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Abstract: This paper analyses agricultural land-use change in Albania as a long-term outcome of post-socialist decollectivisation and rural demographic transition. Following radical and egalitarian land redistribution in the early 1990s, Albania developed a highly fragmented farm structure that continues to shape land-use decisions. Using CORINE Land Cover status layers for 2000, 2012 and 2020 (released in 2020, based on 2018 data), the study examines both total agricultural area and its internal composition. While the agricultural envelope remained broadly stable (-1.3%), its structure changed markedly: arable land expanded, pastures increased, permanent crops remained stable, and heterogeneous agricultural areas declined by about 26%. These changes reflect the interaction of institutional legacies, labour scarcity driven by migration and ageing, and spatial variation in irrigation and market access. The findings identify a phase of recomposition (2000–2012), followed by stabilisation (2012–2020), with post-2020 adjustment increasingly driven by intensification and value-chain upgrading rather than land reallocation.

Key Words: land use and land cover change; post-socialist agriculture; decollectivisation; rural restructuring; Albania

Highlights

- Albania's agricultural area remained stable during 2000–2020 despite major shocks.
- Heterogeneous agricultural mosaics declined, replaced by arable land and pastures.
- Market access and irrigation drove arable expansion in Western Lowlands and Korçë basin.
- Labour scarcity and out-migration pushed marginal land toward extensive pasture use.
- Post-2020 growth shifts from land reallocation to value-chain upgrading.

1. Introduction

Albania represents a distinctive case in post-socialist agrarian transformation. Following one of the most extensive systems of collectivisation in Eastern Europe, the country adopted a radical and highly egalitarian decollectivisation process in the early 1990s, dismantling state and collective farms and redistributing land to rural households (Civici, 2002; Cungu & Swinnen, 1999). This reform produced a highly fragmented farm structure, characterised by multiple small and spatially dispersed plots per holding, which increases transaction costs, constrains mechanisation, and continues to shape land-use decisions (Guri et al., 2011; Zhllima & Guri, 2013). Over the same period, internal and international migration, peri-urbanisation, and population ageing reconfigured rural labour markets, particularly on marginal and steep terrains (Cegielska et al., 2018; Müller et al., 2009; Müller & Munroe, 2008). These processes interacted with improvements in irrigation and drainage infrastructure, as well as with evolving market access, contributing to a gradual shift from heterogeneous agricultural mosaics toward more specialised land-use categories (World Bank, 1999, 2006).

This study connects Albania's land-change outcomes to four interacting drivers: (i) post-socialist institutions that created extreme plot fragmentation and high transaction costs; (ii) market access and water control that shape land-use allocation spatially; (iii) demographic transition that tightens seasonal labour availability; and (iv) measurement constraints that influence what can be observed in spatial data. The framework links these drivers to a two-phase pathway, recomposition (2000–2012) and structural stabilisation (2012–2020), followed by a post-2020 intensification phase in which value chains, rather than land area, account for most of the growth (Alikaj et al., 2022; Cungu & Swinnen, 1999; European Commission, 2022; INSTAT, 2024a; UNIDO, 2023).

This study first quantifies how Albania's agricultural land changed between 2000 and 2020, not only in total area but also in its internal composition across four CLC level 2 subclasses: arable land, permanent

crops, pastures, and heterogeneous agricultural areas. Second, it identifies and interprets two temporal phases – 2000–2012 and 2012–2020 – linking the observed structural recomposition and subsequent stabilisation to demographic change, farm-structure legacies, improvements in irrigation and market access, and municipality-specific conditions documented in the Albanian literature (Ciaian et al., 2018; European Commission Joint Research Centre (JRC), 2015; Guri et al., 2015).

Land use and land cover change (LU, LCC) represents a central process through which socio-economic transformations, policy interventions, and environmental conditions interact, shaping agricultural systems and rural landscapes (Lambin & Geist, 2006; Tešić, 2022; Turner et al., 2007). In Central and Eastern Europe, post-socialist reforms have frequently resulted in land abandonment, reconfiguration of crop systems, and increased spatial polarisation between intensively used lowlands and marginal or labour-demanding areas, illustrating how land-use trajectories reflect broader agrarian transformations (Bański, 2011; Prishchepov et al., 2011). Despite these well-documented patterns, empirical analyses of land use change remain uneven across regions, and evidence from Southeast Europe, including Albania, is comparatively limited. Albania constitutes a particularly relevant case due to its rapid agrarian restructuring, land fragmentation following decollectivization, and strong demographic shifts affecting rural areas (Lerman et al., 2002; Müller & Munroe, 2008).

The remainder of the paper is organised as follows. Section two details the data and methods, including projection choices and known limitations of the CLC. Section three presents national-scale results and interprets the observed structural recomposition in relation to demographic change. Section four concludes with implications for land and rural policy.

2. Contextual framework

Radical, egalitarian decollectivisation dismantled state and collective farms and redistributed land in very small, scattered parcels, raising transaction, coordination, and mechanisation costs; these legacies encourage households to adopt flexible, risk-spreading land-use strategies on marginal plots, and make consolidation slow and partial (Cungu & Swinnen, 1999; Guri et al., 2011; Zhllima & Guri, 2013). Evidence for Albania shows that fragmentation fosters diversification, whereas selective investment or informal consolidation, where feasible, channels parcels into clearer categories (e.g., annual crops on accessible, gently sloped land), setting the stage for the long-run decline of mosaic agriculture (Ciaian et al., 2018; Guri et al., 2015).

2.1 Spatial economics: markets, irrigation, and terrain

Land-system research shows that fertile soils, short distances to markets, and reliable water resources tend to pull land from heterogeneous mosaics into arable or intensive perennial use. Conversely, steeper, thinner, or remote parcels shift toward pasture or semi-natural cover as households optimise land, labour, and capital allocation (Lambin & Meyfroidt, 2010; Verburg et al., 2004).

In Albania, the Western Lowlands and Korçë basin host market-oriented farm types and legacy irrigation/drainage infrastructure, making them well-suited for specialisation once confidence and liquidity return (European Commission Joint Research Centre (JRC), 2015; World Bank, 1999, 2006). This spatial sorting underpins the inverse relationship observed between heterogeneous agricultural areas and specialisation: as markets and irrigation improve, the mosaic contracts in favour of arable land, while more challenging terrain shifts toward pasture (European Commission Joint Research Centre (JRC), 2015; Lambin & Meyfroidt, 2010).

2.2 Demographic transition and labour scarcity

Strong internal and external migration, ageing, and peri-urbanisation compress the farm labour supply, increasing the opportunity cost of maintaining fragmented, sloping parcels under tillage; under these conditions, extensive grazing tends to prevail on marginal land, whereas better-endowed land intensifies (Müller et al., 2009; Sikor et al., 2009a). The decline in rural population share, from roughly two-thirds in

1990 to about one-third by 2023–2024, aligns with a compositional shift toward pasture in upland areas and sustained cropping on the plains (World Bank, 2024).

2.3 Measurement strategy and limits

Conceptually, CLC is treated as a consistent status-change inventory that captures broad trends rather than fine-grain micro-adjustments (Bielecka & Jenerowicz, 2019). Previous studies emphasize that CLC-based analyses typically rely on the use of equal-area coordinate reference systems to minimize areal bias, while explicitly acknowledging the implications of its Minimum Mapping Unit (MMU) – 25 ha for status layers, 5 ha for change layers – and the ≈ 100 m minimum width of linear features (Tešić, 2022; Varga et al., 2020). Scholars also highlight the need to consider potential inconsistencies arising from interpretation procedures and edition updates, as well as the sensitivity of results to class-aggregation choices, particularly for heterogeneous agricultural categories, where mosaic definitions may vary across studies. (Copernicus Land Monitoring Service, 2017; Díaz-Pacheco & Gutiérrez, 2014; European Environment Agency (EEA), 2007a; Varga et al., 2020).

