Journal of Agricultural Sciences
(Tarim Bilimleri Dergisi)

J Agr Sci-Tarim Bili
e-ISSN: 2148-9297
jas.ankara.edu.tr

JAS

Agricultural Land-based Functional Model for Effective Rural Land Management in Türkiye

Orhan Ercan[a*]

[a]*Faculty of Applied Sciences, Department of Real Estate Development and Management Ankara University, TÜRKİYE*

ARTICLE INFO
Research Article
Corresponding Author: Orhan Ercan, E-mail: orhanercan@ankara.edu.tr
Received: 14 August 2023 / Revised: 21 January 2024 / Accepted: 25 January 2024 / Online: 23 July 2024

Cite this article
Ercan O (2024). Agricultural Land-based Functional Model for Effective Rural Land Management in Türkiye. *Journal of Agricultural Sciences (Tarim Bilimleri Dergisi),* 30(3):526-545. DOI: 10.15832/ankutbd.1342935

ABSTRACT
Rapid urbanization and industrial expansion exert escalating pressure on rural areas, resulting in the inappropriate utilization of agricultural lands for non-farming purposes. This misuse is notably prevalent across industry, urban development, tourism, mining, and transportation infrastructure sectors. The challenges associated with this issue include land fragmentation, the underutilization of agricultural lands, a lack of effective agricultural land-use planning, identification and reclamation of abandoned agricultural lands, improvement of land acquisition and banking practices, land consolidation, land valuation, digitalization in agriculture, and the imperative for effective governance. In this study, agricultural land management in Türkiye was evaluated from legal, technical, and managerial aspects, and the article proposes a functional model based on agricultural land that integrates rural land management into a broad framework of land policy and agricultural land-use planning. This model encompasses components related to land ownership, value, use, development, and spatial data infrastructure. Successful implementation necessitates the restructuring of existing institutions or the establishment of new ones. This study aims to address the above-mentioned issues and, with the proposed model, achieve a sustainable agricultural infrastructure by resolving the land-based problems of rural areas, and positioning them as a crucial component of rural land management.

Keywords: Agricultural land management, Agricultural land use planning, Land fragmentation, Land banking, Land use, Land development, Land value

1. Introduction

In rural areas, the management of rural lands presents a multifaceted challenge, combining various sectors, interests, and demands. This complex field of activity necessitates collaboration among practitioners, spanning policy, governance, the economy, and civil society, along with contributions from scientists (Masum 2017; Weith et al. 2019).

Rural areas are typically characterized by low population density and economies that are primarily based on agriculture and forestry. These areas, situated beyond urban centres, often face limitations in accessing essential services like education, healthcare, and infrastructure. Despite their geographical distance, they maintain direct connections with urban areas in economic, social, environmental, and production aspects, thus taking on administrative significance. Rural areas encompass small and medium-sized towns in rural regions, village settlements, agricultural lands, forests, pastures, plateaus, meadows, and natural resources. For instance, Magel (2022) notes that Germany remains a predominantly rural country, with over 2 000 of its 2 300 cities and municipalities in the Bavarian region characterized as rural. In contrast, in Türkiye, out of its 81 provinces, 973 districts, and 32 125 neighbourhoods, approximately 93.4% of the population resides in urban areas, while the remaining 6.6% inhabits the 18 211 villages (TURKSTAT 2023). This demographic distribution highlights Türkiye's departure from rural attributes, positioning it as a country significantly distinct from such characteristics.

Due to the significance of agricultural land in rural land management, the European Union's Rural Development Policy for the 2007-2013 period identified three main axes that necessitate preventive measures: competitiveness, rural development, and the management of agricultural and forested areas. It emphasized the sustainable use of 'agricultural and forested lands,' as one of the sub-components under the main axis of land management (EC 2008).

The development of rural areas, amid the trends of globalization and localization, relies on supporting essential economic activities like agriculture and forestry, alongside fostering continuous ecological interaction with urban areas (SCR 2018). In Türkiye, the economic sectoral management policy for rural areas primarily focuses on the agriculture sector to promote

development, aiming to develop the regions where the rural population lives and works (Kayıkçı 2009). Among the vital components in rural area management are agricultural infrastructure, agriculture, and agricultural governance.

Land management practices, focusing on spatially-oriented horizontal domains, have been integral to Türkiye's rural development policies over the past five decades, with significant projects like Village-Town in 1973 and Agriculture-Town in 1997 (Çolakoğlu 2007). Despite these efforts, the anticipated benefits have proven elusive. Addressing irregular and unauthorized urban development within Turkish urban areas required a systematic approach. This involved meticulous cadastral surveys to unravel land ownership intricacies, culminating in the formalization of land titles within the national land registry. Subsequently, spatial planning was orchestrated and complemented by the design and implementation of appropriate real estate financing models. This comprehensive strategy streamlined land ownership for citizens, catalysing the eradication of informal settlements and fostering the creation of well-structured urban centres.

Similarly, within the realm of land management, establishing an efficient rural land management system in Türkiye necessitates measures such as institutional restructuring, legislative regulations, capacity augmentation, prudent technology utilization, and management strategies focused on constructive resolutions (GDAR 2014).

The primary considerations in agricultural land management encompass various factors, including urban expansion pressures leading to the encroachment upon agricultural lands, land fragmentation due to factors like inheritance, and the revitalization of abandoned lands for agricultural production. Additional priorities involve the regulation of non-agricultural land use permissions, land consolidation processes, effective irrigation strategies, on-farm development services, agricultural information systems, soil databases, digital technologies, the establishment of a well-functioning rural land market, comprehensive agricultural land use planning, the restructuring of relevant institutions, and the imperative need for good governance. In 2013, the Workshop on the Future of Land Consolidation in National Public Investments organized by the General Directorate of Agricultural Reform (GDAR) proposed the establishment of a dynamic and effective land acquisition and land banking institution (GDAR 2014).

In the 11th Development Plan (2019) and the Working Group report spanning 2019-2023 (SCR 2018), specific emphasis was placed on the adverse effects of land fragmentation due to inheritance, hindering the efficient utilization of agricultural lands. The plan included policies to address this issue (SCR 2014; 2018; Küsek et al. 2019; MOF 2019; Türker 2019; 2023; Ercan 2020; Kurugöllü et al. 2021; Akkul 2022; Arslan et al. 2022; Demirbaş 2023; Şanlı et al. 2023). The identification and revitalization of abandoned lands for agricultural production, coupled with effective land acquisition for agricultural enterprises and related land banking practices, were underscored as priorities for developing agricultural land markets. These priorities were also highlighted in the 2019 Presidential Annual Program (SCR 2014; SCR 2018; PAP 2019; MOF 2019; AFC 2019; Türker 2019; 2023).

In the country, integrating land consolidation efforts with irrigation investments is advisable, coupled with a simultaneous call for regulations to streamline the registration processes for consolidation projects (SCR 2018; Akkul 2022). Experts suggest expediting consolidation projects, aiming for completion within a ten-year timeframe (Demirbaş 2023; Türker 2023). A proposition has been put forth advocating the concurrent implementation of land consolidation, land acquisition, and land banking to achieve more efficient and multifunctional land usage (Hartvigsen 2022; Türker 2023).

Within the agricultural sector, advancing agricultural information systems through digitalization, leveraging technologies like artificial intelligence and data-driven business models, is imperative. Ensuring the accessibility of these systems to all stakeholders is vital. A key requirement is enhancing the Land Parcel Identification System (LPIS), aligning with the Integrated Administration and Control System (IACS) and the priorities of the European Union acquis. Recommendations regarding digitization in agriculture and the Integrated Administration and Control System have been focal points in the 10th and 11th development plans (SCR 2014; SCR 2018).

Crucial to the functioning of a well-managed agricultural system is the development of agricultural land use plans grounded in soil information systems (Ercan et al. 2013; 2016; SCR 2018; Ercan 2019; MOF 2019; Türker 2023). Additionally, the distinct treatment of rural settlements in spatial planning and construction compared to urban settlements, alongside the creation of specialized solutions to address challenges in rural areas, stands out as a top priority (Zengin 2015; Çopuroğlu 2017; Ercan 2019; GIS 2023).

Çopuroğlu (2017) and Zengin (2015) emphasize that Law No. 6360, enacted in 2014, resulted in the transfer of services aimed at rural areas in provinces designated as metropolitan municipalities to these municipalities. This shift has introduced significant challenges in the management of rural areas. They underscore that the law has posed legal, demographic, governance, budgetary, institutional, and spatial planning challenges. One notable consequence is the change in administrative boundaries, with metropolitan municipal boundaries being redefined. As a result, the proportion of the town and village population within the total population has disproportionately decreased since 2013 (AFC 2019).

Addressing these changes necessitates a comprehensive and integrated perspective, led by the Ministry of Agriculture and Forestry, concerning rural life. Furthermore, there is a need to reclassify villages that have been transformed into neighbourhoods

in rural areas back to their 'village' status. It's also essential to revise the definition of rural areas. Simultaneously, metropolitan municipalities must provide services such as infrastructure, roads, and drinking water in rural areas while delegating services related to the agricultural sector to the Ministry of Agriculture and Forestry. These discussions took place during the Agricultural and Forestry Summit, and proposed solutions have been integrated into the objectives of the Development Plan (SCR 2018; AFC 2019).

The complexity introduced by the law underscores the urgency of promptly addressing the legal, juridical, and technical aspects related to agricultural land. The effectiveness of land management relies not only on the laws enacted in this field but also on the institutions established. Achieving harmony across various components can only occur through effective coordination and a well-structured organizational framework, ensuring such coordination (SCR 2018; 2019)

2. Conceptual Overview

Global factors, disruptive technologies, and the digital products they offer create significant societal demand in land management within societies. The growing role of the United Nations and the World Bank in implementing digital transformation has sparked discussions about current land use policies, land use systems, sustainable rural land management, and future options.

UNECE (1996) emphasized that the land management system should include multi-purpose cadastre and land information systems based on spatial databases. UNECE (2005) highlighted the importance of registering land property rights and good governance in land management. The land hierarchy, as modelled by Williamson et al. (2010), starts from land policy at the top and goes through the land management paradigm, land administration, spatial data infrastructure, cadastre, and finally the cadastral parcel, forming a six-stage inverted pyramid. UNECE (2005) and Williamson et al. (2010) presented land management as the process of managing the use and development of land resources and emphasizing its significance. FAO (2012) defined land administration as the implementation and operationalization of rules related to land use rights. Land administration involves various systems and processes for managing rights on land, land use regulation, land valuation, and taxation.

