National Institute. https://commons.com.ua/en/mor atirij-i-koncentracija/.

Cela, R., Sallaku, F., Tarreli, I., Zdruli, P., Shallari, S., Korita, J., Brahushi, F., Gjoka, F., 2018. Land resources and land market development in Albania through land consolidation: characteristics, problems and policy options. Albanian J. Agric. Sci. https://www.researchgate.net/publication/329402853_Land_Resources_and_Land_Market_Development_in_Albania_through_Land_Consolidation_characteristics_problems_and_policy_options.

CFS, 2012. Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security. Rome, Italy. https://www.fao.org/publications/card/en/c/I2801E/.

Ciaian, P., Kancs, A., Swinnen, J., Van Herck, K., Vranken, L., 2012. Institutional Factors Affecting Land Market Development. Centre for European Policy Studies (CEPS). https://www.ceps.eu/ceps-publications/institutional-factors-affecting-agricultural-land-markets/.

Dale, P., Baldwin, R., 2000. Lessons Learnt from the Emerging Land Markets in Central and Eastern Europe. FIG Conference Paper. https://www.fig.net/resources/proceedings/2000/prague-final-papers/baldwin-dale.htm.

Deininger, K., 2003. Land Policies for Growth and Poverty Reduction. Oxford University Press. https://documents1.worldbank.org/curated/en/485171468309336484 /310436360_20050007001644/additional/multi0page.pdf.

Deininger, K., Feder, G., 1998. Land institutions and land markets. Handbook of Agricultural Economics. World Bank, Washington, DC.

Deininger, K., Nivievskyi, O., 2019. Economic and Distributional Impact from Lifting the Farmland Sales Moratorium. Vox Ukraine. https://voxukraine.org/en/economic-and-distributional-impact-from-lifting-the-farmland-sales-moratorium-in-ukraine-2/.

Enemark, S., 2009. Land Administration Systems – Managing Rights, Restrictions and Responsibilities in land. Conference Paper. Map World Forum, Hyderabad, India, 10–13 February 2009. https://www.fig.net/organisation/council/council_2007-2010/council_members/enemark_papers/2009/hyderabad_enemark_paper_feb_2009. pdf.

FAO, 2003. Multilingual Thesaurus on Land Tenure. Rome: FAO. http://www.fao.org/3/x2038e00.htm#Contents.

FAO, 2017. Policy Note on Land Abandonment and Recommendations for Policy Advice on Introduction of a Land Consolidation Instrument in Armenia.

FAO, 2018. Assessment of the Legal Framework Compliance with the VGGT in Kyrgyzstan and Tajikistan. Unpublished Project Report.

FAO, 2020a. Smallholders and Family Farms in Europe and Central Asia. Regional Synthesis Report 2019. Budapest. https://doi.org/10.4060/ca9586en.

FAO, 2020b. Smallholders and Family Farms in Georgia. Country Study Report 2019. Budapest, Hungary. https://doi.org/10.4060/ca9822en.

FAO, 2020c. Smallholders and Family Farms in Kyrgyzstan. Country Study Report 2019. Budapest. Hungary. http://www.fao.org/3/ca9826en/CA9826EN.pdf.

FAO, 2022. European Good Practices on Land Banking – FAO Study and Recommendations. Budapest. https://doi.org/10.4060/cb8307en.

Feder, G., Feeny, D., 1991. Land tenure and property rights: theory and implications for development policy. World Bank Econ. Rev. 5 (1), 135–153. https://doi.org/ 10.1093/wber/5.1.135.

Haldrup, N.O., 2011. Land Registration in Developing Countries – An Introduction. Lambert Academic Publishing. https://www.lap-publishing.com/catalog/details/store/gb/book/978-3-8443-0038-3/land-registration-in-developing-countries?search=Haldrup.

Hartvigsen, M., 2013a. Land Reform in Central and Eastern Europe after 1989 and its Outcome in Form of Farm Structures and Land Fragmentation. FAO Land Tenure Working Paper 24. https://www.fao.org/documents/card/en/c/c6bae647-1604-5e09-b664-af2e9f720006/.

Hartvigsen, M., 2013b. Land reform and land fragmentation in Central and Eastern Europe. Land Use Policy 36, 330–341. https://doi.org/10.1016/j. landusepol.2013.08.016.

Hartvigsen, M., 2014. Land mobility in a central and Eastern European land consolidation context. Nord. J. Surv. Real Estate Res. 10 (1), 23–46. https://journal. fi/njs/article/view/41460.

Hartvigsen, M., 2015. Experiences with Land Consolidation and Land Banking in Central and Eastern Europe after 1989. Land Tenure Working Paper no. 26. FAO, Rome. http://www.fao.org/3/a-i4352e.pdf.

Hartvigsen, M., Gorgan, M., 2020. FAO experiences with land market development and land management instruments in Eastern Europe and Central Asia. J. Agric. Environ. Law XV 29, 85–103. https://doi.org/10.21029/JAEL.2020.29.85.

Hartvigsen, M., 2019. FAO support to land consolidation in Europe and Central Asia during 2002–2018. Experiences and way forward. Land Tenure J. (1). http://www. fao.org/3/CA3184EN/ca3184en.pdf.

Hartvigsen, M., Gorgan, M., Palmer, D., 2013. Experiences with Land Reform and Land Consolidation in Moldova. FAO Land Tenure J. (2/2012). http://www.fao.org/nr/tenure/land-tenure-journal/index.php/LTJ/article/view/59.

Hartvigsen, M., Ismayilov, A., Gorgan, M., 2020. Development of a Land Consolidation Instrument in the Republic of Azerbaijan. FIG Working Week in Amsterdam.
https://fig.net/resources/proceedings/fig_proceedings/fig2020/papers/ts01i/TS01I_har tvigsen_ismayilov_et_al_10385.pdf.

Keyzer, M., Merbis, M., Witt, R., Heyets, V., Borodina, O., Prokopa, I., 2013. Farming and Rural Development in Ukraine: Making Dualisation Work. Luxembourg (Luxembourg): Publications Office of the European Union. https://doi.org/10.2 791/85743.

Kvartiuk, V., Herzfeld, T., 2019. Welfare Effects of Land Market Liberalization Scenarios in Ukraine: Evidence-based Economic Perspective. Discussion Paper 186, IAMO. https://www.econstor.eu/handle/10419/195097.

Lerman, Z., Sedik, D., 2018. Transition to smallholder agriculture in Central Asia. Wiley J. Agrar. Chang. 18, 904–912. https://doi.org/10.1111/joac.12282.

Lerman, Z., Csaki, C., Feder, G., 2004. Agriculture in Transition – Land Policies and Evolving Farm Structures in Post-Soviet Countries. Lexington Books. https://ro wman.com/ISBN/9780739108062/Agriculture-in-Transition-Land-Policies-and-Evo lving-Farm-Structures-in-Post-Soviet-Countries.

Lytvyn, A., 2019. Prospects for agricultural land in Ukraine. Ukr. J. Bus. Law (7–8). https://pravo.ua/articles/prospects-for-the-agricultural-land-market-in-ukraine/.

Nyeleni, 2020. Your Land, My Land, Our Land: Grassroots Strategies to Preserve Farmland and Access to Land for Peasant Farming and Agroecology. Nyeleni. https://www.tni.org/files/publication-downloads/en-your_land_my_land_our_land. pdf.

Probert, M., Kelm, K., 2019. Albania – Status Review of the Immovable Property Registration Office (IPRO): Services and Data Quality (English). World Bank Group, Washington, D.C. http://documents.worldbank.org/curated/en/48177156205248655

4/Albania-Status-Review-of-the-Immovable-Property-Registration-Office- IPRO-Services-and-Data-Quality.

Snyder, H., 2019. Literature review as a research methodology: an overview and guidelines. J. Bus. Res. 104, 333–339. https://doi.org/10.1016/j. jbusres.2019.07.039.

Swinnen, J., Ciaian, P., d'Artis, K., 2008. Study on the Functioning of Land Markets in the EU Member States under the Influence of Measures Applied under the Common Agricultural Policy. Working Paper No. 04/2008. Economics and Econometrics Research Institute (EERI), Brussels. http://hdl.handle.net/10419/142516.

Swinnen, J., Van Herck, K., Vranken, L., 2014. Land Market Regulations in Europe. KU Leuven: LICOS – Centre for Institutions and Economic Performance. https://www.econstor.eu/bitstream/10419/126507/1/797825487.pdf.

Swinnen, J., Vranken, L., 2010. Review of the Transitional Restrictions Maintained by New Member States on the Acquisition of Agricultural Real Estate. CEPS. Directorate-General for Financial Stability, Financial Services and Capital Markets Union (European Commission). https://op.europa.eu/en/publication-detail/-/publi cation/ae8aa707-d438-453c-b8f1-26b947d486aa.

Torhonen, M., 2016. Keys to Successful Land Administration. Lessons Learned in 20 Years of ECA Land Projects. World Bank, Washington, D.C.. https://doi.org/ 10.1596/24623

UNECE, 2014. Survey on Land Administration Systems. New York and Geneva. https://unece.org/housing-and-land-management/publications/survey-land-administration-systems.

Versinskas, T., Vidar, M., Hartvigsen, M., Mitic Arsova, K., van Holst, F., Gorgan, M., 2020. Legal Guide on Land Consolidation: Based on Regulatory Practices in Europe. FAO Legal Guide, No. 3. FAO, Rome. https://doi.org/10.4060/ca9520en.

Visser, O., Mamonova, N., 2019. Large-Scale Land Acquisitions in the Former Soviet Union. A Study of Rural Social Movements and Land Conflicts.https://www.landgovernance.org/wp-content/uploads/2019/09/LSLA_FormerSovietUnion.pdf.

Vogelgesang, F., 1998. After land reform, the market? FAO Land Reform, Land Settlement and Cooperatives (FAO). http://www.fao.org/3/a-w8101t.pdf.

Wallace, J., Williamson, I., 2006. Building land markets. Land Use Policy 23, 123–135. https://doi.org/10.1016/j.landusepol.2004.07.003.

Williamson, I., Enemark, S., Wallace, J., Rajabifard, A., 2010. Land Administration for Sustainable Development. ESRI Press Academic, Redlands, California. https://eng.unimelb.edu.au/__data/assets/pdf_file/0004/3929728/land-admin-for-sustainable-development.pdf.

World Bank, 2014. Moldova – Land Governance Assessment Framework (LGAF). Washington, D.C. http://documents.worldbank.org/curated/en/843141504857423593/Moldova-Land-governance-assessment-framework-LGAF-final-report.

World Bank, 2019. Property Registration Index. Doing Business 2019. https://www.doingbusiness.org/en/data/exploretopics/registering-property.

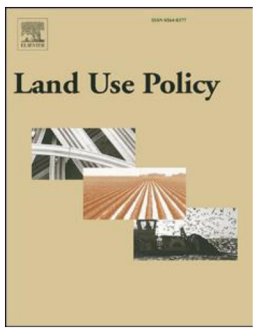
Chapter 3. The role of the land market in shaping farmland abandonment in post-Soviet Armenia.

Authors: Maxim Gorgan, Miroslava Bavorova, Ayat Ullah, Alexander Prishchepov

Published in: manuscript submitted for publication to Land Use Policy journal

Available online: n/a

DOI: n/a



Abstract

In the face of the growing competition and demand for land resources, abandoned farmland has received renewed attention as a land resource that can either be recultivated or provide other land-use opportunities, including recultivation, options for rewilding, and other alternatives to agricultural land uses. Using the example of Armenia, this study examines farmland abandonment from the perspective of land ownership rights in the post-Soviet transition context from centrally planned to market economies. Through a case study across three villages in the Armavir province of Armenia, we evaluate the role of land markets in farmland abandonment and assess the influencing factors of land market participation by landowners. Based on the analysis of structural surveys with logistic regressions, we reveal that landowners who are willing to lease out and sell their land parcels are more likely to leave their farmland abandoned. Additionally, this study reveals that the most frequent factors of importance for landowners' selling and leasing intentions are related to the lack of information regarding market price, indicative rent, interested counterparts for transactions. These findings underscore that addressing these factors could enhance land mobility and facilitate the better functioning of the land market.

This study examines the extent as well as temporal and spatial aspects of farmland abandonment in the studied villages and highlights other risk factors of farmland abandonment, such as the aging of farmers, a lack of successors to continue farming, and the absence of irrigation. Finally, this study recommends designing an integrated policy response to improve the functioning of agricultural land markets and local farming conditions through rural development and farm

structure measures. A toolbox of potential solutions includes lease facilitation or early farmer retirement schemes with the country-wide scope of implementation, as well as solutions applied on a per-project basis such as land consolidation and land banking.

Key words: agricultural land use; private ownership; land ownership and land use markets; land reform; post-Soviet Armenia; policy solutions; land management instruments; non-agricultural land use.

3.1. Introduction

There is strong worldwide competition for land resources in the context of various land uses, such as land demands to satisfy food production and urban growth, supply sustainable bioenergy, and provide land-based solutions to counterbalance the adverse impacts of climate change (Fayet et al., 2022; Van Zanten et al., 2014; Bodirsky et al., 2022). The emergent challenges due to geopolitical tensions and supply disruptions urge many countries, such as in Europe and beyond, to reduce their reliance on food imports and create incentives to boost local food production (FAO, 2020b; JRC, 2013a). However, despite the urgent need to reduce land scarcity and close yield gaps, evidence shows that farmland abandonment is widespread globally (Naess et al., 2021; Prishchepov et al., 2021; Potapov et al., 2022). Several studies have indicated that farmland abandonment has reached 100 million ha in the last three decades, which is comparable to the scale of some hotspots of deforestation for agricultural expansion purposes (Naess et al., 2021; Potapov et al., 2022). In the European Union, which is a global hotspot of farmland abandonment, approximately 30% of agricultural areas are facing at least a moderate risk of farmland abandonment (Levers et al., 2018). Farmland abandonment is common in areas with unfavourable

farming orography, soil, and climate conditions, for instance, in the drought-prone Mediterranean belt of Europe, mountainous regions, but also across the countries of Central, Eastern, and Southern Europe and the Caucasus region (Gorgan and Hartvigsen, 2022).

Farmland abandonment has multiple environmental, social, and economic consequences, which may differ starkly depending on the geographical context (Levers et al., 2018). These impacts can be both positive for the environment and societal well-being, but also negative and variable across time and space (Ustaoglu and Collier, 2018; Leal Filho et al., 2016). While the recultivation of some abandoned croplands can be feasible, this depends on the policy agenda constraining drivers of farmland abandonment and contextual characteristics. Hence, abandoned croplands may provide additional opportunities for rewilding, agroforestry, and carbon offsets (Fayet et al., 2022).

Among the European countries with widespread farmland abandonment is Armenia, a landlocked country in a high biodiversity-rich Caucasus region. After the breakup of the Soviet Union and the proclamation of its independence in 1991, Armenia underwent the turmoil of economic and political transformations towards a market-based economy (Baumann et al., 2014; Bezemer, 2004). One of the key implemented reforms was the transition of agricultural lands from state into private ownership (Lerman et al., 1999; Hartvigsen, 2013). With its side effects, such as excessive fragmentation of land and small farm sizes, the conducted land reform laid the foundation for the land market in the country (Gorgan and Hartvigsen, 2022). At present, the land market in Armenia is functioning reasonably well, with a turnover of around 1% per year (Gorgan and Hartvigsen, 2022). Nevertheless,

its potential to transform the farm structures and mitigate farmland abandonment has not yet been fully realised. As of 2014, approximately 33% of the land of family farms and 38% of the land of corporate farms were abandoned in Armenia (FAO, 2017). An aging rural population, de-appreciation of farming, and shifting labour force from agriculture towards service sectors and outmigration were possibly among the underlying causes of the shrinkage in farming activities, including farmland abandonment. However, the exact patterns and drivers of farmland abandonment remain elusive. Additionally, Armenia is among the European countries that are insufficiently covered in the international peer-reviewed literature on land transitions. To the best of our knowledge, this is also the first empirical study analysing the determinants of farmland Armenia, and one of the few studies that explores the interconnection between abandonment and land markets (intentions).

The relevance of this research stems from the renewed focus on local food production in the context of multiple crises, such as the importance of reducing GHG emissions associated with distantly produced agricultural products or to improve national food security. In many countries, particularly those reliant on food imports, the abandoned yet fertile farmlands are viewed as an untapped resource with potential for bolstering agricultural production, meeting growing food demand, and enhancing food security. The drivers and patterns of land abandonment in countries in transition, like Armenia, may have peculiarities and differences rooted in the post-Soviet context, as a country which transitioned from state-controlled to a market-driven economy, with predominantly private land ownership. Enhancing our understanding of these distinctions, along with exploring available re-

utilisation options, can aid decision-making regarding the recultivation of abandoned lands or alternative land uses.

Our primary objective was to address these gaps and enhance our understanding of farmland abandonment in Armenia through a case study of surveyed communities in the Armavir Province. Specifically, we sought to investigate the relationship between farmland abandonment and land markets as a potential solution to mitigate this issue. Additionally, we aimed to assess several socio-economic and farm structure characteristics, which may influence farmland abandonment.

Thus, the research questions guiding this study are as follows:

1. Is there a connection between land market participation intentions (selling or leasing out land) and farmland abandonment?
2. What factors influence landowners' intentions to participate in the land market?
3. What are the patterns and farm structure determinants of farmland abandonment in the studied villages?

This paper is organised as follows: In the Literature Review and Research Framework Sections, we conduct a brief review of the literature to identify research gaps, define farmland abandonment for our study, and present the research framework utilised to address our research aims and objectives. Subsequently, in the Methodology Section, we introduce the study area and our data collection approach within three surveyed communities in the Armavir province of Armenia. Moving on to the Results Section, we present the main findings of our modelling efforts using logistic regression. Lastly, in the

Discussion Section, we delve into discussing the overall findings by contrasting them with the existing literature, pointing out research limitations and outlining future research pathways.

3.2. Literature review and research framework

3.2.1. Literature review

Farmland abandonment has become an increasingly important topic, witnessing increasing attention from researchers and policy-makers over the last two decades (Subedi et al., 2022; Prishchepov et al., 2021; Rey Benayas et al., 2007).

Several literature review studies have provided an overview of the determinants of land abandonment and pointed to existing research gaps, such as under-examined linkages between farmland abandonment and land markets (Subedi et al., 2022; Leal Filho et al., 2016; Gradinaru et al., 2020; Plieninger et al., 2016).

Drivers of farmland abandonment tend to vary across spatial extent and change over time (Müller et al., 2009; Zhang et al., 2014; Terres et al., 2015; Nguyen et al., 2018). Farmland abandonment may be more pronounced in areas with limited production capacity and productivity, e.g., in areas facing natural constraints. Near cities, farmland abandonment is frequently driven by development and urban sprawl, particularly when land ends up in non-farmers' hands for speculative reasons or when farmland owners opt for temporary farming practices until they can sell at their desired price (Vanwambeke et al., 2012; Zhou et al., 2020; Sinclair, 1967).

Commonly reported drivers across all studies and regions include biophysical ones such as slope, soil quality, land suitability, accessibility

of farm, and remoteness, and socio-economic ones such as off-farm employment and farm income, migration, depopulation of rural areas, and ageing of farmers. Other drivers, such as land fragmentation and farm size, are commonly reported in European countries, while political drivers are often reported in studies conducted in post-Soviet states (Prishchepov et al., 2012; FAO, 2017). Policy and institution-related factors, such as land tenure insecurity and land market failures, are also reported to contribute to farmland abandonment (Kuemmerle et al., 2009; Ojha et al., 2017; Gorgan and Hartvigsen, 2022; FAO, 2023; JRC, 2013b).

While many studies argue for bringing abandoned agricultural lands back into productive use through potential re-utilisation options, this area of study has been comparatively under-examined so far (Subedi et al., 2022). The reutilisation of abandoned farmland, especially for productive purposes, can support rural livelihoods and address food and nutritional security (Khanal, 2018). However, the pathways for re-utilisation are complex and often poorly understood, and support may not be available or suitable (Murua et al., 2013; Munoz-Rios et al., 2020). Thus, this literature review underscores the limited understanding of the role of dysfunctional land markets as both drivers of land abandonment and a possible solution to the issue.

There is a wide range of definitions of farmland abandonment that stems from the administrative, economic, social, ecological/landscape, and agronomic perspectives (Pointereau, 2008; Perpina Castillo et al., 2018). Therefore, farmland abandonment presents a multidimensional process (Gradinaru et al., 2020), posing challenges in defining, measuring, and comparing the patterns and drivers of farmland abandonment across regions and countries

(Ustaoglu and Collier, 2018; Li et al., 2021). In general, farmland abandonment refers to the discontinuation of farming activity, voluntarily or involuntarily, and abandoning farmland which may, over time, be reclaimed by nature, with or without vegetation recovery. In the context of our study design in Armenia, we investigate the cessation of land-use activities associated with farming, resulting in the evident transformation of land cover, i.e., from cropland to areas covered with grasslands and/or shrubs, while certain agricultural fields may experience underuse, and thus incomplete abandonment. This study focuses on farmland used as arable land, vineyards, or orchards, excluding pastures or hayfields.