2.4 From recomposition to intensification

The literature commonly conceptualizes agrarian transformation as a phased process rather than a continuous linear adjustment. In post-socialist and transition contexts, authors describe an initial phase characterized by the disintegration of heterogeneous agricultural mosaics in areas with favorable market access and water availability, accompanied by a reallocation of labor resources (Phase I: 2000–2012) and this is often followed by a period of relative stabilization of land-use patterns, as newly established configurations consolidate and adjustment pressures diminish (Phase II: 2012–2020) (Díaz-Pacheco & Gutiérrez, 2014; Sutcliffe et al., 2015; Tešić, 2022). More recent contributions suggest that subsequent development trajectories increasingly shift toward capital deepening at the margins, including investments in sorting and packing facilities, cold chains, quality standards, and processing capacities, frequently supported by policy instruments (European Commission, 2022; UNIDO, 2023).

Within this framework, livestock systems are frequently discussed as a structurally distinct case, as the availability of mapped pastureland does not automatically translate into higher output. Several studies underline the decisive role of institutional governance (e.g., pasture management regimes) and supporting infrastructure (e.g., water points, access tracks, animal health services), which mediate the relationship between land cover and production outcomes. Consequently, livestock dynamics are often analyzed separately from cropping responses in land-use change studies (Hagedorn, 2014; Ostrom, 1990).

3. Data and methods

3.1 Study location

This study covers the entire territory of Albania, located in Southeast Europe on the western Balkan Peninsula, where strong geographical and socio-economic contrasts shape land use patterns. The country is predominantly mountainous and hilly, while the Western Lowlands along the Adriatic coast constitute the main agricultural areas due to more favourable topographic and climatic conditions (FAO, 2018; INSTAT, 2024b). Albania exhibits a Mediterranean climate along the coast and more continental conditions inland, resulting in marked spatial variability in agricultural suitability (World Bank, 2020). Agriculture remains an important sector of the national economy and rural employment, although its relative importance has declined due to migration and structural change (INSTAT, 2023).

The agrarian system is characterised by highly fragmented land ownership following post-socialist land reforms, which has significantly influenced land management practices and land use trajectories across regions (Lerman et al., 2002; Müller & Munroe, 2008). These characteristics make Albania a suitable case for analysing land use and land cover change at the national scale and for identifying contrasting dynamics between lowland and mountainous areas.

3.2 Research instrument

Despite its high policy relevance, comprehensive structural evidence remains limited. The last Agricultural Census was conducted in 2012 and released in 2017 following significant implementation challenges; since then, monitoring has relied mainly on partial administrative records rather than full-count structural surveys (FAO/INSTAT, 2017; INSTAT, n.d.). This study uses data from the CORINE Land Cover (CLC) program, a standardised European land-use and land-cover classification system developed under the Coordination of Information on the Environment (CORINE) initiative and coordinated by the European Environment Agency (EEA). CLC data will provide indispensable multi-temporal, spatially consistent evidence for analysing long-run land-use dynamics. These include the minimum mapping unit (25 ha for status layers and 5 ha for change layers), the minimum width of linear features (100 m), interpreter and edition effects, and sensitivity to class aggregation. To ensure unbiased areal measurements, all spatial analysis is conducted using an equal-area coordinate reference system while using QIS (Cegielska et al., 2018; Copernicus Land Monitoring Service, 2017; European Environment Agency (EEA), 2007a).

3.3 Data analysis approach

The analysis relies on CLC status layers for 2000, 2012, and 2020. All geometries are re-projected to the ETRS89-LAEA coordinate reference system (EPSG:3035) to ensure unbiased area statistics. The CLC classes are placed in five level 1 groups, followed by the level 2 data group, which is central to the analysis because it is at this level that the processing will take place. Each pair of successive layers is intersected with the municipal boundary, dissolved by the municipality, and then split by the transition type. Analysis is standardised in hectares to generate transition matrices. Throughout the analysis, CLC's minimum mapping unit and interpreter-related constraints are explicitly carried forward in the interpretation, and sensitivity to class aggregation – particularly for heterogeneous agricultural areas – is discussed (Aune-Lundberg & Strand, 2021; Díaz-Pacheco & Gutiérrez, 2014; European Environment Agency (EEA), 2007a; Varga et al., 2020b).

We utilise CLC status layers for the years 2000, 2012, and 2020 (Fig 1). Native classes were recoded into five level-1 groups – Urban, Agricultural, Forest & Semi-Natural, Wetlands, and Water – and then we disaggregated Agricultural into the four CLC level-2 groups central to this paper: Arable land, Permanent crops, Pastures, and Heterogeneous agricultural areas (Copernicus, 2017). Because inference rests on area magnitudes, all geometry was re-projected to ETRS89-LAEA Europe (EPSG:3035) – the standard equal-area CRS for European statistical mapping and for CLC accounting products (EPSG/INSPIRE documentation). (We avoided using geographic CRS for areal measurements.) (EPSG:3035).

Testable propositions (P)

- *P1 (Market–water specialisation)*: Municipalities with better market access and irrigation experience larger declines in heterogeneous agricultural areas and increases in arable or intensive perennial use, holding total agricultural area roughly constant (European Commission Joint Research Centre (JRC), 2015; World Bank, 2006).
- *P2 (Labour–terrain sorting)*: Municipalities with steeper terrain and stronger out-migration or post-1990 ageing show larger increases in pasture and smaller arable gains ((Müller et al., 2009; Sikor et al., 2009a; World Bank, 2024).
- *P3 (Relocation of perennials)*: Permanent crops relocate from dispersed hill plots toward lowlands or foothills with better logistics and water, producing local gains despite flat national totals (European Commission Joint Research Centre (JRC), 2015; Guri, Jouve, & Dashi, 2014).
- *P4 (Stabilisation after 2012)*: After recomposition, changes decelerate system-wide as sunk investments and residual frictions dominate, yielding small, local reallocations rather than sweeping shifts ((Ciaian et al., 2018; Guri et al., 2015).
- *P5 (Post-2020 upgrading)*: Export growth and programme finance correlate more with value-chain upgrading than with additional land-class changes, so post-2020 progress is better tracked in yields,

standards, and logistics than in CLC transitions (European Commission, 2022; INSTAT, 2024a; UNIDO, 2023).

To ensure consistency and robustness of the spatial analysis, additional GIS preprocessing steps were applied, as summarised in Figure 1. All CLC layers were checked for geometry validity and topological errors, and attribute schemas were harmonised across years to guarantee temporal comparability. For each pair of successive layers, explicit from-to land-use transition polygons were created through intersection with municipal boundaries and subsequently dissolved by municipality and transition type to avoid slivers and double counting. Area calculations were performed exclusively in the equal-area ETRS89-LAEA (EPSG:3035) coordinate reference system and expressed in hectares before exporting tidy transition tables for analysis.

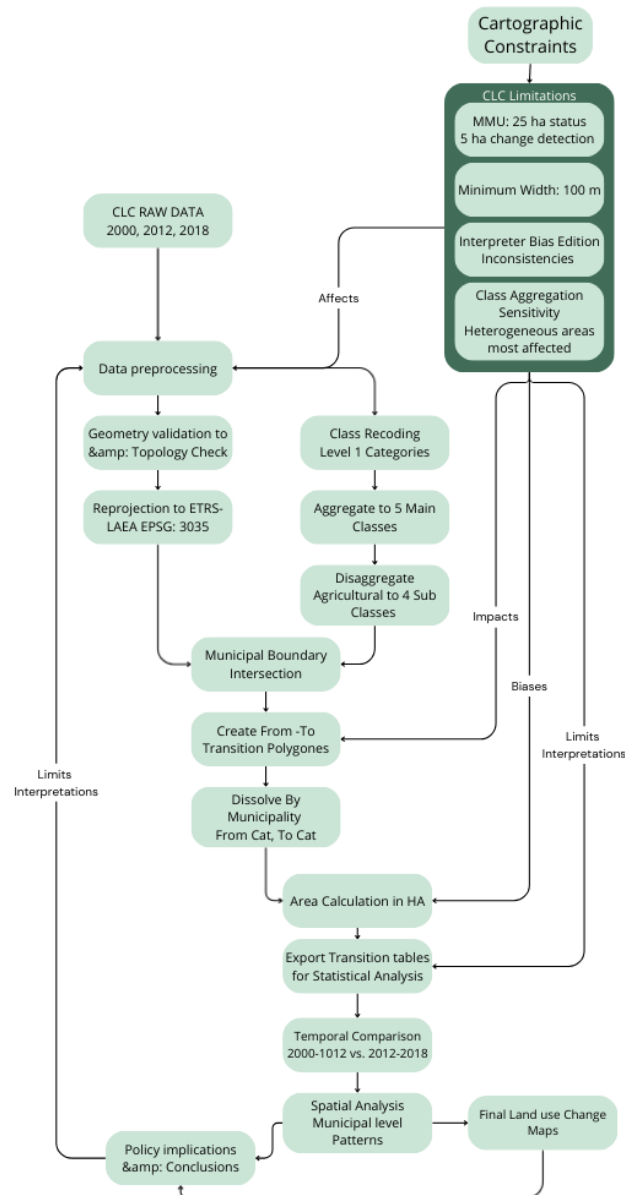


Fig 1. Methodological procedure. Source: author's elaboration

CLC layers were reprojected to EPSG:3035, intersected pairwise with municipal boundaries to generate from-to transition polygons, dissolved by municipality and transition type, and used to compute area changes (ha) for statistical analysis.

