CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences

Household farmland abandonment in the Northwest region of Cameroon

MASTER'S THESIS

Prague 2024

Author: Nshing Rooney, BSc.

Chief supervisor: doc. Ing. Bavorová Miroslava, PhD.

Declaration

I hereby declare that I have done this thesis entitled **Household farmland abandonment in the Northwest region of Cameroon** independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

<div align="right">

In Prague

20th April, 2024.

…...................

Nshing Rooney

</div>

Acknowledgements

Abstract

Farming which is supposed to be one of the main sources of income in less developed countries has been facing many challenges. In the study area in Cameroon, most farmers have migrated or simply abandoned their farmland in the past years. The main objective of this study was to analyse factors influencing farmland abandonment in the Northwest region of Cameroon. The data was collected using online and pen-and-paper questionnaire survey with 157 respondents in 2022.

We applied descriptive statistics and a binary logistic regression (BLR) model to examine the factors that influenced of farmland abandonment. The descriptive results show that 50.6% of the respondents abandoned at least one hectare of farmland, those who abandoned two to four hectares made up 41% and lastly, those who have abandoned five hectares and above made 8.3% of the total respondents. The results from the regression model suggest that household income (p = 0.028), change in household head (p = 0.003), number of plots (parcels) (p=0.002) and labour provision (gender providing most labour) households (p=0.008) are the main factors influencing farmland abandonment. These farmers' perception-based findings will facilitate the improvement of governmental policies to better off farmers' standard of living and build sustainable farmland management.

Keywords: Farmland abandonment, migration, household head, labour , farming

Table of Contents

List of tables

List of figures

List of the abbreviations

BLR	Binary Logistic Regression
FAO	Food and Agricultural Organization
GIS	Geographical Information System
GOC	Government of Cameroon
GDP	Gross Domestic Products
HH	Household
IMF	International Monetary Fund
IDPs	Internally Displaced Persons
LDCs	Less Developed Countries
NIS	National Institute of Statistics
NWR	Northwest Region
USAID	United States Agency for International Development
WB	The World Bank

1.   **Introduction**

The main objective of agriculture is to provide sufficient amount of food and achieve global food security and Sustainable Development Goals 2 and 3 respectively (Zero hunger, Good health and Well-being) (United Nations 2019). Agricultural production is restricted by the available land area. As some parts of the available lands are abandoned, the potential food production is not fully used in some parts of the world (Campbell et al. 2008). Farmland abandonment is defined as the complete stoppage of cultivation of farming activities on a given piece of land (Terres et al. 2015). There is subsequent farmland succession to grassland, weeds, shrubs, and natural vegetation (Yan et al. 2016). Globally, farmland abandoned area is reported to cover around 3.85 million km^2 and 4.72 million km^2 respectively (Campbell et al. 2008). Land management changes are general and farmland abandonment is specifically based on socioeconomic conditions, geographical locations, environmental factors, and government policy regarding land use (Paudel et al. 2020). Contrarily, farmland abandonment has its major consequences, which can be summarized into different factors including the cost of agricultural production, food insecurity, socioeconomics, farmland biodiversity, and environmental degradation (Raj Khanal & Watanabe 2006).

The escalating trend of farmland abandonment has led to a decline in agricultural productivity in rural communities and villages (Chaudhary et al. 2018). This, in turn, has severe repercussions on the livelihoods of marginal farming households, as highlighted by (Khanal & Watanabe (2006). It's important to note that smallholder farmers in sub-Saharan Africa primarily engage in low-yield subsistence agriculture due to limited resources such as finances, labour, and land (Njikam et al. 2021). Consequently, their ability to access broader markets or compete with market prices and players is restricted, resulting in food insecurity in numerous regions and households (Blair et al. 2018).