3.2.2. Research framework

There is no single uniform theory able to explain the complexity behind decisions to abandon farmland. Studies on the determinants of land-use change, including farmland abandonment, are often based on the profit maximisation theory and the concept of proximate (immediate actions on land) and underlying drivers (institutions, economy, technology, demography, cultural, trigger events, and predisposing site conditions) (Geist and Lambin, 2002; Prishchepov et al., 2021; Chaudhary et al., 2020; van Vliet et al., 2015). We find such a typology suitable to understand the determinants of farmland abandonment that operate at different levels in the case of Armenia. The profit maximisation theory is supplemented with additional elements of human behaviour economic models to explain the decision-making process (Gellrich, 2007) and land market theory (Deininger Feder, 1998) to link farmland abandonment with land market decisions (Figure 1).

Classical economic models applied to study land-use change at the individual parcel level often rely on the assumption that the agents of land use make rational choices (Gellrich, 2007; Nelson et al., 2001; Chomitz and Gray, 1996). A land-use decision at each parcel is made by an operator, who may be a single person, household, or group of people in the case of common property ownership (Nelson and Geoghegan, 2002). The operator of the parcel (the person with effective control over the land) is then assumed to make the (rational) land-use decisions by comparing the costs and benefits of alternative land uses (maximising utility or minimising losses otherwise).

The land parcel characteristics (also referred to as biophysical factors), which are endogenous to land use, include soil quality, the availability of water, climate conditions, and terrain conditions which directly influence the productivity and subsequently determine the profitability of the farm operations. In other words, we hypothesise that the profitability of farming serves as a key determinant of farmland abandonment. Farmland is typically abandoned when it no longer generates sufficient income (MacDonald et al., 2000; Gellrich, 2007), or when the opportunity cost—meaning, the forgone benefit that could have been derived from another occupation—is too high. However, rural households use some of their land for subsistence and to ensure self-sufficient food security rather than market-oriented profit-making.

We also assume that there are individual thresholds when economic losses or personal dissatisfaction from farming may result in the cessation of farming and eventual farmland abandonment or even in the distress sale of assets. This means that cultivation may not be stopped until cultivation costs lead to substantial financial losses (see

Strijker, 2005). Thus, the selection of classical factors determining profit maximisation, such as cost of production, input costs, yield and output prices, market access and transportation, government policies and subsidies, can partially explain farmland abandonment from an economic perspective.

The existence of land market mechanisms and the success of their functioning may strongly influence decisions about farmland abandonment. The land market can reshape ownership and usage by transferring land to more efficient users or from disinterested landowners to active farmers seeking more land (Gorgan and Hartvigsen, 2022; Deininger and Feder, 1998). However, due to numerous imperfections and constraints in land markets in many countries, they are often weak and unable to facilitate the necessary structural transformations required to address issues like farmland abandonment (Gorgan and Hartvigsen, 2022). Only a limited amount of land is offered on the market every year because individuals often hold land rights for many other reasons than agricultural production, including prestige and lifestyle values, family traditions, and for storing wealth if confidence in money as a repository of value is low. If agricultural land is sold on the market, it is often for reasons such as the retirement or death of the owner or in cases of distress sales (Ciaian et al., 2012; Bidinger et al. (1991) as quoted in Deininger and Feder, 1998).

We hypothesise that, when farming ceases to be the main livelihood strategy for a household (i.e., when it ceases to generate sufficient income), there are essentially four decision options pertaining to land when cultivation stops: (i) leave farmland abandoned, (ii) lease out farmland, (iii) sell farmland on the market, and (iv) make a non-market

transfer such as bequeath or donation. In the case of the first two options, an operator may still resume land cultivation in the subsequent agricultural seasons, while options three and four imply permanently exiting agriculture and disposing of farm assets, including land.

Such land decisions will be influenced by many contextual and sociodemographic factors that include a farmer's age, gender, economic status, education level, household size, among others (Githinji et al., 2023). In line with the life course theory, age is a factor of particular importance since it determines the stage in the farmer's life and thus strongly influences his/her decisions (Elder et al., 2003). Aged farmers, which is a very relevant demographic in Armenia, may consider transferring farm assets to the next generation or abandoning farm plots, for instance, in the absence of heirs (Lobley, 2010).

In this study, we are particularly interested in understanding the relationship between farmland abandonment and land market decisions. A number of behavioural (psychological) reasons may prevent landowners from either selling or leasing out land. Such reasons can include a profound emotional attachment to the land and unwillingness to give up possession to anyone, personal reasons not to sell or lease land to a specific farmer, and concerns about potential tax implications, among others. Non-agricultural potential uses of land, policy-induced distortions, lack of investment opportunities and use of land as an inflation hedge, credit market imperfections, and other factors tend to drive the equilibrium price of farmland above the capitalised value of the income stream from agricultural production.

In total, we grouped selected factors that are hypothesised to be related to farmland abandonment into five categories: farm structure characteristics (farm size, number of parcels, and income from farming), parcel characteristics (parcel area and irrigation status), farmer characteristics (age, gender, and agricultural education), household characteristics (number of household members and the number of household members engaged in farming), and farmer intentions regarding land (sell land parcel, lease out land parcel, or bequeath land to children to continue farming) (Figure 1).

Due to the extensive sample size and parcel-level data collection, it was not feasible to include and gather data on distance-related variables (such as distance from the household to the parcels, distance to the nearest city, paved roads), altitudes, or soil quality for each parcel. However, to capture variations between the studied villages, the empirical model included a village variable.

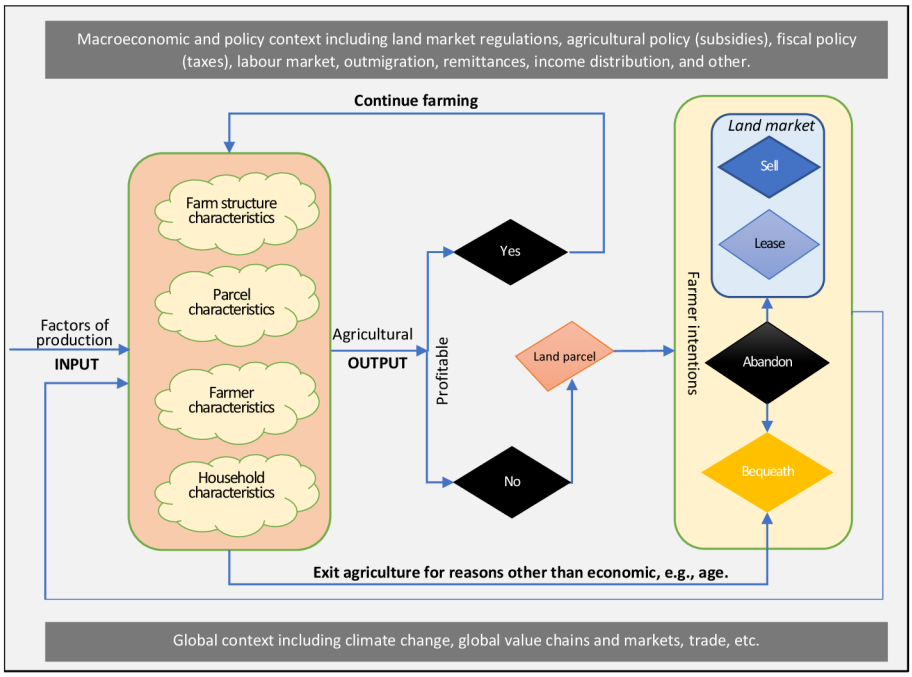


Figure 1. Framework of land use intentions proposed for this study.

3.3. Methodology

3.3.1. The context of Armenia

Legal, policy, and institutional context may underpin farmland abandonment. In Armenia, land-use regulation enforcement appears to be challenging, and the government's land policy can be characterised as passive (FAO, 2017). In other words, although the legislation contains general norms regarding sustainable land management, they are rather declarative, and the control and enforcement of these regulations are not fully operational. Therefore, landowners can abandon farmland for several years without any administrative consequences and fines. We assume that this situation also plays a strong role in the non-cultivation of land and is a disincentive for landowners to make decisions concerning the management of land.

Armenia is a country that is still undergoing transition, and in the "post-Soviet" context, it presents a multitude of distinctive features influencing research on land markets and farmland abandonment. Following independence, one of the initial reforms undertaken was a dissolution of state-owned and collective farms and the redistribution of agricultural land equally among rural families in private ownership (Hartvigsen, 2013). As with many countries in Central and Eastern Europe that opted for land privatisation, Armenia now grapples with the challenge of small farm sizes and a high degree of fragmentation stemming from the land reform. In 2014, the average farm size was 1.48 hectares, where 45% of the farms had three or more land plots, and 20% of the farms had five or more plots (FAO, 2017). Rural households and family farms comprise more than 99% of all active agricultural producers in the country and comprise 97% of the total

agricultural output (Armstat, 2016). We posit that the prevalence of small and fragmented farm structures constitutes the primary underlying structural cause of farmland abandonment by making the production sub-optimal and inefficient and by hindering investment and development.

The transition to market economies in post-Soviet countries involved significant institutional reforms, including changes in land tenure systems, property rights, and regulatory frameworks. The dismantling of collective farming systems has contributed to structural changes in agriculture, leading to shifts in land use patterns and increased abandonment of marginal farmland. At present, the countries in the post-Soviet space often have complex land tenure systems characterised by a mix of private, state, and collective ownership, each at varying stages of development (Gorgan and Hartvigsen, 2020). Moreover, the post-Soviet context is marked by diverse economic, social, and environmental conditions, resulting in pronounced regional disparities in agricultural development and land utilisation.

Finally, the topic of self-sufficiency and sustainability of farming, with the potential re-cultivation of abandoned farmland, remains crucial in Armenia, given the 11% contribution of the agricultural sector to the GDP (World Bank, 2020), and the decreasing employment in the agricultural sector from 39 of total employment in 2010 to 22% in 2020 (Armstat, 2021).

Overall, the agricultural and food sectors play an important but diminishing role in the country's trade balance, accounting for 30% of total exports and about 18% of total imports in 2021. Armenia is a net importer of food, with a significant portion of food imports sourced from Russia and Ukraine, particularly poultry and wheat (Armstat,

2022; Vardanyan and Minasyan, 2022). Armenia exhibits low self-sufficiency ratios in the production of these commodities, covering only 25% and 24% of its consumption, respectively. The food security situation is rather alarming. In 2022, about 23 percent of households were food insecure in Armenia and more than half of the population was at risk of becoming food insecure in the case of shocks or prolonged crises (WFP, 2022). Hand-in-hand with food security comes poverty. From 2008 to 2015, on average, the poverty in rural areas was of about 32 percent, meaning that, on average, the income of approximately every third rural resident was less than approximately USD 87 per month (FAO, 2020).

Agricultural policy and support programmes could have great importance in shaping farmland abandonment. The Government of Armenia supports the agricultural sector (including plant production) through the state budget and through state support programmes that help farmers access primary agricultural inputs, machinery, and modern production technologies through loans with subsidised interest rates. There are also several indirect support measures such as land tax exemptions or subsidised irrigation water payments (FAO, 2020).

The total number of agricultural programmes is small, being in 2016-2020 only 0.06% of the agricultural sector's GDP (Avagyan et al., 2022). The total agricultural spending from the budget is also small, being in the same period of only 0.6% of the agricultural sector's GDP. However, that was not enough to bring the agricultural sector's growth rate to a positive point and the impacts on farmland abandonment are also ambiguous.

For example, the most recent state programme with a potential impact to reduce land abandonment was adopted by the Government of Armenia in March 2024, aiming to enhance the levels of food security (and reduce dependency on imports) by stimulating the production of wheat and other cereals and perennial forage plantations. As a result of this project, it is expected to increase the area of cultivated land by about 14,300 hectares[10].

However, we assume that the agricultural sector can experience an inflow of investment and increased land demand, since, during the COVID-19 pandemic, about 30% of the Armenian population living outside the country returned to Armenia. In addition, the Second Nagorno-Karabakh War in 2020 and the subsequent exodus of the Armenian population in 2023 resulted in an inflow of about 100,000 refugees to Armenia (the exact impact is yet to be evaluated). From a macroeconomic perspective, the remittances have had diverging effects on the country's economy, including the agricultural sector in Armenia. On the one hand, they should stimulate direct investment in farming, while on the other hand, they could reduce the political will to enact policy reforms in the agricultural sector (Karapetyan and Harutyunyan, 2013). We assume that remittances and population movement influence the agricultural land market by raising the demand for land and, subsequently, the land prices.

3.3.2. Study area

This study was conducted in Armavir Province (in Armenian: *Marz*) in Armenia, and more specifically in three villages: Haytagh, Mayisyan, and Bagramyan (Figure 2). Data were collected as part of the FAO

[10] Government Decree no. 384 – L from 14 March 2024

technical assistance project "Establishment of land management instruments and institutional framework to address land abandonment" (TCP/ARM/3705) implemented during 2019-2021, and when the questionnaire was designed and conducted. The study area is situated in the Armavir Plain, which is known for its high agricultural potential, thanks to its well-developed irrigation infrastructure, favourable soil quality, and climate conditions.

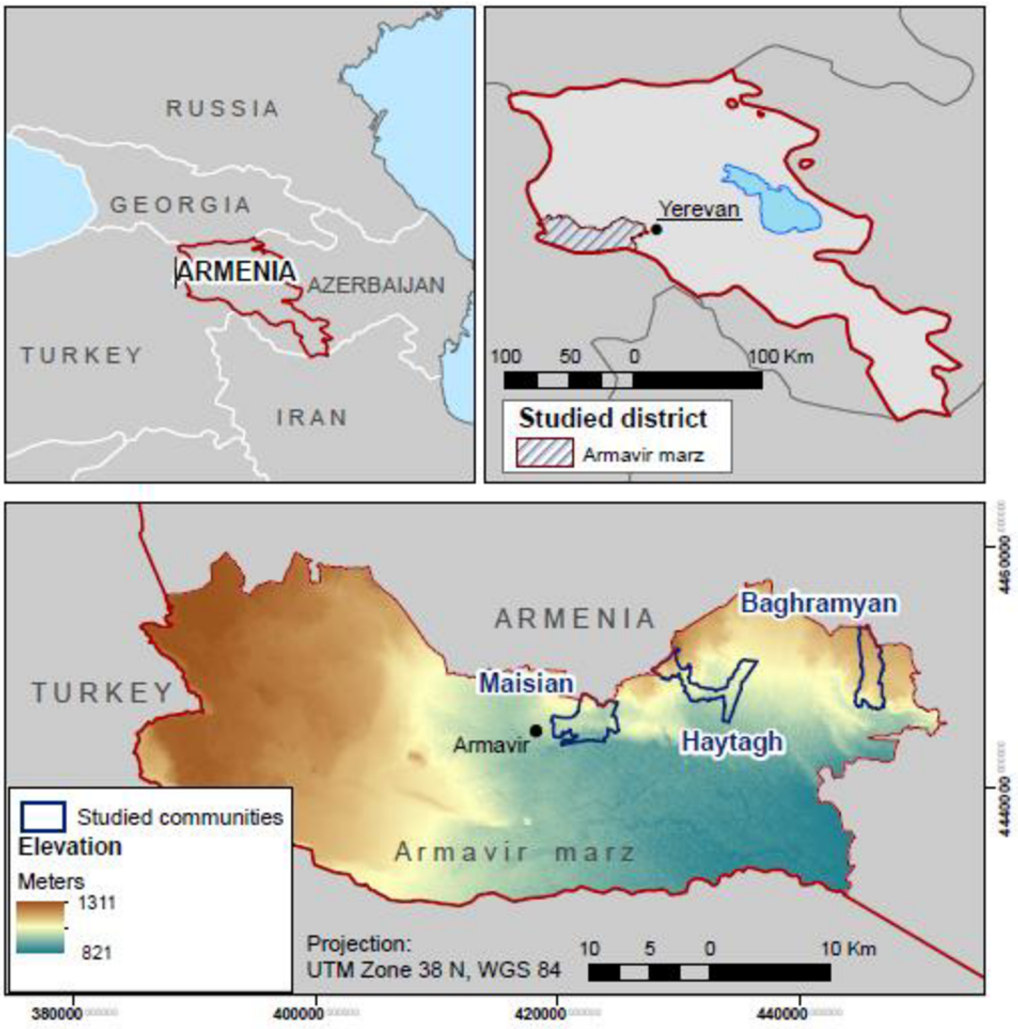


Figure 2: Study area with selected villages/study sites.

The elevation of the province above sea level is 821-1,311 m. The climate is continental and characterised by dry and hot summers and moderately cold winters with irregular snow cover. The average level of annual precipitation is around 250-300 mm. The summer is hot (4-5 months), and temperatures often rise to 40-42 °C. The average monthly temperature in July is 26 °C, while the average temperature in January is 6 °C. During the summer months, the precipitation levels are around 32-36 mm. The winter is usually cold and cloudless, with an average air temperature in January of -10-20 °C. Mountain valley winds are common.

Approximately 78% of the total area of Armavir Province consists of agricultural land. Among this, roughly 53% is under irrigation (Land Balance of Armenia (2022), Decree of the Armenia Government no 1553 of October 6, 2022). The agricultural land is categorised into various types, including arable land, permanent crops, grassland, pastures, and other land (Appendix 1). The province has three main types of soils: brown semi-desert, irrigated meadow-brown, and Solonetz–Solonchak hydromorphic soils. The agro-climatic conditions in the province are highly suitable for producing fruits, grapes for viticulture, and vegetables/melons. Fruits grown in the area include apricots, peaches, plums, cherries, walnuts, and apples. Recently, new additions to the cultivation repertoire include almonds, pistachios, and various types of berries. The province is also engaged in the cultivation of tomatoes, peppers, eggplants, potatoes, cabbages, various salad greens, herbs, melons, and watermelons. Livestock breeding is also common, as is cattle breeding, poultry production, sheep and goat breeding, and pig farming (Armstat, 2020).

In the studied villages, farmland is in private ownership by rural dwellers and primarily consists of arable land, vineyards, and orchards (Appendix 1).

3.3.3. Data collection, questionnaire, and discretisation of variables

To fulfil the study objectives, data were collected following several steps. Cadastral maps and land registration data were obtained and analysed, and an inventory of the land ownership was prepared (see Appendix 1). To evaluate the patterns of farmland abandonment across the studied villages (under research question 3), participatory GIS mapping with the aid of cadastral layouts and interpretation of orthophotos was carried out by the collaborators of the FAO technical assistance project TCP/ARM/3705. Local land surveyors and tax officers from their respective villages were asked to mark on a paper map "agricultural land parcels that, to the best of your knowledge, were not cultivated for at least two years". These analogue maps were then scanned, georeferenced, and digitised. A more comprehensive insight into parcel-level abandonment was acquired through direct interviews with landowners as part of a questionnaire-based survey. For each agricultural parcel that had been abandoned, the temporal span of abandonment was documented in terms of years. Subsequently, to improve confidence in farmland abandonment patterns, these two sources of information on farmland abandonment were combined by using GIS techniques (Figure 3).

A structured questionnaire was developed to facilitate direct interviews with households. The questionnaire played a pivotal role in collecting primary data essential for addressing research questions,

with the subsequent intention of subjecting these variables to model-based examinations. The inquiry items included in the questionnaire were derived from the established research framework and logically organised into two distinct thematic sections: (i) the socio-economic information of the farming households and (ii) land market participation intentions and factors influencing it.

The first section of the questionnaire aimed to collect the socio-economic information of the farming households such as age, gender, agricultural education of the household head (or farm manager), and household composition including the total number of household members engaged in farming. It was expected that households with a higher number of members would be less likely to abandon land as they possess an in-house labour force for farming and do not need to heavily rely on hired labour. In contrast, we assumed that households with a significant share of non-agricultural income would exhibit less interest in farming and may be more prone to abandon their land. To assess this, respondents were asked to indicate the proportion of their household's income derived from farming activities out of the total annual income. The first section of the questionnaire also focused on gathering detailed information about the structure of the farms, including data on the number of parcels making up the farm, the individual surface area of each parcel, and the total farm size. Understanding these farm structure aspects is essential, as it is often observed that larger and more fragmented farms are at a higher risk of facing farmland abandonment.

In total, 1,163 face-to-face interviews were conducted from November 2020 to March 2021 by trained interviewers as part of the FAO technical assistance project. The information was collected at the

parcel level for a total of 1,650 agricultural land parcels. The survey targeted all agricultural households in the study areas/villages and represented the situation as of the 2020/2021 agricultural season. The interviews were conducted using a snowball approach, primarily with the heads of the agricultural households or the farm managers. In some cases, landowners who were physically unavailable were interviewed via telephone. The response rate may have been influenced by the COVID-19 pandemic and the Second Nagorno–Karabakh War in 2020.

After collecting the filled questionnaires, the data were transferred into an Excel spreadsheet, cleaned up, and prepared for analysis. We used the statistical software package STATA for quantitative analysis.

3.3.4. Modelling with Logistic Regressions

The factors that are hypothesised to influence the probability of the decision of farmland abandonment were evaluated with logistic regressions. Cross-sectional econometric methods, such as logistic regressions, have been widely used to study the drivers and determinants of land-use change, including farmland abandonment and re-cultivation, since they make it possible to present "abandonment" and "non-abandonment" as a binary outcome (Prishchepov et al., 2013; Zhang et al., 2014; Ullah et al., 2022).

The analysis was carried out at the parcel level. Parcel abandonment status was used as a dependent dummy variable ("1" —"abandoned plot" and "0" —"non-abandoned plot"). The independent explanatory variables used for modelling were derived from the Research Framework Section and are presented in detail in Table 1.

