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Comparative Analysis of Land Policy Instruments to Tackle Land Fragmentation in the Face of Mounting Climate Risks

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ABSTRACT

Land fragmentation has several manifestations, including but not limited to, the existence of very small parcels, having an awkward shape, scattered with a considerable distance between parcels, and the absence of road access for each land parcel. It is a serious problem in Ethiopia. Landholders own numerous, geographically scattered, relatively small, and fragmented parcels of land, typically ranging from 4 to 5 parcels. On average, their total landholding size amounts to approximately 1.5 hectares, which translates to an average of 0.3 hectares per parcel. It is reaching a critical point that calls for government policy action. Most of the research in this regard concentrated on fragmentation as a problem and farmland consolidation as a solution. Others also revolve around technical issues that need to be considered to implement farmland consolidation. There is no study, as far as I review and I know, on different land fragmentation tackling policy tools apart from land consolidation; and the legal regimes and institutional issues for managing land fragmentation. The main objective of this research is, therefore, to prepare a comparative analysis of different land policy instruments to tackle land fragmentation in Ethiopia and assess the legal and institutional situation of their application. Secondary data through a literature review is conducted using a systematic literature review approach. As the primary source, laws related to land consolidation are reviewed. The research revealed that land consolidation is not the only mechanism to manage land fragmentation, there are various policy instruments. While many instruments involve the re-organization of landholding (e.g., voluntary land exchanges, various forms of land consolidation, market-based land transactions, land banking, expropriation & and compensation), others focus on the consolidation of land use (cluster farming, cooperative formation). Some of the alternative policy tools may be used as preparatory initiatives for land consolidation, while others can be taken as standalone management tools. Other measures, like determining minimum parcel size, encouraging voluntary land exchange that will bring holding consolidation or mitigate distance fragmentation, prohibiting land re-distribution, revisiting inheritance rules, cluster farming, and so on could be considered. It is imperative to have comprehensive and full-fledged policies and laws for managing land fragmentation. Besides, it is essential to establish a land fragmentation management organization, the details to be investigated, which should include a land consolidation commission or unit to oversee national land fragmentation management initiatives. Moreover, there should be an understanding that not all land fragmentations are problems. Research, education, training, and awareness creation on farmland fragmentation and its management tools, one of which is land consolidation, is very important.

Keywords: Land fragmentation, Policy tools, land consolidation, legal framework, institutional arrangement

1. INTRODUCTION

1.1. Background

Land fragmentation is a serious administrative, productivity, and investment problem. It limits the application of modern agricultural types of machinery vis-à-vis productivity ([Bezabih & Goshu, 2022](#)). Ethiopia is not an exception to this problem. It is a critical problem in the highland part of Ethiopia ([Yimer, 2014](#)) ([Alemu et al., 2017](#); [Leta et al.](#)) ([Zewdie & Tamene, 2020](#)); ([Gedefaw et al., 2019](#)); ([Gudina, 2011](#)); ([Beyene, 2019](#)); ([Wang et al., 2022](#)); ([Alemu et al., 2019](#)). Even though, land fragmentation is comparatively severe in the highland parts of the country, it is also quite a problem in the plain areas of southern Ethiopia, e.g. Woliata and Kebata zones, and some parts of western Shewa. Land fragmentation is also high and increasing in the Gamo Highlands of southwest Ethiopia ([Cholo et al., 2018](#)).

It is considered a key constraint to socio-economic development in Ethiopia. The challenges of rural development in Ethiopia, particularly the thorny issue of increasing agricultural productivity, are partly attributed to it. According to the Ethiopian Statistical Service, about 7.4 million landholders (34%) have an average of 0.1-0.5-hectare landholding, each having four parcels on average. Whereas 2.8 million landholders (13 %) have less than 0.1-hectare landholding. On the other hand, based on data generated from the National Rural Land Administration Information System (NRLAIS), the average parcel size is estimated at 0.44, 0.66, and 0.64 ha in Amhara, SNNPR, and Oromia regional states respectively ([Amsalu, 2023](#)). Other studies show the level of fragmentation is severe than the one reported in this study. This shows that land fragmentation is a serious problem in the country. However little has been done to address this fragmentation problem ([TMG, 2019](#)).

1.2. What is Land Fragmentation?

Land fragmentation is defined as the situation in which a single farm or ownership consists of numerous spatially separated and non-contiguous land plots scattered over a wide area ([Bentley, 1987](#)); ([Balogun & Akinyemi, 2017](#)). Land fragmentation has a profound impact on various aspects such as rural development, land management, land use, land administration, and natural resource protection. This issue worsens the conditions of poverty and conflict perspectives, making it a matter of great concern ([TMG, 2019](#)). In Ethiopia, land fragmentation is a prevalent issue characterized by the presence of numerous small parcels with irregular shapes ([Demetriou](#)

[et al., 2013](#)), ([King & Burton, 1982](#)) scattered with a considerable distance between parcels, and the absence of road access for each land parcel, which makes cultivation labour and time-consuming and very difficult to apply modern agricultural practices. The main shortcomings associated with land fragmentation include the small size and irregular shape of the land parcels, the dispersion of parcels, and, in particular, the large potential distance between the parcels and the owner's farmstead.