Land management represents the process of using the physical resources of land effectively, supporting and implementing sound land policies, and facilitating social, economic, and environmental sustainability (Enemark 2005; 2006; 2010). In the context of the importance of land management in the implementation of the Sustainable Development Goals (SDGs), the Framework for Effective Land Administration UNGGIM (2020) document prepared by the Land Administration Experts Group established by the UN defines effective land management as "how," "what," "who," "when," and "where" in relation to land policy, land ownership, land use, land value, land development, and integrated geospatial information components. It supports the SDGs and is defined as the process of determining, recording, and disbursing the relationship between people and land.

Land management considers interactions among diverse land use categories and sectors, explicitly considering the demands of rural and urban areas, as well as the economic, social, and ecosystem functions of the land (Repp et al. 2015). The focus of land management is the procedural aspect of supervising land use and development to ensure effective coordination of spatial, sectoral, and temporal elements in multi-level governance processes. It entails adapting a range of tools and utilizing technological, political, and legal measures and activities. Management involves adjusting the set of tools and employing technological, political, and legal measures and activities (Haber et al. 2010). Rural land management involves the systematic planning, utilization, and conservation of land in rural areas, which encompasses a range of factors including agriculture, water resources, forests, pastures, natural resources, conservation, and development. The aim is to ensure the sustainable use and development of rural land, by considering factors such as environmental, economic, and social factors.

Land governance refers to the policies, processes, and institutions involved in the management of land, property, and natural resources. It encompasses decisions related to access to land, land rights, land value, land use, and land development (FIG 1995). The governance system comprises several distinct components, namely the institutional environment, market governance, private governance, and public governance (Bachev 2020). Land issues are at the core of agrarian governance (Wu et al. 2022). Agricultural governance refers to the system and processes through which agricultural resources and activities are managed and regulated. It encompasses the policies, laws, institutions, and practices that govern land, water, forests, and other natural resources used for agricultural purposes. The objective of agricultural governance is to achieve sustainable and fair management of agricultural resources while fostering agricultural productivity, rural development, and addressing social, economic, and environmental issues in rural areas. It entails decision-making processes that involve diverse stakeholders, such as farmers, landowners, government agencies, and civil society organizations.

Epidemic diseases, conflicts, climate change, demographic and economic challenges arising from rural migration, soil degradation, conflicts arising from the urban-rural balance, and global trends are factors that influence current land management, land use systems, and land use policies. With this awareness, the conservation and efficient use of land, water, agriculture, forests, and natural resources have become part of the Sustainable Development Goals (SDGs). SDG 1 (No poverty), SDG 2 (No Hunger), SDG 3 (Good Health and Well-Being), SDG 6 (Clean Water and Sanitation), SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable cities and communities), SDG 13 (Climate Action), and SDG 15 (Life on Earth) directly involve objectives related to changes in land use and rural land management. The implementation of these objectives takes place

at the regional and local levels, necessitating changes in governance processes (Weith et al. 2019). In this regard, the FAO Strategic Framework for 2022-2031 (2023) aims to support the 2030 Agenda by transforming agri-food systems into more efficient, inclusive, resilient, and sustainable systems. The objective is to achieve better production, nutrition, a healthier environment, and an enhanced quality of life for all, with a commitment not to leave anyone behind.

Land use undergoes continuous change depending on the social, economic, and environmental impacts size and spatial distribution of the population. Urbanization is one of the fundamental reasons for the balance or conflict between economy and ecology in today's world (Ercan 2019). Urbanization will continue to exert pressure on land, causing a transformation from rural to urban areas (GLTN 2021). As cities continue to grow, rural areas are being converted into urban spaces, directly affecting the urban-rural balance in a negative way.

There are various definitions related to land use planning which are very close and related to each other. Metternich (2017) defines land use planning as the most appropriate tool that can help develop policies that harmonize human activities and environmental sustainability. Mattsson et al. (2021) define it as the process of determining future land use, while Williamson et al. (2010) describe it as the integration of land policies and land information into land use management to achieve sustainable development. According to Metternich (2017), Erdoğan et al. (2020), and the FAO guide (1993), land use planning encompasses the systematic evaluation of land and water potential, land use alternatives, and economic and social conditions to select and adopt the best land use options. Without the establishment of effective governance systems, agricultural land management, and consequently, agricultural reforms and their impact on food security and poverty reduction will remain ineffective. In recent years, various land use policies and approaches have been developed based on countries and institutional priorities, such as spatial land use planning, integrated land use planning, participatory land use planning, village land use planning, rural territorial land use planning, regional land use planning, and ecological land use planning. However, it is observed that there is insufficient emphasis on the need for a detailed agro-based macro-level spatial land use planning approach in these approaches and policies.

3. Rural Land Management in Türkiye

The efficiency of land administration in a country serves as a significant indicator of both the effectiveness of land management and the underlying land policy. Successful land management hinges not only on well-established laws but also on the institutions specifically created to implement these policies.

3.1. Land policy

In Türkiye, the legal foundation for land policy is rooted in the Constitution of the Republic of Türkiye and the Turkish Civil Code. According to Article 35 of the Constitution, every individual holds the right to property and inheritance, albeit with the stipulation that the exercise of this right should not contravene the public interest. Furthermore, Article 44 of the Constitution places the duty on the state to take measures for the protection and enhancement of fertile land cultivation, erosion prevention, and the provision of land to farmers engaged in agriculture but lacking adequate land. In situations where the public interest takes precedence, expropriation can be initiated in accordance with Article 46, and state ownership can be established, as outlined in Article 47. These constitutional provisions grant the legislator the authority to restrict property rights when it is deemed to be in the service of social welfare and the public interest. The safeguarding and development of forests are guaranteed by Article 169 of the Constitution. Notably, state forests cannot change ownership; they remain under state management and operation, subject to relevant legislation. Ownership of state forests cannot be acquired through adverse possession, and no easement right can be granted except for circumstances related to the public interest. Settlement within forest areas, pastures, and special conservation areas is prohibited.

The legal framework for rural land management practices in Türkiye is primarily constituted by various laws, including Law No. 5403 on Soil Conservation and Land Use, Law No. 2644 on Land Registry, Law No. 3402 on Cadastre, Law No. 6831 on Forestry, Law No. 4342 on Pastures, Law No. 3213 on Mining, Law No. 442 on Villages, Law No. 6360 on Metropolitan Municipalities, Law No. 3194 on Zoning, Law No. 2863 on the Protection of Cultural and Natural Resources, Law No. 3202 on Services for Villages, along with related Ministry Regulations, bylaws, regulations, and guidelines.

Notably, there is no single organization in Türkiye exclusively responsible for rural land management. Instead, various governmental entities have specific responsibilities. For instance, the General Directorate of Land Registry and Cadastre (GDLRC) is tasked with managing real estate and handling rights, responsibilities, and restrictions related to properties recorded in the land registry through cadastre. The General Directorate of Forestry (GDF) is responsible for overseeing forests, while GDAR manages agricultural lands, pastures, highland and lowland grazing areas, soil conservation, and rural land use. The General Directorate of National Estate manages properties owned by the state treasury, and various other public institutions are responsible for natural resource management based on their respective areas of relevance. It is essential to note that GDLRC is authorized and responsible for registering all types of properties, whether private or public, in the land registry.

3.2. Land administration

Land registry and cadastre services in Türkiye are carried out under the Ministry of Environment, Urbanization, and Climate Change within the structure of GDLRC. GDLRC has a two-tier organizational structure, consisting of central and provincial offices, and conducts its activities through 24 Regional Directorates, 973 Land Registry Offices, and 81 Cadastre Offices (in addition to licensed cadastre bureaus).

GDLRC is responsible for conducting the country's cadastre works, tracking changes, renewing and updating the cadastre. It is also responsible for maintaining the land registries under the state's responsibility in an organized manner, handling all kinds of registered and unregistered land transactions, as well as registration procedures related to real estate. Besides these, GDLRC is also responsible for tracking changes in the registries, conducting inspections, and archiving and preserving the records and documents. Additionally, GDLRC is authorized and responsible for producing or commissioning large-scale cadastral and topographic cadastral maps, controlling the map production process, and establishing the fundamental principles. Moreover, it creates the infrastructure for the spatial information system, allowing real and legal persons, as well as public institutions, to benefit from its data. Cadastre and land registry services are the responsibility of the state, and the state is objectively liable for any losses that may arise from the maintenance of land registers.

The initial cadastre of Türkiye has been completed (Ercan 2021). According to data from GDLRC in July 2023 (GDLRC 2023), the total number of cadastral parcels is 58.8 million. As of 2022, approximately fifteen million cadastral parcels in rural areas have been renewed, improving the spatial data infrastructure in rural regions (Ercan 2023). The automation of land registry activities was completed in 2004 and subsequently expanded in the following years. Cadastral data is provided to both local and foreign individuals and legal entities through mobile applications with a parcel inquiry system, free of charge.

3.3. Rural land use categories, rural population, and seasonal variations

Creating an effective and functioning land management system for the development and progress of urban and rural areas has become not just a necessity but an essential requirement. Especially during the Covid-19 pandemic, conflicts, and climate change, it has become evident that the management of semi-rural areas, situated between urban and rural regions, is just as crucial as urban area management. Rural land, in its simplest form, encompasses village settlements, agricultural lands, forested areas, and public properties like pastures, meadows, and highland areas.

According to TURKSTAT, a new approach at the neighbourhood-village level has been introduced, aligning with the Degree of Urbanization (DEGURBA) system developed by the European Statistical Office. Under this approach, densely populated urban settlements, which account for 1.6% of Türkiye's land area, house 67.9% of the population. In areas classified as rural, comprising 93.5% of the country's land area, 17.3% of the population resides. Additionally, in settlements categorized as moderately dense cities, making up 4.9% of the country's land area, 14.8% of the population resides (TURKSTAT 2022). These demographic distributions have significant implications for governance, social dynamics, and the development of rural settlements, emphasizing the need for policy and legislative frameworks that can effectively address the unique challenges and opportunities within these diverse areas.