The logit model is expressed as follows. The dependent variable is binary, which is the natural log of the odds (logit), that is,

$$\text{logit}[p] = ln[odds(Y = 1)] = \ln(\frac{p}{1} - p0)$$

$$\text{logit}\,[p] = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \cdots B_iX_i + \varepsilon_1$$

The dependent variable (Y) is the parcel's abandonment (1) or non-abandonment status (0) of agricultural land parcels, and X denotes a vector of the independent socio-economic and farm-related variables used in this study (Table 1). The model has been tested for multi-collinearity using the variance inflation factor (VIF) (Appendix 3). All tested explanatory variables had variance inflation factor values <4, which indicates an absence of multi-collinearity (Kleinbaum et al., 2013). The model's goodness of fit was tested using the Hosmer and Lemeshow test. The test revealed a non-significant result with a p-value greater than 0.05, indicating a good fit of the model to the data. The Probit model was employed in addition to the binary logit model to the ensure robustness and convergence of the results, offering a comprehensive analysis of the determinants of farmland abandonment in the study area.

3.4. Results

3.4.1. Descriptive statistics

The study results show that the average age of the head of the household among the surveyed farms in the 2020/2021 agricultural season was 56 years, where 11% were less than 40 years old, 17% were between 40 and 50 years, 35% were between 50 and 60 years, and 37% of the respondents were older than 60 years. Only 5% of the

respondents obtained specialised agricultural education (either vocational training, undergraduate, or postgraduate). An average household consisted of 4.7 family members, out of which only 1.41 members were engaged in agricultural activities. Out of the total interviewed household heads, 22% assumed that their children would take over their landholding and engage in farming activities, 25% did not know, and 53% believed that their children would not continue farming. The mean income from agriculture in the studied villages was rather low and comprised on average 31% of the total income per household, where 43% of the respondents stated having zero income from agriculture and only 11% of the respondents reported that more than 50% of their income came from agricultural activities. The mean agricultural holding size was 0.81 ha and the mean number of parcels per holding was 1.42, where 83% of all interviewed households had less than 1 ha of agricultural land, 14% had between 1 and 3 ha, 2% between 3 and 10 ha, and only <1% had more than 10 ha. The situation with fragmentation of landholdings was as follows: 72% of holdings were composed of one land parcel, 18% of two parcels, and 10% were composed of four and more land parcels. The owners of 37% of the land parcels considered selling them, and the owners of 19% of the parcels considered leasing them out.

Table 1: Description of variables included in the model.

Variable name	Description	Min	Max	Mean	Std. Deviation	Expected effect
Dependent variable						
Abandonment status	If the parcel is abandoned or not (1-Yes; 0-No);	0	1	0.5	0.50	
Independent variables						
Farm structure characteristics						
Farm size	Farm size (continuous, ha)	0.04	29.55	0.81	1.68	+
Number of parcels	Total no of land parcels comprising agricultural holding/farm (continuous)	1	40	1.42	1.64	+
Income from farming	Share of income from farming in % out of total household income (continuous, 0-100%)	0	100	31.30	34.15	-
Parcel characteristics						
Parcel size	Parcel size (continuous, ha)	0.01	22.26	0.53	0.92	
Irrigation status	Actual irrigation status (1-Yes; 0-No);	0	1	0.59	0.49	-
Village	Dummy variable for the study area (1-Baghramyan; 2-Haytagh; 3-Mayisyan)	1	3	1.79	0.78	
Farmers land market participation intentions						
Sell	Willingness to sell land parcel(s) (1-Yes; 0-No);	0	1	0.37	0.48	+

Variable name	Description	Min	Max	Mean	Std. Deviation	Expected effect
Lease out	Willingness to lease out land parcel(s) (1-Yes; 0-No);	0	1	0.19	0.39	+
Children's intention to farm	Children's intention to continue farming land (1-Yes; 0-No);	0	1	0.22	0.41	-
	Farmer characteristics					
Age	Age of household head (continuous)	22	89	55.10	11.93	+
Gender	Gender of the household head (1-Male; 2-Female)	0	1	0.12	0.30	+/−
Agriculture training	Farmer's education or training in agriculture (1-Yes; 0-No)	0	1	0.05	0.22	-
	Household characteristics					
Number of household members	Total family members comprising household (continuous)	0	14	4.72	2.52	-
Household members engaged in farming	Total number of family members engaged in agricultural activities (continuous)	0	8	1.41	1.58	-

3.4.2. Extent and magnitude of farmland abandonment in the studied villages

The extent and pattern of farmland abandonment varied greatly across the studied villages. Participatory GIS mapping made it possible to determine the extent of land abandonment for the entire village (including those land parcels not covered by the structured interviews), and to visually present abandonment patterns (Figure 3). The extent of abandonment obtained through direct interviews correlated with the data collected through the participatory GIS mapping and was supplemented by providing the duration of abandonment in years (Table 2).

Table 2: Percentage of abandoned land parcels (out of total parcels) and the duration of abandonment (obtained based on the interviews).

	Bagramyan	Mayisyan	Haytagh	Total
1-5 years	5%	6%	5%	5%
6-10 years	5%	9%	2%	5%
11-15 years	14%	3%	10%	10%
16-20 years	49%	4%	12%	26%
Total*	73%	22%	29%	47%
Participatory GIS**	87%	23%	27%	-

** out of total interviewed.*

*** out of total parcels in the village.*

The village with the most abandonment, Bagramyan, is located closest to the capital Yerevan, has a higher altitude compared to the other two villages (and thus a different micro-climate), and an irrigation system in a state of disrepair for more than a decade. Farmland abandonment often was not ephemeral but carried a long-term character. For example, approximately half of abandoned land

parcels in Bagramyan village had been abandoned for more than ten years. In the other two villages, abandonment was less present, where only about 6% of all abandoned land in Haytagh and 1.5% in Mayisyan was uncultivated for more than ten years. The spatial pattern of abandonment in Bagramyan differed from the other two villages (Haytagh and Mayisyan), where the abandonment pattern was less localised and was more "dispersed", meaning that abandonment occurred in areas generally cultivated and in between cultivated parcels (and therefore not for biophysical or lack of irrigation reasons).

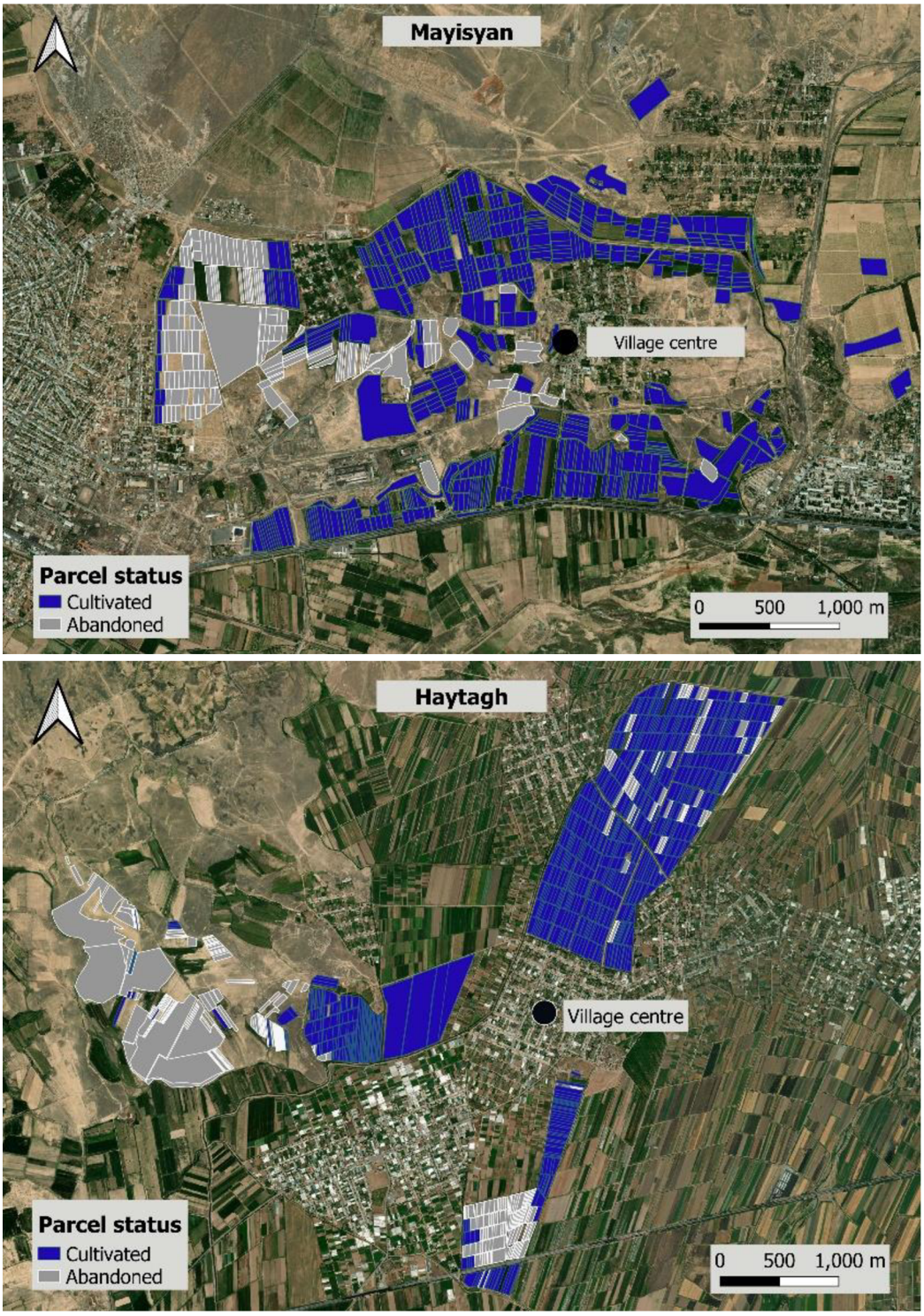


Figure 3: Patterns of farmland abandonment in studied villages (Mayisyan and Haytagh villages)

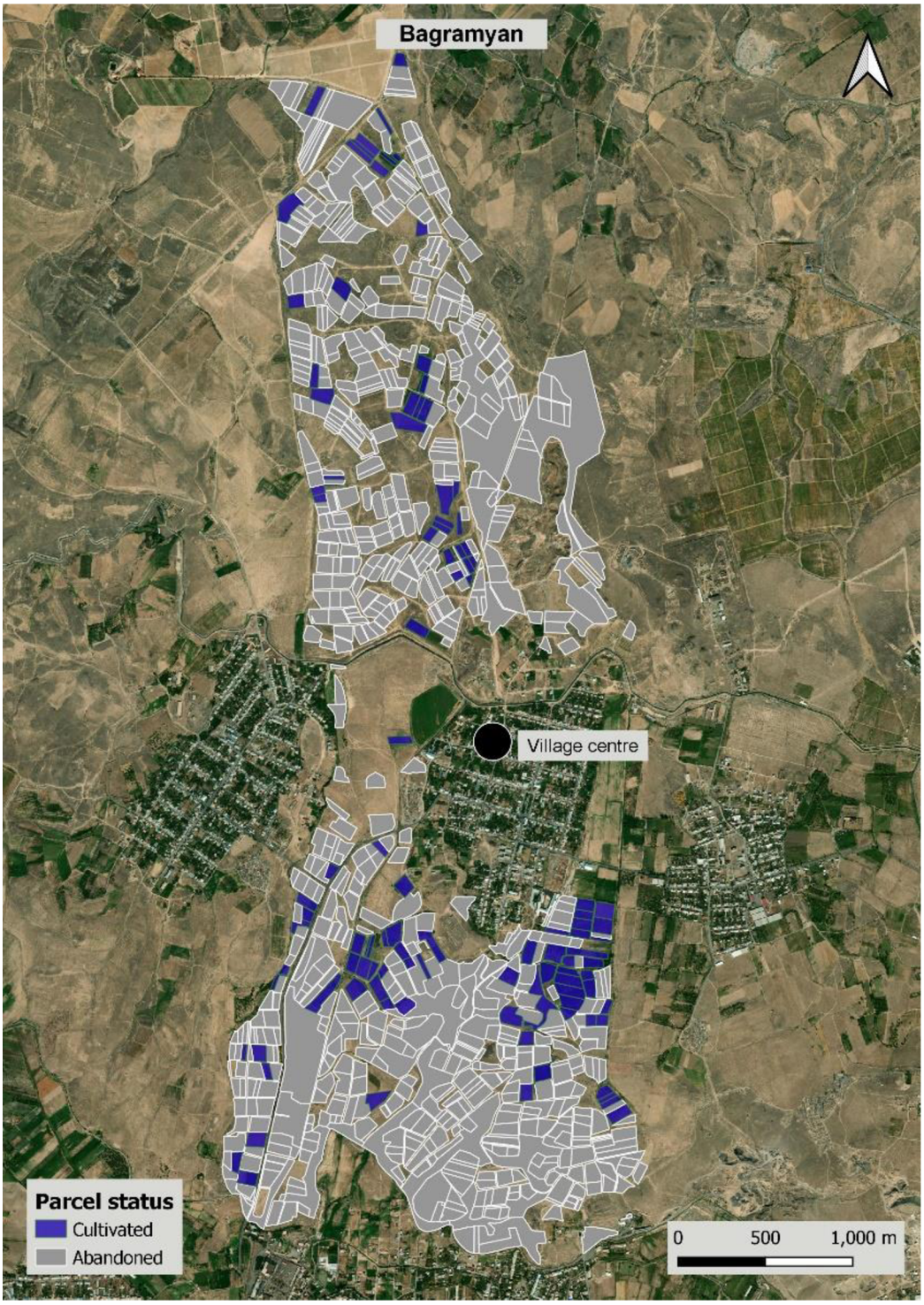


Figure 3: Patterns of farmland abandonment in studied villages (Bagramyan village).

The extent of abandonment in Bagramyan village exceeds both the district average (27%) and the national average of 33%. Conversely, in Haytagh and Mayisyan, the abandonment rates are comparable to the district and national averages (FAO 2017). Discussing the national-scale abandonment pattern, it is evident across all 11 districts, with the highest rates observed in Yerevan (64%), Kotayk (61%), Vayots Dzor (59%), and Tavush (47%).

3.4.3. Logistic regression results

We conducted both the Logit (Table 3) and Probit (Appendix 2) models and obtained similar results. The results from the Logit model indicate a strong fit to the data, with a pseudo-R-squared of 0.489 and a significant chi-square value ($\chi 2 = 1124.689$, $p < .01$), suggesting its effectiveness in elucidating parcel abandonment behaviours.

Our investigation into parcel abandonment reveals intriguing insights into the dynamics at play within the studied communities (Table 3). Willingness to engage in actions like selling (coef. = 0.99, $p < .01$) or leasing out parcels (coef. = 1.43, $p < .01$) significantly increases the likelihood of abandonment. Factors such as actual irrigation status (coef. = -3.036, $p < .01$), percentage of income from farming (coef. = -0.014, $p < .01$), and intentions of children to manage the land (coef. = -0.612, $p < .01$) exhibit significant negative relationships, suggesting that farmers relying heavily on income from farming and with children uninterested in farm management are less likely to abandon their parcels. The age of the farm managers emerges as a significant positive predictor (coef. = 0.024, $p < .01$), indicating that older farmers are more likely to abandon their land. Household members' involvement in farm activities also plays a crucial role, with a strong negative association observed (coef. = -0.491, $p < .01$). Moreover,

agricultural education emerges as a significant negative predictor (coef. = -0.914, p < .01), indicating that farmers with agriculture education or training are less likely to abandon their land. Analysis of the village variable which encompasses inherent properties of the village like location and altitude reveal a notable negative correlation with parcel abandonment (coef. = -1.013, p < .01), indicating that, all else being equal, farmers in Bagramyan village are more likely to abandon their parcels.

Table 3. Results of logistic regressions and factors influencing farmland abandonment.

	Coef.	S.E.	P-value
Farm structure characteristics			
Farm size	.068	.041	.096*
Number of parcels	-.061	.033	.065*
Income from farming	-.014	.003	0***
Parcel characteristics			
Parcel size	-.194	.124	.118
Irrigation status	-3.036	.216	0***
Village	-1.013	.155	0***
Farmers land market participation intentions			
Sell	.99	.214	0***
Lease out	1.43	.276	0***
Children's intention to farm	-.612	.189	.001***
Farmer characteristics			
Age	.024	.007	0***
Gender	.351	.241	.145

	Coef.	S.E.	P-value
Agriculture training	-.914	.351	.009***
Household characteristics			
Total number of household members	.085	.036	.017**
Household members engaged in farming	-.491	.064	0***
Constant	2.205	.472	0***
Mean dependent var	0.496	SD dependent var	0.500
Pseudo r-squared	0.489	Number of obs.	1660
Chi-square	1124.689	Prob > chi2	0.000
Akaike crit. (AIC)	1206.442	Bayesian crit. (BIC)	1287.660

*** p<.01, ** p<.05, * p<.1.

3.4.4. Factors of importance for landowners' land markets intentions

The survey revealed that 39% of the interviewed households/landowners expressed their interest in engaging in land market transactions with agricultural land, i.e., selling or leasing out land parcel(s). The logistic regression model revealed a positive significant relationship between farmland abandonment and readiness to engage in land market transactions (Table 3). In addition, we also assessed the factors of importance for landowners' selling and leasing out intentions (Figure 4 and 5, respectively).

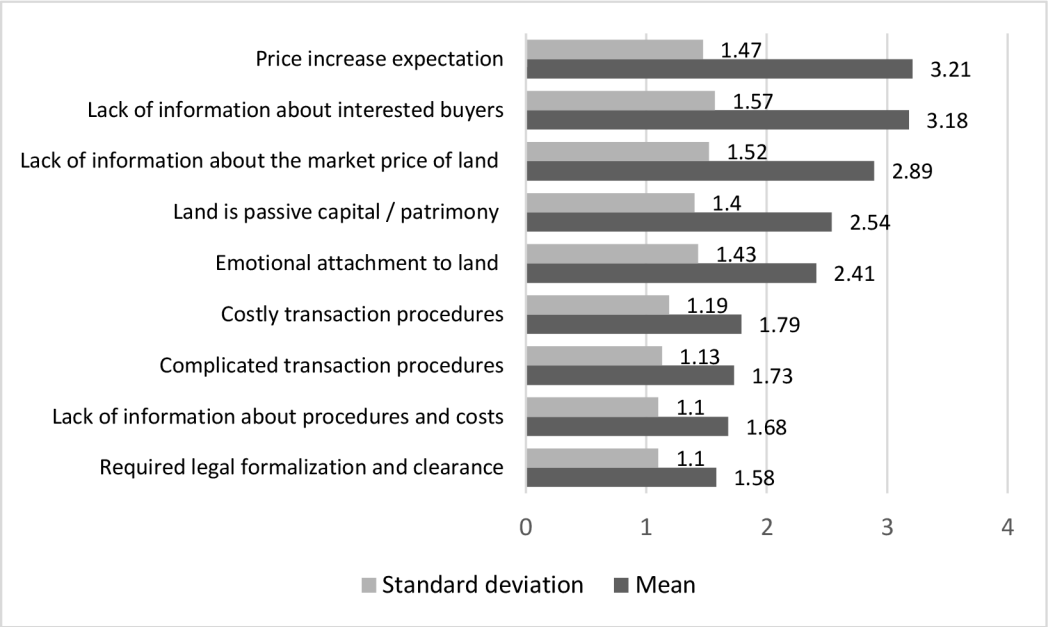


Figure 4. Average score and standard deviation of responses evaluating factors of importance for landowners' selling intentions. The statements were assessed on a five-point Likert scale ranging from 0 (not at all important) to 4 (very important).

Low perceived market price and lack of information about interested buyers were the most frequently named factors of importance for landowners' intensions to sell their land, with a mean of 3.21 and 3.18, respectively. The third most important factor was the lack of information about the indicative market price, with a mean response score of 2.89.

The critical factors in the leasing process revolved around several significant aspects. Notably, the highest ranked with a mean score of 3.44 is the lack of information about interested tenants. Additionally, the low rental income and lack of information regarding potential lessees played a pivotal role in the decisions of landowners, with mean values of 3.22 and 3.17, respectively. Conversely, concerns related to

the potential loss of plot rights, often linked to weak tenure security, held a relatively low level of importance.

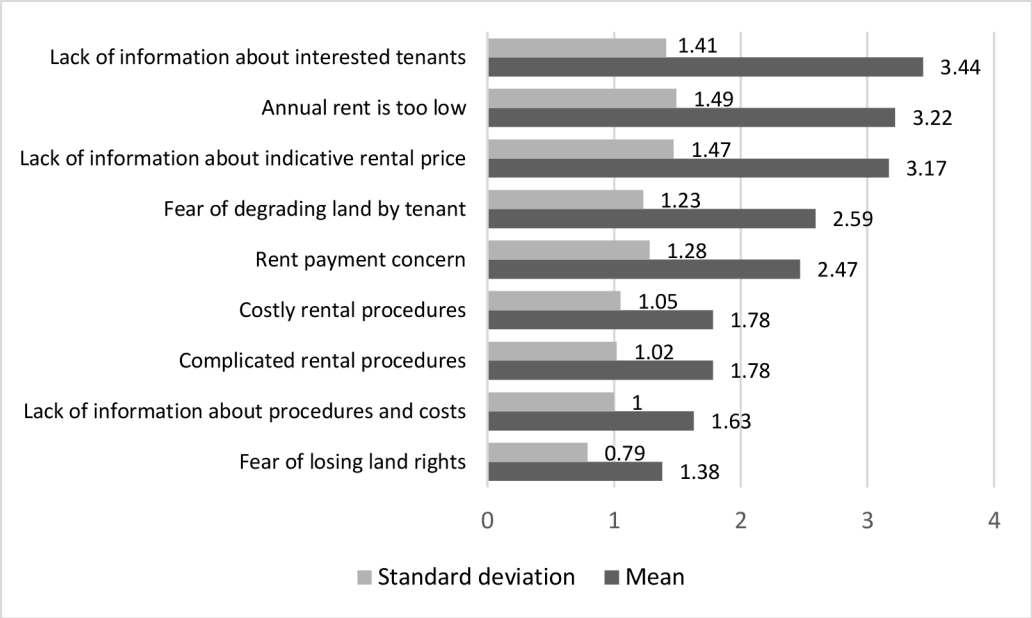


Figure 5. Average score and standard deviation of responses evaluating factors of importance in landowners' leasing out intentions. The statements were assessed on a five-point Likert scale ranging from 0 (not at all important) to 4 (very important).