CLC's cartography applies a 25-ha minimum mapping unit for status layers and a 100-m minimum linear width, while change layers use a 5-ha MMU; these generalisation rules can suppress fine-grained or linear

transformations typical of smallholder and peri-urban settings (Rosina et al., 2020). Beyond scale effects, interpreter differences and temporal inconsistencies across editions may introduce variation unrelated to “real” land change. Results are also sensitive to class aggregation, with substantial impacts on the size and dynamics of Heterogeneous agricultural areas and on any simulations derived from those classes (Aune-Lundberg & Strand, 2021; Bielecka & Ciołkosz-Styk, 2019; Díaz-Pacheco & Gutiérrez, 2014; Varga et al., 2020b).

4. Empirical Results

4.1 Main trends in agricultural area evolution at the national level

Over 2000–2020, Albania’s agricultural land envelope remained essentially unchanged – hovering around 0.80 million ha (from 807,789 ha in 2000 to 797,467 ha in 2020; net -1.3%) (Fig. 2). This stability coexisted with powerful shocks – post-socialist decollectivisation, mass migration, and rapid peri-urbanisation. However, several buffers kept the national agricultural footprint intact: slow and costly land transactions in a highly fragmented holding structure, limited mechanisation on scattered plots, and path-dependent uses on marginal terrains. From the late 2000s, investment support and market access improved; however, the combination of small plot sizes, transaction frictions, and tenure legacies meant that pressure was absorbed within agriculture rather than through large net exits to non-agricultural sector in line with previous studies “Ciaian et al., 2018” and “Guri et al., 2016”.

Within the agricultural envelope, heterogeneous mosaics progressively recomposed into clearer use types – Arable expanding on favourable and consolidated plots, Pastures growing on sloping or labour-demanding terrains, while Permanent crops held roughly constant – patterns consistent with household adaptation under labour scarcity and migration consistent with findings reported in the literature “World Bank, 2024”. Micro-evidence from Albania links fragmentation to diversification and, where consolidation or selective investment is feasible, to specialisation; where it is not, plots drift toward extensive uses or are intermittently grazed. In short, the level stayed steady while the mix shifted – an outcome shaped by post-reform institutions and rural demography, and one we will unpack at the municipal scale in the subsequent sections.

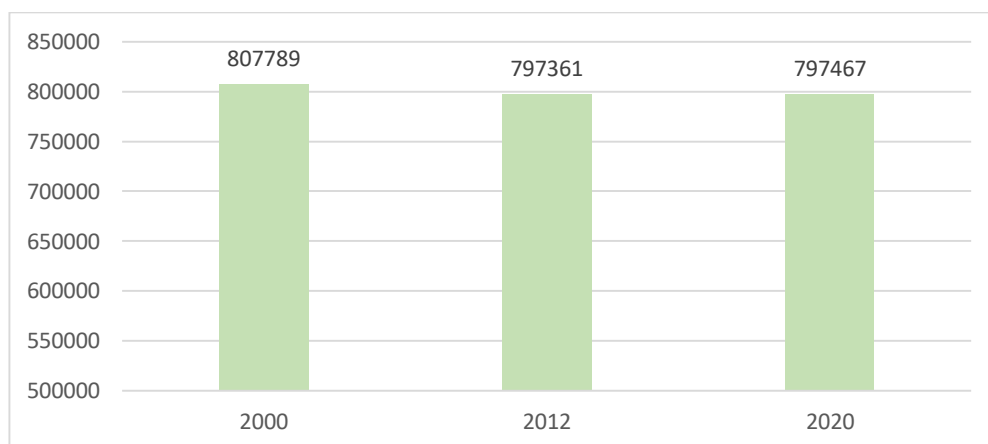


Fig 2. Agricultural land in Albania for the period 2000–2012. Source: author’s elaboration

Between 2000 and 2012, Albanian agriculture underwent a significant transformation, albeit without a corresponding increase in size. Families concentrate effort on the land that pays back: valley floors and gentle slopes are brought under tighter cultivation, while scattered plots on harder ground drift toward extensive uses. Early public support to farm investment (notably for orchards) and strong out-migration push in the same direction – intensify the better hectares, loosen the grip on the rest (Ciaian et al., 2014; Civici, 2002; Guri et al., 2016). The result is less of the old patchwork and more clearly defined uses, as shown in Fig. 3.

From 2012 to 2020, the system settled. The big moves have largely happened; what follows is refinement rather than overhaul. Policies mature, households have already reallocated labour and capital, and the parcels that were easy to adjust have been adjusted. What remains are the stubborn bits – plots with awkward access, steep slopes, or ownership frictions – so change slows to a lower and more stable rate (Ciaian et al., 2018; Guri et al., 2016).

Set side by side, 2000 vs. 2020 capture the main pattern. Arable land almost doubles its share – from about 14% to 27% – signalling a larger nucleus of directly cultivable, mechanisable fields. Permanent crops account for nearly 8% nationwide: despite the 2007–2012 push for olive and nut orchards, these programmes nudged local landscapes more than they rewrote the national mix (Ciaian et al., 2018; Civici, 2002; Guri et al., 2016). That structural pivot – toward flexible, annual-crop systems – matches how small, fragmented farms manage risk and liquidity.

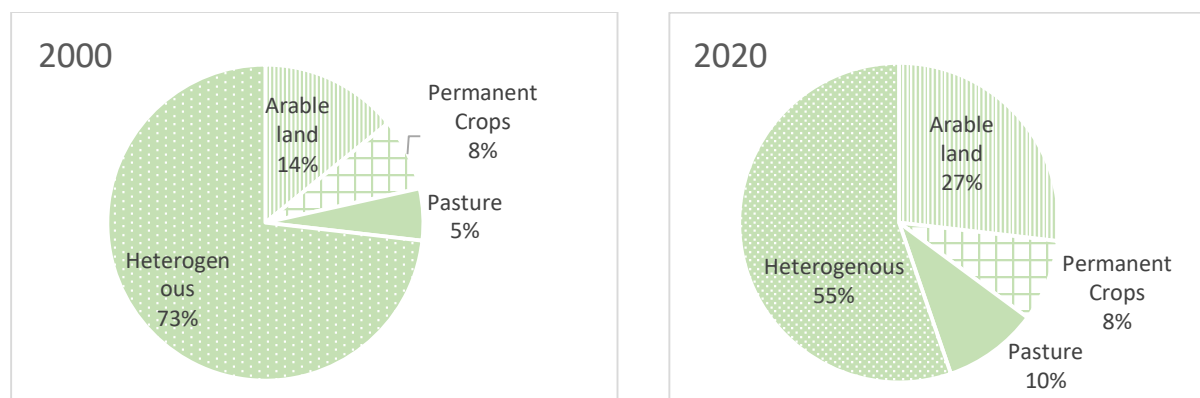


Fig 3. Agricultural land structure during the period 2000–2020 (in %). Source: author's elaboration

The other quiet shift is the rise of pastures – from 5% to 10%. Steeper, more labour-intensive parcels that once saw intermittent cropping are now increasingly grazed. Demography is part of the reason: Albania's rural share has shrunk from roughly 64% in 1990 to 35% in 2023 (34.6% in 2024), thereby tightening peak-season labour on marginal land (World Bank, 2024). With fewer hands available, extensive uses make economic sense on the edges, while the good land doubles down on crops (Müller et al., 2009; Sikor et al., 2009a).