Based on the recalculated data from the General Directorate of Geographic Information Systems website (2023), the per capita total agricultural land, which was 0.76 hectares in 1990, witnessed a decline to 0.46 hectares by 2018. Considering the total agricultural land in 2022 (23.864 million hectares), the per capita agricultural area has further diminished to 0.28 hectares.

Among the 58.8 million existing cadastral parcels, 32.5 million are classified as agricultural parcels in Türkiye. Türkiye accommodates 3.1 million agricultural enterprises, and due to various factors, the amount of abandoned agricultural land totals 2 million hectares, with an approximate shareholder count of 40 million (MT 2019). Furthermore, 7.66-million-hectare non-agricultural land rural areas are occupied by structures, including buildings and graveyards (TURKSTAT 2016). Along with these, 7.66 million hectares of non-agricultural land (rocky land, swamp, arid land, etc.), and 2.01 million hectares of land occupied by buildings in rural settlements (graveyards, etc.), are included in the land use category.

Approximately one-third of Türkiye's total land area, amounting to 23.864 million hectares, is identified as cultivable agricultural land, as outlined in Table 1. This comprises a significant proportion of the country's 78-million-hectare total land area.

In Türkiye, an expanse of 23.864 million hectares of land is designated as cultivable and falls under the status of permanent crops. The aggregate arable land encompasses 20.194 million hectares, with 16.510 million hectares dedicated to active cultivation. Additionally, 81.088 hectares are placed under protective cover according to their respective types. Notably, the total expanse left fallow amounts to 2.960 million hectares. The nation boasts 23.11 million hectares of forested land, with an additional 14.617 million hectares designated as permanent meadows and pastures (Table 1).

Table 1- Land use categories and amounts in Türkiye (ha)

Total utilized agricultural land	38 482 000
Total arable land and land under permanent crops	23 864 000
Total arable land	20 194 000
Sown area	16 510 000
Fallow area	2 960 000
Areas of vegetables and gardens	718 000
Area of ornamental plants	6 000
Total land under permanent crops	3 671 000
Areas of fruits, beverages and spices crops	2 385 000
Area of vineyards	385 000
Area of olive trees	901 000
Land under permanent meadows and pastures	14 617 000
Forest area	23 110 000
Areas for land under protective cover by type	810 881 000
Ornamental plants production for land under protective cover	1 599 706 562 (plants)

Source: TURKSTAT, 2022

Regarding the number of parcels, a significant 98.2% of holdings consist of land areas ranging from 5 to 499 hectares, with 77.5% falling within the 20-to-499-hectare range. On average, each agricultural holding contains 5.9 parcels of land, and the average parcel size for agricultural land is 12.9 decare (Table 2). This fragmentation results in each farmer cultivating, on average, 11 separate land parcels. Moreover, a single piece of land is jointly owned by an average of 13 individuals, leading to a fragmented ownership structure and a complex land use system. Consequently, agricultural holdings tend to be small, scattered, and divided into numerous parcels, often not generating sufficient income.

Table 2- Number of parcels of agricultural land per holding and average parcel size of agricultural land

Holding size (decare)	*Number of parcels of agricultural land per holding*	*Average parcel size of agricultural land (decare)*
Total	5.9	12.9
-5	1.5	1.6
5 – 9	2.4	2.7
10 – 19	3.4	3.8
20 – 49	4.7	6.4
50 – 99	6.9	9.4
100 – 199	10.1	12.9
200 – 499	13.7	20.6
500 – 999	21.1	30.3
1000+	36.9	60.3

Source: TURKSTAT 2016

Out of the total 6 189 351 households in the country, 4 106 983 (66.34%) are engaged in agricultural activities, while 2 082 368 (33.66%) do not participate in agricultural activities. These figures indicate that one out of every three households, despite residing in rural areas, is not involved in agriculture. Therefore, there is a need to reassess the agricultural infrastructure, particularly in terms of agricultural land, alongside other factors (Table 3).

Table 3- Rural settlement number, population structure, and seasonal population changes

Total number of households	6 189 351
Total number of households engaged in agricultural activity	4 106 983
Total number of households not engaged in agricultural activity	2 082 368

Source: TURKSTAT 2016

Among the 37 036 rural settlements in Türkiye, 61% of the residents choose to relocate from their villages, rural neighbourhoods, or towns to district centres or cities during the winter months, as reported by DAGD 2020. Among the rural population, 22.0% derive their livelihood from agricultural production activities, 22.0% from livestock activities, 20.4% from retirement pensions and social assistance, 7.9% from leasing activities, 6.5% from agricultural labour, 2.3% from forestry, and others engage in construction labour, guarding, mining labour, mushroom cultivation, transportation, and the service sector

(DAGD 2020). Only 42.4% of rural residents rely on agriculture and livestock for their livelihoods, highlighting the significance of more than half leaving their villages during the winter to live in provincial and district centres. This underscores the inadequacy of agricultural production and the agricultural economy in rural areas (Table 4).

Table 4- Rural settlement number, population structure, and seasonal population changes

Type of settlement	*Period*	*Average*	*Median*	*Total*	*Rural settlement count*	*Population Change According to Winter Period (%)*
Village	Winter	275	145	4 994 167	18 186	66
	Summer	457	250	8 315 167		
Rural neighbourhood	Winter	698	300	12 880 413	18 464	58
	Summer	1 102	400	20 345 925		
Township	Winter	3 052	2.5	1 178 015	386	68
	Summer	5 138	3.5	1 983 378		
Overall	Winter	514	207	19 052 429	37 036	61

Source: DAGD 2020

These statistical data underscore the imperative to address the institutional structure and functional model of Türkiye's agricultural administration within the framework of rural land management. This finding highlights a crucial concern for agricultural administration, emphasizing the concrete identification, modelling, resolution, and effective management of issues related to agricultural lands. The generation of these findings and solutions forms the foundational rationale for the preparation of this article.

3.4. Institutions and activities for rural land

Rural land management inherently involves various disciplines, spanning agriculture, water, biodiversity, climate change, demographics, and the economy. Similar to other countries, Türkiye lacks a single organization exclusively responsible for rural land management. We have constructed a 25x14 matrix, presented in Table 5, illustrating activities related to rural land management and their corresponding responsible institutions. This matrix highlights which technical components, among the 14 defined, are carried out by each organization, denoted by an 'x' in the respective field.

An analysis of Table 5 reveals that in the field of rural land management, 25 different institutions and organizations play various roles and possess distinct authorities. Given that rural land management is a holistic concept, these institutions should be integral components of the whole. Being part of the whole can only be possible through effective coordination within an institutional framework that facilitates such coordination. However, in Türkiye, there is no authorized and responsible administration for rural land activities. Consequently, a single activity may be carried out by multiple institutions, resulting in the duplication of work and the wastage of resources and labour.

The exclusive authority responsible for registration in the land registry is GDLRC. Although forest demarcation and cadastre, as well as pasture cadastre activities, are undertaken by their respective institutions as illustrated in Table-5 (GDF 2021; 2023), the cadastre, property-related controls, and registration fall under GDLRC's purview. Map production and spatial data management are conducted by all institutions according to their needs.

GDAR, as the authorized institution, is responsible for defining rural areas, developing agricultural infrastructure, enhancing productivity, and managing them. In its current form, GDAR continues to function as an organization responsible for executing a substantial portion of the Ministry's duties. Therefore, the restructuring of the institution to address land-related issues in the agricultural sector has become not only a necessity but an obligation.

Table 5- Matrix of institutions and activities for rural land

	INSTITUTIONS	*Mapping*	*Expropriation*	*Environment and Soil*	*Land valuation*	*Spatial Planning*	*Infrastructure*	*State Land Management*	*Land and Housing Production*	*Cadastre*	*Forest*	*Land Consolidation*	*Spatial Data Management*	*Land Registry*	*Coastal Management*
1	General Directorate of Land Registry and Cadastre	X			X			X		X	X		X	X	
2	General Directorate of Agriculture Reform	X	X	X	X	X	X	X	X			X	X		
3	General Directorate of Forestry	X	X	X	X			X		X	X		X		
4	General Directorate of Spatial Planning.	X	X		X	X			X						X
5	Municipalities	X	X	X	X	X	X	X	X			X	X		
6	General directorate for state hydraulic works	X	X	X	X		X	X				X	X		
7	Mass Housing Administration	X	X		X	X	X		X				X		
8	Disaster and emergency management presidency	X	X			X	X		X				X		
9	Petroleum pipeline corporation	X	X	X	X	X	X						X		
10	General directorate for highways	X	X	X	X		X						X		
11	Provincial Banks	X	X	X		X	X						X		
12	General Directorate of Turkish Coal Enterprises	X	X	X	X								X		
13	General Directorate for Foundations	X	X		X			X					X		
14	General Directorate of Mining Affairs	X	X	X				X					X		
15	General Directorate of Cultural Heritage and Museums	X	X	X		X		X					X		
16	South-eastern Anatolia Regional Development Administration	X				X	X						X		
17	Directorate General of Investments and Enterprises.		X	X		X							X		
18	General Directorate of Mineral Research and Exploration	X	X	X									X		
19	General Directorate of Turkish Electricity Distribution Corporation		X		X								X		
20	Directorate of Privatization Administration	X			X	X							X		
21	General Directorate of National Property		X		X			X					X		
22	General Directorate for Environmental Management			X									X		
23	General Directorate for Water Management			X									X		
24	General Directorate of GIS	X											X		
25	National Mapping Agency	X											X		

Source: Developed with inspiration from SCR 2014, GDAR 2014 and AFC 2019

4. Legal regulations and technical studies

4.1. Key legal regulations

In 2005, the General Directorate of Agricultural Reform formulated and enacted Law No. 5403, commonly known as the Law on Soil Conservation and Land Use. This legislation aimed to achieve several objectives, including the scientific classification of land and soil resources, the establishment of minimum sizes for agricultural land, and the promotion of income-generating agricultural practices. The law also sought to prevent land fragmentation, establish land use plans, and consider social, economic, and environmental dimensions in conservation and development, utilizing participatory methods. Furthermore, it aimed to deter unauthorized and improper land uses while developing methods for ensuring land protection.

In 2014, the Regulation on the Transfer of Agricultural Lands was introduced to address inheritance-based transfers of agricultural lands. This regulation incorporated provisions related to valuation, land use changes, minimum agricultural land size, sufficient income-generating land size, economic integrity, and procedures and principles for determining the qualifications of competent heirs. In response to evolving needs, the regulation underwent revisions in 2021.