Farmland abandonment stems from a complex interplay of various local and internal factors, leading to diverse outcomes for landscapes (Bhawana & Race 2020). Khanal & Watanabe (2006) emphasised that farmland abandonment profoundly affects food security, particularly in areas already grappling with widespread poverty and food

deficits. Additionally, it endangers adverse consequences for hill-slope processes in regions where extensive labour has been applied to terrace hill-slopes. Therefore, the landscape plays a pivotal role in farmland abandonment.

One consequential change involves alterations in the management and scale of farmland (Chen et al. 2014). The shortage or loss of family labour due to outmigration can be deterred by the economic benefits accrued from migrants' remittances (Gray 2009). For instance (Khanal et al. 2015) found that members of these households may opt to reduce their involvement in traditional occupations, choosing instead to increase leisure time due to higher income from remittances. Similarly, many rural youth in China exhibit reluctance to remain in rural areas, and according to (Liu et al. 2016), the less appealing nature and lower returns associated with manual work in agriculture contribute to this trend, thus negatively impacting agricultural productivity. With agriculture proving unattractive to rural youth and the ageing demographic of current farmers, Cameroon's rural land use has undergone significant transformations (Asaha & Deakin 2016).

The onset of political unrest in the English-speaking regions of Cameroon since 2016, including the study area, has given rise to a notable influx of Internally Displaced Persons (IDPs) (Ekah 2019) . According to the Worl Bank (2019), displaced persons are defined as individuals or groups compelled to flee their homes due to generalized violence, armed conflict, human rights violations, natural or human-made disasters, without crossing internationally recognized state borders. This situation has significantly impacted land-use management, leading to diminished agricultural productivity, food insecurity, and compromised food safety. This phenomenon is not only confined to migrant households alone, although researchers have identified rural outmigration as a pivotal catalyst for significant shifts in land use, the rural economy, and socio-economic opportunities.

Gender plays a major role in agricultural productivity (Yadav et al. 2016; Merfeld 2021; Njikam et al. 2021). In the study area, males predominantly migrate leaving females behind to take over the farm. It is crucial to acknowledge the role of gender in land-use management, as understanding agriculture necessitates an appreciation of gender dynamics within the sector (Quisumbing & Doss 2021).

Agriculture is the backbone of Cameroon's economy. The sector is dominated by subsistence farming where the majority of the producers are female farmers, dominating and playing an indispensable role in food production (Njikam et al. 2021).

This research aims to elucidate the factors influencing farmland abandonment in the Northwest region of Cameroon. Additionally, it intends to propose policy measures for sustainability, aiming to enhance farmers' perspectives on prospects and opportunities in agriculture. In this study, we focused on farming households in 4 divisions of the Northwest region of Cameroon and analysed the factors that influence farmers' decision to abandon their agricultural farmlands. We hypothesised that migration, female household heads and labour availability increase farmland abandonment. We also paid close attention to the role of farming practices and household characteristics, including the importance of household income, in farmer's decision to leave the entire or part of their farmland uncultivated as in the work of (Ding & Lichtenberg 2010)

The challenges in productivity, food insecurity, and increase in prices of agrifood products are not unique to Cameroon, especially in the Northwest region but also in other less developed countries. Researchers point out that farmland abandonment is linked to various socio-economic and political factors (Nkomoki et al. 2018), a phenomenon evident in Cameroon as well. This complexity makes Cameroon, especially the Northwest region, a significant focal point for a thorough examination of farmland abandonment.

The research problem underscores the issue of agricultural lands, which serve as the primary income source for over 70% of residents in the Northwest region (NWR) of Cameroon, experiencing abandonment primarily driven by household migration, gender and labour shortage (Lendzele 2018; Forbanka 2021). The resultant food insecurity poses a threat to the standard of living, necessitating farmers to diversify their income sources to cope with life demands.

Recognizing the diverse consequences of land-use management gaps, this study aims to investigate the driving forces behind household farmland abandonment in the region. The research will explore the variables influencing farming households in both

urban and rural communities in the industrially undeveloped Northwest region, leading to the abandonment of their farmlands.