Over the course of two decades, Albania's heterogeneous agricultural areas – the mixed mosaics of small arable areas, perennials, and intermittent grazing – acted like a reservoir that feeds specialisation. As farm investment, market access and confidence in agriculture grow, households simplify land use: the easier, better-located parcels are pulled out of the mosaic and become Arable; the harder, steeper ones settle into Pasture. That is why this class shrinks so visibly in our accounting: roughly -150 thousand ha between 2000 and 2020, about 26% of its 2000 extent (from 591,111 to 440,676 ha), with its share falling from 73% to 55% of agricultural land. The more agriculture professionalises, the more this "reservoir" is tapped and transformed.

The mechanism is familiar on the ground. Fragmentation pushes families to diversify across tiny plots for risk and self-provisioning, but whenever consolidation (formal or informal), better access, or selective investment is possible, parcels move toward clearer categories – most often Arable on gentle terrain and accessible valley floors (Ciaian et al., 2018). Small, cumulative steps matter, such as levelling a plot, fixing drainage, laying a short pipe from an existing canal, or simply aligning field boundaries with a neighbour, can tip a mixed patch into regular field crops. This is why Arable almost doubles its share nationally (from 14% to 27%) while Permanent crops remain broadly steady near 8% – perennials need larger, committed blocks and longer payback; many smallholders prefer the flexibility of annuals under fragmented tenure and income uncertainty according to "Civici, 2002" and "Guri et al., 2016".

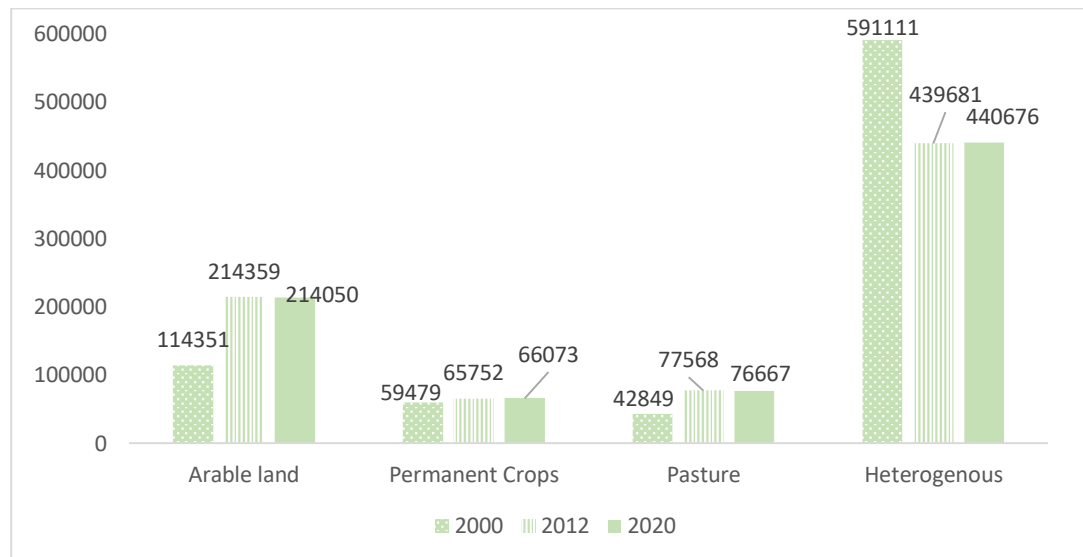


Fig 4. Land structure in ha for the period 2000–2020. Source: author's elaboration

Labour constitutes a key structural constraint. As the rural population share declined from roughly 64% in 1990 to 35% in 2023 (34.6% in 2024), farm households have faced a reduced capacity to manage fragmented holdings. Where slopes are steep and access is limited, extensive grazing tends to prevail, consistent with observed national land-use shifts: pasture expanded from 5% to 10% of agricultural land between 2000 and 2020. In contexts such as Albania, migration and population ageing raise the costs of maintaining heterogeneous agricultural mosaics; parcels either consolidate into arable use or transition toward pasture as a lower-input land-use configuration (Müller & Munroe, 2008; World Bank, 2024) (Figures 4–5).

In Part II, we will examine where, municipally, the reservoir was drawn down most and whether the drawdown reflects consolidation around markets and infrastructure or a labour-driven move toward extensive uses – linking those patterns to the Albanian micro-evidence on fragmentation, diversification and specialisation.

4.2 Local realities – analysis on a municipality basis

The municipality analysis is organised in two comparable windows – 2000–2012 and 2012–2020, the latest CLC status years, and focuses on four agricultural subclasses: Arable land, Permanent crops, Pastures, and Heterogeneous agricultural areas. Looking below the national average matters because land-use change is spatially uneven and scale-dependent: local configurations of terrain, tenure, infrastructure and markets can pull the same national system in different directions (Hersperger & Bürgi, 2009; Lambin & Meyfroidt, 2010, p. 2009, 2010). All measurements are harmonised to a single, post-reform municipal geometry and computed in an equal-area CRS so that percentages are comparable across time and space.

Municipalities near extensive labour and consumer markets tend to specialise earlier and faster, while upland or peripheral municipalities absorb pressure through extensive uses; the same drivers – fragmentation, migration, access to processing and irrigation – play out differently across places (Ciaian et al., 2014; Guri et al., 2016). Pockets of Permanent-crop expansion (e.g., olives and nuts during the 2007–2012 push) may coexist with plateaus or declines elsewhere; Arable gains on coalescing valley floors can sit next to Pasture gains on steeper tracts. In short, the municipal lens surfaces local realities – and policy entry points – that remain invisible in national totals (Civici, 2002; Müller & Munroe, 2008; Sikor et al., 2009a).

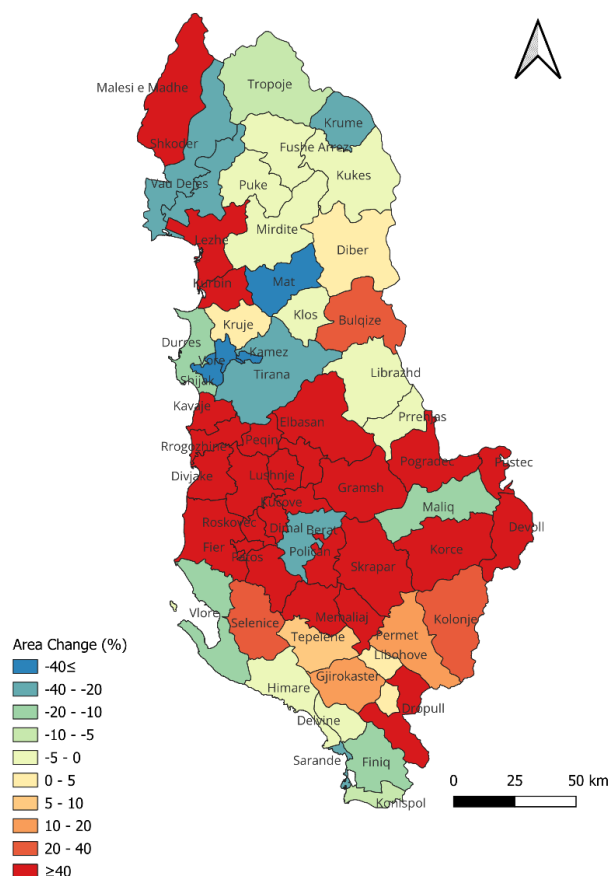
To facilitate the local base analysis, we have reported the changes as a percentage of the municipal agricultural area for each subclass and period, and then derived from-to matrices to characterise the transitions. Two database shortcomings must guide the interpretation:

- (i) CLC's generalisation rules (25-ha MMU for status; 5-ha for change) under-detect minimal, linear or highly fragmented shifts; and
- (ii) (ii) the modifiable areal unit problem (MAUP) means patterns can look different under alternative zoning – here we fix boundaries and projection to minimise artefacts, but we interpret hot- and cool-spots as indicative, not absolute (Díaz-Pacheco & Gutiérrez, 2014; Fotheringham & Wong, 1991; Pontius et al., 2004). The subsequent maps for 2000–2012 and 2012–2020 illustrate these municipal contrasts and lay the groundwork for the transition analysis that follows.