The Medium-Term Plan for 2018-2020, endorsed by the Council of Ministers' Decision in September 2017, featured a provision aimed at bringing abandoned agricultural lands into production. This was to be achieved through models like land banking. Additionally, the "2018 Program" placed emphasis on developing models for utilizing abandoned agricultural lands and ensuring the efficient operation of agricultural enterprises. The "Agriculture and Food" section of the 2019 Presidential Annual Program (PAP 2019) highlighted efforts to utilize abandoned agricultural lands and develop land acquisition practices for the effective operation of agricultural enterprises, with a specific focus on land banking. These provisions elevated the identification and utilization of abandoned agricultural lands, land acquisition, and land banking as strategic objectives.

4.2. Land related activities and implementation project

Land consolidation projects in Türkiye were initiated in 1961. Since 2002, there has been a growing demand for land consolidation, making it a priority area for the government, particularly between 2009 and 2014. As of the end of 2022, the total area suitable for consolidation in the country is 14.3 million hectares. Out of the 8.78 million hectares of land tendered for consolidation projects, 6.78 million hectares have been completed and registered, while work is ongoing on the remaining 2 million hectares (SHW 2022; Demirtaş 2023). In addition to soil graduation and block design, land consolidation projects also offer services such as reducing land fragmentation, improving local road infrastructure, addressing irrigation and drainage issues, and providing on-field land development services like levelling and stone collection.

The 'Agricultural Monitoring and Information System' (TARBIL) was developed as part of the Integrated Administration and Control System (IACS). TARBIL is an integrated system that records all aspects of the country's agriculture, stores data, generates reports, and monitors results. One of the primary goals of the TARBIL project was to establish an information system for continuous and real-time data collection, rather than relying on periodic estimations. TARBIL is based on two main pillars: the production and utilization of accurate real-time data and the Agriculture Information System, which includes mobile applications.

The LPIS project, a requirement for candidate countries in the process of transition with the European Union, was implemented in 2014. As part of the project, orthophoto maps of the entire country were created and integrated with digitized agricultural parcels. In this context, a digital geospatial database for reference parcels was established, serving as a unique, homogeneous, reliable, and accurate LPIS database to support application administration.

In the permitting process for lands intended for agricultural and non-agricultural purposes, the Agricultural Lands Assessment and Information System (TAD Portal) was established to centralize the management of land and soil studies, assessments, inquiries, and archiving processes. With the TAD Portal, agricultural parcel inquiries can be conducted through the e-Government platform.

In recent years, a project has been developed to enhance and implement the existing soil database primarily using satellite imagery. Additionally, the institution has achieved a significant accomplishment by protecting large plains with high agricultural potential and facing erosion and degradation risks through a Council of Ministers decision. However, despite pilot project implementations for rural land valuation, the results have not been communicated to relevant professionals.

GDAR, with its authority in rural management and land use planning, has endeavoured to establish a nationwide model called the “Agro-Based Macro Level Land Use Planning” approach. Unfortunately, due to certain institutional reasons, the project could not be implemented.

4.3. Legal changes made by other institutions affecting rural land management

4.3.1. Transfer of land consolidation works to state hydraulic works

In 2018, a regulation was enacted that transferred the responsibility for implementing land consolidation and on-field development services from GDAR to State Hydraolic Works (DSİ). Other institutions and organizations now have the authority to act as project administrators for these services, subject to approval from DSİ.

4.3.2. Enactment of the metropolitan municipality law

In accordance with Law No. 6360, enacted in 2012 and amended in 2013, the number of Metropolitan Municipalities was increased to 30. This law expanded the boundaries of Metropolitan Municipalities to align with provincial administrative boundaries and equalized the boundaries of metropolitan district municipalities with district administrative boundaries (see Figure 1).

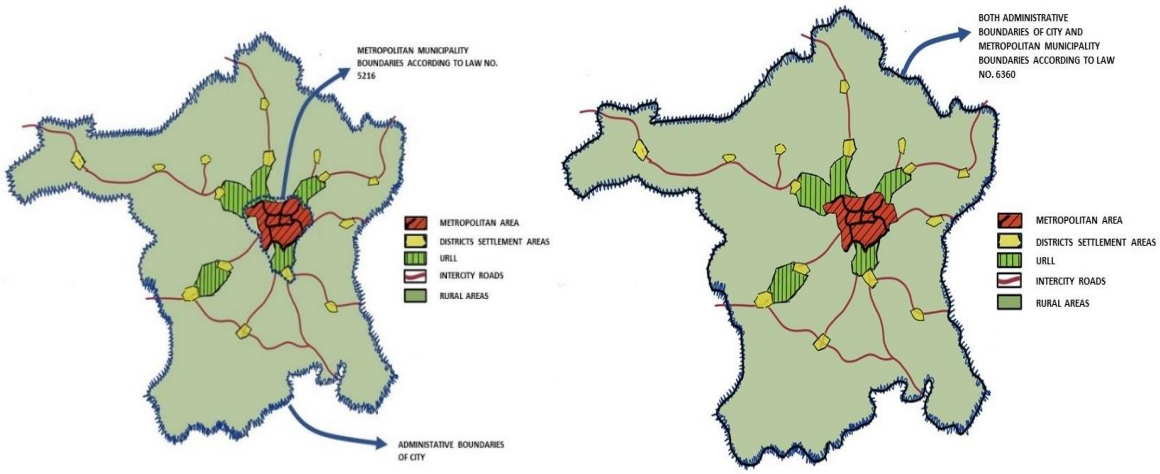

Figure 1- Before (left) and after (right) the Law No. 6360

The legal identity of villages situated within the boundaries of metropolitan municipalities was annulled by the law and transformed into neighbourhoods. This transformation resulted in the reclassification of a total of 18 211 areas, previously designated as villages, into neighbourhood status (Tekeli 2018). In 2012, approximately 22.7% of the Turkish population resided in villages. However, following the implementation of the aforementioned legal changes, this proportion significantly decreased to 8.2% in 2014 (see Table 6). Subsequently, in 2021, the percentage of individuals residing in provincial and district centres, initially at 93.2%, saw a slight rise to 93.4% in 2022. At the same time, the percentage of the population living in towns and villages experienced a reduction from 6.8% to 6.6% during this period (TURKSTAT 2023).

Table 6- Distribution of Rural and Urban Population between 1927-2022

Year	*Total*	*Rural Population*	*Urban Population*	*Rural (%)*	*Urban (%)*
1927	13 648 270	10 342 391	3 305 879	75.8	24.2
1950	20 947 188	15 702 851	5 244 337	75.0	25.0
1970	35 605 176	21 914 075	13 691 101	61.5	38.5
1980	44 736 957	25 091 950	19 645 007	56.1	43.7
1990	56 473 035	23 146 684	33 326 351	41.0	59.0
2000	67 803 927	23 797 653	44 006 274	35.1	64.9
2010	73 722 988	17 500 632	56 222 356	23.7	76.2
2012	75 627 384	17 178 953	58 448 431	22.7	77.2
2014	77 695 904	6 409 722	71 286 182	8.2	91.8
2015	78 741 053	6 220 543	72 520 510	7.9	92.1
2016	79 814 871	6 145 745	73 669 126	7.7	92.3
2017	80 810 525	6 060 789	74 749 736	7.5	92.5
2018	82 003 882	6 314 298	75 689 583	7.7	92.3
2019	83 154 997	5 987 159	77 167 837	7.2	92.8
2020	83 614 362	5 853 005	77 761 357	7.0	93.0
2021	84 680 273	5 758 258	78 922 014	6.8	93.2
2022	85 279 553	5 628 450	79 651 102	6.6	93.4

Source: Simplified from TURKSTAT data.

The reclassification of rural settlements, particularly villages within provincial boundaries, has resulted in substantial legal changes. In this restructuring, these settlements have undergone a legal transition from being self-governing villages to becoming neighbourhoods of the districts to which they were previously affiliated. This transformation has introduced numerous urban-oriented approaches, projects, programs, and practices that were primarily designed for urban environments. Moreover, the municipal and zoning legislation governing urban areas has been directly applied to rural environments. These changes have given rise to various challenges and issues in rural regions (Zengin 2015; Çopuroğlu 2017). Consequently, the traditional self-governing rural administrations, often deeply rooted in local customs and practices, have been entirely abolished. This transition marks a significant shift in the governance and administration of rural areas, imposing urban-centric models and regulations on communities accustomed to more autonomous modes of governance.

5. Discussion and Results

5.1. Discussion

The increasing migration from rural to urban areas in Türkiye is influenced by multiple factors, primarily rapid industrialization and urban expansion. This migration is a response to various challenges faced by rural communities, including limited income from agriculture, suboptimal living conditions, fragmentation of agricultural lands due to inheritance practices, and a growing need for social services such as education and healthcare. Consequently, agricultural lands in rural areas are being abandoned.

To tackle these challenges, the GDAR is actively engaged in comprehensive legal and strategic planning. The main objective is to rejuvenate abandoned agricultural lands through a process known as land banking. This strategy also aims to address the problem of agricultural land fragmentation caused by inheritance laws. Despite the introduction of the Regulation on the Transfer of Agricultural Lands in 2014, with subsequent revisions in 2021, certain ambiguities still impede its effective implementation. The fragmentation of agricultural lands poses a significant obstacle to efficient land use, leasing, inheritance management, and the success of land banking initiatives.

Moreover, the challenge of achieving an economically viable size for agricultural land, large enough to manage the complexities of rural land, remains unresolved. This challenge is rooted in issues such as land parcel fragmentation, intricate land tenure arrangements, and complex regulatory matters.

The existing challenges in valuing rural and agricultural lands, evident in institutional practices, pose a significant hurdle to the establishment of a functional rural land market. Moreover, the absence of a comprehensive and effective model for land banking hampers practical implementation, despite the potential utilization of existing technologies to identify and reintegrate abandoned lands into agricultural production. The lack of concerted efforts to execute project-based approaches further exacerbates these issues. Addressing these challenges is imperative for ensuring the sustainability of Türkiye's agricultural sector and the equitable and effective use of its crucial agricultural resources.