3.5. Discussion

A central finding of this study, in congruence with the research question #1 (Is there a connection between land market participation intentions and farmland abandonment?), was a robust empirical link between the land market participation intentions and land abandonment. Notably, landowners ready to either lease out or sell their land parcels demonstrate a higher propensity to abandon land. This finding confirms the assumption put forward in the Research Framework Section that transferring land through the land ownership or land use market is indeed one of the viable options for farmers and landowners when they retire or when agriculture stops generating

sufficient income and farmers look for other income opportunities. This finding has important policy implications and concurs with the work by Gorgan and Hartvigsen (2022), who argue that functioning land markets have the potential to alleviate farmland abandonment by transferring land to more efficient users, and by being a key market mechanism for providing access to land for farmers who want to enlarge, new entrants, and young farmers. The lease market in particular can enlarge farms without major investments.

Aligned with research question #2 (What factors influence landowners' intention to participate in the land market?), this study found that the three main factors influencing landowners' sales intentions are (i) expected price increase, (ii) lack of information about interested buyers willing to pay the desired price, and (iii) lack of information about the market price of land. In the case of land leases, the top three factors influencing potential lessors' intentions are (i) lack of information about interested tenants, (ii) too little rent, and (iii) lack of information about indicative rent values. These findings point at the possibility of improving the functionality of land ownership and rental markets by facilitating more equitable and transparent access to information about market prices and transaction dynamics. The value of land in Armenia is often influenced by numerous factors beyond solely its production value, and landowners hold land rights for many other reasons than only agricultural production, including storing wealth and to transfer it between generations. The availability of trustworthy information about reference market prices would support negotiations and the conclusion of transactions between the parties and, thus, increase the mobility of land and market turnover (Gorgan and Hartvigsen, 2022). Concerns regarding the potential loss

of property rights for leased land, often associated with weak tenure security (Jin and Deininger, 2009; Lichtenberg and Ding, 2008), held a relatively low level of importance. This observation further supports the prevailing notion that tenure security in Armenia tends to be notably robust, with approximately 80% of land rights holders perceiving their property rights for land as secure (Prindex, 2020).

The study results also found that farmers whose children intend to cultivate land after the farmer's retirement are less likely to abandon agricultural land. A similar relationship was reported by Lobley (2010) in a study on farmland abandonment in the United Kingdom, namely that farms lacking a successor were less likely to be managed intensively and that, in old age, production tends to shift towards a more subsistence-oriented compared to other stages in one's life (Symes, 1973 as quoted by Lobley, 2010). Only 27% of the interviewed farm managers and heads of households expressed conviction that their children would take over the land and continue farming it. The identification of a successor can act as a trigger for business development, and the existence of a successor can provide a powerful motivation for ongoing investment in the business, even into the old age of the retiring farmer (Potter and Lobley, 1996).

Interlinked with farm succession is the issue of the ageing farmer community. Our modelling results indicate that the farm manager's age had a statistically significant and positive relationship with farmland abandonment among the surveyed farms. In other words, farmland abandonment was more likely to be found among aged farmers and those close to retirement. This aligns with the life course theory, which postulates that individuals' decisions are influenced by many factors, including their life stage (Elder et al., 2003). This

relationship can be attributed to the declining physical and health condition and the ability of aged farmers to manage land, and support numerous earlier studies, such as those of Kristensen et al. (2004) on landscape changes in Denmark, or that of Prishchepov et al. (2020) on farmer's recultivation intentions in Russia, which have also reported a correlation between age and decisions to abandon or restart the cultivation of abandoned land. Overall, the continued ageing of the farming population (also linked to the outmigration of youth from rural areas) and the problem of intergenerational transfer suggests that, if no measures are taken, the amount of abandoned land in Armenia will most likely continue to increase in the coming years.

Answering the research question #3 (What are the patterns and farm structure determinants of farmland abandonment in the studied villages?), the study results show a significant relationship between the share of income from agriculture and the likelihood of abandonment.

This finding confirms one the central assumptions made in the research framework for this study: when farming stops generating enough income, land tends to be abandoned. Studies on determinants of farmland abandonment in Latvia (Abolian and Luzadis, 2015) and Slovakia (Lieskovsky et al., 2013) similarly found that economic and financial constraints resulted in a failure to manage agricultural land. Many earlier studies identified income differences between farm and non-farm jobs as important drivers of changing land-use intensity (Surber et al., 1973; Walther, 1986; Pezzatti (2001) as quoted in Gellrih et al., 2007). An increase in off-farm income, either from wages or other sources such as remittances, leads to an increased probability of farmland abandonment in China (Yan, 2016).

Thus, lower wages in agriculture, as compared to other sectors, perceived lack of opportunities, rural lifestyle, and social factors, especially among young people, encourage a shift in labour from agriculture to other sectors, thereby increasing the likelihood of farmland abandonment. These findings also corroborate the identified underlying drivers of farmland abandonment at the national level in Armenia, including the projections about the decline in the agricultural sector's contribution to the GDP, a decrease in the percentage of the population relying on agriculture as their primary income source, and a significant influx of remittances into the country.

Concerning land parcel characteristics or biophysical factors endogenous to land use, the logistic regression model revealed a noteworthy relationship between the actual irrigation status and the likelihood of abandonment. This rather logical finding suggests that, when a parcel has access to water and can be irrigated, the chances of it being cultivated substantially increase as compared to parcels without irrigation. This aligns with previous research findings, such as those by Ojha et al. (2017) and Blair et al. (2018) in Nepal and South Africa, demonstrating that water scarcity resulting from a lack of access to irrigation plays a significant role in farmland abandonment. In the perception of landowners in the study areas, lack of irrigation water and obsolete irrigation infrastructure were the most significant reasons for farmland abandonment, followed by a group of factors defining farm profitability, such as lack of financial sources to cover operational and capital costs, high prices for agricultural inputs, and low productivity in agriculture in general (FAO, 2021).

Our analysis did not specifically address the impact of distances or soil quality on abandonment likelihood. However, the significance of the

village variable shows that, in Bagramyan village, landowners are generally more prone to abandon land compared to those in Haytagh and Mayisyan. The village-level factors driving land abandonment in Bagramyan are determined to be the distance to the capital Yerevan, which offers more diverse employment opportunities to its residents as compared to the other two villages, a slightly different micro-climate as compared to the other two villages due to the higher altitude, and a virtually dysfunctional irrigation system which makes agriculture in the village almost impossible.

The model showed the negative influence of the total number of parcels on the likelihood of abandonment, meaning that the more parcels a household possesses, the less likely it is that they will be abandoned. This negative relationship can be explained by the "localised" patterns of abandonment in the study villages, as explained in Section 3. Holdings with many parcels may indicate that it is an active farmer who cultivates all land parcels except those found in the hotspot of abandonment where, due to biophysical reasons (poor soil quality or lack of irrigation), farming is either not reasonable or feasible. At the same time, the inherent dataset structure where only 10% of the studied households have more than two land parcels (and only 3% have more than four parcels) means that such data structure provides relatively few degrees of freedom for the logistic regression modelling and does not allow for drawing definite conclusions about the number of parcels (but also other farm structure parameters such as the farm size and parcel size) effect on land abandonment.

3.6. Conclusions

This study examined the farmland abandonment case of Armenia and evaluated the role of land markets in relation to farmland abandonment, by also assessing the influencing factors of land market participation for landowners.

This study elucidated a spatial pattern of farmland abandonment mainly represented by hotspots of abandoned farmland in areas which have no irrigation opportunities. To a lesser extent, abandoned parcels are more scattered and within agricultural areas which are generally cultivated. Regarding the temporal pattern of abandonment, it often was not ephemeral but carried a long-term character.

This study revealed that landowners with intentions and readiness to either sell land or lease out land will have a higher likelihood to leave land parcels abandoned. Potential sellers of land are foremost interested in receiving a fair price for land and have expectations about the price increase in the future. Sellers are also interested in information about the interested buyers. For the potential lessors, the most important factors are information about potential tenants and receiving sufficient rent. Concerns regarding the potential loss of property rights for leased land, often associated with weak tenure security, did not prove to be influential in the studied villages. This study's results confirm that, when farming stops generating enough income, land tends to be abandoned. Additionally, lack of irrigation water, absence of an heir to inherit farmland and continue farming, lack of agricultural training, and a low number of household members engaged in farming are factors that increase the likelihood of farmland abandonment.

These study findings suggest that the land market has great potential to mitigate farmland abandonment by making land parcels available to other farmers and stimulating the transfer of land from passive landowners to active farmers. Land market in Armenia is functioning; however, it is still weak and hampered by several constraints. To leverage its full potential to address abandonment and facilitate structural development in agriculture, land market development requires guidance and facilitation by relevant government bodies and agencies. The national legal framework of Armenia contains no direct legal mechanisms to combat farmland abandonment. Due to the lack of regulations that may discourage abandonment (e.g., in the form of land taxes or administrative (punitive) measures), it literally does not cost anything to landowners to keep land abandoned, and landowners have no stimuli to take any decisions regarding it, e.g., start farming land, lease it out, or sell.

The policy response to this complex and inter-connected problem needs to be integrated, aiming to improve the functioning of agricultural land markets by increasing the land market turnover and the mobility of land, while improving at the same time local farming conditions through rural development and farm structure measures. A toolbox of potential solutions includes lease facilitation or early farmer retirement schemes with the country-wide scope of implementation, and solutions applied in on a per-project basis like land consolidation and land banking.

Farmland abandonment is a local-specific phenomenon, and thus, addressing the problem requires local-level data. Legally defining farmland abandonment and identifying abandoned land parcels represent the first step. An efficient monitoring system that relies on

GIS and remote sensing approaches is essential to further delve into the site-specific root causes of abandonment and applying solutions from the toolbox to mitigate abandonment, recultivate land already abandoned, or convert it for other alternative land uses.

To the best of our knowledge, this was the first study to link farmland abandonment with land market intentions. Therefore, our findings may be relevant not only to Armenia but also to other countries in Europe and Central Asia, as well as to other regions of the world that have experienced farmland abandonment.

A limitation of this study is that variables endogenous to land use such as distances and soil quality were considered in the general context of our analysis and were not looked at for their impact on land abandonment at the surveyed parcels. Another limitation concerns the statistical method used. While logistic regressions are widely used for modelling binary outcomes in research and practical applications, they may oversimplify the complexities inherent in real-world phenomena such as land abandonment. Future research ideas could be to conduct similar studies in other countries and regions for a comparison and validation of the results or to approach the topic from behavioural and psychological perspectives, utilising structural equation models or Bayesian networks for more rigorous linkages.

Appendix 1: Results of the inventory of land registration data.

Indicator/village	Bagramyan	Mayisyan	Haytagh
Total village area (ha)	1,076	1,990	1,241
of which agricultural land	890	1,267	1,023
arable lands	533	363	433
perennial crops	58	151	70
pastures*	-	204	416
other lands	299	549	104
Irrigated agricultural land (ha)**	590	514	503
Total number of landowners (households or families)	606	557	987
Total number of land parcels	905	747	1,204
Average number of land parcels per owner	1.5	1.3	1.2
Total surface area of registered parcels (ha)	612	495	478
Average surface area per owner (ha)	1.01	0.89	0.48
Number of parcels owned by the municipality	2	6	14
Area of parcels owned by the municipality (ha)	5.42	5.63	100

(Source: FAO, 2021).

* no pastures were found in private ownership of rural families.

** nominal information according to the “land balance”.

Appendix 2: Probit regression results.

Abandonment status	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Village	-.577	.086	-6.68	0	-.746	-.407	***
Farm size	.038	.024	1.57	.116	-.009	.086	
Number of parcels	-.033	.018	-1.87	.061	-.068	.002	*
Age	.013	.004	3.55	0	.006	.02	***
Gender	.214	.139	1.54	.124	-.059	.486	
Total number of household members	.047	.02	2.42	.016	.009	.086	**
Household members engaged in farming	-.276	.035	-7.85	0	-.345	-.207	***
Parcel size	-.112	.072	-1.56	.12	-.253	.029	
Irrigation status	-1.73	.117	-14.79	0	-1.959	-1.5	***
Income from farming	-.008	.002	-4.60	0	-.012	-.005	***
Children's intention to farm	-.345	.105	-3.28	.001	-.552	-.139	***
Sell	.579	.118	4.90	0	.347	.81	***
Lease out	.754	.148	5.10	0	.465	1.044	***
Agriculture training	-.532	.199	-2.67	.007	-.922	-.142	***
Constant	1.299	.263	4.94	0	.784	1.814	***

Mean dependent var	0.496	SD dependent var	0.500
Pseudo r-squared	0.490	Number of obs.	1660
Chi-square	1126.707	Prob > chi2	0.000
Akaike crit. (AIC)	1204.423	Bayesian crit. (BIC)	1285.642

**** p<.01, ** p<.05, * p<.1.*

Appendix 3: Variance inflation factor.

	VIF	1/VIF
Farm size	3.879	.258
Village	3.602	.278
Number of parcels	2.852	.351
Income from farming	2.715	.368
Irrigation status	2.384	.419
Sell	2.085	.48
Household members engaged in farming	1.998	.5
Parcel size	1.968	.508
Children's intention to farm	1.399	.715
Lease out	1.34	.746
Total number of household members	1.325	.754
Agriculture training	1.055	.948
Gender	1.049	.953
Age	1.045	.957
Mean VIF	2.05	.

3.7. References

Armstat, 2022. Statistical Yearbook of Armenia: External Economic Activity. Statistical Committee of the Republic of Armenia. https://armstat.am/file/doc/99533523.pdf.

Armstat, 2021. Labour Market in Armenia. 2021. Statistical Committee of the Republic of Armenia. https://armstat.am/file/article/lab_market_2021_4.2.pdf.

Armstat, 2016. Agricultural Census 2014 of the Republic of Armenia. Statistical Committee of the Republic of Armenia. https://www.armstat.am/am/?nid=82&id=1860.

Avagyan, G., Mkhitaryan, K., Vardanyan, K., and Mirumyan, A., 2022. Evaluation of The Effectiveness of State Assistance Programs Implemented in the RA Agricultural Sector through a Survey Among Farmers and Experts. Messenger of ASUE. DOI: 10.52174/1829-0280_2022.6-22.

Baumann, M., Radeloff, V.C., Avedian, V. et al., 2015. Land-use change in the Caucasus during and after the Nagorno-Karabakh conflict. Reg Environ Change 15, 1703–1716 (2015). https://doi.org/10.1007/s10113-014-0728-3.

Bezemer, D., Lerman, Z., 2004. Rural Livelihoods in Armenia. Post-Communist Economies 16, no. 3 (September 2004): 333–48. https://doi.org/10.1080/1463137042000257555.

Blair, D., Shackleton C.M., Mograbi P.J., 2018. Cropland Abandonment in South African Smallholder Communal Lands: Land Cover Change (1950–2010) and Farmer Perceptions of Contributing Factors. Land; 7(4):121. https://doi.org/10.3390/land7040121.

Bodirsky, B.L., Chen, D.MC., Weindl, I. et al., 2022. Integrating degrowth and efficiency perspectives enables an emission-neutral food system by 2100. Nat Food 3, 341–348 (2022). https://doi.org/10.1038/s43016-022-00500-3.

Chaudhary, S., Wang, Y., Dixit, A.M., Khanal, N.R., Xu, P., Fu, B., Yan, K., Liu, Q., Lu, Y., Li, M., 2020. A synopsis of farmland abandonment and its driving factors in Nepal. Land 9, 84. https://doi.org/10.3390/land9030084.

Ciaian, P., Kancs, A., Swinnen, J., Van Herck, K., Vranken, L., 2012. Institutional Factors Affecting Land Market Development. Centre for European Policy Studies (CEPS). https://www.ceps.eu/ceps-

publications/institutional-factors-affecting-agricultural-land-markets/.

Chaudhary, S.; Wang, Y.; Khanal, N.R.; Xu, P.; Fu, B.; Dixit, A.M.; Yan, K.; Liu, Q.; Lu, Y. Social Impact of Farmland Abandonment and its Eco-Environmental Vulnerability in the High Mountain Region of Nepal: A Case Study of Dordi River Basin. Sustainability 2018, 10, 2331. https://doi.org/10.3390/su10072331.

Deininger, K., Feder, G., 1998. Land institutions and land markets. Handbook of Agricultural Economics. World Bank, Washington, DC.

Elder, G.H., Johnson, M.K., Crosnoe, R., 2003. The emergence and development of life course theory. In: Handbook of the Life Course. Springer, pp. 3–19.

FAO, 2023. Analysis of land abandonment and development of agricultural land markets in the Republic of North Macedonia – Conclusions and policy recommendations. https://www.fao.org/3/cc4778en/cc4778en.pdf.

FAO, 2021. Feasibility Study Report. Designing interventions to address land abandonment and improve farm structures in Haytagh, Mayisyan and Bagramyan municipalities, Armavir Marz. Project Report. https://www.fao.org/3/cb8878en/cb8878en.pdf.

FAO, 2020b. COVID-19 and the role of local food production in building more resilient local food systems. Rome. https://doi.org/10.4060/cb1020en.

FAO, 2017. Policy Note on Land Abandonment and Recommendations for Policy Advice on Introduction of a Land Consolidation Instrument in Armenia. Unpublished project report

prepared under the "ENPARD Technical Assistance to the Ministry of Agriculture of the Republic of Armenia" (GCP/ARM/006/EC).

FAO, 2015. Pilot evaluation: Land consolidation in Konya Region, Cumra District, villages Inli and Dinlendik (2014-2015) – Final Report.

Fayet, C., Reilly, K., Van Ham, C., Verburg, P., 2022. The Potential of European Abandoned Agricultural Lands to Contribute to the Green Deal Objectives: Policy Perspectives. Environmental Science & Policy 133 (July 2022): 44–53. https://doi.org/10.1016/j.envsci.2022.03.007.

Foley, J., Ramankutty, N., Brauman, K. et al., 2011. Solutions for a cultivated planet. Nature 478, 337–342 (2011). https://doi.org/10.1038/nature10452.

Garcia-Alvarez-Coque, J.M., Martinez-Gomez, V., Tudela-Marco, L., 2021. Multi-actor arrangements for farmland management in Eastern Spain. Land Use Policy, 111. DOI: https://doi.org/10.1016/j.landusepol.2021.105738.

Geist, H.J., Lambin, E.F., 2002. Proximate causes and underlying driving forces of tropical deforestation. Bioscience 52, 143–150. https://doi.org/10.1641/0006-3568(2002)052[0143:PCAUDF]2.0.CO;2.

Gellrich, M., Baur, P., Koch, B., Zimmermann, N.E., 2007. Agricultural land abandonment and natural forest re-growth in the Swiss mountains: a spatially explicit economic analysis. Agric. Ecosyst. Environ. 118, 93–108. https://doi.org/10.1016/j.agee.2006.05.001.

Giller, K.E., Delaune, T., Silva, J.V., Descheemaeker, K., van de Ven, G., Schut, A.G.T., van Wijk, M., Hammond, J., Hochman, Z., Taulya, G., Chikowo, R., Narayanan, S., Kishore, A., Bresciani, F., Teixeira, H.M.,

Andersson, J., Van Ittersum, M.K., 2021. The future of farming: Who will produce our food? Food Sec. 13, 1073–1099. https://doi.org/10.1007/s12571-021-01184-6.

Gorgan, M., Hartvigsen, M., 2022. Development of agricultural land markets in countries in Eastern Europe and Central Asia. Land Use Policy, 120. DOI: https://doi.org/10.1016/j.landusepol.2022.106257.

Gorgan, M., Bavorova, M., 2022. How to increase landowners' participation in land consolidation: Evidence from North Macedonia. Land Use Policy 123 (2022) 106424. https://doi.org/10.1016/j.landusepol.2022.106424.

Gradinaru, S., Ioja, C., Vanau, G., and Onose, D., 2020. Multi-Dimensionality of Land Transformations: from Definition to Perspectives on Land Abandonment. Carpathian Journal of Earth and Environmental Sciences, February 2020, Vol. 15, No. 1, p. 167 – 177. DOI:10.26471/cjees/2020/015/119.

Hartvigsen, M., 2019. FAO Support to land consolidation in Europe and Central Asia during 2002-2018 - Experiences and way forward. Land Tenure Journal 1/2019. http://www.fao.org/3/CA3184EN/ca3184en.pdf.

Hartvigsen, M., 2013. Land reform in Central and Eastern Europe after 1989 and its outcome in the form of farm structures and land fragmentation. Land Tenure Working Paper no 26. FAO.

Jin, S., Deininger, K., 2009. Land rental markets in the process of rural structural transformation: productivity and equity impacts from China. J. Comp. Econ. 37,629–646. https://doi.org/10.1016/j.jce.2009.04.005.