The study's findings aim to equip policymakers with valuable information on transforming or addressing the challenges associated with migration, gender of a household, and labour on farmland abandonment. The goal is to alleviate constraints while fostering opportunities for both rural and urban population in the region.

2.   **Literature Review**

2.1.   **Farmland abandonment phenomenon**

Farmland, a basic resource for human survival, is necessary to maintain sustainable agricultural development (Falco et al. 2018). Farmland abandonment is becoming the most common global land-cover change issue, with both adverse and beneficial consequences on the environment (e.g., biodiversity, new ecosystems, carbon sequestration, wildfires) and societal well-being (livelihood, farm landscapes) (Haddaway et al. 2013). Farmland abandonment has long been a concern of scholars, especially in the field of agriculture and sustainable development (Schuh et al. 2020). The term farmland abandonment is also known as "abandonment of farmland". There is no unique definition of the concept of a cultivated piece of land. The Food and Agriculture Organization (FAO) in 1995 defined farmland that had not been used for more than 5 years as "abandoned land", (Biswas & Kim 2022). Contrarily in 2011, the International Symposium on Land Management and Land Reserves defined it as farmland that could be farmed but had not been cultivated for more than 2 years and had been greatly perturbed due to improper management as "abandoned land". Farmland abandonment is mostly linked to marginal areas where farming inputs (costs) are no longer compensated by the profits accrued from production (Wang et al. 2020). Studies have shown that rational decision-making and profit maximization, including alternative livelihood strategies and weighing up opportunity costs are some of the consequences associated with farmland abandonment. Existing studies regarding the impact of abandoned farmland have shown as farmland ceases to be cultivated, the artificial ecosystems that lack management gradually metamorphose into natural ecosystems over

time, which might completely change the primary agricultural landscape but also brings ecological and environmental effects (Chaudhary et al. 2018). The decision to abandon or continue farming can be highly complex and influenced by non-economic factors such as distance from farm to house, personal perspectives for farming, education, religion, ethnicity, age, and the availability of next of kin. Overall, the studies by Nahuelhual et al. (2012) throw more light on the drivers of land abandonment in Southern Chile and the implications for landscape planning, by examining the factors associated with land abandonment and their impact on the environment. The study provided valuable insights for developing sustainable land management strategies in the region.

Farmland abandonment has been influenced by migration which has become a commonplace strategy for both rural and urban households, resulting in adverse effects on land management (Goldsmith et al. 2004; Deotti & Estrusch 2016). Gray & Bilsborrow (2014) study in rural Ecuador emphasised the significance of out-migration for the income and labour resources of agricultural households and communities. Forecast trend figures by the United Nations show that by 2050, 70% of Cameroon's population will live in urban zones. However, international evidence suggest that it is almost impossible to stop completely the inflow of rural population into urban zones. Urbanization is due to the push factors (low income in agriculture) making migrants leave rural areas and pull factors of better opportunities in cities (The World Bank Goup 2018).

In Cameroon, the urban population reached approximately 52% in 2010, largely attributed to the net migration of youthful labour from the agricultural economy (Abomo et al. 2013). Considering the focus on agricultural labour migration, a similar study conducted in the backward district of Perambalur aimed at identifying the main causes of rural out-migration and to determine the key correlates of agricultural labour migration in that specific area (Sundaravaradarajan et al. 2011). This emphasises the importance of improving the agricultural economy's social capital, as urban industries require a consistent supply of labour. Chaudhary et al. (2018) in the mountainous areas in Nepal found that, as farmlands are abandoned, household farming equipment and livestock were also given up. However, some farmers who began organising themselves

into initiative groups to pool their personal resources for common benefit still carried out farm activities in the mountain region.

The global socio-economic phenomenon of farmland abandonment due to migration is observed in numerous countries worldwide (Ruskule et al. 2013). However, comprehensive research on farmland abandonment among rural farmer households remains scarce in many regions (Zhou et al. 2020). Limited studies have explored the quantitative impacts of labour migration on farmland abandonment by rural households as well (Liu et al. 2016). Recent research shows that inadequate agricultural labour in and within the family brings about land abandonment but (Liu et al. 2016) revealed that with the rising labour scarcity in the agricultural sector, many agricultural cultivation methods have been developed with agricultural production and crop types too to increase farming profits.