Despite the substantial legal transformation introduced by Law 6360, aimed at improving rural land management, no substantial progress has been made in amending this law. This has resulted in inter-institutional challenges that complicate rural land management. The transfer of authority and responsibilities for land consolidation to the DSİ has weakened GDAR, adding to the complexities.

The transfer of the TARBİL project to a different ministry unit has removed GDAR's jurisdiction and accountability over the project, hindering its contribution to GDAR's efforts. Conversely, the TAD portal, a valuable tool for agricultural inquiries, maintains its significance within e-government applications. The successful nationwide completion of the orthophoto production project forming the basis of the Land Parcel Identification System (LPIS) benefits not only GDAR but also various other governmental entities.

The preparation of Agricultural Land Use Plans, especially lacking at a micro scale in rural areas with prevalent agricultural activities, should align with the provisions of Soil Conservation and Land Use Law No. 5403. GDAR, a pivotal institution in rural development, rural land management, and the formulation of rural and regional planning regulations, aims to establish a nationwide Agro-Based Macro Level Land Use Planning model. However, the project's implementation, initially planned for three provinces, faces challenges due to complex institutional dynamics.

Over the past ten years, frequent rotations of senior officials within the institution's decision-making bodies have cast a shadow over the process, adversely affecting the implementation of evolving corporate strategies and technical projects. This has contributed to a persistent lack of success in these endeavours. Ongoing legal and institutional challenges call for collaborative and innovative solutions to facilitate more effective rural land management in Türkiye.

5.2. Results

The findings from the evaluation of land use categories, land use, legal regulations, ongoing projects, and institutional structure have been summarized as follows:

I. The Soil Conservation and Land Use Law is identified as not adequately responsive to practical needs, highlighting the necessity for improvement.
II. Measures are required to prevent the fragmentation of agricultural lands through inheritance, address land fragmentation and multiple ownership issues, and spatially identify and repurpose abandoned agricultural lands for agricultural production.
III. There is a need for the establishment of a rural land valuation model integrated into legislation.
IV. Clear definitions of competent farmers in agricultural management are essential, addressing issues related to tenancy, partnership, and joint cultivation.
V. Immediate initiation of land acquisition and banking practices is recommended.
VI. The expansion of the content of land consolidation projects, along with their implementation in conjunction with irrigation projects and land acquisition/banking, is deemed necessary.
VII. The development of macro and micro-level land use plans for agricultural purposes, with a focus on urban-rural land interlinkages and small-scale agricultural enterprises, is suggested.
VIII. The restructuring of the existing institutional framework into rural land management administration is proposed.
IX. Emphasis on good governance, capacity building, and digitalization in agriculture is underscored.
X. The development of an effective functioning rural land market in the country is identified as a crucial need.
XI. The necessity to resolve technical, legal, and administrative problems related to agricultural land is acknowledged.
XII. Metropolitan municipalities with expertise in infrastructure projects, including infrastructure, road, and drinking water projects, must expand their services to rural areas and transfer services related to the agricultural sector to the rural land management administration.

All these findings address issues related to rural land management, and it is believed that these problems can be effectively addressed through the proposed functional model and, consequently, institutional restructuring.

6. Rural Land Management Functional Model Proposal

In Türkiye, the primary issues related to agricultural land involve challenges in land transfers due to inheritance and shared ownership, inadequacy of farming land (scale problem), and land fragmentation. Secondary issues include the aging of the agricultural population, rural-to-urban migration, lack of farm capital, and the limited adoption of modern agricultural technologies. To effectively tackle these challenges, there is a need for the establishment of legal regulations pertaining to property, the creation of a comprehensive and efficient agricultural information system, the development of an agricultural land market, and the establishment of a dynamic institution to provide these services.

The persisting problems concerning agricultural land and its management remain at the forefront of the country's agenda. The framework for rural land management is depicted in Figure 2, encompassing key components aligned with the Sustainable Development Goals. These components include digital land data (ownership, value, use, and development), land policy, institutional framework, agricultural land use planning, and the establishment of an effective rural land market.

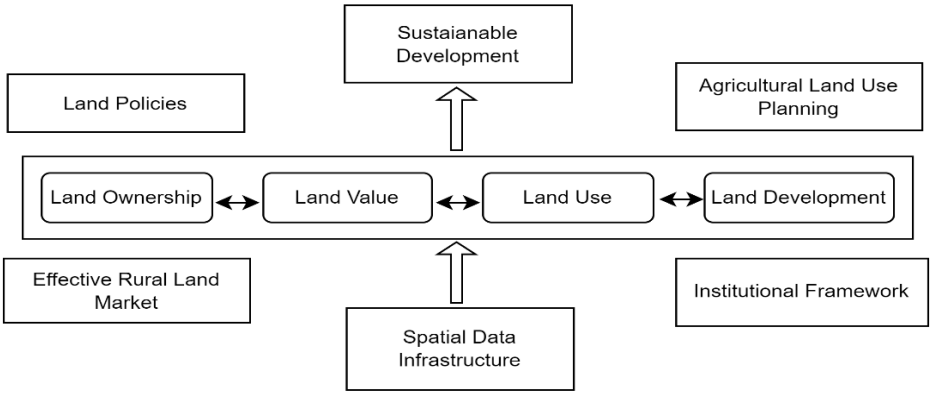

Figure 2- Rural land management framework (Source: modified based on Govender (2018))

In Türkiye, discussions on rural land management often gravitate towards the concept of land consolidation. Unfortunately, this association has contributed to a lack of clarity in understanding the broader scope of rural land management. Consequently,

there is an urgent need to develop a comprehensive paradigm for rural land management structured around a functional model centred on agricultural land, encompassing all relevant parameters.

As depicted in Figure 3, the Framework for Effective Land Administration (UN 2020) highlights the foundational elements of land management, including land ownership, use, value, development, and spatial data infrastructure. The hierarchical model of land management proposed by Williamson et al. outlines a series of activities situated between cadastral parcels and land policy, as illustrated in Figure 4. This research aims to formulate a land-based functional model that serves as the foundation for rural land management. The developed model strives to integrate the intricate processes and procedures between land policy and agricultural land use planning in rural areas. The subsequent sections elaborate on the proposed model, elucidating its components and the functional relationships between them.

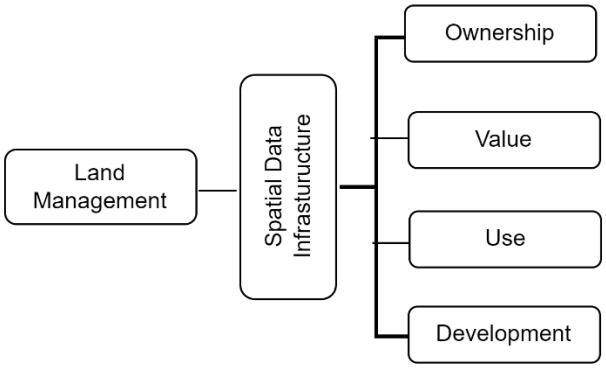

Figure 3- Land management components

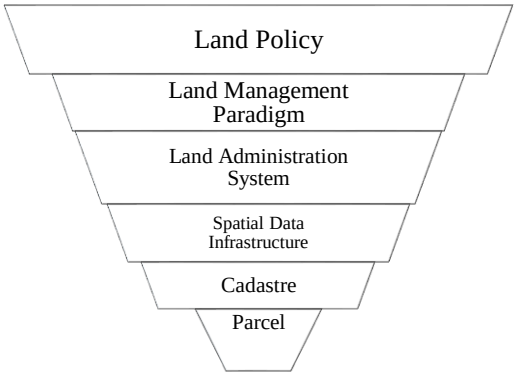

Figure 4- Land management hierarchy

6.1. Land policy, land administration, and rural land definition

Rural land management, a crucial subcomponent within the broader land management framework (depicted in Figures 3 and 4), constitutes a parcel-based system grounded in the principles of land policy, land administration, and rural land. This multidimensional domain demands a comprehensive and holistic approach. Through the implementation of effective land management strategies and a careful consideration of the urban-rural equilibrium, rural areas can thrive, preserving agricultural lands, forests, natural resources, and cultural heritage for the benefit of future generations.

In the realm of rural land management, land policy plays a central role. It involves the formulation, implementation, and regulation of guidelines, rules, and laws governing land ownership, utilization, and development in rural areas. The overarching goal of these policies is to ensure the sustainable and equitable exploitation of rural land resources, considering economic, social, and environmental factors. Effective land policy requires a balanced approach that harmonizes the diverse needs and interests of various stakeholders, including rural communities, government bodies, investors, and environmental organizations.

Key aspects integral to land policy in the context of rural land management include the regulatory framework, land ownership and value, land use, development, institutions and services, agricultural lands and village settlements, community development and empowerment, and digital land data and its dissemination (as illustrated in Figure 5).

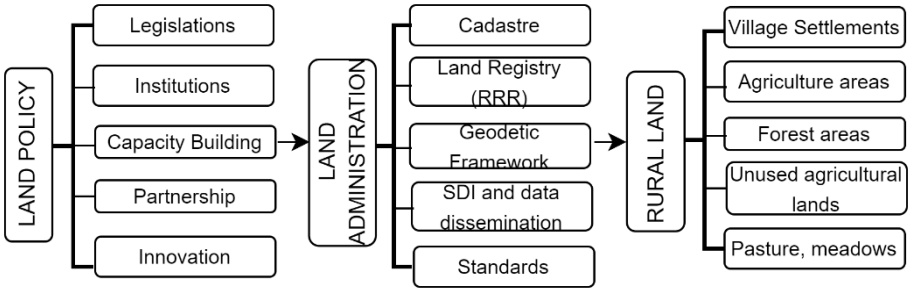

Figure 5- Rural land management paradigm

Land administration in rural land management involves the systematic organization, regulation, and oversight of land-related activities, encompassing functions such as land registration, tenure systems, geodetic framework, cadastre, and land records (Rights, Restrictions, and Responsibilities) as well as the establishment of spatial data infrastructure. The fundamental objective

of this framework is to ensure the efficient utilization of land, safeguard land rights, mitigate disputes, and facilitate sustainable rural development.

Rural land management, in particular, constitutes an integrated system aimed at preserving the economic, social, and environmental functions of land. It also entails fostering interaction among diverse land-use types and related sectors. This intricate coordination is realized within the spatial planning projections and spatial data infrastructure associated with village settlements, urban-rural transition zones, and agricultural lands. It is noteworthy that forests, pastures, and highlands are excluded from this model due to their status as public lands.