In general, it is pointed out by [Amsalu, 2023](#) that:

Land fragmentation has a significant negative impact on production and productivity contributing significantly to the nation's food insecurity. The cost of inaction (in tackling land consolidation) is a lot. Land Fragmentation Index, the number of parcels held by a household, and the distance between parcels have adversely affected crop productivity. Analysis of the costs of land fragmentation in Ethiopia and failure to act on land consolidation has revealed that, apart from the negative social and ecological implications, the country is likely to lose several thousands of tons of grain yearly due to land fragmentation. In this regard, the analysis made on grain loss due to land fragmentation has indicated an estimated annual loss ranging from 31,403 tons to 281,073 tons at the national level, and the estimated grain loss due to parcels distance from homestead ranged from 15,702 tons to 202,023 tons ([Amsalu, 2023](#)).

1.3. Types of Land Fragmentation

Pieces of literature divided land fragmentation into four different types: fragmentation (1) of land ownership, (2) of land use, (3) within a farm, and (4) separation of ownership and use ([Dijk, 2003](#)). Besides this, there are four fundamentally different types of land fragmentation rooted in different reasons for fragmentation.

- ☞ That which is unavoidable because of natural conditions
- ☞ That which arises from physical conditions from human activities not connected with agriculture (e.g. due to construction of roads, railways, canals, etc.)
- ☞ That which is agricultural rational (to minimize the potential risk of climatic and natural disasters, greater variety of soils, crops, and growing conditions, different harvesting schedules depending on altitudes)
- ☞ That which, not falling within the first two categories is agriculturally irrational. Thus, not all land fragmentation can or shall be combatted.

There are also ownership and land use fragmentation where the former refers to the situation where the ownership of agricultural land is split between many owners of small and often badly shaped parcels, whereas the latter implies the actual use of the land.

1.4. Causes of Land Fragmentation

Land fragmentation is caused by several occurrences. Population growth causes parcel fragmentation, which negatively impacts production efficiency ([UNICEF, 2009](#)). This land fragmentation is caused by inheritance, exchange, alienation ([Ram et al., 1999](#)) donation, land re-distribution ([Thein, 1997](#)), and heterogeneous land quality ([Bezabih & Goshu, 2022](#)). Besides, causes of land fragmentation are divided into four: socio-cultural variations (inheritance laws, population growth, marriage, etc.), variations in economic efficiencies (land market, land transactions); (3) physical variations (soil qualities, topography, location, operational variations (land redistribution) ([Hartvigsen, 2014](#)).

In Ethiopia, the root cause of the matter is the nation's land inheritance tradition. The 1975 'Land to the Tiller' reform backed by distributive and redistributing rules of farmlands aggravated the situation of Land Fragmentation via repeated distribution and redistribution of farmlands of peasants. The effect was a frequent resizing of farmlands, which led to the present condition of Land Fragmentation. The fragmented plots are dubbed at times 'starvation plots' to indicate the subsistence nature of the landholding typifying rural Ethiopia. While land fragmentation can be considered a risk management strategy for landholders as it allows for a diversification of production in various agro-ecological zones, it hinders mechanization, leads to time loss, and constrains plant growth monitoring due to long distances between plots.

Besides the fragmentation of parcels, increasing fragmentation of agricultural production can be observed in Ethiopia. It is projected that the number of small agricultural enterprises having less than 2 ha, and particularly having less than 0.5 ha will be increasing exponentially in the coming years. This significantly reduces the competitiveness of Ethiopian small-scale farmers against larger agricultural producers in Ethiopia and against imports from abroad.

Despite the presence of several studies in the country on land fragmentation on one hand and land consolidation as a tool to manage the former on the other, there is no comprehensive study on comparative analysis of different land policy instruments to tackle land fragmentation in Ethiopia.

1.5. Land Fragmentation as a Land Management Risk Mitigation Mechanism

Land fragmentation is labelled as a constraint to efficient crop production and agricultural modernization ([Sundqvist & Andersson, 2007](#)). On the contrary, there are studies, which argue that small family farms are as efficient as large farms through enhancing intensification, facilitating crop diversification, risk aversion mechanism, and so on. There is no consensus that fragmentation is strictly a negative phenomenon. Land fragmentation can be considered a tool for land management. Farmland fragmentation is not necessarily a problem ([Ntihinyurwa & de Vries, 2020](#)). Landholders utilize land fragmentation as a strategy to address their vulnerability to climate impacts and fluctuating market prices. While enacting land consolidation and other land fragmentation management laws, it is very crucial to understand that not all land fragmentations may require land consolidation as a management strategy. This point should be explicitly stated in the LC strategy document, with more detailed and specific criteria. There are intentional fragmentations made by households as a responsible land management tool ([de Vries & Chigbu, 2017](#)) for crop diversification, climate change adaption, and mitigation, and risk management strategies ([Ntihinyurwa & de Vries, 2020](#)). A high land fragmentation also promotes crop diversification, manure application and terracing ([Cholo et al., 2018](#)). Nevertheless, in any case, there is a minimum amount of land that is efficient and productive. The potential benefits of land fragmentation must be compared with the potential costs. To achieve this, a thorough examination is necessary to understand the potential consequences of land fragmentation in the face of climate change. By quantifying the risks associated with this phenomenon, we can gain valuable insights into the expected loss and damages. Simultaneously, it is crucial to acknowledge the perceived risks, which may differ from the quantifiable ones. As a result, there should be incentives to avoid further land fragmentation below the efficiency line. This needs a clear and transparent land policy responsive to local contexts and local demands having incentive clauses that allow land as collateral and efficient transactions ([Thein, 1997](#)).