At the municipal scale, the national arc becomes clear: a decade of **substantial arable expansion (2000–2012)** followed by **broad stabilisation (2012–2020)**, with trajectories driven by local mixes of soils, slope, parcel structure, irrigation and market access (Hersperger & Bürgi, 2009; Lambin & Meyfroidt, 2010; Verburg et al., 2004).

The most significant gains in 2000–2012 cluster across the **Western Lowlands** – Myzeqe and its belt of municipalities (Divjakë, Lushnjë, Fier, Roskovec, Rrogozhinë, Patos) – where flat terrain, good soils and rehabilitated irrigation/drainage let farmers shift mosaics into field crops (Lushaj, 2021; World Bank, 1999, 2006). Water bodies and schemes such as **Thana** and the coastal drainage lines around Divjakë/Myzeqe underpin this intensification by lowering production risk and enabling annual rotations (State of Water Quality of Thana Reservoir and Its Influence on Irrigated Soils, 2021).

Dynamics of Arable Land Cover 2012–2020



Dynamics of Arable Land Cover 2012–2020

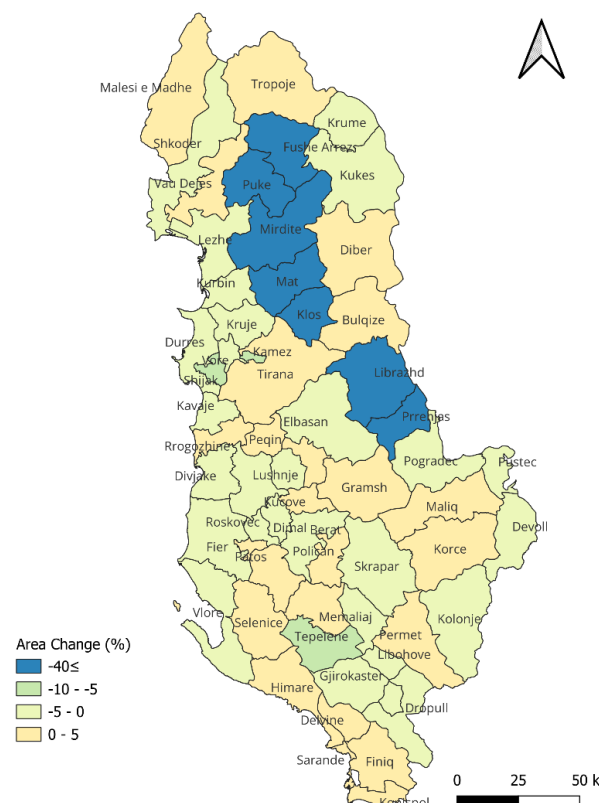


Fig 5. Dynamics of Arable Land Cover for the period 2000–2020. Source: author's elaboration

JRC–IPTS farm-typology work places the most market-oriented **arable** and **polyculture** types in these same lowlands, implying the smallest “distance” from mixed mosaics to arable fields, where irrigation and markets are close. This is why the early 2000s recomposition appears first and strongest there (European Commission Joint Research Centre (JRC), 2015).

Around **Tirana** and **Durrës** – and to a lesser degree the belts of **Shkodër** and **Vlorë** – arable land faces sustained pressure from construction and peri-urban conversion, with land values and commuting opportunities tipping choices away from cropping even on good soils (Haxhiu et al., 2025; Regional development in the Tirana–Durrës corridor, 2022).

Across the Korçë plain, arable land expands strongly from 2000 to 2012, as expected in a classic cereal–potato basin. However, the Maliq sub-area lags because peat soils, drainage limitations, and the legacy of the former marsh make conversion costlier and more fragile, particularly where water management is weak (Damo & Icka, 2010; Maho et al., 2025). After 2012, most municipalities registered **small arable changes** because the easy conversions on good land had already occurred, while mountain municipalities – **Fushë-Arrëz, Pukë, Mirditë, Mat, Klos, Librazhd** – see retreat as steep slopes, thin soils and long market distances meet a shrinking rural workforce, consistent with earlier evidence on upland abandonment and sustained out-migration (Müller et al., 2009; Sikor et al., 2009).

Dynamics of Permanent Crops Cover 2000–2012

Dynamics of Permanent Crops Cover 2012–2020

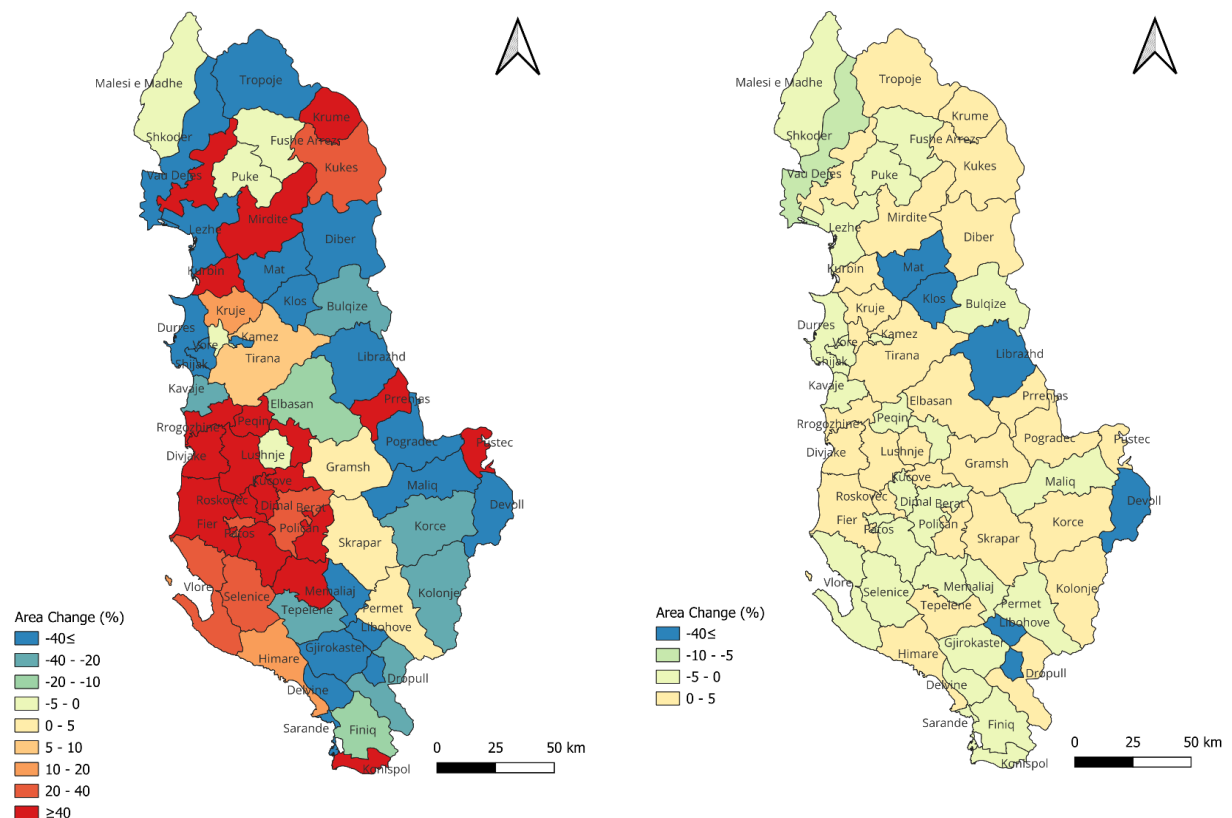


Fig 6. Dynamics of Permanent Crop Cover for the period 2000–2020. Source: author’s elaboration

Permanent crops in Albania have long been a hill-country story, because arable land per capita is limited, households historically placed tree crops on sloping, rain-fed terrains – olives and nuts along the foothills and orchard belts in cooler uplands – using low external inputs and family labour (Guri, Jouve, & Muça Dashi, 2014; Zhllima & Guri, 2013). That spatial logic reflects both agronomy and institutions: fragmented holdings and thin land markets made tree crops a natural fit where mechanised field crops were costly to run, while proximity to homesteads reduced supervision (Cungu & Swinnen, 1999; Guri, Jouve, & Muça Dashi, 2014).