Türkiye has made notable strides in the realms of land policy, land administration, and the delineation of rural land, forming the legal and institutional foundation of rural land management. However, a significant challenge lies in the absence of a dedicated institution tasked with the responsibility of rural land management.

6.2. Key drivers and spatial planning strategies for sustainable rural development

Agriculture, forests, natural resources, the environment, climate change, biodiversity, rural infrastructure, demographic dynamics, and rural development serve as pivotal drivers for promoting sustainable rural land management. These factors exert a profound influence on decision-making and actions related to land utilization, management, and development. They are intricately interconnected, often entailing complex interlinkages that significantly shape practices within rural land management. Understanding these interconnections is of paramount importance in effective rural land management planning and policymaking. It allows for the cultivation of a balanced approach that carefully considers economic, social, environmental, and cultural dimensions.

Spatial plans and land use projects are acknowledged as potent technical instruments for achieving harmony and equilibrium between the natural environment and the built environment. These plans encompass social and economic activities, providing a visual representation of the spatial distribution of these activities within land use plans. Successful plans meticulously integrate the natural environment, encompassing biological elements such as soil, water, and air, with the human-made, socio-economic, and physical (constructed) environment, all while adhering to sustainability principles. Within this framework, there's an imperative need to harmoniously unify various factors, including:

- Natural Environment Factors: These factors involve elements such as soil, agriculture, pastures, forests, water, and underground resources.

- Economic Environment Factors: This category encompasses industry, trade, service, and tourism activities.

- Social Environment Factors: Here, we consider components related to education, health, culture, and housing activities.

- Technical Infrastructure Factors: This involves addressing transportation and logistics activities in the execution of spatial plans.

- When implementing spatial plans, it becomes evident that gaps exist in the production of national and regional spatial macro plans across various levels, including local and communal micro-level land use plans in Türkiye. To address these deficiencies, it is imperative to adhere to specific principles:

- Establish Spatial Arrangements: This should be done within the framework of Agricultural Land Use Plans, with the aim of fulfilling the designated functions of rural and agricultural settlements, thereby enhancing their overall efficiency.

- Comprehensive Integration of Agricultural Resources: Ensure that agricultural resources are thoroughly integrated into urban physical plans.

- Optimize the Distribution of Urban Centres: Focus on optimizing the distribution of urban centres that support agricultural activities, spanning national, regional, sub-regional, provincial, district, and community scales.

- Incorporate Spatial and Physical Dimensions: Include spatial and physical dimensions into agricultural and rural development plans and policies to foster integrated planning.

- In conjunction with planning policies that emphasize the development of spatial plans and land use plans within agricultural areas and rural settlements, which inherently possess the characteristics of "bottom-up" planning approaches, the following strategies should be pursued:

- Emphasis on Natural Environmental Elements: Emphasize the significance of natural environmental elements within the context of man-made socio-economic and physical environmental planning, with due consideration to agriculture.

- Utilization of Agropolitan and Integrated Rural Development Models: Ensure the optimal distribution of metropolitan, large urban, middle urban centres, sub-urban centres, urban service centres in rural areas, and agro-industrial focus areas within the framework of agropolitan and integrated rural development models.

- Addressing the Lack of Physical Dimensions: Address the deficiency in physical dimensions within development plans, particularly as they relate to socio-economic aspects on a sectorial basis.

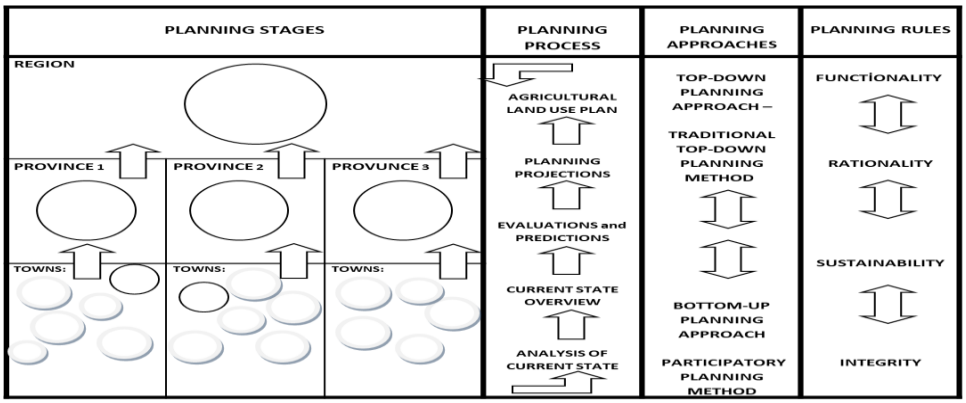

Figure 6- Planning processes, approaches, and rules

In the domain of land use planning, a multi-tiered approach is essential, integrating systems at the local, provincial, sub-regional, regional, and national levels. These systems functionally interconnect vertically and are spatially organized horizontally Figure 6).

Decisions and practices in land use planning hinge upon the identification of local resources and the establishment of specific thresholds. In this context, lands subject to planning can be categorized as follows (Table 7):

I. Suitable areas for development and urbanization,
II. Areas demanding absolute protection and preservation,
III. Areas that necessitate both protection and balanced utilization simultaneously.

To establish a rational 'protection and use' mixed land allocation plan, several methodological steps must be undertaken. First, a set of criteria is indispensable for determining construction and protection rates, ratios, and allocations for land use decisions within planning areas. Subsequently, conditions for protection and construction activities must be defined, alongside enforcement and control mechanisms. Completing these steps is paramount to achieving a well-balanced land use plan that prioritizes the equilibrium between economic and ecological considerations, thereby contributing to sustainable development.

The reduction of conflicts in rural areas, especially within urban-rural transition zones, aimed at fostering a more sustainable and habitable rural environment, is depicted in Table 7. As illustrated in Table 7, this approach constitutes the central element of the model proposed in this article. It seamlessly integrates both top-down and bottom-up planning approaches and policies, aligning with the recommendations put forth by Kleemann et al. (2023) for European contexts.

Table 7- Methodology for a balanced development of natural (ecological) and man-made (build-up) environments

BUILT-UP AREAS	*PROTECTION & LAND USE PATTERN* *Determination of criteria* *Determination of land use characteristics* *Determination of conditions for protection* *Opening the land for use in respect to the conditions of protection* *Defining audit and sanction mechanisms*			*ABSOLUTE PROTECTION AREAS*
Residential Areas Production Areas Service Areas Transportation Lines Infrastructure Facilities and Utilities	Pre-Dominantly Built Up and Subsidiary Protected Areas	Equivalently Protected and Built-Up Areas	Pre-Dominantly Protected and Subsidiary Built-Up Areas	Ecological Production Areas Vegetation Areas Absolute Agricultural Production Areas. Irrigated Agricultural Production Areas. Natural Conservation Areas Juridical Status Areas

6.3. Integration of land management components with rural land

The components of land management, encompassing land ownership, value, use, and development, are pivotal parameters within the proposed functional model. Land ownership plays a central role in rural land management, fostering stakeholder engagement and empowerment. It incentivizes sustainable land use, facilitates wealth creation, and promotes asset building. Land ownership also opens pathways to credit access, land transfers, and conflict resolution. Moreover, it encourages responsible land stewardship, compliance with regulations, the establishment of a vibrant rural land market, and private investment for rural development. It further strengthens community cohesion, preserves cultural identity, and ensures the sustainable management of natural resources. In practice, land ownership constitutes the legal foundation of rural land, governing property law and daily transactions, including land transfers, inheritance, mortgages, and subsidies.

Rural land valuation assumes paramount importance in rural land management, as it determines the market value for transactions and informs decision-making. It serves as a crucial tool for asset management, taxation, revenue generation, rental fee assessments, insurance and risk evaluations, land use planning, agricultural and rural development, natural resource management, land conservation, land preservation, land transaction negotiations, and policy formulation and regulation. Therefore, there is an imperative need to develop and implement a feasible model for rural land valuation, distinct from urban land valuation.

Land use and management serve as the driving forces behind rural land management. Proper planning efficiently allocates resources, thereby enhancing agricultural productivity, ensuring food security, and promoting sustainable farming practices. This approach contributes to environmental sustainability by preserving ecosystems, managing natural resources, and mitigating climate change. Additionally, rural-urban linkages, community development, disaster risk reduction, tourism promotion, and infrastructure development are key benefits. Rural land use aligns with various Sustainable Development Goals (SDGs), including property rights, zero hunger, clean water and sanitation, sustainable cities and communities, responsible consumption and production, climate action, and life on land, fostering equitable land use. Rural land use management practices, such as conservation easements, land trusts, and zoning regulations, play a vital role in protecting natural landscapes, historic sites, and cultural heritage.

In the Turkish context, land use manifests through the establishment of build-up areas, achieving a balance between urban and rural land, and preserving natural areas. Rural build-up areas primarily encompass settlement areas in villages and semi-rural regions. Village settlement areas are associated with village settlement plans, construction permits, residence permits, and agricultural land use planning. The urban-rural perspective emphasizes new land use developments through agricultural land use planning, resulting in village-district development axes, planning and plan decisions, and the provision of social and economic amenities, all from a rural standpoint. Rural land uses are determined through detailed soil analyses and land use protection patterns, which include decisions about which lands are to be preserved for agricultural purposes and which are allocated for other uses.

Within the realm of rural land management, rural land development plays a critical role. This encompasses planning, design, and execution to optimize land use and its value. The significance of rural land development lies in promoting economic growth, enhancing infrastructure, creating livelihood opportunities, expanding agriculture, developing tourism, and fostering community growth. Practical applications of rural land development are carried out through land use planning, land acquisition and banking, land consolidation, and expropriation.

Agricultural land use planning is a fundamental component of rural land management, facilitating the sustainable and balanced development of agriculture. It plays a central role in shaping a resilient and sustainable future for rural areas and the broader agricultural sector. The planning process focuses on the efficient allocation of land resources, taking into account factors such as soil quality, climate, topography, and water availability. Beyond these fundamental considerations, it addresses crucial aspects such as climate change mitigation, support for rural livelihoods, infrastructure planning and development, adaptation to evolving market demands, conflict resolution, and the protection of land rights. In essence, agricultural land use planning is instrumental in charting a resilient and sustainable path for the agricultural sector and rural areas by ensuring responsible and balanced land resource utilization. In summary, the objective is to determine the most suitable land use for each parcel and the most suitable land for each use within rural areas.