Cameroon like most sub-Saharan countries is a less developed country with a slightly slow economic growth (Depledge 2006). Recent estimates indicate a GDP growth of 3.8% primarily driven by the agroindustry and service sectors. The inflation rate, standing at 6.3% at the close of 2022 (up from 3.5% in 2021), is notably influenced by a 13.7% increase in food prices, resulting in an average inflation rate of 7.5% annually by the end of May 2023 (IMF 2015). Over the past five years, rural-to-urban migration has surged exponentially, predominantly involving the adult youth demographic (Mberu & Pongou 2016). Literature suggests that rural out-migration is intricately linked to economic decline, smallholder farmers' land abandonment, or economic growth and development (Khanal et al. 2015). The Northwest region of Cameroon has notably experienced a substantial increase in smallholder farmer migration over the past six years, with prominent destinations like Bamenda, Yaoundé, and Douala, influenced by the ongoing Anglophone crisis since 2016 (Eluke 2020).

Studies suggest that farmland abandonment is mostly rational because of profit while considering the opportunities and alternative livelihood means (Benayas et al. 2007). It's essential to recognise that the complexities of land abandonment or maintenance extend beyond economic factors, with non-economic elements such as education, religion, age, and succession playing crucial roles (Benayas et al. 2007). The abandonment of agricultural land can yield a diverse array of positive consequences and opportunities, including the restoration of forest plantations, water retention, soil

recovery, nutrient cycling, and a favourable impact on biodiversity (Benayas et al. 2007). However, the identified problems associated with farmland abandonment do not manifest uniformly or hold the same relevance across different regions (Terres et al. 2013). Cameroon has recently grappled with considerable political instability (Ekah 2019) and according to reports, migration is predominantly motivated by socio-economic factors. Migrants seek to enhance their incomes, reunite with family members who have undergone migration, or navigate challenges posed by inadequate political institutions or conflicts (Falco et al. 2018).

Despite contributing approximately 21% to the GDP, agriculture in Cameroon faces challenges, with a substantial portion of those reliant on farming for a livelihood experiencing (Domguia et al. 2019). Wide income gaps between household farmers and civil servants persist, leading to significant malnutrition and food insecurity in both rural and urban populations(Arrey 2020). It remains an open question whether these issues can be solely attributed to poor agricultural sector performances. Land abandonment due to migration, labour shortages, inadequate workforce, civil conflicts, and stagnant agricultural growth may stem from broader factors hindering economic growth. A multitude of complex factors influence land-use decisions and subsequently shape landscapes (Orbelle et al. 2016). The ongoing trend of farmland abandonment raises the risk of persistent food insecurity in Cameroon. To find out more reasons and solutions, (Bhawana & Race 2020) advocate for a suite of policy tools tailored to local contexts, suggesting that such measures may prove more effective than broad national policies in addressing the underlying challenges faced by rural communities.

The Northwest region of Cameroon encompasses approximately 80% hilly terrain, presenting a considerable challenge for farmers (Innocent & Fang 2017). Previous study in Nepal by Khanal & Watanabe (2006) highlighted the adoption of various techniques by farmers to mitigate runoff and control soil erosion on hilly landscapes. These techniques included constructing waterways, stone pavement trails, and retention walls. The escalating abandonment of cultivated land has not only led to a reduction in agricultural production within villages and urban fringes but has also significantly impacted the livelihoods of marginal household farmers in both settings (Khanal & Watanabe 2006). To curb some of the effects of farmland abandonment such as food security being one of the major challenges for the future, the EU has a suitable

strategic interest in keeping its agricultural production potential, in view of both short and long-term needs such as foods, biomass production, feed, fibre (Kastner et al. 2012).