Even though national permanent-crop area stays roughly flat over the period, municipal patterns show delocalisation into lowland or gently rolling municipalities with better market access and improved water control – especially across the Myzeqe plain and parts of Vlorë – where investment went into denser planting, modern spacing and quicker market logistics (European Commission Joint Research Centre (JRC), 2015; World Bank, 2006). In these settings, trees shift from extensive hill plots to intensified lowland orchards closer to packing, cold storage and export corridors, which shortens the time to cash and reduces losses – hence the visible gains in permanent-crop shares in the Western Lowlands despite the flat national total (European Commission Joint Research Centre (JRC), 2015; Lambin & Meyfroidt, 2010).

Several northern mountain municipalities – such as Dibër, Mat, and Klos – and classic orchard zones in the Korçë–Pogradec–Devoll basin show declines, a pattern consistent with three frictions: varietal choices not aligned to markets, fragmented parcels that raise maintenance costs, and missing links in the processing chain that depress farmgate prices (Guri, Jouve, & Muça Dashi, 2014; Rajcaniova et al., 2018).

The second window shows small net changes almost everywhere, with mild retreats in several mountain municipalities and stable or slight increases in lowland ones that had already invested, mirroring the stabilisation seen for arable land (European Commission Joint Research Centre (JRC), 2015). By this time, the first investment cycle had matured, the “easy” relocations were done, and labour scarcity – reinforced by continued rural out-migration – made the upkeep of scattered hill orchards harder to sustain, while better-located plantings held their ground or inched up (Hersperger & Bürgi, 2009; World Bank, 2024).

Permanent crops do not surge nationally, but they move – from dispersed, low-input hill plots toward fewer, more intensive, market-proximate orchards in the plains and lower foothills, particularly across Myzeqe and parts of Vlorë (European Commission Joint Research Centre (JRC), 2015; World Bank, 2006). Where variety renewal, water control and cold-chain investments co-evolved, municipalities retained or expanded perennial plantings; where those pieces were missing, especially in labour-short, highland settings, perennials receded or were replaced by more flexible uses (Guri, Jouve, & Muça Dashi, 2014; Müller et al., 2009). As with other CLC-based findings, small-scale plot shifts may be under-detected by the mapping thresholds; however, the direction and spatial logic of the relocation remain robust to these constraints (Díaz-Pacheco & Gutiérrez, 2014).

Across many municipalities, the early 2000s brought a marked increase in pasture cover, less because of livestock surges than because agriculture specialises on the best land while marginal cropland exits annual tillage and reverts to grazing or rough grass, a classic land-use transition under market opening and labour reallocation (Lambin & Meyfroidt, 2010; Mottet et al., 2006; Verburg et al., 2004). The pattern fits Albania’s mixed terrain: valley floors intensify crops; hills and mountains with thin soils, steep slopes or long market distances drift toward extensive uses that are cheaper to manage, especially as households remodel their portfolios after decollectivisation (Müller et al., 2013; Sikor et al., 2009b).

Municipalities of the south and southeast – and upland belts more generally – show the clearest growth of pasture area in 2000–2012, while parts of the Western Lowlands move the other way as irrigation rehabilitation and proximity to markets pull land into field crops (World Bank, 1999, 2006). This spatial sorting – cropland concentrating where water control and access are strongest, and pasture absorbing land where cultivation is costly – is typical of Mediterranean agro-ecosystems in transition as farms re-optimize land, labour, and capital (Debussche et al., 1999; MacDonald et al., 2000).

Rural out-migration and ageing tighten the supply of seasonal labour, raising the opportunity cost of keeping fragmented, sloping parcels in tillage and making extensive grazing a practical fallback; the demographic downsizing of the farm workforce is well documented for Albania and the region, and it amplifies the conversion of hard-to-farm land to pasture (Müller & Munroe, 2008; World Bank, 2024; Zhllima & Guri, 2013). In short, the pasture map of 2000–2012 reads like a demographic map as much as an agricultural one (Lambin & Meyfroidt, 2010; Sikor et al., 2009b).

Administrative statistics indicate that between 2014 and 2024, the cattle herd declined by approximately 45% and small ruminants by 36%, signalling stresses – such as price volatility, feed costs, labour scarcity,

and weak processing chains – that extend beyond land availability (INSTAT, 2024). Micro-level work echoes these constraints: farm incomes are thin, labour is mobile, and many households diversify into non-farm work even where land for grazing is plentiful (Guri et al., 2016; Zhllima & Guri, 2013). Similar decouplings of grassland extent from herd trends are noted across Southern Europe, where structural change outpaces pastoral adaptation (Keenleyside & Tucker, 2010; MacDonald et al., 2000).

Dynamics of Pastures Cover 2000–2012

Dynamics of Pastures Cover 2012–2020

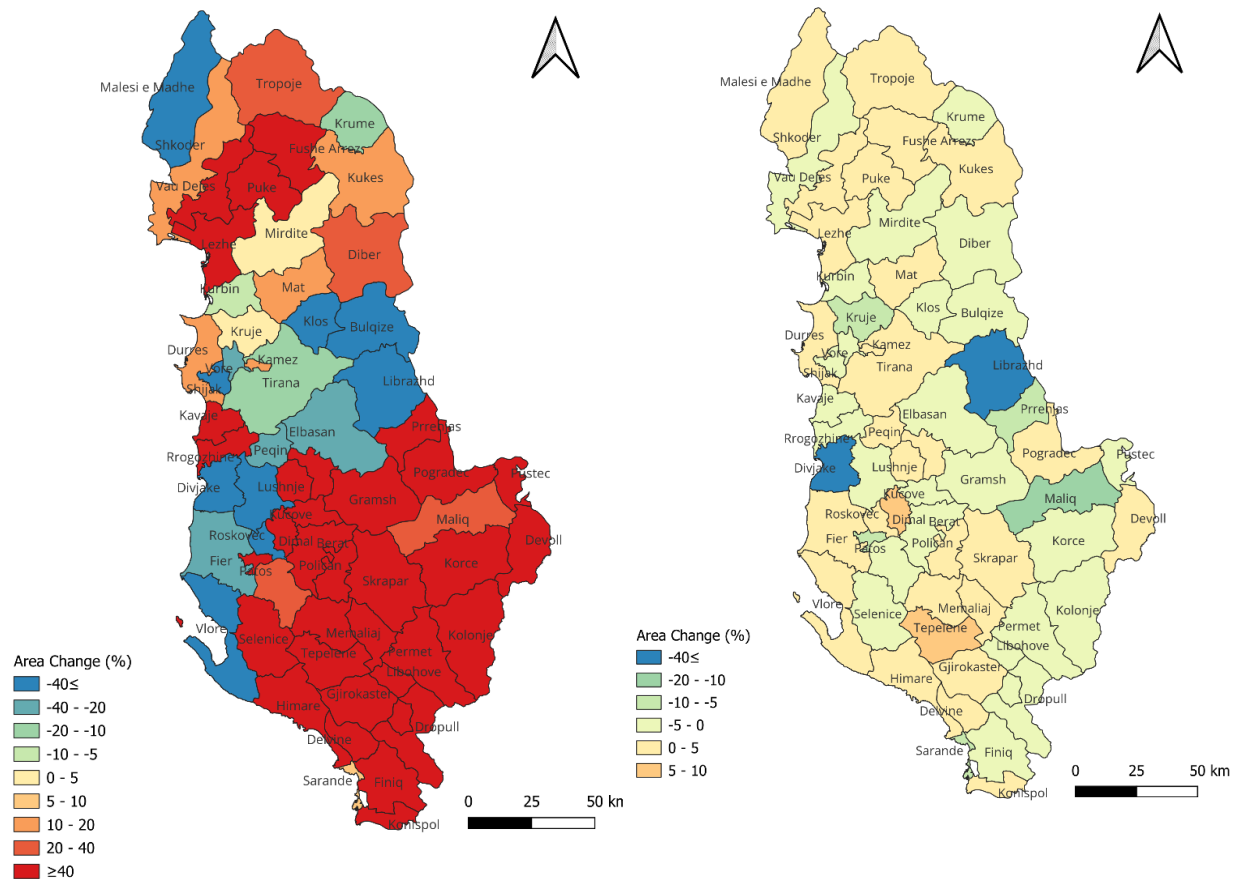


Fig 7. Dynamics of Pasture Cover for the period 2000–2020. Source: author's elaboration

Turning potential into production depends on access, water points, tracks, tenure clarity and collective management – without those, larger mapped pasture areas do not translate into sustainable grazing pressure or viable flocks (Hagedorn, 2014; Ostrom, 1990). In Albania's uplands, fragmented use rights and limited infrastructure can keep costs high and utilisation low, so the apparent ecological opportunity created by cropland retreat is only partially captured by the livestock economy (Guri et al., 2016; Zhllima & Guri, 2013).