6.4. Urban-rural land linkages

The relationship and interdependence between urban and rural lands hold significant importance in terms of land use and development. These interactions and dynamic connections play a critical role in sustainable development and community well-being.

Rural areas are indispensable as primary sources of essential resources, including agriculture, water resources, energy production, and forest resources. Cities primarily meet their fundamental resource requirements from rural areas, encompassing agricultural products, water, and energy production. Furthermore, cities offer opportunities for trade with rural regions,

supporting the sale of rural products. Rural areas provide the workforce and certain services required by urban centres. Additionally, rural areas can serve as vital recreational and tourist destinations for urban residents. Urban areas, in turn, rely on rural regions for services such as housing, infrastructure, transportation networks, and energy production. These services and resources originate in rural areas and are supplied to urban centres.

This symbiotic relationship between urban and rural areas underscores the essential role they play in each other's sustainability and development.

The intricate relationship and interactions between urban and rural areas should be integral considerations in land use planning. An integrated planning approach holds the potential to foster sustainable growth and development in both urban and rural regions. Such comprehensive planning should encompass topics like agricultural production, environmental protection, and the sustainable utilization of natural resources.

In essence, acknowledging the interdependence and interactions between urban and rural areas is crucial for a sustainable future. In this context, agricultural land use planning and balanced land use play a pivotal role in achieving economic and ecological equilibrium. To establish this equilibrium, it is essential to employ detailed soil maps, soil threshold analyses, and land use and protection patterns, as outlined in Figure 7 and Table 7.

Addressing the challenges of urban and rural areas collectively and implementing urban-rural integrated development strategies is essential (GLTN 2021; Wu et al. 2022). As evident from the proposed functional model tailored to Turkish conditions, which is based on agricultural land, it encompasses components such as land valuation, land use, and land development, all directly or indirectly interconnected with land ownership and spatial data. These relationships can be established, integrated into agricultural land use plans, and facilitated through spatial data infrastructure. In line with the GLTN recommendations, recognizing the urban-rural land relationship as a valuable land management tool allows for the leveraging of each other's strengths. The proposed functional model, the focal point of this article, developed to enhance this relationship, is illustrated in Figure 7.

6.5. Proposed functional model

Based on the research findings, it is evident that effective rural land management is influenced by a combination of political, legal, administrative, and technical factors. Rural land management is cantered to the implementation of a functional model referred to as the 'land-based' model. Figure 7 illustrates the proposed agricultural land-based functional model for enhancing rural land management. This model is constructed on the principle of transforming rural land ownership, value, use, development, and spatial data infrastructure into an integrated economic, social, and environmental entity. Practical implementation of this model is anticipated to contribute significantly to achieving a harmonious balance between economic and ecological considerations. It will aid in enhancing agricultural infrastructure, fostering the development of liveable rural settlements, advancing agricultural practices, and facilitating the growth of robust rural land markets. Consequently, we recommend restructuring the GDAR into the General Directorate of Rural Land Management to spearhead this transformative process.

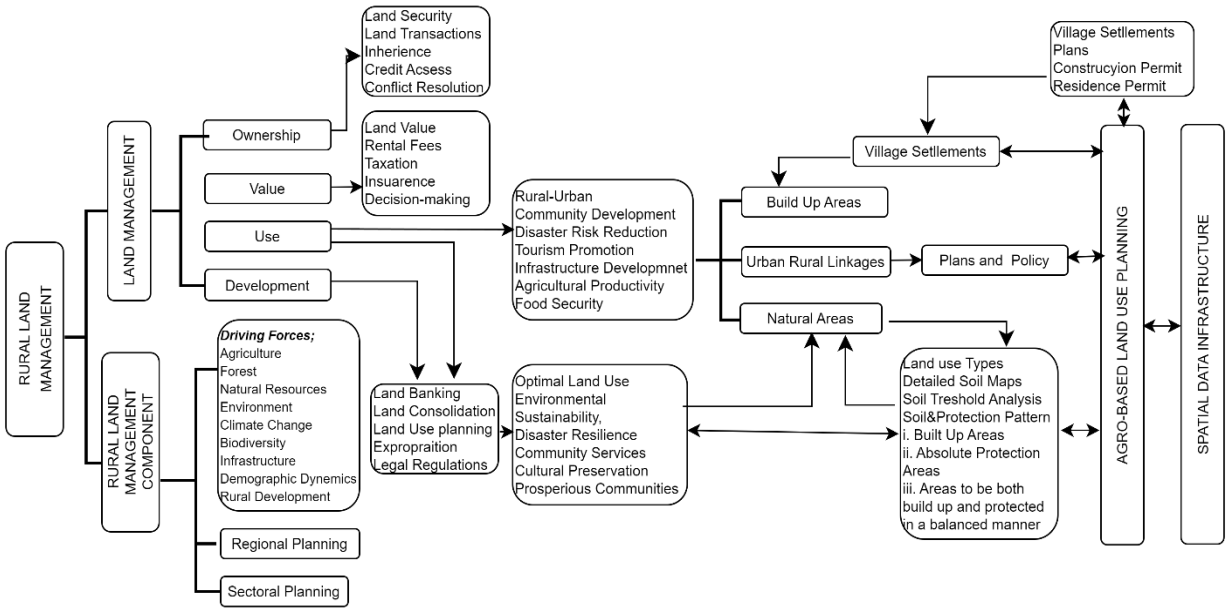

Figure 7- Proposed rural land management functional model

7. Conclusions

Based on the legal and technical activities conducted by the GDAR between 2005 and 2023, this research aimed to develop an effective rural land management system, primarily focusing on agricultural infrastructure. Taking national conditions into account within the context of global approaches, the study has yielded several significant conclusions:

The most remarkable outcome of this research is the identification of the predominant driving forces for change in rural land management within the proposed rural land functional model. These driving forces are grounded in policies regulating agriculture, spatial development, property rights, land use, value, land development, and good governance. In addition to technical, political, and institutional factors, these elements have emerged as significant driving forces, emphasizing the necessity for change in rural land management. The proposal of the functional model is structured around land management components in rural areas, involving the determination of the ownership, value, use, and development of each parcel, as well as agricultural land use planning. Another component of the model is the provision of data through spatial data infrastructure. The issues of land transfers due to inheritance and shared ownership, which we define as the primary problem in agriculture, can be addressed technically under the "land development" component, which includes land acquisition and land banking, land consolidation practices, and the essential component of agricultural land use planning. Administratively, these issues can be resolved through the coordination of the Rural Land Management Administration with the General Directorate of Land Registry and Cadastre and the General Directorate of Census and Citizenship. Land consolidation projects should be carried out in coordination with irrigation, land acquisition and banking, land valuation, and agricultural land use planning, thus eliminating the issue of land fragmentation. Abandoned lands can be easily identified using modern image processing technologies such as remote sensing and unmanned aerial vehicles, and brought into agricultural production.

Another significant finding of this research is the absence of an authoritative and responsible institution for rural land management. Therefore, the establishment of a Rural Land Management General Directorate has become a necessity. The primary activities outlined in the agricultural land-based functional model should be the core responsibilities of this proposed directorate. In this context, the transformation of the GDAR into the Rural Land Management General Directorate will be a crucial step in laying the foundation for agricultural development.

Furthermore, the research underscores the urgent need for new regulations in the agricultural land market, especially within the framework of the proposed model. These regulations should focus on land ownership, land value, land use, and development, with the aim of strengthening the agricultural infrastructure in Türkiye.

References

11th Development Plan (2019). Onbirinci Kalkınma Planı (2019-2023), Republic of Türkiye Presidency, Strategy and Budget Directorate, 2019, Ankara.605-7599-08-7, Kasım 2019, AnkaraAFC (2019). Tarım ve Orman Bakanlığı, III. Tarım Orman Şûrası, Şûra Kitabı (III. Agriculture Forest Summit, Council Book), ISBN: 978-605-7599-08-7, Kasım 2019, Ankara

Akkul M (2022). Sürdürülebilir Arazi Yönetimi Açısından Kırsal Arazi Düzenlemesi Uygulamalarında Mülkiyete Yönelik Sorunların İrdelenmesi: Kop Bölgesi Örneği, Doktora Tezi, (Examination of Property-Related Issues in Rural Land Arrangement Practices from the Perspective of Sustainable Land Management: The Case of the KOP Region, Doctoral Thesis Necmettin Erbakan Üniversitesi Fen Bilimleri Enstitüsü, Harita Mühendisliği Anabilim Dalı, Konya

Arslan F, Kartal S, Ünal S & Ayata Ü (2022). Arazi Bankacılığı, Ziraat & Orman, Su Ürünlerinde Araştırma ve Değerlendirmeler (Land Banking, Research and Evaluations in Agriculture & Forestry, Fisheries), Book, ISBN: 978-625-430-565-8, Gece Publishing

Bachev H I (2020). Level of agrarian Governance sustainability in Bulgaria, Journal of Social and Administrative Sciences, Volume 7 Issue 3, September 2020

Çolakoğlu E (2007). Kırsal Kalkınma Problemine Bir Çözüm Arayışı Olarak Köy- Kent Projesi (A Village-Town Project as a Search for a Solution to Rural Development Issue), *ZKÜ Sosyal Bilimler Dergisi* Cilt 3, Sayı 6, ss. 187–202.