Historically, the livelihoods of many low-income households were primarily rooted in village agriculture (Angelsen et al. 2014). With limited investment opportunities beyond agriculture, outside income, such as remittances and pensions, played a crucial role in supporting agricultural activities (International Fund for Agricultural Development 2022). However, the availability of such employment opportunities for low-income households has diminished due to increasing farmland abandonment (Khanal & Watanabe 2006). This shift has compelled low-income households to either migrate from villages in search of employment or rely on marginal public land for their sustenance. Yet, the prospect of finding lucrative jobs outside villages or local communities poses challenges for many small farm households, requiring significant initial investments in education, preparation, and transportation (Nagayets et al. 2005). Simultaneously, these farm households face discouragement from utilising abandoned land due to high land rent and landlords being reluctant to transfer land ownership rights at lower prices or rent out their land to local villagers (Khanal & Watanabe 2006). Consequently, this situation has led to an increase in food insecurity and poverty among marginal and small farming households.

The environmental impacts of farmland abandonment can be viewed as either an opportunity for ecological restoration to a stage preceding agricultural establishment or as the loss of an ongoing process of land management, sometimes posing a threat to biodiversity (Benayas et al. 2007). The ecological advantage or threat posed by land abandonment depends on the agricultural history and the presence of ecological systems reliant on regular management for their existence (Haddaway et al. 2013).

2.2.   Migration drivers and effects

Farmland abandonment has far-reaching implications for the income and labour resources of agricultural households and communities globally but the precise positive and adverse effects on livelihoods and land use change remain insufficiently elucidated (Gray & Bilsborrow 2014). Several articles conveyed that out-migration and

remittances significantly undermine local or traditional agricultural activities, leading to the abandonment of farmland (Grau & Aide 2008). This study adopts the neoclassical theory, founded on the assumption that land abandonment in relation to migration is primarily driven by economic considerations of relative advantages and costs, encompassing both financial and psychological aspects (Haas 2009; De Haas 2010). Additionally, internal migration resulting from geographical disparities in labour supply and demand, particularly between the rural traditional agricultural sector and the urban modern manufacturing sector, is considered (Hagen-Zanker 2008).

Research by Khanal et al. (2015) in hilly areas of Nepal reveals that emigration from hills and mountains has brought about both positive and negative social and economic consequences for the places of origin. They contend that the loss of family labour due to emigration can be compensated by the income gains derived from migrants' remittances (World Bank 2019). Echoing this theoretical framework, they suggest that household members might opt to reduce agricultural work and increase leisure time due to higher income from remittances, particularly for those engaged in low-returns and less appealing manual work in agriculture. This shift negatively impacts agricultural productivity and food production at both the household and national levels, contributing to land abandonment.

In a study by Tamang et al. (2014) in Kavre and Lamjung-Nepal, the out-migration of youth from villages to urban areas, and at times internationally, emerges as the primary cause of labour shortage, resulting in reduced cropping intensity. The remaining women and elderly individuals struggle to provide sufficient care, and the traditionally female household members, engaged in reproductive work and providing agricultural labour for livelihood security, contribute to increased farmland abandonment in these districts which in turn leads to a decline in local food production directly affecting food security, exacerbating food waste and adverse human nutrition. In 2022, an estimated 2.4 billion people in the world, including a higher proportion of women not letting out those residing in rural areas in Cameroon, lacked access to nutritious, safe, and sufficient food throughout the year (FAO et al. 2023).

Building on this perspective, FAO (2016) suggests that migration may alleviate pressure on local labour markets, leading to a more efficient allocation of labour and

higher wages in agriculture. However, rural areas of origin might risk of losing their youthful population, particularly men, who constitute a vital and dynamic segment of their labour force. Consequently, women left behind may gain greater control over productive resources and services, potentially contributing to bridging the broader gender gap in agriculture. Falco et al. (2018) believes that climate effects on migration have mostly been assumed to occur through an agricultural channel in areas mainly dependent on agriculture.