1.5.1. Advantages

- ⇒ It allows farmers to cultivate a diverse range of crops, serving as an insurance mechanism against various soil and growing conditions. This practice effectively mitigates the risk of complete crop failure by providing farmers with multiple options for soil and growing conditions ([Blarel et al., 1992](#)) ([Gedefaw et al., 2019](#)).
- ⇒ It facilitates crop rotation in multiple eco-zones ([Gedefaw et al., 2019](#)).

⇒ Different plots enable farmers to grow a wider mix of crops, which is important for the nutritional balance, for food quality, and food sustainability as components of food security ([Galli et al., 2020](#)).

NB: These are advantages if the situation will stay as it is, and without applying any other policy measure, not just LC.

1.5.2. Disadvantages

- It is a constraint to efficient crop production and agricultural modernization in small and irregularly shaped fields that hinders economies of scale and farm mechanization.
- Considerable distance between parcels and the absence of road access for each land parcel makes cultivation time and labor-consuming, and non-feasibility of larger scale productive investment.
- Management, supervision, and securing of scattered plots can also be more difficult, time-consuming, and costly.
- Difficulty of supervision of farm activities.
- Leads to a greater post-harvest loss.
- Inefficient allocation of resources (labor and capital).
- Increases costs of production (for instance, transportation costs).
- Small and scattered plots are a waste of a land area and require more land for fencing, border constructions, and paths and roads that lead to the high boundary and land waste.
- Increases the risk of disputes between neighbors.
- Discourage the development of infrastructure like transportation, communication, irrigation, and drainage ([Mwebaza & Gaynor, 2002](#)).
- Banks are not willing to take small, scattered land holdings as collateral, which prevents farmers from obtaining credit to make investments ([Mwebaza & Gaynor, 2002](#)).

2. OBJECTIVE OF THE ASSIGNMENT

The overriding objective of the study is to prepare a comparative analysis of different land policy instruments to tackle land fragmentation in Ethiopia and assess the legal and institutional situation of their application.

The specific objectives are to:

- Analyse the different policy instruments that could be used to tackle farmland fragmentation;
- Assess the legal situation of Ethiopia regarding the application of the different policy instruments that could be used to tackle farmland fragmentation; and
- Assess the institutional situation of the country regarding the implementation of the different land fragmentation management policy instruments.

3. METHODOLOGY

In this study secondary sources, which is desk-based research, are used. Data is collected from secondary sources, including but not limited to, laws, previous studies, and reports from land administration offices at the federal and regional levels. A review of the federal and regional laws related to land fragmentation is conducted. A literature review is conducted to scrutinize and evaluate many studies in particular topical areas is employed. Library Genesis, Scie-Hub, Google Scholar, and direct search platforms are used in identifying related works of literature. A preliminary systematic search using the aforementioned platforms found that there are thousands of secondary literature on the subject matter. The search applied three areas of interest, including (1) Land fragmentation; (2) policy tools to tackle land fragmentation; including but not limited to the definition and concepts of land consolidation; and (3) advantages and disadvantages of each of the policy tools. Key terms used during the search are land fragmentation, causes of land fragmentation, policy tools to tackle land fragmentation, land consolidation, land consolidation in Ethiopia, benefits of land consolidation, types/approaches of land consolidation, legal frameworks for land consolidation, and institutional arrangements for land consolidation. Primarily, by critically scanning all titles and abstracts of the articles collected some relevant hundreds of materials selected for a full-text review. Other frequently cited articles in these selected articles are also searched backward using a spider backward literature search technique. As the primary source, laws related to land fragmentation, including but not limited to land consolidation, are also reviewed.

4. LAND POLICY TOOLS TO TACKLE LAND FRAGMENTATION

In a transition to the market economy, the farm structure and economies of farm size are very important ([Thein, 1997](#)). There is a close relationship between farm size and the amount of machinery owned as they can earn extra income by hiring them out, in addition to using them. The “Land to the tiller” policy and inheritance traditions and rules due to population growth

have created a fragmented small and uneconomical farm size that, in the long term, affects the efficiency of the land. International practice and academic debate discuss various land policy instruments to address the development challenges of land fragmentation. While many instruments involve the re-organization of landholding (e.g., voluntary land exchanges, various forms of land consolidation, market-based land transactions, land banking, expropriation & compensation), others focus on the consolidation of land use (land use consolidation, yield clustering, cooperative formation). While these land policy instruments share common objectives and use partly overlapping approaches, they all encompass specific comparative advantages and disadvantages depending on the geographic and socio-economic context and in their compatibility with agricultural development strategies.

Given the diverse landscapes and food production systems in Ethiopia, it is understood that different land policy instruments must be applied and combined within a comprehensive strategy to tackle land fragmentation. So far, there is no widespread knowledge of the variety of individual instruments on a decision-makers level in Ethiopia and only a limited understanding of their advantages and disadvantages. To improve the knowledge about land policy instruments available to tackle land fragmentation and to assess the legal situation of its application in Ethiopia, an analysis and overview shall be prepared. In brief, the following are some of the policy tools that can be used to manage land fragmentation problems.