Çopuroğlu M A (2017). Büyükşehir Belediye Sınırları İçinde Yer Alan Kırsal Yerleşmelerin Sorunları Üzerine Bir Değerlendirme (An Evaluation on the Problems of the Rural Settlements in the Metropolitan Municipal Boundaries), Süleyman Demirel University Journal of Architecture Sciences and Applications Research article JASA2017, 2(2):18-32. e-ISSN: 2548-0170

Demirbaş S (2023). Land Consolidation Studies İn Türkiye, III International Conference on Real Estate Development and Management, Ankara Üniversitesi Gayrimenkul Geliştirme ve Yönetimi Bölümü, ISBN:978-605-136-626-5, Ankara Üniversitesi Basımevi, 2023

EC (2008). The EU Rural Development Policy 2007-2013, http://ec.europa.eu/agriculture/publi/fact/rurdev2007/2007_en.pdf. (access date: May 21, 2023)

Enemark S (2005). Understanding the Land Management Paradigm, FIG Commission 7 Symposium on Innovative Technologies for Land Administration, Madison, Wisconsin, USA, 19-25 June 2005

Enemark S (2006). Understanding the Land Management Paradigm, GIM International, January 2006, https://www.researchgate.net/publication/228342504_Understanding_the_land_management_paradigm

Enemark S (2010). The Evolving Role of Cadastral Systems in Support of Good Land Governance, The Digital Cadastral Map, FIG Commission 7 Open Symposium Karlovy Vary, Czech Republic, 9 September 2010

Ercan O (2019). Essentials of a Sustainable Land Use Planning Approach for Rural Areas and a Model Proposal to be Applied Under Turkish Conditions, Turkish Journal of Engineering (TUJE) Vol. 4, Issue 3, pp. 154-163, July 2020 ISSN 2587-1366, Turkey, DOI: 10.31127/tuje.650238 Research Article

Ercan O (2020). Arazi Yönetimi Sistemi ve Kırsal Boyutu (The Land Management System and Rural Dimension), ICREDM2020 Conference, Ankara

Ercan O (2021). A closer look at Turkish cadastre and its successful completion, Land Use Policy, Volume 110, November 2021, https://doi.org/10.1016/j.landusepol.2020.104951

Ercan O (2023). Evolution of the cadastre renewal understanding in Türkiye: A fit-for-purpose renewal model proposal, Land Use Policy, Volume 131, August 2023, 106755, https://doi.org/10.1016/j.landusepol.2023.106755

Erdoğan E H & Bastidas S (2020). FAO, Framework for Integrated Land Use Planning: an Innovative Approach, Technical Report · July 2020, DOI: 10.13140/RG.2.2.20078.23365

FAO (2012). Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries, and Forests in the Context of National Food Security. Food and Agriculture Organization of United Nations (FAO), Rome

FAO (2023). Strategic Framework 2022-2031, www.fao.org/strategic-framework/en (access date: 29 June, 2023)

FIG (1995). The FIG Statement on the Cadastre. International Federation of Surveyors (FIG) Publication No. 11

GDAR (2014). Final Report on the Workshop on the Future of Land Consolidation in National Public Investments, GDAR, Ankara

DAGD (2020). Türkiye'de Kırsal Yerleşimler Saha Çalışması Raporu, Kalkınma Ajansları Genel Müdürlüğü Yayını Sayı: 8 Araştırma Raporu Sayı : 6 Aralık 2020, Ankara ISBN : 978-605-7679-06-2 (Rural Settlements Field Study Report in Turkey, Development Agencies General Directorate Publication Number: 8 Research Report Number: 6 December 2020, Ankara ISBN: 978-605-7679-06-2)

GIS (2023). https://csb.gov.tr/, (access date: 13 June, 2023)

GDLRC (2023). https://GDLRC.gov.tr/, (access date: 12 June, 2023)

GLTN (2021). Report3, Author: Uchendu Eugene Chigbu, Urban-Rural Land Linkages: A Concept and Framework for Action, HS Number: HS/003/21E, Kenya

GDF (2021). Türkiye Orman Varlığı 2020, (Turkish Forest Asset), Published by General Directorate of Forest, ISBN 978-605-7599-68-1, 2021, Ankara

GDF (2023). Orman Genel Müdürlüğü 2022 Yılı İdare Faaliyet Raporu, Strateji Geliştirme Dairesi Başkanlığı Ankara/2023(The General Directorate of Forestry 2022 Administrative Activity Report, Strategy Development Department) Ankara/2023

Govender W (2018). IOT/AI Disruption in Land Administration, (access date: 26 October, 2023). https://geospatialworldforum.org/speaker/SpeakersImages/WillyGovender-iot.pdf

Haber W, Bückmann W & Endres E (2010): Anpassung des Landmanagements in Europa an den Klimawandel, Natur und Recht (32): 377-383

Hartvigsen M (2022). The potential of multi-purpose land consolidation in Eastern Europe, FIG Congress 2022, Warsaw, Poland, 11–15 September 2022

Kayıkçı S (2009). Türkiye'de Kırsal Alan Yönetimi, Ankara Üniversitesi Sosyal Bilimler Enstitüsü Kamu Yönetimi ve Siyaset Bilimi (Yönetim Bilimleri) Anabilim Dalı, Doktora Tezi (Rural Area Management in Türkiye, Ankara University Institute of Social Sciences, Department of Public Administration and Political Science (Management Sciences), PhD Thesis), Ankara

Kleemann J, Struve B & Spyra M (2023). Conflicts in Urban Peripheries in Europe, Land Use Policy, Volume 133, October 2023, 106849, https://doi.org/10.1016/j.landusepol.2023.106849

Kurugöllü S & Ünel F B (2021). Ekonomik Katkısı Olmayan Tarım Arazilerinin Araştırılması ve Değerlendirilmesi (Investigation and Evaluation of Agricultural Lands Without Economic Contribution), Türkiye Arazi Yönetimi Dergisi–2021; 3(2): 58-65, DOI: 10.51765/tayod.906612

Küsek G, Akdemir Ş, Türker M, Hayran S & Berk A (2019). The Effects of Land Consolidation and Farmer Satisfaction: Cases of Adana and Mersin Provinces, Fresenius Environmental Bulletin, January 2019

Magel H (2022). Urban - Rural - Partnership - It's a matter of territorial justice and status of mind!, FIG Congress 2022, Plenary session II, Warsaw, 12 October 2022

Masum F (2017). Rural Land Management in Bangladesh: Problems and Prospects, Geomatics, Landmanagement and Landscape No: 4, pp. 79-93

Mattsson H, Lindner G & Mansberger R (2021. Higher Education on Land Management and Land Administration, (access date: 12 February, 2021)

Metternich G (2017). UN Convention to Combat Desertification, Global Land Outlook Working Paper Land Use Planning.

MOF (2019). Tarım ve Orman Bakanlığı Tarım Reformu Genel Müdürlüğü, Atıl Tarım Arazilerinin Üretime Kazandırılması İle Arazi Bankacılığı Kurumsal Altyapı Oluşturma Bölge ve Merkez Çalıştayları Sonuç Ve Değerlendirme Raporu (Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, Regional and Central Workshop Results and Evaluation Report on Establishing Institutional Infrastructure for Bringing Unused Agricultural Lands into Production and Land Banking), Ankara 2019

PAP (2018). 2019 Yılı Cumhurbaşkanlığı Yıllık Programı, (2019 Presidential Annual Program, published in the Official Gazette with the number 30578, dated October 27, 2018).

Repp A & Weith T (2015). Building Bridges across Sectors and Scales: Exploring Systemic Solutions towards A Sustainable Management of Land—Experiences from 4th Year Status Conference on Research for Sustainable Land Management, *Land* 2015, 4(2): 325-336. doi.org/10.3390/land40203225

SCR (2014). Kalkınma Bakanlığı Tarim Özel İhtisas Komisyonu, Tarim Arazilerinin Sürdürülebilir Kullanımı Çalışma Grubu Raporu (Sustainable Use of Agricultural Lands Working Group Report), Ankara.

SCR (2018). Kalkınma Bakanlığı Kalkınma Planı on Birinci (2019-2023), Kırsal Kalkınma Özel İhtisas Komisyonu Raporu (Ministry of Development, Eleventh Development Plan (2019-2023), Report of the Specialized Commission on Rural Development), Ankara 2018

SHW (2022). Faaliyet Raporu, Strateji Geliştirme Dairesi Başkanliği, Ankara (Activity Report, General Directorate of State Hydraulic Works, Head of Strategy Development Department, Ankara)

Şanlı H, Özdemir Ş & Türker M (2023). Türkiye'de Arazi Bankacılığı Uygulamaları ve Sürdürülebilir Tarımsal Üretim (Land Banking Practices and Sustainable Agricultural Production in Türkiye), III International Conference on Real Estate Development and Management, Ankara Üniversitesi Gayrimenkul Geliştirme ve Yönetimi Bölümü, ISBN:978-605-136-626-5, Ankara Üniversitesi Basımevi, 2023

Tekeli, İ (2018). İzmir İli/Kenti İçin Bir Tarımsal Gelişme ve Yerleşme Stratejisi (ikinci baskı) (An Agricultural Development and Settlement Strategy for the Province/City of Izmir) (Second Edition), Akdeniz Akademisi Yayınları, DOI: 10.32325/iaak.1802217, İzmir, 2018

Türker M (2019). In Turkey Land Abandonment and the Combat Activities (Land Banking Services), 6-8 November 2019/ Santiago.

Türker M (2023). Türkiye'de Tarımsal Arazi Yönetimi ve Geleceğİ (Agricultural Land Management and its Future in Türkiye), III International Conference on Real Estate Development and Management, Ankara Üniversitesi Gayrimenkul Geliştirme ve Yönetimi Bölümü, ISBN:978-605-136-626-5, Ankara Üniversitesi Basımevi, 2023

UNECE (1996). Land Administration Guidelines. ECE/HBP/96. United Nations: New York, Geneva

UNECE (2005). Land Administration in the UNECE Region. Development trends and main principles Economic Commission for Europe. New York and Geneva, ECE/HBP/140. UNECE Information Services

UNGGIM (2020). Framework for Effective Land Administration (draft)

Weith T, Barkmann T, Gaasch N, Rogga S, Strauß C & Zscheischler J (2019). Sustainable Land Management in a European Context, A Co-Design Approach, Springer, Human-Environment Interactions, ISSN 2214-2339 ISSN 2452-1744 (electronic), ISBN 978-3-030-50840-1, ISBN 978-3-030-50841-8 (eBook)

Williamson I, Enemark S, Wallace J & Rajabifard A (2010), Land Administration for Sustainable Development, Esri Press, 380 New York Street, Redlands, California 92373-8100

Wu Y, Long H, Zhao O & Hui E C (2022). Land use policy in urban-rural integrated development, Land Use Policy, Volume 115, April 2022, 106041, https://doi.org/10.1016/j.landusepol.2022.106041

Zengin O (2015), Büyükşehir Belediyesi Reformu ve Kırsal Alana Etkisi (Metropolitan Municipality Reform and Its Impact on Rural Areas), 21. Yüzyıl İçin Planlama Semineri (Planning Seminar for the 21st Century, in Ankara), Ankara