According to Bhawana & Race (2020) existing studies have predominantly centred on migrant households, with limited literature or comprehensive understanding of the distinctions in land management practices between migrant and non-migrant households. Across most African countries, the pursuit of arable land frequently propels smallholder farmers to migrate from one agricultural setting to another. This quest for new land, often resulting in land abandonment, can be influenced by factors such as poor soil fertility, topographical characteristics, distance from house to farm, landscape features, industrialization, low productivity, political instability, climate change (e.g., desertification), agricultural inputs, land disputes, lack of machinery, among others (Liu et al. 2016).

In a broader sense, rural agricultural economy migration involves marginal or smallholder farmers spontaneously seeking new lands, as highlighted by (Akeju 2013). As more individuals migrate to urban centres worldwide, they expand their spheres of influence and create additional opportunities, fostering a more stable financial environment for their kin back home. Families of these migrants often experience an enhancement in their financial stability (Gray & Bilsborrow 2014; Chaudhary et al. 2018). Generally, out-migrants envision achieving financial freedom in other sectors or a more stable agricultural environment to elevate their living standards. This financial independence is then often invested in once-abandoned farmlands or directly in agriculture as a whole, as observed in a project conducted by FAO, reported by (Deotti & Estrusch 2016).

Centuries ago, both male and female households in the North West Region of Cameroon were recognized for their collaborative efforts in farming, a pivotal role in agriculture as indicated by (Walker 1990) in research conducted under the World Bank

(WB). Consequently, in the absence of male members, female household members have assumed more significant responsibilities in agriculture than before (Baliyan 2018). An investigation by Tamang et al. (2014) reveals that women are increasingly adopting farming strategies to the best of their abilities but tend to engage in less intensive farming practices, leading to the abandonment of their agricultural lands. Consequently, there is a decline in food production, contributing to food insecurity primarily at the local level.

2.3.   **Factors influencing farmland abandonment**

The term "land abandonment" or "abandoned land" encompasses various definitions, with each legal or scientific text adopting its interpretation, as noted by (Orbelle et al. 2016). It is essential to distinguish between land abandonment in agricultural areas, which may not necessarily be farmland abandonment. Often, farmland abandonment is closely associated with the abandonment of various types of land in rural areas, and vice versa (Schuh et al. 2020).

This study primarily focuses on farmland abandonment, specifically the relinquishment of land intended for agricultural productivity. Historically, research on farmland abandonment and marginalisation has concentrated on remote areas like mountain regions, islands, and extreme terrains, typically examined through case studies Schuh et al. (2020). Currently, farmland abandonment is at its peak, driven by a complex interplay of biophysical, farming, structural, market, regional, institutional, and policy factors (Lasanta et al. 2017). Contemporary trends in land abandonment are also influenced by three major external factors that actors have limited control over but significantly impact management change: climate change, globalisation of markets, and health crises, exemplified by events such as the COVID-19 pandemic.

The abandonment of agriculture or farmland yields both positive and negative consequences for household livelihoods (Schuh et al. 2020). However, these outcomes, whether positive or negative, are not universally consistent or applicable across all regions or only relevant at small scales. (Benayas et al. 2007; Haddaway et al. 2013) in their research which aligns with the present study, identified three major types of drivers for agricultural land abandonment. The first type encompasses ecological

drivers, alternatively referred to as geo-bio-physical, physiographic, or abiotic drivers. These include factors such as elevation, geological substrate, slope, fertility, low productivity, crisis, soil conditions, better-off farm opportunities, and climate change, which significantly influence agricultural production. The second type of driver involves socio-economic factors, encompassing market incentives, migration, rural depopulation, industrialization, land-tenure systems and security, farm characteristics (distance, farm size, etc.), farmer age, and availability of labour, among others. Typically, some of these drivers act as mediators of macro-driving forces of change, representing new economic opportunities (Benayas et al. 2007). They include;