4.1. Land Consolidation

Pieces of literature divided land fragmentation into four different types: fragmentation (1) of land ownership, (2) of land use, (3) within a farm, and (4) separation of ownership and use ([Dijk, 2003](#)). One of the tools to overcome this serious problem is land consolidation, in addition to other fragmentation management tools ([Gudina, 2011](#)); ([Tenagne, 2018](#)); ([Ntihinyurwa et al., 2019](#)); ([Gedefaw et al., 2019](#)); ([Beyene, 2019](#)); ([Alemu et al., 2019](#)); ([Ortiz-Becerra, 2021](#)).

Land consolidation is the process through which small land parcels or shares in land are exchanged for one or more larger parcels that are approximately equivalent in land value to the original holding. It creates parcels of more economic and rational size, shape, and location. Land consolidation can be used to improve the tenure structure in support of rural development by addressing land fragmentation ([STUDIES, 2003](#)). It helps fragmented lands to be united, fragment numbers decreased, fragment sizes increased and fragment shapes are re-formed ([Tumer et al., 2010](#)). It is highly linked with land tenure and property right issues as it uses land

tenure information (existing land owner, type of ownership, and 3Rs (Rights, restrictions, and responsibilities)) in the identification of the existing situation, potential changes, and updating the new changes ([Rubanje, 2016](#)). The researcher's practical experience revealed that land consolidation could bring different benefits, and save its shortcomings in different situations, which the law should take into account. These benefits are in one way or another linked with land tenure and property rights. Land consolidation saves traveling time, energy, and cost of production. Reducing the number of parcels via land consolidation means a lot, especially cost reduction. Let alone other costs, it will reduce the number of oxen required to plough the parcels. Carrying and traveling the ploughing materials from parcel to parcel consumes a lot of energy. It reduced boundary disputes as the number of neighbouring landholders and boundaries after land consolidation will be reduced. It helps to manage crop residuals closely both for animal feeding (fattening) and organic fertilizer preparation. Land consolidation can also reduce post-harvest crop losses as the crops can be harvested at the same place. Besides, it can avoid the tragedy of anti-commons, as public and communal areas (such as roads and green areas) will be created. In general, land consolidation is an approach that can lead to a new and innovative tenure arrangement. All these benefits make sense against the backdrop of a clear depiction of the level and challenges of land fragmentation in Ethiopia.

There is no single universal definition or approach to land consolidation; different countries apply different models and follow different objectives ([Food & Nations, 2003](#)). A voluntary (100 % landholders' acceptance), simple majority (50%+1 landholders or area), an absolute majority (at least 75% of landholders or area), and mandatory-based land consolidation approaches could be considered, but what matters is determining which one best fits a certain area/location and depends on the policy of a country. Land consolidation is the process through which small land parcels or shares in the land are exchanged for one or larger parcels that are approximately equivalent in land value to the original holding. It creates parcels of more economic and rational size, shape, and location (Glossary of Land Related Terms with a Focus on the VGGT). The purpose of land consolidation should go beyond supporting agricultural development and include community development, and environmental and infrastructure projects ([HARTVIGSEN et al., 2019](#)). Legal frameworks and institutional arrangements must align with this multi-purpose approach.

It should be made very clear that land consolidation has nothing to do with expropriation of land and properties. This implies that no one should be dispossessed from his or her land during

land consolidation project implementation. In countries that have a freehold tenure arrangement, land consolidation may offer opportunities for landowners to sell their land to others but this should be done willingly. The objective of land consolidation is to improve rural livelihoods that is more than improving agricultural products. However, this may vary from country to country. In the case of Ethiopia, the primary focus should be on initiating improvements in land structure and infrastructure to enhance agricultural productivity. Moreover, this endeavor holds immense potential for future integration with broader economic and rural development objectives.

Promulgation of context-oriented land consolidation legislation is a crucial requirement to implement land consolidation programs ([HARTVIGSEN et al., 2019](#)). Among other essential elements/requirements for Fit for Purpose land consolidation (such as institutional capacity, costs required for the project, recognition of customary and secondary rights, good governance in the process (Public participation for instance), updating land information system infrastructure) legislation including competent dispute settlement and grievance redress mechanisms is a very critical one. Understanding this FAO has conducted an assessment of good practices on land consolidation legislation and published a Legal Guide on Land Consolidation ([HARTVIGSEN et al., 2019](#)). Many countries have implemented land consolidation laws as a means of improving land management and utilization. Instead of simply piloting land consolidation projects without any legal framework, these countries have chosen to develop and test specific laws to govern the process. This approach ensures that land consolidation initiatives are carried out in a systematic and regulated manner, leading to more effective outcomes. The FAO legal guide identified six principles of the land consolidation legal framework. These are respect for and protection of legitimate tenure rights; “at least as well off”; sustainability and environmental protection; the participatory approach; gender equality; and transparency ([HARTVIGSEN et al., 2019](#)). From the principles, gender equality is very narrow. It has to address other social inclusion aspects beyond gender equality. The respect for and protection of legitimate tenure rights shows that there should be some sort of registration and titling program in areas where land consolidation is going to be implemented. As a result, the SLLC completion of an area may help to make the implementation of the consolidation program in Ethiopia smooth.