The second window shows small net changes almost everywhere and a few municipal outliers (e.g., Librazhd, Divjakë, Maliq), a signal less of pressure from herds than of local land-use reallocations and classification shifts as the agricultural mix stabilises after the big rebalancing of the 2000s (Díaz-Pacheco & Gutiérrez, 2014; European Commission Joint Research Centre (JRC), 2015). With cropland already concentrated on the best hectares and labour persistently scarce, the pasture map essentially holds its ground, illustrating a new equilibrium where extensive uses persist on the margin while the core farming area remains in crops (Lambin & Meyfroidt, 2010; World Bank, 2006).

In the CLC system, *Heterogeneous Agricultural Areas* bundle the mixed mosaics – bits of arable, perennials and rough grass – that smallholders keep in flexible use; as farming professionalises, those mosaics tend to dissolve and reappear as cleaner categories (arable, pasture, orchards) in an almost inverse relationship

with sector development and market access (i.e., the more specialisation, the less “heterogeneous”). That inverse pattern is a classic outcome of land-use transitions under improving infrastructure, irrigation and market signals, and it is precisely how this class behaves in Albania over the long run (Lambin & Meyfroidt, 2010; Verburg et al., 2004; Zhllima & Guri, 2013).

Between 2000 and 2012, the most significant *losses* of heterogeneous area line up with the country’s most farmable terrain – the Western Lowlands/Myzeqe and other market-proximate plains – where improved water control and short distances to buyers made it worthwhile to turn patchwork plots into regular fields and orchards. Put differently, the map of heterogeneous *losses* resembles the negative of the arable-gains map, because the same places that intensified crops are also the ones that dismantled mosaics first (European Commission Joint Research Centre (JRC), 2015; World Bank, 1999, 2006). The shift aligns with Albanian micro-evidence on how fragmentation, coupled with selective investment and improved roads/water, leads to land being allocated to clearer, mechanizable uses (Ciaian et al., 2018; Zhllima & Guri, 2013).

In parts of the uplands – with steeper slopes, longer market distances, and weaker irrigation – heterogeneous areas contract more slowly, and in a few municipalities, even tick up, reflecting continued parcel fragmentation, defensive diversification, and the high fixed costs of switching to specialised systems. These are the places where households keep options open across tiny plots, and where out-migration and ageing complicate the jump to capital-intensive crops; Albania’s upland studies have documented precisely these frictions since the 2000s (Müller et al., 2009; Sikor et al., 2009).

Dynamics of Heterogeneous Agricultural Areas 2000-2012

Dynamics of Heterogeneous Agricultural Areas 2012-2020

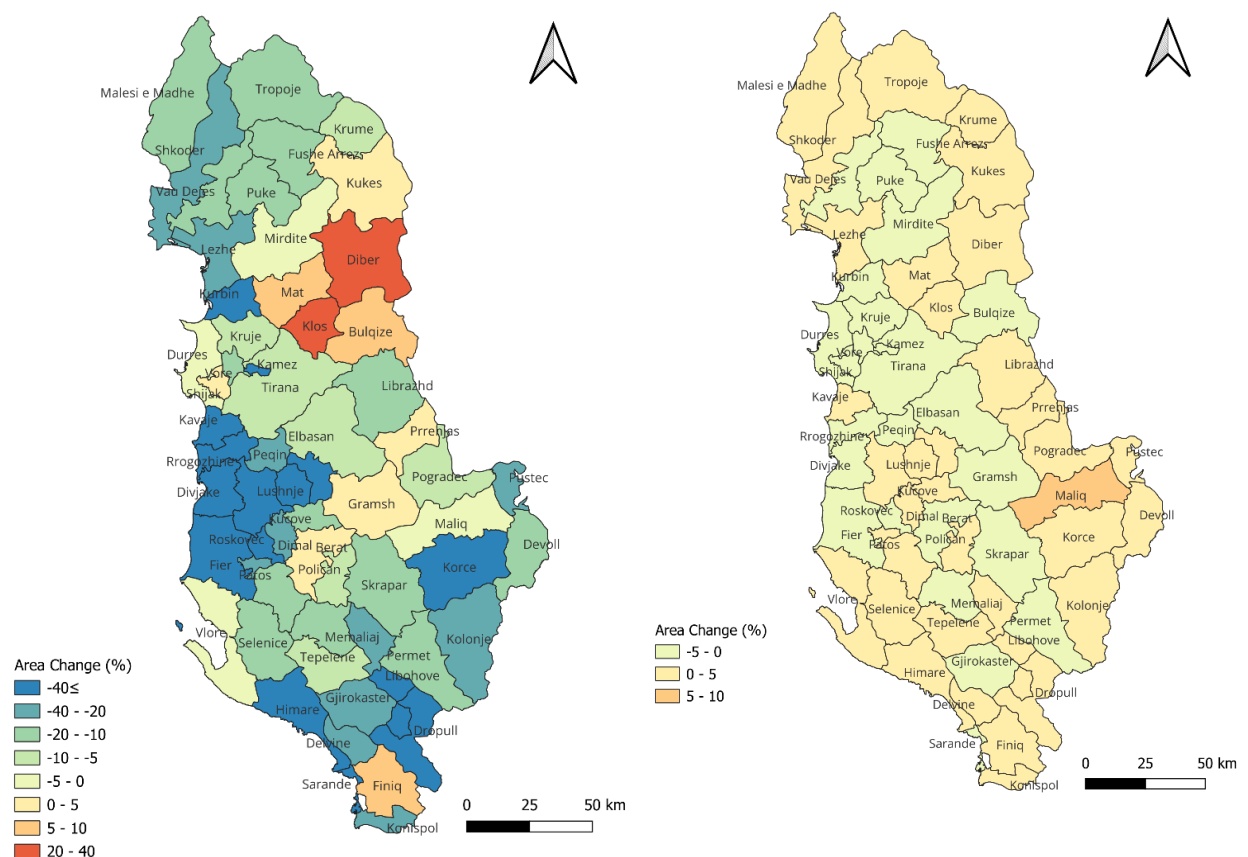


Fig 8. Dynamics of Heterogeneous Agricultural Area Cover for the period 2000–2020. Source: author’s elaboration

After 2012, the heterogeneous class changes little almost everywhere, which fits a system that has already reallocated the “easy” hectares and now moves in smaller steps. Two forces reinforce the quiet: sunk

investments that lock in use patterns on the plains, and persistent labour scarcity that keeps marginal hills extensive but not necessarily convertible to orchards or tillage.

For policy, the heterogeneous share is a barometer: when irrigation schemes, consolidation instruments, and value-chain investments take effect, the reservoir shrinks, and the gains materialise as arable or (on steeper ground) pasture.

5. Discussion

Taken together, the maps, the transition tables, and the Albania-specific literature point to a story that cleanly follows our framework. First, institutions and farm structure mattered early and deeply. The radical, egalitarian split-up of state/collective farms created a fine-grained mosaic of small, scattered parcels, raising the cost of coordination and mechanisation. In such settings, households keep options open – diversifying across tiny plots – until selectively investing on the best land or informally amalgamating neighbouring strips becomes feasible. That is precisely the mechanism behind the long, visible draw-down of the “mosaic” class (Heterogeneous agriculture) and the rise of clearer categories on good land (Arable) versus marginal land (Pasture) during 2000–2012 (Cungu & Swinnen, 1999; Guri et al., 2009, 2018).