JRC, 2013a. Short food supply chains and local food systems in the EU: a state of play of their socio-economic characteristics. Gomez y Paloma, S.(editor), Santini, F.(editor). Joint Research Centre, Institute for Prospective Technological Studies. Publications Office, 2013. https://data.europa.eu/doi/10.2791/88784.

JRC, 2013b. Assessing the risk of farmland abandonment in the EU. Institute for Environment and Sustainability. Publications Office. https://data.europa.eu/doi/10.2788/81337.

Kleinbaum, D., Kupper, L., Nizam, A., Rosenberg, E.S., 2013. Applied regression analysis and other multivariable methods. Boston, MA: Cengage Learn.

Kristensen, L.S., Thenail, C., Kristensen, S.P., 2004. Landscape changes in agrarian landscapes in the 1990s: the interaction between farmers and the farmed landscape. A case study from Jutland, Denmark. J. Environ. Manag. 71, 231–244. https://doi.org/10.1016/j.jenvman.2004.03.003.

Kuemmerle, T., Muller, D., Griffiths, P., Rusu, M., 2009. Land use change in Southern Romania after the collapse of socialism. Reg. Environ. Change 9, 1–12. https:// doi.org/10.1007/s10113-008-0050-z.

Levers, C., Schneider, M., Prishchepov, A.V., Estel, S., Kuemmerle, T., 2018. Spatial variation in determinants of agricultural land abandonment in Europe. Sci. Total Environ. 644, 95–111. https://doi.org/10.1016/j.scitotenv.2018.06.326

Lichtenberg, E., Ding, C., 2008. Assessing farmland protection policy in China. Land Use Policy 25, 59–68. https://doi.org/10.1016/j.landusepol.2006.01.005

Lieskovsky, J., Kanka, R., Bezak, P., Stefunkova, D., Petrovic, F., Dobrovodska, M., 2013. Driving forces behind vineyard abandonment in Slovakia following the move to a market- oriented economy. Land Use Policy. 32:356–365. https://doi.org/10.1016/j.landusepol.2012.11.010

Li, Y., Shan, Y., Chen, Y., 2021. Analysis of farmland abandonment and government supervision traps in China. Int. J. Environ. Res. Publ. Health 18, 1–27. https://doi.org/10.3390/ijerph18041815

Leal, F.W., Mandel, M., Al-Amin, A.Q., Feher, A., Jabbour, C., 2016. An assessment of the causes and consequences of agricultural land abandonment in Europe, International Journal of Sustainable Development & World Ecology. doi:10.1080/13504509.2016.1240113

Lerman, Z., M Lundell, A Mirzakhanian, P. Asatrian, and A. Kakosian. "Armenia's Private Agriculture: 1998 Survey of Family Farms." World Bank, 1999, 57 p.

Lobley, M., 2010. Succession in the Family Farm Business. Conference Paper. Journal of Farm Management Vol.13. No. 12. Pages 839 – 851. https://www.iagrm.com/content/large/journals/jofm/volume_13/jofm-vol13-no12-pages-839-851.pdf

MacDonald, D., Crabtree, J.R., Wiesinger, G. et al., 2000. Agricultural abandonment in mountain areas of Europe: environmental consequences and policy response. J. Environ. Manage. 59 (1), 47–69. https://doi.org/10.1006/jema.1999.0335.

Mrunalini, K., Behera, B., Jayaraman, S., Abhilash, P. C., Dubey, P. K., Swamy, G. N., Prasad, J. V. N. S., Rao, K. V., Krishnan, P., Pratibha, G., Srinivasa Rao, C., 2022. Nature-based solutions in soil restoration for

improving agricultural productivity. Land Degradation & Development, 33(8), 1269– 1289. https://doi.org/10.1002/ldr.4207.

Müller, D., Leitão, P.J., Sikor, T., 2013. Comparing the Determinants of Cropland Abandonment in Albania and Romania Using Boosted Regression Trees. Agricultural Systems 117: 66–77. https://doi.org/10.1016/j.agsy.2012.12.010.

Müller, D., Kuemmerle, T., Rusu, M., Griffiths, P., 2009. Lost in transition: determinants of post-socialist cropland abandonment in Romania. J. Land Use Sci. 4, 109–129. https://doi.org/10.1080/17474230802645881.

Næss, J.S., Cavalett, O., Cherubini, F., 2021. The land–energy–water nexus of global bioenergy potentials from abandoned cropland. Nat Sustain 4, 525–536 (2021). https://doi.org/10.1038/s41893-020-00680-5.

Nguyen, H., Holzel, N., Volker, A., Kamp, J., 2018. Patterns and Determinants of Post-Soviet Cropland Abandonment in the Western Siberian Grain Belt. Rem. Sens. 10 https://doi.org/10.3390/rs10121973.

Ojha, H. R., Krishna K. Shrestha, Yuba R. Subedi, Racchya Shah, Ian Nuberg, Binod Heyojoo, Edwin Cedamon, Jonathan Rigg, Sujata Tamang, Krishna P. Paudel, Yam Malla, Phil McManus., 2017. Agricultural land underutilisation in the hills of Nepal: Investigating socio-environmental pathways of change. J. Rural Stud., 53, 156–172. https://doi.org/ 10.1016/j.jrurstud.2017.05.012.

Perpina Castillo C., Kavalov B., Diogo V., Jacobs-Crisioni C., Batista e Silva F., Lavalle C. 2018. Agricultural Land Abandonment in the EU within 2015-2030. European Commission. https://joint-research-

centre.ec.europa.eu/document/download/fd756a75-5aba-4051-9aaae1c21485f34d_en?filename=jrc113718.pdf.

Plieninger, T., Draux, H., Fagerholm, H., Bieling, C., Bürgi, M., Kizos, T., Kuemmerle, T., Primdahl, J., Verburg, P. H., 2016. The driving forces of landscape change in Europe: A systematic review of the evidence. Land Use Policy 57 (2016) 204–214. http://dx.doi.org/10.1016/j.landusepol.2016.04.040.

Pointereau, P., Coulon, F., Girard, P., Lambotte, M., Stuczynski, T., S´anchez Ortega, V., Del Rio, A., 2008. Analysis of the driving forces behind farmland abandonment and the extent and location of agricultural areas that are actually abandoned or are in risk to be abandoned. In: Anguiano, E., Bamps, C., Terres, J.-M. (Eds.), JRC Scientific and Technical Reports. EUR 23411 EN.

Potapov, P., Turubanova, S., Hansen, M.C. *et al.* Global maps of cropland extent and change show accelerated cropland expansion in the twenty-first century. Nat Food 3, 19–28 (2022). https://doi.org/10.1038/s43016-021-00429-z.

Potter, C., Lobley, M., 1996. The farm family life cycle, succession paths and environmental change in Britain's countryside. Journal of Environmental Management 47, 172–190. https://doi.org/10.1111/j.1477-9552.1996.tb00683.x.

Prindex 2020. A global assessment of perceived tenure security from 140 countries. Prindex. https://www.prindex.net/documents/537/PRINDEX-Comparative-2020.pdf.

Government of Armenia, 2020. The availability and distribution of the Armenia land fund (land balance). Government Decision No. 1927 of December 3, 2020.

Prishchepov, A.V., Müller, D., Dubinin, M., Baumann, M., Radeloff, V. C., 2013. Determinants of Agricultural Land Abandonment in Post-Soviet European Russia. Land Use Policy 30, no. 1 (2013): 873–84. https://doi.org/10.1016/j.landusepol.2012.06.011.

Prishchepov, A.V., Schierhorn, F., Löw, F., 2021. Unraveling the Diversity of Trajectories and Drivers of Global Agricultural Land Abandonment. Land 10, no. 2 (January 22, 2021): 97. https://doi.org/10.3390/land10020097.

Ray D.K., Mueller, N.D., West, P.C., Foley, J.A., 2013. Yield Trends Are Insufficient to Double Global Crop Production by 2050. PLoS ONE 8, no. 6 (June 19, 2013): e66428. https://doi.org/10.1371/journal.pone.0066428.

Ray, D.K., Sloat, L.L., Garcia, A.S., Davis, K.F., Ali, T., Xie, W., 2022. Crop Harvests for Direct Food Use Insufficient to Meet the UN's Food Security Goal. Nature Food 3, no. 5 (May 2022): 367–74. https://doi.org/10.1038/s43016-022-00504-z.

Rey Benayas, J.M., Martins, A., Nicolau, J.M., Schulz, J.J., 2007. Abandonment of agricultural land: an overview of drivers and consequences. CAB Rev. 2(057): 14. doi:10.1079/PAVSNNR20072057.

Schuh, B. et al. 2020. Research for AGRI Committee – The challenge of land abandonment after 2020 and options for mitigating measures. European Parliament, Policy Department for Structural and Cohesion Policies. Brussels.

http://www.europarl.europa.eu/RegData/etudes/STUD/2020/652238/IPOL_STU(2020)652238(ANN01)_EN.pdf.

Sharmina, M., Hoolohan, C., Bows-Larkin, A., Burgess, P.J., Colwill, J., Gilbert, P., Howard, D., Knox, J., Anderson, K., 2016. A nexus perspective on competing land demands: wider lessons from a UK policy case study. Environmental Science & Policy, 59. 74-84. https://doi.org/10.1016/j.envsci.2016.02.008.

Smith Pete, Gregory Peter J., van Vuuren Detlef, Obersteiner Michael, Havlík Petr, Rounsevell Mark, Woods Jeremy, Stehfest Elke and Bellarby Jessica. 2010. Competition for land Phil. Trans. R. Soc. B3652941–2957. http://doi.org/10.1098/rstb.2010.0127.

Subedi, Y., Kristiansen, P., Cacho, O., 2022. Drivers and consequences of agricultural land abandonment and its reutilisation pathways: A systematic review. Environmental Development 42 (2022) 100681. https://doi.org/10.1016/j.envdev.2021.100681.

Tilman D., Balzer, C., Hill, J., Befort, B.L., 2011. Global food demand and the sustainable intensification of agriculture. Proc Natl Acad Sci USA 108: 20260– 20264. https://doi.org/10.1073/pnas.1116437108.

Terres, J.-M., Scacchiafichi, L.N., Wania, A., Ambar, M., Anguiano, E., Buckwell, A., et al., 2015. Farmland abandonment in Europe: identification of drivers and indicators, and development of a composite indicator of risk. Land Use Policy, 49: 20–34. doi:10.1016/j.landusepol.2015.06.009.

Ullah, A., Zeb, A., Saqib, S. E., & Kächele, H., 2022. Constraints to agroforestry diffusion under the Billion Trees Afforestation Project (BTAP), Pakistan: policy recommendations for 10-BTAP.

Environmental Science and Pollution Research, 29(45), 68757-68775. https://doi.org/10.1007/s11356-022-20661-9.

Ustaoglu, E., Collier, M.J., 2018. Farmland abandonment in Europe: an overview of drivers, consequences, and assessment of the sustainability implications. Environ. Rev. 26, 396–416. https://doi.org/10.1139/er-2018-0001.

van Vliet, J., de Groot, H.L.F., Rietveld, P., Verburg, P.H., 2015. Manifestations and underlying drivers of agricultural land use change in Europe. Landsc. Urban Plan. 133, 24–36. https://doi.org/10.1016/j.landurbplan.2014.09.001.

van Zanten, B.T., Verburg, P.H., Espinosa, M. et al., 2014. European Agricultural Landscapes, Common Agricultural Policy and Ecosystem Services: A Review. Agronomy for Sustainable Development 34, no. 2 (April 2014): 309–25. https://doi.org/10.1007/s13593-013-0183-4.

Vanwambeke, S.O., Meyfroidt, P., and Nikodemus, O., 2012. From USSR to EU: 20 years of rural landscape changes in Vidzeme, Latvia. Landscape Urban Plann. 105: 241–249. DOI: 10.1016/j.landurbplan.2011.12.009.

Vardanyan, T., Minasyan, S., 2022. Food Security Issues of The Republic of Armenia. Messenger of Armenian State University of Economics. DOI: 10.52174/1829-0280_2022.6-60 https://asue.am/upload/files/science/banber/2022-year-6/4.pdf.

Vlek, P.L.G., Khamzina, A., Azadi, H., Bhaduri, A., Bharati, L., Braimoh, A., Martius, C., Sunderland, T., Taheri, F., 2017. Trade-Offs in Multi-Purpose Land Use under Land Degradation. Sustainability *9*, no. 12: 2196. https://doi.org/10.3390/su9122196.

WFP, 2022. Fourth Food Security and Vulnerability Assessment in Armenia. https://docs.wfp.org/api/documents/WFP-0000142417/download/?_ga=2.164138998.896267219.1710495519-1199462408.1710402002.

World Bank, 2020. Data Bank. Agriculture, forestry, and fishing, value added (% of GDP) – Armenia. https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=AM.

Yan, J., Yang, Z., Li, Z., Li, X., Xin, L., Sun, L., 2016. Drivers of cropland abandonment in mountainous areas: A household decision model on farming scale in Southwest China. Land Use Policy 57 (2016) 459–469. http://dx.doi.org/10.1016/j.landusepol.2016.06.014.

Zhang, Y., Li, X.B., Song, W., 2014. Determinants of cropland abandonment at the parcel, household and village levels in mountain areas of China: a multi-level analysis. Land Use Policy 41, 186–192. http://dx.doi.org/10.1016/j.landusepol.2014.05.011.

Zhou, T., Koomen, E., Ke, X., 2020. Determinants of farmland abandonment on the urban-rural fringe. Environ. Manag. 65, 369–384. https://doi.org/10.1007/ s00267-020-01258-9.

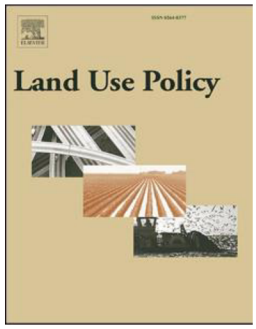
Chapter 4. How to increase landowners' participation in land consolidation: evidence from North Macedonia.

Authors: Maxim Gorgan, Miroslava Bavorova

Published in: Land Use Policy 123 (2022) 106424

Available online: 31 October 2022

DOI: https://doi.org/10.1016/j.landusepol.2022.106424



Abstract

Land consolidation is a well-proven land management instrument traditionally used for farm restructuring. A land consolidation project's success depends to a large extent on the interest and willingness of landowners and communities to participate in the project. Here, local governments and responsible agencies can contribute to the higher motivation of landowners if the factors influencing the landowners' readiness to participate are known and appropriately addressed. Building on qualitative and quantitative data collected from landowners' interviews in 10 municipalities in North Macedonia during 2019, this article provides insights into the individual factors influencing landowners' readiness to participate in land consolidation and behavioural factors at both individual and social level determining negative attitude towards land consolidation. The article further identifies possible incentives, techniques, and nudges to increase landowners' participation in land consolidation. Low economic interest, adversarial and non-cooperative attitude, lack of trust in institutions, fear of manipulation, and the belief that the process will be unjust, are the top subjective reasons landowners are not interested in participating in land consolidation. The regression analysis results revealed that the age of a landowner, plans to pass land to children, the sufficiency of information and the number of parcels forming a holding have a statistically significant relationship with the readiness to participate in land consolidation.

Keywords: land consolidation, landowners' interest, decision-making, behavioural factors, incentives, nudges.

4.1. Introduction

The topic of land consolidation is of constant interest and attention among scholars, experts, and policymakers in different countries. However, whilst a considerable amount of literature has been published on the topic, a vast majority of it focuses on institutional, legal or technical aspects of the land consolidation process (Sklenicka, 2006; Leenen, 2014; Hiironen and Riekkinen, 2016), and significantly fewer studies attempt to investigate behavioural and participatory aspects (Coelho et al., 1996; Lisec et al., 2014; Haldrup, 2015; Zhang et al., 2018).

As a measure applied primarily for agricultural development and with its roots in Western Europe, land consolidation has evolved into a powerful multi-purpose land management instrument. It can aim at achieving several agricultural and non-agricultural objectives even in one process, e.g., re-allotment of parcels in part of the project and restoration of a wetland or afforestation in other parts of the project (Hartvigsen, 2014; Versinskas et al., 2020). In contrast to Western Europe, in most countries in Eastern Europe and Central Asia (EECA), land consolidation is thought of primarily in the agricultural context. In EECA countries, farm structures are either entirely dominated by smallholders or have a dualistic farm structure with a large number of small farms on the one hand and a small number of large corporate farms on the other (FAO, 2020). Although the problem of small and fragmented agricultural holdings is generally recognized as limiting agricultural output, hampering agricultural development or even leading to land abandonment, the vision of various actors about the exact modality of addressing it differs widely from introduction of land

consolidation, establishment of cooperatives, contract farming to development of agricultural land markets.

While acknowledging these other modalities of addressing farm structure inefficiencies and mobilizing land including those based on coordination of land management and use (Garcia-Alvarez-Coque et al., 2021; Takahashi et al., 2018), this article discusses land consolidation as a policy instrument applied on a project basis to adjust the property rights structure[11]. This article also builds on the contention that not all types of fragmentation can or shall be combatted (Binns, 1950; Coelho, 1996; Ntihinyurwa et al., 2019) and that land consolidation shall be applied in a demand-driven way.

Despite the variety of land consolidation approaches (Thomas, 2006; Vitikainen, 2004; Bullard, 2007; Versinskas, 2020), any land consolidation project is essentially a behavioural intervention. Different land consolidation approaches offer different choice architecture for landowners and use different enforcement mechanisms, yet regardless the approach the ultimate goal is to induce support to the intervention among the participants (or minimize the dissatisfaction otherwise). From this perspective, the Food and Agriculture Organization of the United Nations distinguishes three fundamentally different land consolidation approaches: *(i) voluntary, (ii) majority-based, and (iii) mandatory (or statutory)* (Versinskas et al., 2020).

11 FAO defines land consolidation as a legally regulated procedure led by a public authority and used to adjust the property structure in rural areas through a comprehensive reallocation of parcels, coordinated between landowners and users in order to reduce land fragmentation, facilitate farm enlargement and/or achieve other public objectives, including nature restoration and construction of infrastructure (Verˇsinskas et al., 2020).

In *voluntary land consolidation,* landowners within the project area freely decide whether to participate in the project or not (on the conditions offered). In *majority-based land consolidation*, if a legally defined qualified majority of landowners within the project area approves the land consolidation plan (i.e., a collective action induced by the project) the remaining minority landowners are "forced" to participate. Such a majority can be defined as a percentage of landowners and/or a percentage of a project area owned by the landowners who agree with the land consolidation (Versinskas et al., 2020). As Noorth (1987) notes, voting for implementing the land consolidation scheme is a realistic solution to ensure that the land consolidation plan is optimal. Finally, in *mandatory land consolidation* (usually integrated projects backed by public interest), landowners within the land consolidation project area do not have an opt-out option and the land consolidation plan is enacted without formal voting by the landowners[12].

These main land consolidation approaches use different enforcement mechanisms. However, the capacity and legitimacy of state agencies to enforce land consolidation (and thus attain desired public objectives) cannot be taken for granted (Haldrup, 2015). Policymakers and responsible agencies (especially in case of the first-time introduction of land consolidation) need to take account of a wide range of social and psychological factors, power balances and hierarchal structure of the society, the mentality of people, history of property rights and others. This is further supported by the fact that in the former centrally-planned economies, land consolidation projects

[12] All three types of land consolidation shall always include consultations, safeguards and a possibility of administrative and judicial appeal.

were often enforced, or at least the landowner's options to influence the land consolidation decisions were limited, as was the case in the former Yugoslavia (Lisec et al., 2014). Because of such a legacy, in the former socialist block countries, land consolidation can have a negative reputation or be erroneously misconceived with the establishment of production cooperatives or something that would deprive landowners of their land.

In line with a general shift in society and governance towards more participatory and human-centred development approaches, stakeholders' participation has become one of the modern land consolidation process determinants regardless of the approach (Beunen and Louwsma, 2016; Palmer et al., 2004). Stakeholders' involvement in land consolidation is a two-fold process. On the one hand, stakeholders' active participation can help to devise an all-acceptable land consolidation plan. On the other hand, it better guarantees that all relevant voices are heard and rights considered, thereby minimizing cases of eventual judicial appeal. Moreover, public participation is more than just ensuring that people are well informed. In public participation, interactions, dialogue, and, ideally, deliberation occur (Holmes, 2011).

Against this backdrop, the article answers the following research questions: (i) what individual factors influence landowners' readiness to participate in land consolidation, (ii) what are the main reasons for being against land consolidation and the underlying behavioural factors, (iii) what incentives and techniques can be used to nudge landowners into land consolidation.

Despite the relevance of this issue, we are aware of no previous systematic quantitative studies neither in the field of behavioural

sciences nor in the region that look at land consolidation. The study fills the gap and provides empirical evidence about the factors affecting the readiness of landowners to participate in land consolidation. The study's findings and the research approach will be relevant for the decision-makers and researchers in North Macedonia as well as in other countries, especially with similar land tenure systems and historical backgrounds.

The paper is organized as follows. The second section presents a literature review to reveal the factors and behavioural drivers shaping landowners' readiness to participate in land consolidation at the social (community) and individual levels. The third section describes the methodology, including the study area, data collection, and analysis. We apply quantitative analysis to test the motivations of landowners to participate in land consolidation with regard to their individual and socio-economic characteristics, while qualitative analysis is applied to understand the main reasons of individuals for the rejection of land consolidation. The fourth section discusses the research findings, while the last section concludes and provides recommendations to the decision-makers in terms of incentivizing landowners to participate in land consolidation.