The establishment of an appropriate institutional arrangement is a crucial prerequisite for the successful implementation of land consolidation programs. According to the legal guide

provided by the Food and Agriculture Organization (FAO), there is no pre-existing, one-size-fits-all institutional arrangement for this purpose. Instead, the specific arrangement required depends on the objectives of the consolidation initiative and the unique circumstances of the country in question. Ideally, this role should be closely linked to sectors such as agriculture, environment, water management, and food, as this alignment offers the greatest potential for achieving the defined objectives. Establishing a public Lead Agency is of utmost importance in order to effectively determine the land consolidation policy and establish a comprehensive legal framework. This agency will bear the ultimate responsibility for these crucial tasks. The decision-making and approval of the re-allotment plan can be executed through two distinct approaches: administrative approval, which grants the power to the lead agency, or judicial approval, which designates a separate land consolidation commission to wield this authority. Among others, the public lead agency would uphold fairness and transparency in land consolidation processes. By implementing clear guidelines and regulations, the agency would prevent favouritism, corruption, and disputes. This would instil confidence among landowners, encouraging their active participation in consolidation initiatives.

In the context of land consolidation, public participation plays a crucial role. It encompasses a wide range of activities beyond mere voting, including diverse consultation methods and information mechanisms that span from the initial conception to the final implementation of the project. Public involvement holds immense significance in these land consolidation approaches, as it ensures that the perspectives and concerns of the community are taken into account. By actively engaging the public, decision-makers can gather valuable insights, foster transparency, and build trust throughout the entire process. Moreover, public participation serves as a means to enhance the overall quality of the project. By involving stakeholders from the early stages, valuable local knowledge and expertise can be tapped into, leading to more informed and effective decision-making. This collaborative approach not only empowers the community but also helps to address potential conflicts and mitigate any adverse impacts that may arise.

4.1.1. Advantages

- ☞ Facilitates the creation of competitive agricultural production arrangements by enabling farmers to have farms with fewer parcels that are larger and better shaped allowing the farmer to introduce better farming techniques.
- ☞ Improves natural resource management and environmental conservation.
- ☞ Reduce traveling time, energy, and post-harvest loss.

- ☞ Creates competitive farming, for example through the promotion of commercially viable family farms.
- ☞ Result in substantial changes in land tenure arrangements.
- ☞ Improve rural development in general.
- ☞ Improve the efficiency and cost-effectiveness of public and private investments in transportation and communication networks, utilities, and irrigation systems.
- ☞ Reduce disputes by reducing boundaries.
- ☞ Enhances opportunities for mechanization and concomitant increases in land productivity;
- ☞ Improves labor productivity arising from effective work organization and supervision;
- ☞ Enhances transport efficiency to and from residential places;
- ☞ Better utilization of farm equipment and other fixed assets;
- ☞ Reduction in average costs of farm inputs and enhanced profitability of farm enterprises;
- ☞ Increases opportunities for public and private investments in agriculture-related infrastructure ([TMG, 2019](#)).
- ☞ Attract young people into farming and agribusiness.
- ☞ Efficiency of monitoring farm activity.

4.1.2. Disadvantages

- Land consolidation may not always be a fit and the only solution for land fragmentation.
- Even though it is economically efficient, it might not be socially efficient. Implementation of land consolidation policies faces many shortcomings and challenges. Some of these include: limited budget, challenges related to valuation of land and properties, difficulty obtaining approval from landowners and landowner consensus, future sub-divisions and fragmentation of holdings ([Yuliasuti et al., 2021](#)); and the like.
- Initial investments for land consolidation projects are both costly and time-consuming. In Serbia, for instance, Costs were too high and even exceeded the land price ([Serbia](#)). However, it is crucial to recognize that such projects should be regarded as a significant social measure. Once implemented, these projects yield a comparatively high return on investment and increase the price of land Vis a Vis land market.
- It may have its own risk by reducing a variety of soils and growing conditions. This is against diversification and may have environmental risks in terms of family-level food security.

→ It would negatively affect smallholders, in terms of decreasing the need for agricultural laborers due to increased dependence on mechanization – as a result, may increase rural-urban migration if off-farm jobs are not created.

4.2. Voluntary Parcel Exchange

This approach is considered a soft alternative to land consolidation ([Teijeiro et al., 2020](#)). Conceptually, this is one type of land consolidation. Nevertheless, voluntary parcel exchange cannot bring large-scale land consolidation results, as it is limited to parties who are exchanging their parcels. This holding/parcel voluntary exchange can be used to manage distance fragmentation and parcel fragmentation issues. The policy can take different incentive mechanisms to encourage voluntary land exchange, which has the effect of decreasing land fragmentation. Voluntary parcel exchange can be very useful in restructuring holdings when a large number of owners participate ([Teijeiro et al., 2020](#)).

4.2.1. Advantages

- + Manage distance fragmentation and parcel fragmentation issues.
- + Very useful in restructuring holdings when a large number of owners participate

4.2.2. Disadvantages

- * Voluntary parcel exchange may not bring large-scale land consolidation results, as it is limited to parties who are exchanging their parcels.
- * It may easily become challenging as it involves many people in isolation, unlike land consolidation, which applies a comprehensive approach.