Second, spatial economics – markets, irrigation, and terrain – sorted uses predictably across space. The Western Lowlands and the Korçë basin, with flatter terrain, better soils, and legacy water control, had the shortest “distance” from mixed mosaics to field crops once confidence and liquidity returned. That is why the largest 2000–2012 arable gains and heterogeneous losses cluster where irrigation was rehabilitated and buyers are close, while uplands rebalanced toward grazing as cultivation costs rose with slope and distance (European Commission Joint Research Centre (JRC), 2015; World Bank, 1999, 2006).

Third, demography tightened the labour constraint. Albania’s rural share fell from roughly two-thirds in 1990 to about one-third by 2023/2024. Fewer seasonal workers for scattered, sloping plots tips the calculus away from labour-hungry tillage and toward extensive uses on the margin – exactly what we see in the pasture map and in municipal trajectories in mountain belts after 2012 (Müller et al., 2013; Sikor et al., 2009b; World Bank, 2024).

Fourth, measurement limits shaped what we could see. CLC remains a consistent, harmonised baseline for direction and magnitude, but its 25-ha status MMU, 5-ha change MMU, and 100-m minimum width under-detect very small or linear transformations typical of smallholders and peri-urban fringes. Our interpretation therefore emphasises robust, map-scale movements while cross-referencing administrative series and micro-studies; future work can add multi-source fusion to capture sub-MMU dynamics (Copernicus Land Monitoring Service, 2017; European Environment Agency (EEA), 2007b; Rosina et al., 2020).

Finally, after 2012 we observe structural stabilisation in the maps and upgrading in the economy. The agricultural envelope stops moving much; instead, value grows through capital deepening – grading and packing centres, cold-chain, standards, and processing – backed by larger public envelopes (IPARD III) and national co-financing (AZHBR, 2023; European Commission, 2022; UNIDO, 2023). Official trade statistics are consistent with this turn: by 2023, food and live-animal exports reached about 10% of merchandise exports, up 50.4% over 2019, with momentum continuing into 2024–2025 per EU monitoring (European Commission, DG AGRI, 2024; INSTAT, 2024).

One caution is livestock: more mapped pasture did not yield larger herds. Since the mid-2010s, cattle and small-ruminant numbers declined despite the ecological space created by cropland retreat – signalling bottlenecks in labour, feed costs, processing, and collective resource governance that land availability alone cannot resolve (Guri et al., 2016; INSTAT, 2024b; Zhllima & Guri, 2013). This is precisely where the institutions for commons and cost-sharing infrastructure – water points, tracks, animal-health and extension systems – determine whether potential turns into viable production (Hagedorn, 2014; Ostrom, 1990).

A second caution is environmental. Experience from Central and Eastern Europe shows that a headlong chase for tonnage can carry hidden costs for biodiversity, soils, and water, and can leave farm incomes fragile once externalities are priced in. Albania's advantage is timing: the area transformation has largely happened, so the next step can be smart intensification – precision irrigation on rehabilitated schemes, climate-smart rotations, targeted varietal renewal aligned to export windows, and broad uptake of quality/traceability – without repeating the worst ecological arc observed elsewhere (Emmerson et al., 2016; Levers et al., 2016; Pe'er et al., 2014; Strohbach et al., 2015; Zabel et al., 2019).

Taken together, P1–P5 describe a coherent sequence for Albania's rural transformation: as markets and irrigation improve, mixed mosaics contract and arable (and some intensive perennials) expand in the best-watered lowlands (P1), while labour scarcity on steeper, fragmented terrain nudges use toward pasture (P2) (European Commission Joint Research Centre (JRC), 2015; Müller et al., 2013; Sikor et al., 2009; World Bank, 2006). Perennial crops do not grow everywhere; rather, they relocate from extensive hill plots to more accessible lowlands/foothills where logistics, water control and packing infrastructure reduce risk (P3) (European Commission Joint Research Centre (JRC), 2015; Guri, Jouve, & Muça Dashi, 2014). After this recomposition wave, the system stabilises: sunk investments and residual frictions mean post-2012 change is smaller and place-specific (P4) (Ciaian et al., 2018; Guri et al., 2016). Since 2020, the growth margin shifts from land reallocation to upgrading – quality standards, cold chain, processing and advisory – mirrored in programme finance and export momentum (P5) (European Commission, 2022; INSTAT, 2024b; UNIDO, 2023).

P1 (Market–water specialisation). Municipalities with better market access and functioning irrigation show larger declines in Heterogeneous areas and gains in Arable or intensive Perennials, while keeping total agricultural area roughly constant – clearest across the Western Lowlands/Myzeqe and the Korçë basin (European Commission Joint Research Centre (JRC), 2015; World Bank, 2006).

P2 (Labour–terrain sorting). Steeper, more remote municipalities with stronger post-1990 out-migration and ageing register bigger increases in Pasture and smaller arable gains, consistent with rising seasonal labour scarcity on fragmented slopes (Müller et al., 2009, 2013; World Bank, 2024).

P3 (Relocation of perennials). Permanent crops shift from dispersed hill plots toward lowlands/foothills with better logistics and water – producing local gains (e.g., Myzeqe, parts of Vlorë) despite flat national totals (European Commission Joint Research Centre (JRC), 2015; Guri, Jouve, & Muça Dashi, 2014).

P4 (Stabilisation after 2012). Once mosaic areas were reallocated, system-wide change decelerated: sunk investments, residual fragmentation and institutional frictions yielded small, place-specific reallocations rather than sweeping shifts (Ciaian et al., 2018; Guri et al., 2016).

P5 (Post-2020 upgrading). Growth since 2020 is driven more by value-chain upgrading (quality, standards, cold chain, processing) than by further land-class transitions, aligning with programme finance (IPARD III, national schemes) and trade momentum (European Commission, 2022; INSTAT, 2024b; UNIDO, 2023).

6. Conclusions and policy implications

The maps tell a compact story. Phase I (2000–2012) dissolved mosaics: Arable consolidated on the best hectares while Pasture expanded where labour and terrain made tillage costly, with total agricultural area roughly unchanged. Phase II (2012–2020) stabilised that pattern, leaving smaller, place-specific reallocations as sunk investments and residual frictions dominated. Post-2020, growth margins shifted from “where farming happens” to “how it is organised” – quality, logistics, and standards – supported by IPARD III and national schemes and reflected in a step-up of agri-food exports (Civici, 2002; European Commission, 2022; European Commission, DG AGRI, 2024; INSTAT, 2024b; UNIDO, 2023).

Policy should now match this structure:

- Lower transaction costs on land so that voluntary consolidation and cooperative service models can proceed where they make economic sense – simplifying production on plains while preserving flexibility where conditions are marginal (Cungu & Swinnen, 1999; Sikor et al., 2009b).

- Finish the water story: prioritise maintenance and precision-use upgrades on rehabilitated schemes (measurement, scheduling, energy efficiency), because irrigation remains the hinge that turns mosaics into stable, high-value rotations on the lowlands (World Bank, 1999, 2006).
- Deepen value chains: scale grading/packing hubs, cold storage, processing and logistics, tied to export-oriented standards (HACCP, GlobalG.A.P.) and targeted varietal renewal; use IPARD III and the Skema Kombëtare to crowd in private investment and advisory services (AZHBR, 2023; European Commission, 2022; UNIDO, 2023).
- Rebuild the livestock enabling environment: invest in rangeland governance (clear rules and monitoring), water points and tracks, veterinary and extension capacity, and risk-finance instruments, recognising that institutions – not hectares – unlock herd recovery (Hagedorn, 2014; INSTAT, 2024b; Ostrom, 1990).
- Guard the resource base: couple public support to measurable soil, water, and biodiversity safeguards so Albania’s upgrading does not replay the “productivism first” trap seen elsewhere in the region (Levers et al., 2016; Pe’er et al., 2014; Sutcliffe et al., 2015; Zabel et al., 2019).
- Upgrade evidence: keep using CLC for the big picture but complement it with multi-source fusion (HRL/Sentinel/admin data) and timely structural data to monitor sub-MMU change and policy targeting at municipal scale (FAO/INSTAT, 2017; Rosina et al., 2020).

If Albania leans into this sequence – transactions and water on the plains, institutions on the rangelands, and quality-first upgrading across value chains – the country can grow value and resilience without expanding the agricultural footprint, aligning competitiveness with stewardship and the lived constraints of its post-reform farm structure (European Commission Joint Research Centre (JRC), 2015; INSTAT, 2024b).

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