4.2. Theoretical background: acceptance of land consolidation

Traditional theories of behaviour change can be incomplete, focusing solely or primarily on individual behaviours (Petit, 2019). The assumption that individuals will act to benefit themselves provides a robust explanation for certain practices. However, these theories fail to encompass the wide range of behaviours individuals engage in for

social or collective reasons. To this end, in this chapter, we describe some of the most important factors which, according to the analysed literature, influence behaviour of participants in land consolidation: (i) the individual level characteristics, (ii) uncertainty and information, (iii) interest and behavioural (cognitive) biases, (iv) the social level behavioural factors, and (v) the incentives in land consolidation.

4.2.1. Landowner, farm and household characteristics

Socio-economic background and individual characteristics are important drivers of interest and attitude and eventually influence decision-making (Petit, 2019). Personal characteristics involve the influence of a wide set of physiological and socio-demographical determinants and relate to lifestyles. The main attributes include age, gender, ethnicity, life-cycle stage (regardless of age, certain moments in a person's growth trajectory), education level, social status (level of respect, competence, authority position, etc.), poverty level, religious affiliation, household composition, possible disorders and alcohol/drug use. These overarching background elements directly influence the psychological drivers (Petit, 2019).

Individual characteristics influence the way they look for and act upon information (Morgan and Munton, 1971 as quoted in Coelho et al., 1996). For example, due to their more advanced stage in their life cycle, older farmers are generally less willing to take risks, as it may look so in the case of a land consolidation project[13].

There is a wide range of farm and household characteristics, which can also influence behaviour and decision-making. Agricultural

[13] Even if only perceived risks and with a very low probability. In voluntary land consolidation landowners can decide whether to participate under offered conditions or not.

households, or family farms, vary concerning size (sales and hectares), fragmentation and spatial distribution of parcels comprising the landholding, product mix, legal organization, land tenure, and financial performance. Agricultural households show diversity in demographic characteristics, the hours they spend working on and off the farm, the share of non-agricultural income in the total income, and their managerial practices (Sommer et al., 1995).

We analyse the effect of the selected landowner, farm and household characteristics on the readiness to participate in consolidation in the quantitative part of our empirical study. Factors comprising interest and psychological drivers are analysed in the qualitative part of the study.

4.2.2. Uncertainty and information

Once the decision to implement a land consolidation project has been made, landowners are faced with a number of questions and *uncertainties* (Beunen and Louwsma, 2016). Research shows that uncertainty plays a major role in the land re-allotment process, especially at the start of a project when participation conditions are not fully clear (Kool, 2013).

Uncertainty may be reduced by information. The availability and use of information are key factors in the process of perception of socio-economic change, and this is especially the case in government-promoted policies, such as land consolidation (Coelho et al., 1996). The "information acceptance depends not only on its source but also on its content, particularly its novelty. If the idea that is communicated just completes or amplifies a known technique, it is more likely that the farmer will accept and adopt it than if the concept is entirely new.

In the former case, he/she will also require less information before acceptance and adoption of the idea" (Morgan and Mutton (1971) referenced in Coelho 1996).

4.2.3. Interest and behavioural biases

Interest characterizes how sympathetic people are to an alternative practice and how much they want to know about it, be involved in activities, or try it out. This combines some cost/benefit thinking with a dimension of appeal and desire on a more emotional level (Petit, 2019).

Initially centred on corporate organizations and commercial transactions, transaction costs theory (TCT) with its recent theoretical advancements offers a suitable conceptual framework for the analysis of environmental and land use issues. Transaction cost theory (Williamson, 1979, 1995) posits that the optimum organizational structure is one that achieves economic efficiency by minimizing the costs of exchange. The theory suggests that each type of transaction produces coordination costs of monitoring, controlling, and managing transactions.

While it is beyond the scope of this paper to establish a detailed understanding of the TCT, there are at least three outstanding features making it attractive and applicable to the land consolidation: first, similar unit of analysis (a transaction); second, similar object of a transaction (the property rights and not, as is often supposed by economists, physical entities); and third, an understanding of transaction as an elementary coordination problem between at least two parties in conflict over resource use (Bougherara et al., 2008). Also applicable are three dimensions developed for characterizing

transactions: uncertainty, frequency, and asset specificity (Williamson, 1995). Participation in land consolidation is a one-time decision (transaction); therefore, the frequency of transaction is low while asset specificity is high since land is a primary factor of production and not a commodity in a conventional sense (Gorgan and Hartvigsen 2020).

Thus, TCT helps to explain how a land consolidation project can facilitate low transaction costs and thus serve as a strong incentive to cooperate (Haldrup, 2015). Transactions costs in this paper are understood as landowners' efforts related to the participation in land consolidation and comprised of time, physical and psychological efforts and financial expenses required to search for information (search and information costs), negotiate best re-allotment options with land consolidation planners (bargaining and decision costs), and formalize the new ownership situation (policing and enforcement costs).

Since the landowners' situation before the project is different (i.e., in terms of the holding size, the number of parcels comprising the holding, or parcels location and access), the motivation to participate or the cost/benefit ratio will also be different. For example, some landowners with one parcel or with several but in proximity to each other or the homestead may not be motivated to participate in the same way as those with excessive fragmentation.

Because of the unique characteristics of land as an asset, some behavioural economics factors will affect behaviour and decision making in land consolidation. According to the *endowment effect*, the farmers will value their own parcels higher than identical parcels they do not own, making

participants feel they have lost in the process of consolidation. Endowment effect is also closely related to place attachment, where people are emotionally attached to their residence (or land) and unwilling to move even if the alternative housing is better (Bao and Robinson, 2022). For this reason, landowners will generally prefer avoiding losses, that is, avoiding participation in land consolidation, than acquiring equivalent gains (*loss aversion*) (Kahneman and Tversky, 1979).

Thus, both endowment effect and loss aversion are behavioural biases to be considered in public policies involving land, such as land consolidation (Bao and Robinson, 2022). Both these emotional effects can be regarded as psychological costs in the process of land consolidation, and even if only perceived effects will have to be addressed, especially for those having unpronounced economic interest, by demonstrating that the benefits of participation will outweigh the costs, including by "compensating" participation through economic and non-economic benefits and incentives, and by proper communication techniques including nudges. Building a fair and transparent land valuation system is, thus, a precondition to land consolidation in any country.

4.2.4. Social behavioural factors

Social capital and trust appear to be central in various development initiatives, including land consolidation, as it empowers individuals to organize themselves into groups in pursuit of common development objectives, can induce collective action, and reduce opportunistic behaviour and conflict. Social capital is most frequently defined in the

groups, networks, norms, and trust people have available to them for productive purposes (Grootaert et al., 2004). Social capital is defined as "connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them" (Putnam, 2000).

Intertwined with social capital, trust has received research attention across multiple disciplines that have differed in their definitions and approaches (Lewicki et al., 2006). Trust is a crucial factor for enhancing individual well-being and socio-economic development at the community level (Yokoyama and Ishida, 2006). Yet, there is no commonly accepted definition of trust. However, Lewicki et al. (2006) reveal some considerable convergence on the central elements of trust. These include "positive" or "confident" expectations about another party and a "willingness to accept vulnerability" in the relationship under conditions of interdependence and risk.

The essence of the concept of trust implies both purely rational self-interest and that people can also act morally to pursue a common good. Most people practice some balance where they wish to contribute to the common good but also look after their self-interest. Efficient cooperation for common purposes can come about only if people trust that other people will also choose to cooperate (Rothstein, 2005, as quoted in Haldrup, 2015).

If social capital and trust are vital for the socio-economic development of communities, its lack in a given community would be an indicator that land consolidation might be problematic or that benefits would not outweigh the costs or potentially have adverse social effects. Understanding the social capital levels, existing networks and groups,

and power balances in a given community is thus of crucial importance for the success of public intervention.

Building trust between different groups (bridging social capital) and between groups and institutions (linking social capital) is an essential first step in any land consolidation project. It should continue throughout the entire life of the project. Trust has a dynamic character related to the dynamics of the planning process wherein interaction between individuals and implementing organizations plays a significant role (Kool, 2013). Whether land consolidation is a success, in the end, will depend on whether the project will manage to build up the trust through the project activities beginning from the feasibility study, over the re-allotment planning to the final plan adoption and implementation. Land professionals representing the government usually have little trust when they start the project but will need to build it through transparent and participatory processes and throughout the public meetings, engagement of committee of stakeholders, etc. This is also why interpersonal (non-technical) skills are necessary and maybe even more important than technical skills.

So land consolidation is a state action that comes out as the most explicit source of social capital than most other public interventions (Haldrup, 2015). We analyse the effect of the social factors on the readiness of landowners to participate in consolidation in the qualitative part of our empirical study.

4.2.5. Incentives in land consolidation

Land consolidation policy can bring significant benefits of different nature both within the intervention areas and on a broader regional and national scale. However, the numerical expression of such

benefits would largely depend on the specific country and projects (Versinskas, 2020).

As mentioned earlier, the cost/benefit ratio of taking part in land consolidation will also be different because of the socio-economic, psychological, farm or other individual characteristics differences. Incentives provide one option that can better align benefits with costs to make behaviour change (participation) attractive. Overall, incentives appear to work best if they reinforce what individuals already want to do (Madrian, 2014).

Haldrup (2015) distinguishes three types of incentives in the case of a land consolidation project for wetland restoration in Denmark: zero transaction costs, the scope for farm restructuring, and cash compensation. The key incentive lies in combining the two first: to offer farm restructuring according to preferences and with transaction costs paid by the project.

The transaction costs pertinent to farm restructuring and comprised of the time-consuming efforts, physical and psychological efforts as well as financial expenses, are handled on behalf of (for) the land consolidation participants. The financial expenses are either directly covered by the implementing agency from the public funding sources, or the law waives certain fees. The project's temporary situation of zero transaction costs is an important instrument to persuade landowners' cooperation and participation.

The main economic (direct) benefits expected from land consolidation include reduction of the number of land parcels, improvement of parcel shape and size, and as a result reduction of the production costs, transportation costs, and time-saving (time savings

especially important for those engaged in agriculture on a part-time basis). One of the strongest incentives for landowners to take part in land consolidation is when interventions provide improved drainage, irrigation and access roads (individual access to each parcel).

Not all landowners will be interested in farm restructuring and might be drawn into the process by indirect (non-economic) benefits, such as the possibility of selling land to other participants or the land bank or transferring land. Rural areas in many countries typically face many challenges, including demographic changes, outmigration and workforce availability, poor infrastructure, and sub-optimal land use. In this context, intergenerational farm transfer is increasingly viewed as fundamental to the sustainability and development of global agriculture and family farming (Leonard et al., 2017). Land consolidation is one of the several policy instruments that can support such a transfer (either through inheritance transfer or normal land market transfer) by being a decision trigger for landowners and facilitating the process. In this way, land consolidation also contributes to alleviating land abandonment, development of land markets, and reinvigoration of agriculture and rural areas (Gorgan and Hartvigsen, 2022).

The adjudication of various uncertainties in ownership, including the sorting out of inheritances, could also be a strong incentive if would be free (Haldrup, 2015).

4.3. Methodology

After setting the theoretical framework in the previous section (Section 2), the current section explains the methodology behind the study. First, we describe the study area, second, data collection and,

lastly, data analysis approach. Data analysis approach is mixed and employs a logit regression model to measure individual level factors influencing general interest of landowners to participate in land consolidation and content analysis to understand behavioural factors both individual and social levels underlying the negative attitude.

4.3.1. Study area

North Macedonia is a landlocked, upper-middle-income country in Southeast Europe. It gained independence in 1991 as one of the successor states of Yugoslavia. In April 2004, the Stabilization and Association Agreement between the Republic of North Macedonia and the European Union entered into force. At present, North Macedonia continues to implement EU-related reforms on the accession path.

North Macedonia and the remaining countries from the former Yugoslavia have a long and complicated history of land management and land ownership. The complicated history of land ownership has led to excessive fragmentation of land ownership and land use, primarily due to the pre- and post-World War II period and due to the restitution process and further fragmentation through land inheritance (Hartvigsen, 2013).

As a result, private agricultural land in North Macedonia is highly fragmented, with an average farm size of 1.7–2.0 ha and an average parcel size of 0.2–0.5 ha, in the past two decades (Keith et al., 2009).

The outmigration from rural areas and the unwillingness of landowners to neither lease out their parcels nor sell results in a considerable number of abandoned agricultural parcels, estimated at 24,663 ha in 2013. This negatively affects the productivity,

competitiveness, and efficiency of farms and prevents further modernization and economies of scale.

The Government of North Macedonia had recognized the structural problems of land fragmentation and small average farm sizes and began around 2007 to take practical steps. First, two land consolidation pilots were implemented in 2008 – 2012 with Dutch technical assistance and funding (Hartvigsen, 2015). Then in 2010, the Government adopted National Land Consolidation Strategy and, in December 2013, a Law on Consolidation of Agricultural Land[14], thus creating a legal basis for establishing a land consolidation programme.

During 2014 – 2017, FAO continued supporting land consolidation in North Macedonia through a pilot project designed to assist MAFWE in devising a successful land consolidation process[15] and, starting from 2017, supported the implementation of the first round of land consolidation projects in the field under the National Land Consolidation Programme through a follow-up project known as MAINLAND[16]. The overall policy objective behind land consolidation in North Macedonia is to reduce land fragmentation, increase farm sizes, and increase farm productivity and competitiveness.

The start of the land consolidation on a national level requires preparatory activities to determine areas where land redistribution is mainly needed, and one of the commonly used tools for selection of the optimal solution scenario and informed decision making is multi-criteria analysis (Pasakarnis et al., 2020; Tomic et al., 2018;

14 Official Gazette no. 187 of 30/12/2013

15 ”Support to the formulation and implementation of a national land consolidation programme” (TCP/MCD/3501)

16 “Mainstreaming of the National Land Consolidation Programme” (GCP) http://www.fao.org/europe/news/detail-news/en/c/886230/

Triantaphyllou, 1997). This analysis was carried out in North Macedonia as a starting point in a multi-staged selection process shown in Figure 1.

Three main criteria have had a decisive role in selecting the potential land consolidation projects: i) readiness of local communities to implement land consolidation, ii) justification of the needs for such process and iii) expected impact on the broader local community.

The following villages selected for the initiation of land consolidation with support of MAINLAND and covered by this study are: *Logovardi, Optichari, Carev Dvor, Sokolarci, Spanchevo, Cheshinovo, Chiflik, Zhabeni, Trn and Stojakovo.* The empirical analysis provided hereafter builds on the data collected from individual interviews conducted as part of land consolidation feasibility studies in these municipalities in North Macedonia. Factual information about the selected villages, including the total number of right holders, number of conducted interviews, and crop specialization, is provided in Appendix 1.

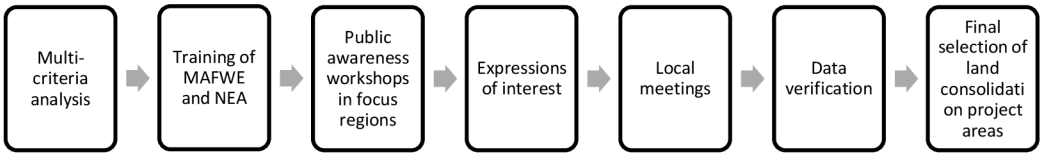


Figure 1. Project areas selection flow-chart (MAFWE- Ministry of Agriculture, Forestry and Water Economy, NEA - National Extension Agency).

Source: Authors elaboration based on FAO (2018).

4.3.2. Data collection

The face-to-face interviews were conducted between Q4, 2018 and Q3, 2019 by service providers (land planners) subcontracted to implement land consolidation projects. The structured questionnaire

was divided into three major blocks: (i) information about the landowner and land parcels comprising the holding, (ii) interest in and wish for the land consolidation project, and (iii) information on farming activities. Part two of the interview questionnaire contained an open-ended question about the reasons for unwillingness to participate, which is further analysed using a qualitative content analysis approach.

No sampling was applied since all right holders falling within the land consolidation project area had to be identified and interviewed. Interviews were done predominantly at the landowners' households. Some landowners who were physically unavailable were interviewed via telephone or messengers. A household member (legal heir) was interviewed when the formal landowner was deceased.

In total, 4335 interviews have been conducted. The percentage of landowners who have not provided any response or were not-identified in all ten municipalities is circa 11%.

We used a statistical software package, SPSS, to perform quantitative analysis.

4.3.3. Data analysis

4.3.3.1. Sample description

The prevailing (median) number of family members in a household in the study areas is three, where 21% of households have two members, 20% - three, 18% - four, and 15% - five. It's worth noting that 17% of households have one family member while 9% have six and more family members.

The median age of the farmer (household head) is 60 years, where 42% are between 41 and 60 years, 8% are younger than 40 years, while 46% are older than 60 years.

Regarding the number of parcels of land per household (fragmentation), 43% have one parcel; 18% have two parcels; 11% have three parcels, 21% have between four and 10 parcels, and more than ten parcels have 7% of households. The mean number of parcels per household is 3.33, while the median is equal to 2 parcels.

The amount of owned land shows that the mean holding size is 0.97 ha, while the median value is 0.49 ha. A 51% of households own less than 0.5 ha of agricultural land (where 6.2% of households own less than 0.1 ha), 23% between 0.5 and 1 ha, 19% between 1 and 3 ha, 7% between 3 and 10 ha and only 0.2% of households have more than 10 ha of land in ownership.

Notably, 70% of households have indicated to be non-active farmers. For only 30% of households, agriculture represents more than 50% of the annual income. About 42% of the respondents have indicated their income is 100% from non-agricultural activities, meaning that they are either cultivating their parcels for subsistence or being abandoned or cultivated by someone else. In general, it had been reported by the interviewers that the majority of respondents were not comfortable answering the question about income, where the response rate to this question is only 43%.

All in all, 82% of interviewed households have shown interest in land consolidation, with 35% being very interested, 34% moderately interested, and 13% slightly interested. As much as 18% of households have indicated not to be interested in land consolidation.

4.3.3.2. Regression model

The general interest of landowners in land consolidation was investigated. As the dependent variable is of binary nature (interest to participate in land consolidation), the binary logit model was used to analyse the effect of independent variables.

The logit model in its specific form is:

$$\boldsymbol{y = \beta_0 + \beta_1 X_1 \ldots\ldots\ldots\ldots\ldots + \beta_9 X_9 + \varepsilon} \qquad (1)$$

Where:

y = participation in the land consolidation project.
β0 - intercept.
β1 - β9 - logistic regression coefficients (parameters).
X1 = gender.
X2 = age.
X3 = active in farm.
X4 = non-agricultural income.
X5 = children inherit.
X6 = family members.
X7 = enough information.
X8 = number of parcels.
X9 = farm size.
ε = residual.

The model has been tested for multi-collinearity using the variance inflation factor. All tested explanatory variables had variance inflation factor values within the range of 1.006–1.536, and the mean-variance inflation factor is 1.19, which indicates an absence of multi-collinearity (Kleinbaum et al., 2013).

4.3.3.2.1. Description of the variables

The binary dependent variable was created based on the expressed levels of initial potential interest to participate in land consolidation: the answers very interested, moderately interested, and slightly interested were merged and built a group of interested landowners. Nine individual, socio-economic and farm structure variables were selected based on previous studies (as described in Section 2) and the expert knowledge from the area and tested in the logistic regression model for their significance in predicting landowner's interest in landowners in land consolidation. These are presented in Tables 1a 1b below.

Table 1a. Description of the variables imported into the model (categorical variables).

Variable	Item	Frequency	Percentage
Dependent variable			
Interest to participate	Yes	3,545	81.8
	No	790	18.2
Independent variables			
Gender	Male	3,318	76.9
	Female	994	23.1
Active farmer	Yes	1,317	30.4
	No	3,018	69.6
Children inherit	Yes	1,728	58.5
	No	1,228	41.5
Enough information	Yes	3,803	95.6
	No	176	4.4

Table 1b. Description of variables imported into the model (continuous variables).

Variable	Minimum	Maximum	Mean	Standard deviation
Age (years)	19	97	59.31	12.25
Agricultural income (%)	0	100	27.73	33.63
Family members (persons)	1	17	3.31	1.79
Number of parcels	1	102	3.33	4.24
Area of parcels (m2)	40	180101	9691	13911

4.3.3.3. Content analysis

As much as 18% of households have indicated not to be interested in land consolidation. The underlying reasons for not being interested in land consolidation have been analysed using the questionnaire's open-ended question and qualitative content analysis approach. Out of 790 uninterested in participating landowners, 605 have indicated the reason. These records have been analysed, and a list of key reasons was synthesized. Based on frequencies, these were ranked from most relevant to least relevant and then validated in consultation with the MAINLAND experts (Table 3).

4.4. Results and Discussion

In this section we present and discuss the results of the empirical study conducted following the methodology outlined in Section 3. Here we also discuss what incentives, techniques and nudges can be applied to encourage landowners' positive attitude.

4.4.1. Quantitative analysis (Logit regression)

The result of the logit regression in Table 2 shows factors influencing the readiness of farmers to participate in land consolidation.

The result shows that age has a statistically significant negative influence on farmers' interest in participating in land consolidation, with an odd ratio of 0.976. This is an exciting finding showing that younger farmers and landowners are more supportive of land consolidation ideas.