4.3. Farmland Subdivision Restrictions and Creation of Family Farms

This principle restricts or forbids subdivision of agricultural land during several transactions. For instance, some countries restricted the right to purchase or to sell parts of agricultural real estate ([Jacoby, 1959](#)). Besides, as the subdivision and fragmentation of land is partly caused by at the time inheritance based on the succession laws ([Ram et al., 1999](#)), it is important to restrict or prevent subdivisions of agricultural businesses and agricultural land to protect further fragmentations. Farmland subdivisions fragment the farms and affect their future viability. Countries use this mechanism as one solution in combating farmland fragmentation. For instance, the federal and regional rural land laws enshrined provisions that determines minimum holding/parcel size, where dividing a parcel because of any reason (inheritance, donation, rent, etc.) below this size is prohibited by the law. This may, for instance, involve

introducing a mechanism for simplification of legacy transfer to one inheritor and determining a minimal land plot size that may not be divided ([Kurylo et al., 2017](#)). On the other hand, the restrictions on the subdivision of land either through inheritance or through sale, may lead to joint ownership by the heirs, and in turn cooperative farming.

Switzerland is known for using Farmland Subdivision Restrictions as a policy tool in tackling fragmentation. The law embeds exceptions into the inheritance law and land-market regulations. It restricts subdivisions and aims to pass the land ownership to competitive family farms. It strives to protect the structure of Swiss agriculture by way of a ban on the fragmentation of parcels and the de facto splitting of whole estates. Agricultural parcels may not be partitioned into segments smaller than 25 Ares (a quarter hectare) ([Schmidt et al., 2019](#)). During inheritance, the legal estate will be assigned to one of the heirs, while the heir taking the estate is obliged to pay compensation that requires a huge investment. Alternatively, a family farm may be created. In Ethiopia, certain regional states have implemented a similar arrangement. For example, the Amhara National Regional State has already incorporated subdivision restrictions into its land law. However, these restrictions do not prevent farmers from dividing their land, either through formal means (with court decisions favoring sub-divisions) or informally (without registering further sub-divisions). Consequently, this model encounters enforcement challenges and appears to lack significant impact. To address this issue, a robust institutional framework is necessary to ensure strict adherence to the law.

4.3.1. Advantages

- Farmland subdivision restrictions may lead to cluster development and the creation of bigger family-owned farms, which are efficient and easy for mechanization.

4.3.2. Disadvantages

- This may limit liberty and, as a result, legally and politically contested.
- Women's land rights might be at stake during divorce if such subdivision restrictions apply.
- Monitoring can pose a challenge and potentially push landholders towards operating informally. Additionally, it has the potential to escalate conflicts within families who are forced to jointly own land.

4.4. Land Sale/Land Swapping

This is one aspect of the land fragmentation management policy tool, that involves land contract transfer used to combine small fragment land parcels into large ones to realize land

use consolidation ([You, 2010](#)). Larger farms can be formed through the sale and leasing, or other transactions ([Platonova & Jankava, 2011](#)). There are countries, like Germany, which incentivize these kinds of consolidation through land sale and swapping. In the Slovak Republic, there is an official price of the land during land consolidation. This price is used by the state to buy the land that the owners offer for sale through the Slovak Land Fund or the trustee ([Peráček et al., 2022](#)).

4.4.1. Advantages

- ❖ This could allow one to sell his small plot somewhere and buy another near his big parcel or homestead which may lead to land consolidation.
- ❖ Uneconomical and very small plots could be transferred to the most efficient hand.

4.4.2. Disadvantages

- ❖ Mostly benefit those who have better bargaining power and capital
- ❖ It may potentially result in a surge of individuals without land ownership residing in rural regions.

4.5. Expropriation

Expropriation measures are necessary to make land available for the enlargement of farms ([Jacoby, 1959](#)). This is a mechanism where the government applies forced purchase/expropriation on small plots and consolidate them with the neighbouring, by different modalities, parcels in order to create bigger land suitable for agriculture. The forced sale of agricultural land can be considered as a broader public purpose to consolidate land. Laws can be developed that give power to the government to expropriate fragmented parcels to attain the public goal of creating a more convenient farm field for mechanization and commercialization. Forced Rent to large farm owners can be also used as a short-term solution. The concept of expropriation sets it apart from land banking as it allows for forceful implementation without the need for landowners' consent. In contrast, land banking is a voluntary approach that refrains from imposing on landowners who may require additional support through promotion and awareness initiatives.

4.5.1. Advantages

- ☞ Can create available land for the government that can be allocated to the most efficient use.
- ☞ Uneconomical and very small plots could be forcefully purchased by the government and allocated to the most efficient purpose.

4.5.2. Disadvantages

- ☞ Very complex task demanding both commercial, legal, and administrative capacities.
- ☞ May create corruption and injustice through the process.

4.6. Agricultural Zoning as a Farmland Protection Tool

This policy tool implies that areas that possess good agricultural soils, a viable farming industry are prime for agricultural zoning. This is common in countries like Georgia ([Franzen & Center, 2006](#)) and the United States ([Cordes, 2001](#)). It is zoning land exclusively or almost exclusively to agricultural purposes, according to the land use. This zoning is supplemented by farmland subdivision restrictions up to a size appropriate for farming. Agricultural zoning permits the use of the land for agricultural purposes only, allowing for a very limited amount of non-farm-related development such as compatible or accessory buildings. Building residential farm dwellings are not allowed as they create one form of land fragmentation ([Franzen & Center, 2006](#)).