Gender

When examining gender as an influence on agricultural farmland abandonment, it is observed that males exhibit a greater tendency than females to relocate or seek off-farm employment (Yadav et al. 2016). The heightened male migration, driven by the pursuit of alternative income sources for food security and livelihood, has prompted an increased burden on female members to assume additional responsibilities in agricultural roles, as highlighted by (Tamang et al. 2014). Consequently, women, particularly in rural or suburban areas, who are less inclined to engage in off-farm jobs and instead focus on agricultural activities, may demonstrate heightened efficiency compared to their male counterparts. In developing countries, women consistently face challenges in land ownership (Tamang et al. 2014; Azong et al. 2018; Valera et al. 2018), possessing fewer rights to land, and often having access to lower-quality land compared to that owned by men, as noted by (Food and Agriculture Organisation, 2017). As men migrate from rural zones, women inevitably assume the role of farm managers (Sama-lang et al. 2013)

Distance from house to farm (location)

The agricultural farmlands in this research area are dispersed and situated far from human settlements. The relatively remote farm locations, exceeding 10 kilometres in the Boyo Division of the Northwest region, heighten the susceptibility of crops to damage by wildlife species, leading to increased production costs. This situation prompts farmers to grapple with questions and decisions about whether to continue

cultivation. In a study akin to this literature, (Bhawana & Race 2020), which delved into out-migration and land-use change, observed a trend where farming is increasingly concentrated in areas close to human settlements (Zhou et al. 2020). This shift enables women and the elderly to manage farmland with fewer household members, offering protection against wildlife species and reducing production costs, notably travel time. In some instances, the availability of water through rainfall or natural sources becomes a factor allowing farmers to cultivate near their residences. An example cited involves farmers in Gausahar who often rely on their home water supply for vegetable production (Bhawana & Race 2020). While less intensive farming and farmland abandonment are commonly associated with marginal land conditions in remote areas, urban fringes also confront situations where farming may not necessarily be marginal and does not face the challenges of being remote, as discussed by (Zhou et al. 2020).

Income

When the income generated from farming is high, farmers are highly motivated to continue their farming activities (Zhou et al. 2020), thus a higher income and favourable working conditions will hinder land abandonment.

Age

Age is one of the most important factors that influence migration and land abandonment (Deotti & Estrusch 2016). Previous studies have revealed that old ageing or the elderly reduce the chance of finding off-farm jobs thus increasing labour availability for farming jobs. On the other point of view, ageing means weaker physical condition and thus a decrease in ability for farming, especially for cultivation from far distant farmlands (Yan et al. 2016).

Education

Despite numerous articles from previous studies suggesting that a household head with a higher level of education is more likely to secure off-farm employment, indicating an increased likelihood of farmland abandonment or migration (Bhawana & Race 2020), other studies consider education a non-factor in influencing migration and land abandonment. In their research, (Yan et al. 2016) explained that a household head

with a higher level of education may possess enhanced capabilities to gather information and knowledge related to the management of their farmlands. Additionally, individuals with higher education levels may demonstrate superior proficiency in managing the application of fertilisers, insecticides, pesticides, and other agricultural supplies.

Shortage of manpower

Past studies have shown that labour shortage is one of the main causes of farmland abandonment (Paudel et al. 2020). Agricultural labour is mostly provided by the youthful population and this same age group always migrates from villages to cities or sub-urban zones to get off-farm jobs (Su et al. 2020). Remote areas and areas with territorial specificities: mountains, islands, coastal area and sparsely populated zones are the most vulnerable to farmland abandonment (Schuh et al. 2020).