As mentioned in Section 3, residents in rural communities often see land consolidation as a risky venture with a lot of uncertainty, especially at the beginning of the process. The *life cycle risk aversion hypothesis* posits that risk aversion should increase with age (older people would be less willing to risk than the young ones). Even if this hypothesis cannot be directly tested because it would require testing the same person at different ages (Damodaran, 2008), in weak support of this hypothesis, some studies found that older people are, in fact, more risk-averse than younger (Morin and Suarez, 1983; Harrison et al., 2007) and also that older adults prefer less choice than young adults (Reed et al., 2008).

Table 3: Logit regression of factors influencing the farmer's readiness for participation, N=4335

Variable	B	SE	Wald	Sig*	Exp (B)/ odd ratio
Gender	.270	.185	2.122	.145	1.310
Age	-.024	.007	12.741	**.000**	.976
Active in farm	.319	.202	2.494	.114	1.376
Non-agricultural income	.003	.003	.951	.330	1.003
Children inherit	.775	.175	19.633	**.000**	2.170
Enough information	.993	.329	9.128	**.003**	2.699

Variable	B	SE	Wald	Sig*	Exp (B)/ odd ratio
Number of parcels	.053	.029	3.381	**.066**	1.055
Constant	1.557	.619	6.325	**.012**	4.743
Nagelkerke R Square	**.080**				

**-The selected confidence interval is 90%*

The model results depict that farmers' intention to leave an inheritance (land parcels) to children has a statistically significant positive influence on farmers' participation in land consolidation. This means that when farmers' children inherit the land, it will create 2.2 times more chances of participation in land consolidation than when children will not inherit the land. This can be explained by the fact that farmers want their children to continue farming and that there are economic decision-making considerations to improve farming conditions in view of subsequent operations continuation.

On the other hand, many landowners expect that they can solve inheritance problems through the project or transfer land to their children. Therefore, supporting landowners with inheritance proceedings (by facilitating the procedure or even by partially covering the costs) can be a great incentive to ensure the communities' support for land consolidation. As was reported in Section 3.3.1, almost half of all respondents in the studied areas are older than 60 years; therefore, transferring land to younger generations is a very actual topic in rural communities.

Before being asked about their preferences vis-`a-vis participation in the project, the respondents were asked a control question - whether they have received enough information about the project and participation conditions. The logistical regression model shows a statistically significant positive relationship between perceiving to

have enough information about the project and the participation in the land consolidation program, with an odds ratio of 2.699. This implies that farmers who believe in having enough information about the project have three times more chances of participating than farmers with insufficient information. With more information, there should be more trust (information reduces uncertainty), less bounded rationality, and reduced psychological costs.

This finding resonates with Lisec et al. (2014), reporting that landowners' active participation contributes to their comprehension of the aims and satisfaction with land consolidation results. Therefore, it is necessary to launch public awareness campaigns involving as many interested parties as possible and present landowners with the advantages of land consolidation for themselves and its contribution to rural development.

The result also shows that the number of parcels forming a holding has a statistically significant favourable influence on landowners' interest in the land consolidation project with the odd ratio of 1.055. The odd ratio indicates that an increase in holding with one parcel creates 1.055 times more chances of being interested in participation, confirming that farmers with a large number of scattered parcels are more interested than farmers with a low number of parcels.

This effect size is smaller, as might be expected. An excessive number of parcels comprising the holding is one of the problems which land consolidation is fundamentally designed to address. However, not all fragmentation types are agriculturally irrational and represent a concern to farmers/landowners (Binns, 1950). The number of parcels does not necessarily indicate the need for land consolidation and the landowner's level of interest. It depends on the general situation in the project area and each specific case. The spatial dimension/

characteristics of the parcels comprising the holding have to be considered, i.e., shape, the distance between the parcels, and distance from the farmstead/household to the parcels. For example, a landowner may have several agricultural parcels but see it as agriculturally rational (i.e., improved risk-management because of different micro-climatic zones, various soil quality suitable for various crops, etc.).

Another common situation is when parcels have different property titles but are either located one next to another (forming de facto a contingent parcel) or within a small distance from each other.

4.4.2. Qualitative analysis

Based on the frequencies of answers, Table 3 classifies and ranks the main reasons for non-willingness to participate in land consolidation as expressed by landowners during the interviews. Column 4 classifies the reasons under main categories, and column 5 suggests incentives, nudges and operational techniques to influence the landowner's non-supportive attitude.

Table 3: Reasons for not being interested in land consolidation and proposed motivators.

No.	Reasons for unsupportive attitude	N	Reasons classification	Possible incentives, nudges and/or techniques
1	Because the respondent has only one (few) parcel in the project area, or because the respondent's parcel(s) have a good location, access to the road and irrigation canal	223	Lack of economic incentive	Incentives: non-economic benefits Nudges: messenger; salience and affect, norms, commitments and ego Techniques: empowerment, flexibility during negotiations
2	Because the respondent is against the project/land consolidation, refuses to provide an explanation and talk with the land consolidation planner	143	Adversarial attitude	Nudges: messenger; salience and affect, norms Techniques: foster constructive conversation, empowerment, flexibility during negotiations
3	Because of lack of interest in agriculture and thereby in land consolidation (e.g. parcels are either rented out, abandoned, landowner is abroad)	127	Lack of economic incentive	Incentives: non-economic benefits (i.e., intergenerational transfer) Nudges: messenger; norms Techniques: information and awareness-raising, empowerment
4	Because the informal sale or exchange of the parcel has taken place	88	Uncertainty, loss aversion	Incentives: non-economic benefits (i.e., clarification of ownership), zero transaction costs Nudges: messenger; salience and affect, norms Techniques: information and awareness raising
5	Because of the ongoing dispute, legal issues with	73	Uncertainty	Incentives: non-economic benefits (i.e., assistance

No.	Reasons for unsupportive attitude	N	Reasons classification	Possible incentives, nudges and/or techniques
	the ownership, or initiated inheritance process			with the formalization of inheritance), zero transaction costs Nudges: messenger, norms Techniques: mediation of conflict, information and awareness raising
6	Because of lack of trust in institutions, fear of manipulation, and an unjust process (e.g., negative past experiences with subsidies and other types of state support, negative experience and perception of land consolidation, political reasons)	55	Lack of trust, low levels of social capital	Incentives: bonding, bridging, and linking social capital; investments in agricultural and social infrastructure Nudges: messenger; salience and affect Techniques: empowerment, transparency
7	Because no specific condition of participation are offered at the time of the interview or conditions of participation are misunderstood (e.g., price, new location, or landowners don't know that they can sell, exchange or rent parcels through the project)	48	Uncertainty, low information	Incentives: economic and non-economic benefits, zero transaction costs Nudges: norms, defaults Techniques: information and awareness raising, empowerment
8	Because of the belief that the respondents land is of higher quality than that of others (including parcels with perennials, installations, or other investment) and fear that he/she will get a lower class land after the project	29	Endowment effect, loss aversion	Incentives: economic benefits, zero transaction costs, non-economic benefits Nudges: messenger, norms Techniques: empowerment

No.	Reasons for unsupportive attitude	N	Reasons classification	Possible incentives, nudges and/or techniques
9	Because of insufficient information and the need to consult with relatives, co-owners, or lessors, advanced age of a landowner	27	Uncertainty; low information	Incentives: economic and non-economic benefits, zero transaction costs Nudges: norms, salience and affect Techniques: information and awareness raising
10	Because of the emotional attachment to land (e.g., “mine to stay mine” or “they do not give up their father's land” or “the parcels should remain where it is in the same place as a memorial to the ancestors”)	26	Psychological cost	Incentives: non-economic benefits Nudges: messenger; salience and affect, norms Techniques: empowerment, flexibility during negotiations
11	Because the respondent doesn't believe in the success of land consolidation project and thinks that it will be too burdensome	21	Cognitive bias, uncertainty, lack of trust	Incentives: economic benefits, zero transaction costs, non-economic benefits Nudges: defaults, norms Techniques: information and awareness-raising, empowerment

Qualitative analysis revealed 11 main reasons for unsupportive attitudes towards land consolidation. The majority of landowners are not supporting the land consolidation project because they have one or several parcels in good location and with access to the road and irrigation canal. In other words, they are satisfied with the structure of their farm, and calls for economic benefits resulting from the reduction of land fragmentation, improved access and shape of parcels under zero transaction costs will be of no avail and little weight for such landowners. Same stands for the third group of landowners

with no economic incentives and interest in land consolidation, because they are not actively engaged in agriculture and either lease out their land parcels or keep them abandoned.

Thus, the non-economic benefits such as clarification of ownership, correction of cadastral and registration errors, intergenerational transfer and/or some other incentives and motivators from the realm of individual principles and values, a sense of belonging, appeal to the community interest and reciprocity, and others should be used to influence these two groups. A landowner might distrust the government and the land consolidation implementing agency, but he/she may be motivated to help a neighbour, friend or community as a whole. Such connections bridging individual and community level interests must be identified and exploited for each specific landowner.

Second most frequent situation of non-cooperation is when landowners are dead set against the project/land consolidation, refuses to provide explanation and talk with the land consolidation planner. In some cases, such adversarial and non-cooperative behaviour can be changed relatively easy through information and communication. At the same time, in some other instances, more significant efforts and personal approaches will be necessary until constructive conversations can be established. Land consolidation planners may apply some operational techniques and nudges to persuade landowners to change their attitudes and overcome lack of economic incentives, uncertainty, loss aversion and low levels of trust. Empowering landowners by including them in land consolidation bodies, using mediation techniques in case of conflicts, information and awareness raising, transparency and flexibility during negotiations, for example, with regards to selecting the fixed parcel, are some of the techniques that can be applied.

4.4.2.1. The potential of nudges to influence landowners' attitude

Nudges can be defined as small changes in the environment that are easy and inexpensive to implement (Ferrari et al., 2019) to alter people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. Nudges are not mandates (laws and regulations) and to count as a mere nudge, the intervention must be easy to avoid (Thaler and Sunstein, 2008).

With reference to Blumenthal-Barby and Burroughs (2012) and Ferrari et al. (2019), various nudge types can be used to increase landowners' participation in land consolidation. For example, humans are social creatures living within social and cultural norms and, thus, we rely on other people for our behavioural and decisional cues. The information on how many landowners have already agreed to participate can have a great persuasive effect on the swinging landowners or those who are against (norms). Or a landowner may better receive information if it is delivered by their fellow community members, peers, or other messengers with the authority. The weight we give to information depends greatly on our reactions to the source of that information (messenger). Further, the framing of the information delivered to landowners – the way information is formulated - may affect its acceptance.

Individuals tend to choose pre-set options to simplify their decision-making process. Offering several re-allotment options during planning and negotiation with landowners to choose from, may change the perception about the entire process of land consolidation as less

complicated (defaults). Linked to norms principle, commitments and ego can as well be useful. Individuals try to be consistent with their public commitments in the way they behave and act in a manner that makes them feel better about themselves. Participation in consolidation is good for the community, so the landowner may feel good and satisfied if he/she participates and contributes to the public good.

Individuals are commonly influenced by novel, personally relevant, and vivid examples and explanations. By eliciting the right emotional associations readily available in the memory, the salience effect has the potential to be used (in the right moment and context during the project), for example, to persuade landowners with a strong attachment to the land. Affect means that moods, rather than deliberate decisions, can influence judgments. For example, people in a good mood make more optimistic judgements than those in a bad mood.

4.5. Conclusions

The primary objective of this research article was to gain insights into the individual and behavioural factors influencing landowners' interest and willingness to participate in land consolidation and ways to motivate and engage landowners using the empirical evidence from North Macedonia. The country is uniquely positioned in the region since its Government is taking practical steps to introduce a land consolidation instrument on a long-term basis. Hence, the findings of this study shall be of practical importance first of all for the decision makers and, secondly, for a wider community of experts, researchers and planners dealing with land consolidation.

This article responds to a global call for participatory and people-centred land development approaches, as presented before, and also to a call for the application of behavioural tools to land use policy studies using survey data from the field (Bao and Robinson, 2022). Land consolidation in this paper is considered as a particular case of public intervention aiming to induce a behaviour change and a collective action. Going through various stages of a land consolidation project, a complex interplay of different factors and behavioural drivers influences and informs landowners' decisions.

Answering the first research question, the study revealed that the *age of the landowner, plans to pass land to children, the sufficiency of information, and the number of parcels forming a holding* have a statistically significant relationship with the readiness to participate in land consolidation. Several policy implications stemming from these findings can help shape future interventions. First, the direct relationship between the sufficiency of information and the readiness to participate in land consolidation underlines the importance of awareness campaigns in the process. Thoroughly designed and tailored to the community characteristics, communication campaigns play a crucial role in interventions' success as they inform the participants about the "rules of the game" and expected benefits, reduce uncertainty landowners are facing, especially at the beginning of the project, and increase the overall transparency of the process. Second, the significance of other factors, such as the landowner's age and the existence of the plans to pass land to children, gives some clues to planners that can be applied during negotiations and communication with landowners. The inverse relationship between the age and the willingness to participate in the project means in

practice that older landowners will require additional efforts to persuade and incentivize them to participate. One such incentive relevant for the retired or preparing to retire landowners can be an offer to carry out inheritance proceedings with the support of the project (which also has a statistically significant relationship with the readiness to participate) or alienate land on favourable conditions, thus "exit" agriculture. Thus, project designers and planners can exploit these two variables in interconnection with each other. The significance of the number of parcels forming a landholding with the willingness to participate confirms that the participants' default strategy in the project is the maximization of economic benefits. The implication of this finding asserts that project areas (at least with the primary purpose of farm restructuring) have to be carefully selected, avoiding areas where fragmentation is not seen as a problem by the majority of landowners.

The second research question of this study aimed to explore the reasons for being against land consolidation and the underlying individual and social level behavioural factors. The main reasons for not being interested in land consolidation revealed by the study include the *lack of direct economic interest when a landowner's landholding is not fragmented and is in a suitable location, adversarial attitude when landowners are speaking out against land consolidation and refuse interviews, uncertainty, the lack of trust in institutions, fear of manipulation, and the belief that the process will be unjust*. The policy and project implications of these findings are that not all landowners in the communities will be driven by economic rationality considerations (or their situation will already be optimal, i.e. landholding is not fragmented and in a good location). Such

landowners' decisions can be influenced primarily by cognitive and emotional drivers such as norms, trust, reciprocity, personal beliefs and attitudes, and self-efficacy. Social capital and trust represent part of the overall environment of a project and can also create an enabling or constraining effect that will directly or indirectly influence individual behaviours. Therefore, it would be recommendable in the initial stages of land consolidation to pay more attention to the existing power dynamics in the communities, main groups and networks and the overall trust levels as predictors of success or failure. Land consolidation interventions can serve as a source of social capital and can leave communities more united, resilient, trusting and responsive, where also individual self-interests meld with the common good.

The third research question focused on incentives and techniques available to stimulate land consolidation participation. The main cornerstone incentive that comes to reinforce landowners' direct economic interest, uniquely and temporarily offered for the duration of a project, is *zero transaction costs*. In addition, landowners without economic interest, those who refused interviews, and with other rejection reasons can be motivated in the process by using various nudging techniques such as: for example, *norms and messenger*. Nudging techniques and principles should be included in the overall implementation strategy and awareness campaign to subtly influence landowners' perceptions and behaviours alongside mandates and incentives.

The limitation of this study is that it was not in its scope to test all the behavioural factors quantitatively, and thus some of them are only tested qualitatively.

Appendix 1. Data on project areas where feasibility studies have been conducted

no.	Project area	no. of property sheets	no. of parcels	Area (ha)	Total no. of right holders	no. of conducted interviews	Crop specialization (% of surface)
1	Logovardi	460	1,037	514	570	538	First crop: cereals (wheat, barley, and corn); Second crop: forages (fodder corn), vegetables (winter cabbage, tomato and pepper)
2	Opticari	423	1,221	630	423	396	First crop: 55% cereals (wheat, barley) and 45% corn; Second crop: forage crops (silk maize), vegetables (pepper)
3	Sokolarci	544	1,929	268	511	418	Rice –80%, barley, cabbage
4	Spanchevo	632	1,879	276	642	486	Rice (80%), alfalfa and maize
5	Carev Dvor	392	1,044	386	569	314	Apples 85%
6	Zabeni	208	724	276	208	198	Corn 58% , alfalfa 13%, wheat 10%, beans 5%, pepper 5%
7	Trn	240	755	329	249	248	Wheat - 53%, corn -31%, alfalfa, barely, tobacco, 2nd crop: maze, cabbage, pepper
8	Stojakovo	1,327	1,630	469	1,337	895	Vegetables: cabbage (spring and winter), onion, pepper, eggplant, tomato, gherkin etc.
9	Cheshinovo	752	2,355	445	656	527	Rice – 93%, wheat, barley
10	Chiflik	499	1,150	139	378	356	Rice – 71%, wheat – 11%, barley – 8%, alfalfa, vineyards, vegetables
	Total	**5,477**	**13,724**	**3,732**	**5,536**	**4,335**	

4.6. References

Bao, H., Robinson, G., 2022. Behavioural land use policy studies: past, present, and future. Land Use Policy 115, 106013. https://doi.org/10.1016/j. landusepol.2022.106013.

Binns, B., 1950. The consolidation of fragmented agricultural holdings. FAO.

Blumenthal-Barby, J.S., Burroughs, H., 2012. Seeking better health care outcomes: the ethics of using the "Nudge". Am. J. Bioeth. 12 (2), 1–10. https://doi.org/10.1080/ 15265161.2011.634481.

Beunen, R., Louwsma, M., 2016. Participatory approaches to land re-allotment: on the interplay between institutional frameworks and trust. Conference paper. Symposium on Land Consolidation and Land Readjustment for Sustainable Development. Apeldoorn, the Netherlands. https://www.researchgate.net/publication/309618983_Participatory_approaches_to_land_re-allotment_on_the_interplay_between_institutional_frameworks_and_trust.

Bougherara, D., Grolleau, G., Mzoughi, N., 2008. Application of Transaction Costs Economics to Environmental Issues, American Agricultural Economics Association, July 27–29, Orlando, Florida, USA. https://hal.archives-ouvertes.fr/hal-01462523.

Coelho, J.C., Portela, J., Pinto, P.A., 1996. A Soc. Approach Land Consol. Scheme.: A Port. case Study.: Val. Proj. Land Use Policy 13 (2), 129–147. https://doi.org/ 10.1016/0264-8377(95)00037-2.

Damodaran, A., 2008. Strategic Risk Taking: A Framework for Risk Management. Prentice Hall, Pearson.

Bullard, R., 2007. Land Consolidation and Rural Development. Papers in Land Management Series No. 10. Anglia Ruskin University, Cambridge. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.600.2529&rep=rep1&type=pdf.

FAO, 2018. First Annual Project Report. Mainstreaming of the National Land Consolidation Programme (MAINLAND). Unpublished project report.

FAO, 2020. Smallholders and Family Farms in Europe and Central Asia. Regional Synthesis Report 2019. Budapest. DOI: https://doi.org/10.4060/ca9586en.

Ferrari, L., Cavaliere, A., De Marchi, E., Banterle, A., 2019. Can nudging improve the environmental impact of food supply chain? A systematic review. Trends Food Sci. Technol. 91, 184–192. https://doi.org/10.1016/j.tifs.2019.07.004.

Garcia-Alvarez-Coque, J.M., Martinez-Gomez, V., Tudela-Marco, L., 2021. Multi-actor arrangements for farmland management in Eastern Spain. Land Use Policy 111. https://doi.org/10.1016/j.landusepol.2021.105738.

Gorgan, M., Hartvigsen, M., 2022. Development of agricultural land markets in countries in Eastern Europe and Central Asia. Land Use Policy 120. https://doi.org/10.1016/j. landusepol.2022.106257.

Grootaert, C., Narayan, D., Nyhan Jones, V., Woolcock, M., 2004. Measuring Social Capital: An integrated questionnaire. The World Bank, Washington, D.C.. http://hdl .handle.net/10986/15033.

Haldrup, N.O., 2015. Agreement based land consolidation – In perspective of new modes of governance. Land Use Policy 46, 163–177. https://doi.org/10.1016/j. landusepol.2015.01.027.

Harrison, G.W., Lau, M.I., Rutstr¨om, E.E., 2007. Estimating risk attitudes in denmark: a field experiment. Scand. J. Econ. 109, 341–368. https://doi.org/10.1111/j.1467- 9442.2007.00496.x.

Hartvigsen, M., 2013. Land Reform in Central and Eastern Europe after 1989 and its outcome in form of farm structures and land fragmentation. FAO Land Tenure Work. 24.
https://www.fao.org/documents/card/en/c/c6bae647-1604-5e09-b664-af2e9f 720006/.

Hartvigsen, M., 2014. Land consolidation and land banking in Denmark. Tradit., multi- Purp. Perspect. Dan. J. Geoinformatics Land Manag. 47 (1–7), 52. http://journals. aau.dk/index.php/tka/article/view/987.

Hartvigsen, M., 2015. Experience with Land Consolidation and Land Banking in Central and Eastern Europe after 1989. FAO Land Tenure Working Paper no 26. https://www.fao.org/3/i4352e/i4352e.pdf.

Hiironen, J., Riekkinen, K., 2016. Agricultural impacts and profitability of land consolidations. Land Use Policy 55, 309–317. https://doi.org/10.1016/j. landusepol.2016.04.018.

Holmes, B., 2011. Citizens' engagement in policymaking and the design of public services. Parliament of Australia, Department of Parliamentary Services. Parliament Library. Retrieved August 16, 2020, from https://parlinfo.aph.gov.au/parlInfo/download/library/prspub/942018/upload_binary/942018.pdf;fileType=application/pdf#search=%222010s%22.