4.6.1. Advantages

- Results in the preservation of large tracks of land for farming.
- Inexpensive way to protect large areas of agricultural land.
- Familiar and widely used method of regulating land use.
- Mostly¹, accepted by the public. Agricultural zoning is a cost-effective and planning-based approach that enhances the productivity of landholders and promotes economically sustainable agriculture. This, in turn, enables landowners to settle in specific areas with improved social and economic infrastructures ([Franzen & Center, 2006](#)). This is also very easy to explain to landowners who are farmers and are familiar with agricultural zoning.
- It is flexible and can be adapted to the changing circumstances very easily.

4.6.2. Disadvantages

- It increases the travel time of farmers from the center to their farmlands.
- Potential legal challenges to the restrictions due to the perceived unfairness of limiting the residential and commercial developments.
- They are susceptible to change when development pressure increases; as a result, they are not a permanent land preservation method.

¹ Farmers sometimes oppose it because they experience a decline in property value as the land use of their parcels is restricted solely to agricultural purposes.

- It is difficult to monitor and enforce on a day-to-day basis.
- It only has an impact on certain types of fragmentation. As a result, it needs to be combined with other methods to effectively address various aspects of fragmentation.

4.7. Land Use Consolidation

This process does not entail consolidating a single holding; instead, it focuses on consolidating the land use of various parcels owned by different individuals. In this endeavor, the aim is to streamline and optimize the utilization of multiple land parcels, each owned by separate individuals. Rather than merging these parcels into a single entity, the focus is on harmonizing their land use practices. By consolidating the land use of these diverse parcels, we can enhance efficiency, maximize productivity, and ensure a more cohesive approach to their management. This consolidation process allows for better coordination and utilization of resources, leading to improved outcomes for all stakeholders involved. Furthermore, this approach promotes collaboration and cooperation among landowners, fostering a sense of unity and shared purpose. It enables the pooling of expertise, resources, and efforts, resulting in a more effective and sustainable land use strategy. The following are the types of land use consolidation.

4.7.1. Cluster Farming

This is also referred to as Crop Consolidation, which is the consolidation of the use of agricultural lands, in terms of unifying the cultivated crop. This is one of the tools for managing land fragmentation challenges. Cluster farming has particularly very useful in employing mechanization technologies and the prevention of post-harvest losses. Cluster Farming creates real profit by merging several smallholder farms, helping farmers to increase harvest, agricultural productivity, and value chain products; and boost food security. Nevertheless, the drawback with this policy tool is it does not solve the problem of land waste because of many boundaries and ditches, which still is inefficient in terms of the use of natural resources.

In Ethiopia, cluster farming involves about 30–200 smallholder farmers with adjacent farm plots who voluntarily pool a portion of their land to benefit from targeted government support and cluster economic agglomeration ([Dureti et al., 2023](#)).

4.7.1.1. Advantages

- Useful in employing mechanization technologies and the prevention of post-harvest losses.
- Creates real profit by merging several smallholder farms.
- Increase harvest, agricultural productivity, and value chain products.

- Better able to get market information.

4.7.1.2. Disadvantages

- It does not overcome the problem of land waste due to numerous boundaries and on-field ditches, and thus the inefficient use of natural resources.
- Producing similar crops is against food security (the 1996 World Food Summit defines food security as all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life ([Shaw, 2007](#))).
- It can only solve the distance/traveling time problem if mechanization is available and applied throughout the whole farming cycle.
- Managing land can be a complex task for farmers, especially when their parcels are scattered across various clusters over a wide area.
- In addition, this process incurs high transaction costs due to the extensive coordination required, and it requires continuous public support for it to be successful.

4.7.2. Cooperative Farming

Cooperative Farming is a land fragmentation management tool where landholders form a cooperative and bring their parcels together, with/without amalgamating them, cultivate them together, and share the input costs and products based on prior agreed criteria (parcel size and fertility for instance). This is where households volunteer to make contributions of finance and land for production according to a common plan, process, and form of farming with similar markets of input and output. Cooperative farming requires an investment of capital from farmers, which facilitates commercialization ([Huggins, 2013](#)). This involves changing intercropping techniques for high-priority mono-cropping. The government can support the cooperative in selling, processing, distributing, and marketing agricultural products for the cooperative ([Kathiresan, 2012](#)). This support by the government encourages farmers to engage in this cooperative farming mechanism. Cooperative farming may involve contract farming.

In contrast to other land use consolidation instruments like cluster farming, this approach sets itself apart by creating a distinct legal entity for the cooperative. This unique feature empowers the cooperative to function as a cohesive unit, operating seamlessly as a single entity.

This collaborative approach allows for increased efficiency and mutual benefit among members. By pooling resources and expertise, the cooperative can optimize agricultural practices and maximize yields. Additionally, the shared costs help alleviate financial burdens

on individual farmers. The agreed-upon criteria ensure fairness and transparency in the distribution of both inputs and outputs. This cooperative model not only fosters a sense of community and teamwork but also promotes sustainable and profitable farming practices.

Farmer cooperatives in Ethiopia have a long and debated history, which were characterized by a coercive top-down approach that forced farm households to join cooperatives and put individual land holdings under the control of cooperatives ([Dureti et al., 2023](#)).

4.7.2.1. Advantages

- ❖ They can get the government incentive mechanism in selling, processing, distributing, and marketing agricultural products for the cooperative.
- ❖ Improve agricultural input adoption and livelihood among cooperative users.
- ❖ Larger markets and better competition.

4.7.2.2. Disadvantages

- ❖ It requires strict management to avoid disputes and dissolution of the cooperative.
- ❖ It requires an investment of capital from farmers
- ❖ Poorer farmers tend to be excluded from marketing cooperatives, particularly in the decision-making process.
- ❖ Corruption of the cooperative leaders
- ❖ Sentimental attachment to their lands - farmers may not be willing to release the land to the co-operative society for better management.

4.7.3. Contract Farming

It is a well-defined practice in which agricultural producers enter into agreements with buyers or companies for a given period to cultivate and supply specific crops or livestock, which provides a framework for both parties to outline their respective roles, responsibilities, and expectations. Farmers commit to producing a predetermined quantity and quality of agricultural products within a specified timeframe. In return, buyers or companies offer various forms of support, such as technical assistance, inputs, and ensuring a guaranteed market for the produce. This collaboration fosters a sense of security and stability for farmers, as they can rely on a predetermined price and market for their goods. By formalizing agreements and establishing clear expectations, this practice promotes sustainable agricultural practices, enhances productivity, and fosters economic growth for all parties involved.

This is potentially attractive tool for land commercialization is being implemented in Ethiopia through Agricultural Commercialization Clusters (ACC) contract farming. This is a potential tool that can be used as a land fragmentation management tool. It facilitates contract farming-based large-scale land investment through consolidating smallholder farms under a crop/commodity of specialization ([Bezabih & Goshu, 2022](#)). For instance, in Rwanda, foreign agricultural investment involves contract-farming arrangements with cooperatives, which are facilitated by the state, which when necessary, uses coercive mechanisms as well as highly interventionist strategies (such as regional crop specialization policies and mandatory land use consolidation) to create an ‘enabling environment’ for agricultural investment ([Huggins, 2013](#)). This can be an alternative to expropriation and allows direct control of production by corporations, without creating dispossession/displacement on landholders ([Kathiresan, 2012](#)).

4.7.3.1. Advantages

- Attractive tool for land commercialization, and facilitates large-scale land investment
- Can be an alternative to expropriation and leasing of land to investors, as it does not create dispossession and displacement on landholders
- It often introduces new modern farming technology, improved inputs, and promotes the transfer of knowledge and expertise from companies to farmers that enables farmers to learn new methods of production
- It provides managerial, technical, and extension services to farmers.
- It leads to increased income for farmers, as they can negotiate fair prices and avoid the uncertainties of fluctuating market conditions.

4.7.3.2. Disadvantages

- Tended towards mono-crop which affects crop diversification
- It may lead to risks of market failure and production problems.
- Companies want to maximize their production at the cost of the environment using hazardous chemicals if regulatory frameworks are not strong enough.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Land fragmentation has several manifestations including, but not limited to, the existence of very small and several parcels, having an irregular shape, scattered with a considerable distance between parcels, and absence of road access for each land parcel. Ethiopia's land fragmentation is reaching a critical point that calls for government policy action.

There are a lot of land fragmentation management tools, among them is land consolidation. Land consolidation is costly and time-consuming, even though, once implemented, it creates a comparatively high return on investment and brings a comprehensive rural development. Land consolidation is a transformative process that demands substantial upfront investments. However, the long-term advantages it offers make it a worthwhile endeavor. Once the consolidation is completed, it will bring about a remarkable reduction in costs. Unlike other forms of land use consolidation, LC substantially reduces any additional financial burdens. However, it is crucial to acknowledge that various approaches to land use consolidation involve recurring transactional costs. These costs are incurred by both the administration/cooperatives responsible for extension services and the diligent farmers themselves. The farmers invest a significant amount of time and effort in coordinating and negotiating production steps, among other essential activities. By streamlining these processes, LC not only optimizes land utilization but also minimizes the financial and operational complexities associated with land use consolidation. Looking into other alternative land fragmentation management policy tools is also an option. Some of the alternative policy tools may be used as preparatory initiatives for land consolidation, while others can be taken as standalone management tools. Some of the tools may require policy changes, for instance, land sale/swapping.

Farmland fragmentation may not necessarily be a problem. It may be used for crop diversification, climate change adaptation, mitigation, and risk management strategies. However, it has also problems related to economic efficiency, for instance. Ethiopia does not have a full-fledged policy, legal frameworks, and institutional arrangements for farmland fragmentation management tools. Based on the findings of the research, the following recommendations are made:

⇒ Land consolidation is not the only mechanism to manage land fragmentation. Other measures, like determining minimum parcel size, encouraging voluntary land exchange that

will bring holding consolidation or mitigate distance fragmentation, prohibition on land redistribution, revisiting inheritance rules, cluster farming, and so on should be considered.

- ⇒ It is imperative to have comprehensive policies and laws for managing land fragmentation.
- ⇒ It is essential to establish a land fragmentation management organization, including a land consolidation commission or unit to oversee national land consolidation initiatives.
- ⇒ Take a case-by-case approach to land consolidation, keeping in mind that not all land fragmentations pose problems.
- ⇒ It is crucial to do research and provide education, training, and awareness raising on land fragmentation challenges on one hand, land consolidation, and other land farmland fragmentation management strategies on the other.

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