Kahneman, D., Tversky, A., 1979. Prospect theory: an analysis of decision under risk. Econometrica 47 (2), 263–291.
https://doi.org/10.2307/1914185.

Keith, S., Georgievski, K., Mitic, K., 2009. Options for the management of state land in rural areas in the Republic of North Macedonia. FAO Land Reform Journal 2009/1. https://www.fao.org/3/i0899t/i0899t00.htm.

Kleinbaum, D., Kupper, L., Nizam, A., Rosenberg, E.S., 2013. Applied regression analysis and other multivariable methods. Boston, MA: Cengage Learn.

Kool, S., 2013. Voluntary re-allotment in the Netherlands: a case study about the processes of voluntary re-allotment in Heusden, Epe-Vaassen and Kempen-Broek. WUR. https://edepot.wur.nl/261286.

Leenen, H., 2014. Land Development in the Netherlands. 3/2014, pp. 166–172. Zeitschrift für Geod¨asie, Geo-information and Land Management. DOI: 10.12902/ zfv-0023–2014.

Leonard, B., Kinsella, A., O'Donoghue, C., Farrell, M., Mahon, M., 2017. Policy drivers of farm succession and inheritance. Land Use Policy 61, 147–159. https://doi.org/ 10.1016/j.landusepol.2016.09.006.

Lewicki, R.J., Tomlinson, E.C., Gillespie, N., 2006. Models of interpersonal trust development: theoretical approaches, empirical evidence, and future directions. J. Manag. 32 (6), 991–1022. https://doi.org/10.1177/0149206306294405.

Lisec, A., Primozic, T., Miran, F., Sumrada, R., Drobne, S., 2014. Land owners' perception of land consolidation and their satisfaction with the results – Slovenian experiences. Land Use Policy 38, 550–563. https://doi.org/10.1016/j.landusepol.2014.01.003.

Madrian, B.C., 2014. Applying insights from behavioral economics to policy design. Annu. Rev. Econ. 2014 6 (1), 663–688. https://doi.org/10.1146/annurev-economics-080213-041033.

Morgan, W.B., Munton, R.J., 1971. Agricultural geography. Methuen & Co., London. https://nla.gov.au/nla.cat-vn2601867.

Morin, R.-A., Suarez, A.F., 1983. Risk aversion revisited. J. Financ. 38, 1201–1216. https://doi.org/10.1111/j.1540-6261.1983.tb02291.x.

Noorth, P.C., 1987. Land consolidation in the Netherlands. Land Use Policy 5, 11–13. https://doi.org/10.1016/0264-8377(87)90004-4.

Ntihinyurwa, P.D., Vries, W.T.D., Chigbu, U.E., Dukwiyimpuhwe, P.A., 2019. The positive impacts of farm land fragmentation in Rwanda. Land Use Policy 81, 565–581. https://doi.org/10.1016/j.landusepol.2018.11.005.

Palmer, D., Munro-Faure, P., Rembold, F., 2004. Land consolidation and rural development in Central and Eastern Europe. Journal for Geodesy. Geoinf. Land Manag. (2/2004). https://geodaesie.info/system/files/privat/zfv_2004_2_Palmer_Munro-Faure_Rembold.pdf.

Pasakarnis, G., Malienea, V., Dixon-Gough, R., Malys, N., 2020. Decision support framework to rank and prioritize the potential land areas for comprehensive land consolidation. Land Use Policy 100. https://doi.org/10.1016/j. landusepol.2020.104908.

Petit, V., 2019. Behav. Driv. Model.: A Concept. Framew. Soc. Behav. Change Program. https://www.unicef.org/mena/reports/behavioural-drivers-model.

Putnam, R., 2000. Bowling Alone: The Collapse and Revival of American Community. Simon & Schuster. New York.

Reed, A.E., Mikels, J.A., Simon, K.I., 2008. Older adults prefer less choice than young adults. Psychol. Aging 23 (3), 671–675. https://doi.org/10.1037/a0012772.

Rothstein, B., 2005. Social Traps and the Problem of Trust. Cambridge University Press,.

Sklenicka, P., 2006. Applying evaluation criteria for the land consolidation effect to three contrasting study areas in the Czech Republic. Land Use Policy 23, 502–510. https:// doi.org/10.1016/j.landusepol.2005.03.001.

Sommer, J.E., Hoppe, R., Green, R., Korb, P., 1995. Structural and Financial Characteristics of U.S. Farms, 1995: 20th Annual Family Farm Report to the Congress. Resour. Econ. Div., Econ. Res. Serv., U. S. Dep. Agric. Agric. Inf. Bull. No. 746. https://www.ers.usda.gov/publications/pub-details/?pubid=42192.

Takahashi, D., Chang, T., Shobayashi, M., 2018. The role of formal and informal institutions in farmland consolidation: The case of Shiga Prefecture, Japan. Int. J. Commons 12 (2), 80–107. https://doi.org/10.18352/ijc.829.

Thaler, R., Sunstein, C., 2008. Nudge: Improving decisions about health, wealth, and happiness. Yale University Press.

Thomas, J., 2006. Attempt on systematization of land consolidation approaches in Europe. Z. für Geod¨asie, Geoinf. und Land Manag., 3/2006, 156-161.
https://geodaesie.info/system/files/privat/zfv_2006_3_Thomas.pdf.

Tomic, H., Masteli´c Ivi´c, S., Roi´c, M., 2018. Land Consolidation Suitability Ranking of Cadastral Municipalities: Information-Based Decision-Making Using Multi-Criteria Analyses of Official Registers' Data. ISPRS Int. J. Geo-Inf. 7 (3) https://doi.org/ 10.3390/ijgi7030087.

Triantaphyllou, E., S´anchez, A., 1997. A sensitivity analysis approach for some deterministic multi-criteria decision making methods. Decis. Sci. 28 (1), 151–194. https://doi.org/10.1111/j.1540-5915.1997.tb01306.x.

Versinskas, T., Vidar, M., Hartvigsen, M., Mitic Arsova, K., van Holst, F., Gorgan, M., 2020. Legal guide on land consolidation. Based on regulatory practices in Europe. FAO,, Rome. https://doi.org/10.4060/ca9520en.

Vitikainen, A. (2004). An Overview of Land Consolidation in Europe. Nordic Journal of Surveying and Real Estate Research, 1(1). https://journal.fi/njs/article/view/41504.

Williamson, O.E., 1979. Transaction-cost economics: the governance of contractual relations. J. Law Econ. 22 (2), 233–261. http://www.jstor.org/stable/725118.

Williamson, O.E., 1995. Transaction cost economics: how it works; where it is headed. De. Econ. 146 (23–58), 1998. https://doi.org/10.1023/A:1003263908567.

Yokoyama, S., Ishida, A., 2006. Social Capital and Community Development: A Review. Potential of Social Capital for Community Development. APO,, Tokyo, Japan. https://www.apo-tokyo.org/00e-books/AG-17_PotentialSocialCapital/AG-17_Potential SocialCapital.pdf.

Zhang, X., Yea, Y., Wang, M., Yua, Z., Luoa, J., 2018. The micro administrative mechanism of land reallocation in land consolidation: a perspective from collective action. Land Use Policy 70, 547–558. https://doi.org/10.1016/j.landusepol.2017.09.056.

Chapter 5. Conclusions

5.1. Aim of the research project and key findings

The thesis aimed to explore the problem of farmland abandonment as an extreme case of land use inefficiency and discuss how land market and land consolidation can mitigate it. The thesis's main contention is that small and fragmented farm structures are among the main root causes of farmland abandonment, and thus, efforts should aim at improving the farm structures as a precondition of enhancing land use efficiency and competitiveness of farmers. Another contention of the thesis is that functioning land markets have the potential to address the issue of abandonment. The geographic scope of the thesis was the region of EECA, where two rather comparable countries, Armenia and North Macedonia, were used to delve into the problem of farmland abandonment and land consolidation, respectively, as key land management instruments to mitigate abandonment and support land market development.

Although all the results have been discussed in the previous chapters, the most significant results of the thesis are summarized in Table 5.1 and highlighted below. The policy response to such a complex and inter-connected problem as land abandonment needs to be integrated, aiming to improve the functioning of agricultural land markets by increasing the land market turnover and the mobility of land while, at the same time, improving local farming conditions through rural development and farm structure measures. A toolbox

of potential solutions besides land consolidation includes lease facilitation or early farmer retirement schemes with the country-wide scope of implementation and solutions applied on a per-project basis, like land consolidation and land banking. Farmland abandonment is a local-specific phenomenon, and thus, addressing the problem requires local-level data to better understand spatial and temporal patterns of abandonment as well as key drivers, to further delve into the site-specific root causes of abandonment and applying solutions from the toolbox to mitigate abandonment, recultivate land already abandoned, or convert it for other alternative land uses.

Table 5.1: Main findings of the thesis

Specific objectives	Specific propositions	Article	Main results
O1 – Establish an understanding of key land market mechanisms and the ways land markets can support addressing land abandonment.	P1 - Land markets are able to ensure sustainable development of the agricultural sector and offer a basis for many land management instruments.	Development of agricultural land markets in countries in Eastern Europe and Central Asia.	Land markets, when functioning, can alleviate the issue of land abandonment by shifting land to more efficient users. *·Findings support P1.*
O2 - Assess the level of development of the agricultural land markets in the EECA countries and analyse constraints that are hampering the functioning and development of the agricultural land markets.	P2 - Land markets in EECA countries are at different stages of development, however, still weak and requiring support and guidance.		Agricultural land markets remain weak and still face many constraints in EECA, and most countries have farm structures characterized by excessive land fragmentation and small average farm sizes. *·Findings support P2.*
O3 - Investigate determinants of farmland abandonment at the farm, parcel, household, and farmer's individual levels.	P3 - Farmland abandonment is driven by a set of social, economic and environmental factors, with	The role of the land market in shaping farmland abandonment	The aging of farmers and a lack of successors to continue farming represent risk factors leading to farmland abandonment. Small-scale, fragmented

Specific objectives	Specific propositions	Article	Main results
	inefficient farm structures being among its root causes.	in post-Soviet Armenia.	farm structures and the absence of irrigation increase the likelihood of farmland abandonment, along with weak agricultural land markets and a lack of efficient land-use policies. ·*Findings support P3.*
O4 - Investigate the relationship between farmland abandonment and landowners' land market intentions.	P4 - There is a linkage between land market intentions (sell and lease out land) and farmland abandonment, and functional land markets may strongly leverage decisions about farmland abandonment.		Low perceived market price and lack of information about interested buyers (who would be willing to pay the desired price) are the most important factors for the potential sellers. ·*Findings support P4.*
O5 - Analyse land consolidation instrument from a participatory perspective.	P5 - Land consolidation is a well-established land management instrument that can improve farm efficiency and competitiveness and thus decrease the likelihood of land abandonment.	How to increase landowners' participation in land consolidation: evidence from North Macedonia.	There are a number of main land consolidation approaches using different enforcement mechanisms. The ultimate goal is to induce support for the intervention among the participants (or minimize the dissatisfaction otherwise). ·*Findings support P5.*

Specific objectives	Specific propositions	Article	Main results
O6 - Explore factors influencing landowners' interest and willingness to participate in land consolidation and ways to motivate and engage landowners.	P6 - An interplay of different factors and behavioural drivers influences and informs landowners' decisions during the land consolidation process.		The age of the landowner, plans to pass land to children, the sufficiency of information, and the number of parcels forming a holding have a statistically significant relationship with the readiness to participate in land consolidation. Low economic interest, adversarial and non-cooperative attitude, lack of trust in institutions, fear of manipulation and the belief that the process will be unjust, are the top subjective reasons landowners are not interested in participating in land consolidation. ·*Findings support P6.*

5.2. Land market mechanisms and the status of agricultural land markets in Europe and Central Asia

Chapters 1 and 2 set the scene for the entire research by providing an introduction to farmland abandonment and agricultural land markets.

O1 was to explore land market mechanisms and the ways land markets can support addressing land abandonment. The findings indicate that well-functioning agricultural land markets are generally among the basic preconditions for sustainable agricultural and rural development. The theoretical expectation behind land markets is that it can provide a low-cost means to carry out transactions that would bring the land to its most productive use. The land markets, of both ownership and use rights, are key for the enlargement of farms and represent a main mechanism to provide access to land for new entrants, young farmers and for the development of small farms into commercial family farms. The lease market can enlarge farms without major investments and actively contribute to the mitigation of land abandonment.

Land market development in a certain country will be inextricably linked with the prevailing systems of property rights and land administration in that country. In very general terms, a formal land market exists in countries with private ownership for agricultural land. However, long-term and secure use rights that are fully transferable and formally registered can become virtually undistinguishable from private ownership. Land reforms were high on the political agenda and a key part of the overall agrarian reforms, together with the restructuring of large-scale socialist farms in most countries in Central

and Eastern Europe and Central Asia at the beginning of the transition from centrally planned to market economy in the 1990s. The way in which the land reforms were conducted largely defines the status of development of agricultural land markets in many (but not all) of the countries today.

As discussed in Chapter 2, small family farms dominate the farm structures in most countries in the Western Balkans, Eastern Europe, the Caucasus, and Central Asia. The small farms are divided into several small and often badly shaped land parcels and often have problems with access to appropriate agricultural infrastructure such as roads, irrigation, and drainage. In addition to the structural problem of inefficient farm structures, which are hampering both the development of agricultural land markets and agriculture and rural development in general, rural areas in most of the assessed countries typically face a wide range of challenges, including demographic changes, outmigration and availability of workforce, poor rural infrastructure, among others.

Summarizing the findings of the research under O1, it can be concluded that the land market can alleviate the issue of land abandonment (transform land ownership and use patterns) by shifting land to more efficient users/uses or from landowners who are not interested in cultivating land, to active farmers interested in the acquisition of more land. Strengthening the regulation of land sales and rental markets can leverage the necessary structural development of farms on a voluntary basis.

The countries and territories where land markets were assessed under the O2 are Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kosovo, Kyrgyz Republic, Republic

of Moldova, Montenegro, North Macedonia, Serbia, Tajikistan, Turkey, Turkmenistan, Ukraine, and Uzbekistan. Out of these, in 13 countries, land markets exist but are still limited, characterized by a small number of transactions and numerous constraints, while in the remaining five (Central Asian countries except Kyrgyzstan and Belarus), land markets do not exist because of the way land reforms have been designed and implemented in these countries in the 1990s. As explained in Chapter 2, in North Macedonia and Armenia, the two case study countries, land markets are in the third ("land trading") and fourth ("land market") stage of development accordingly. In North Macedonia, during 2017-2020, the annual land market turnover was around 0.5% of the total agricultural land in private ownership. Armenia is assessed to be higher placed because of a more dynamic situation with a turnover of around 1% (2016). Both countries have a minimum set of land market regulations.

Even though land administration and land registration infrastructure are in place in most countries, several constraints prevent land parcels from accessing formal land markets, hence hampering development. These constraints include absentee landowners, unresolved inheritance, informal land transactions, co-ownership, and, in many countries – excessive problems with the quality and accuracy of registration data and cadaster maps. There is a general need to support the development of agricultural land markets, both rental and ownership, in all countries in EECA. Strengthening market regulations can leverage the necessary structural development of farms on a voluntary basis, however, it should be balanced and serve the land policy goals of the country and those of the agriculture and rural development policies in general. Without regulations, land

markets can easily become the means to such negative phenomena as overconcentration of land, land speculation, and even land grabbing. Another way to directly support land markets is through such instruments as land consolidation and land banking.

Summarizing the findings on the O2, despite the many efforts since the beginning of the transition in 1990 from both governments and donors throughout the countries in Eastern Europe and Central Asia, the agricultural land markets are, in general, still weak, with multiple and inter-related constraints hampering their development. Turnover of the land markets remains limited also due to non-technical reasons such as lack of alternatives to storing wealth other than land, nonmaterial values attached to land by people such as social, emotional, cultural, or even religious values.

5.3. Determinants of farmland abandonment and land markets

Land abandonment is a widespread problem in Europe and Central Asia, and countries are interested in addressing it since abandoned farmland has negative environmental impacts and, at the same time, the potential to boost local food production, satisfy other demands for land, and thus become a driver for agriculture and rural development.

The study finds that farmland abandonment has a multidimensional perspective, which poses challenges to define, measure, and compare the patterns and drivers of farmland abandonment across the regions and countries. Drivers of farmland abandonment are also numerous and overlapping and tend to vary across spatial extent and change over time.

In response to O3, the results show that a number of characteristics or factors at farm, parcel, household, and farmer's individual levels are increasing the risk of farmland abandonment. For example, the aging of farmers and a lack of successors to continue farming may lead to the cessation of agricultural activities and land abandonment. Small-scale, fragmented farm structures and the absence of irrigation also increase the likelihood of farmland abandonment. Legal, policy and institutional context may underpin farmland abandonment, along with weak agricultural land markets and a lack of efficient land-use policies. Land-use regulations and their enforcement appear challenging in many countries in EECA, and the government's land policies can be characterized as passive. In other words, the legislation may contain general norms regarding sustainable land management, however, without the system of monitoring, control and enforcement, these regulations will be challenging, and thus, they will remain declarative. This leads to the situation when landowners can abandon farmland for several years or even longer without any administrative consequences. These findings lead us to accept P3.

In response to O4, which was to investigate the relationship between farmland abandonment and land markets, the study results confirm that there is a relationship between land market and farmland abandonment, namely that the owners of abandoned land parcels are more likely willing to participate in the land market to either sell their farmland or lease it out. Thus, functioning land markets of ownership or lease may strongly leverage the decisions of landowners about farmland abandonment and mitigate its occurrence by making land parcels available to other farmers and stimulating the transfer of land from passive landowners to active farmers. On the contrary,

weak or inexistent land markets will be inefficient in mitigating the timely transfer of land to prevent its abandonment.

As mentioned above, because of the absence of direct legal mechanisms to combat farmland abandonment and no regulations that would discourage abandonment (e.g., in the form of land taxes or administrative (punitive) measures), it literally does not cost anything to landowners to keep land abandoned, and landowners have no stimuli either to start farming land, lease it out, or sell. Factors of concern for landowners potentially willing to sell or lease out their parcels are related to the market price and the availability of information about the potential buyers. Thus, the findings under the O4 confirm the P4 on the existence of interconnection between farmland abandonment and the land market and lead to looking more in detail into the land market-based solutions such as land consolidation that can address the structural root causes of farmland abandonment.

5.4. The potential of land consolidation to address farmland abandonment and behavioural aspects of land consolidation participation

The O5 was to analyse land consolidation instruments from a participatory perspective with a proposition that land consolidation is a well-established land management instrument that can improve farm efficiency and competitiveness and thus decrease the likelihood of land abandonment.

Small average farm sizes and excessive land fragmentation represent a long-term handicap of farm structures and are, in general, a limiting

factor for agricultural and rural development and a root cause of farmland abandonment. This structural problem in agriculture is not just causing low productivity and competitiveness of the farms but is also creating bottlenecks limiting the impact of other development programs and initiatives. Land fragmentation and small farm sizes are also among the root causes of outmigration from rural areas and, in several countries in the region, are the main reasons for arable agricultural land being abandoned. In particular, the young generation is leaving, resulting in an aging rural population in many countries.

To enhance the competitiveness and viability of farms, the farms need to become bigger and "better", i.e., less fragmented. In addition to normal land market functioning, this can be achieved by applying land management instruments with more direct impacts, such as land consolidation. Land consolidation is a well-proven land management instrument traditionally used for farm restructuring. European experiences also show that land consolidation instruments through the improvement of inefficient farm structures can have a great potential to address land abandonment. Furthermore, land consolidation can support rural infrastructure projects such as irrigation and drainage infrastructure (as well as roads), which can improve the productivity, competitiveness, and profitability of the farms. In this way, it contributes to bringing abandoned agricultural land back into production at the same time.

The final O6 was to explore factors influencing landowners' interest and willingness to participate in land consolidation, and ways to motivate and engage landowners.

Land consolidation is a particular case of public intervention aiming to induce a behaviour change and a collective action. Going through

various stages of a land consolidation project, a complex interplay of different factors and behavioural drivers influences and informs landowners' decisions. Stakeholders' involvement in land consolidation is a two-fold process. On the one hand, stakeholders' active participation can help to devise an all-acceptable land consolidation plan. On the other hand, it better guarantees that all relevant voices are heard and rights considered, thereby minimizing cases of eventual judicial appeal.

Some of the most important factors which, according to the analysed literature, influence the behaviour of participants in land consolidation: (i) the individual level characteristics, (ii) uncertainty and information, (iii) interest and behavioral (cognitive) biases, (iv) the social level behavioural factors, and (v) the incentives in land consolidation. Landowners' age, landowners' plans to pass land to children, the sufficiency of information and the number of parcels forming a holding have a statistically significant relationship with the readiness to participate in land consolidation. Low economic interest, adversarial and non-cooperative attitude, lack of trust in institutions, fear of manipulation, and the belief that the process will be unjust, on the contrary, are the top subjective reasons landowners are not interested in participating in land consolidation.

Several incentives and techniques are available to stimulate land consolidation participation. The main cornerstone incentive that reinforces landowners' direct economic interest, uniquely and temporarily offered for the duration of a project, is zero transaction costs. In addition, landowners without economic interest, those who refused interviews, and those with other rejection reasons can be motivated in the process by using various nudging techniques such as

for example, norms and messengers. The implementation strategy and awareness campaign should include nudging techniques and principles to subtly influence landowners' perceptions and behaviours alongside mandates and incentives.

ISBN: 978-80-213-3374-1