2.4.   Other external drivers of farmland abandonment

Agro-ecological or biophysical

Agroecological or biophysical factors consistently play a crucial role in the abandonment of farmland, as they determine the productivity and profitability of agricultural holdings. Terres et al. (2015) highlight certain unfavourable biophysical factors such as low soil productivity, adverse climate conditions, steep terrain, and significant altitude as primary natural constraints to agriculture, potentially escalating the risk of farmland abandonment. Sluiter & De Jong (2007) assert that challenges associated with operating agricultural machinery in fields rank as the second most influential agroecological factor contributing to abandonment. In a free market economy, manual techniques render products uncompetitive, leading to the discontinuation of cultivation on steep slopes, small plots, and areas with poor accessibility. For instance, soil erosion poses a significant and widespread threat linked to land abandonment in various parts of the world (Benayas et al. 2007). The evolution of soil after abandonment is intertwined with the abilities of plants to colonize and establish themselves (i.e., vegetation resilience) and subsequent land uses. Spontaneous plant colonization in hilly areas with terraced fields encounters erosion issues in

situations where overgrazing impedes plant growth, compacting and removing topsoil (Harden 1996). Sluiter & De Jong (2007) additionally emphasize that the type of soil remains a critical factor in land abandonment, with those having a weak capacity for water retention being the first to be forsaken. Climatic factors significantly contribute to land abandonment, particularly in the Mediterranean mountains and arid or semi-arid areas in Southern Europe. (Lasanta et al. 2017) note that rainfall scarcity poses challenges in converting cereal fields into pastures, limiting progress in extensive livestock farming and exacerbating land abandonment in the central and southern Spanish mountains.

Internal socio-economic

Internal socio-economic factors can lead to abandonment on both regional and individual holding levels. The lack of competitiveness in crops, extensive urbanisation of the territory, a limited land market, and competition from alternative economic ventures for more fertile fields contribute to abandonment in entire regions. Similarly, specific holdings may face abandonment due to a lack of capitalisation, the high economic cost of land, small farmland sizes, and difficulties in renting lands (Lasanta et al. 2017). The urbanisation of agricultural plots often signifies the transfer of farm holdings, as noted by (Collantes 2009). In mountainous areas with vibrant tourism activities, there is frequent competition for the workforce among the primary, secondary, and tertiary sectors. The migration of the active population from the primary sector to other sectors emerges as a primary factor leading to the discontinuation of some farmlands, resulting in farmland abandonment (Riedel et al. 2005).

Agricultural holding features

The final category of local drivers encompasses factors tied to the region, such as the active population, number of farmers, and migration trends, as well as features associated with holdings, including size, farmer's age, and prospects for continuity (Doorn & Bakker 2007). In a study conducted in European mountainous areas, Lasanta et al. (2017) observed a significant rural exodus during the middle decades of the 20th century. This exodus had far-reaching consequences, leading to the marginalization, reduction of agricultural holdings, and widespread abandonment of agricultural

farmland. The study concluded that emigration ultimately resulted in the loss of vital services and infrastructure, impacting the sustainability of villages. On the contrary,

(Pinilla et al. 2008; Weissteiner et al. 2011) posit that a qualified and well-trained younger population emigrated, leaving farm holdings in the hands of an older population with limited capacity and interest in enhancing production systems.

Table 1 External drivers of farmland abandonment (Lasanta et al. 2017)

Agro-ecological or Biophysical	Socio-economic	Agricultural holding features
• Poor soils • Poor access to farmlands • Remote farmlands • Climatic influence • Nature of farmland (steep, slopy) • Inefficient field mechanization • Small plot sizes • Soil degradation e.t.c	• Less competitiveness of products • High cost of land • Urbanization • High cost of renting land • Small size of farmland • Extensive/Intensive management • Economic alternatives	• Competency of the workforce • Family disputes over land inheritance • Lower proportion of farmers • Low workforce percentage where the farmland is located • Unrealisable capitalization

2.4.1. **Conceptual Framework**

The table presented below illustrates the conceptual framework for agricultural farmland abandonment within the study area and the relationship among the variables. Numerous factors contribute to the abandonment of farmland in agriculture, exerting either positive or negative influences on the agricultural sector in an economy. This conceptualization is organized into four primary categories, all revolving around migration and land abandonment, indicating their inherent correlation with each variable. These variables are classified in the literature as follows;
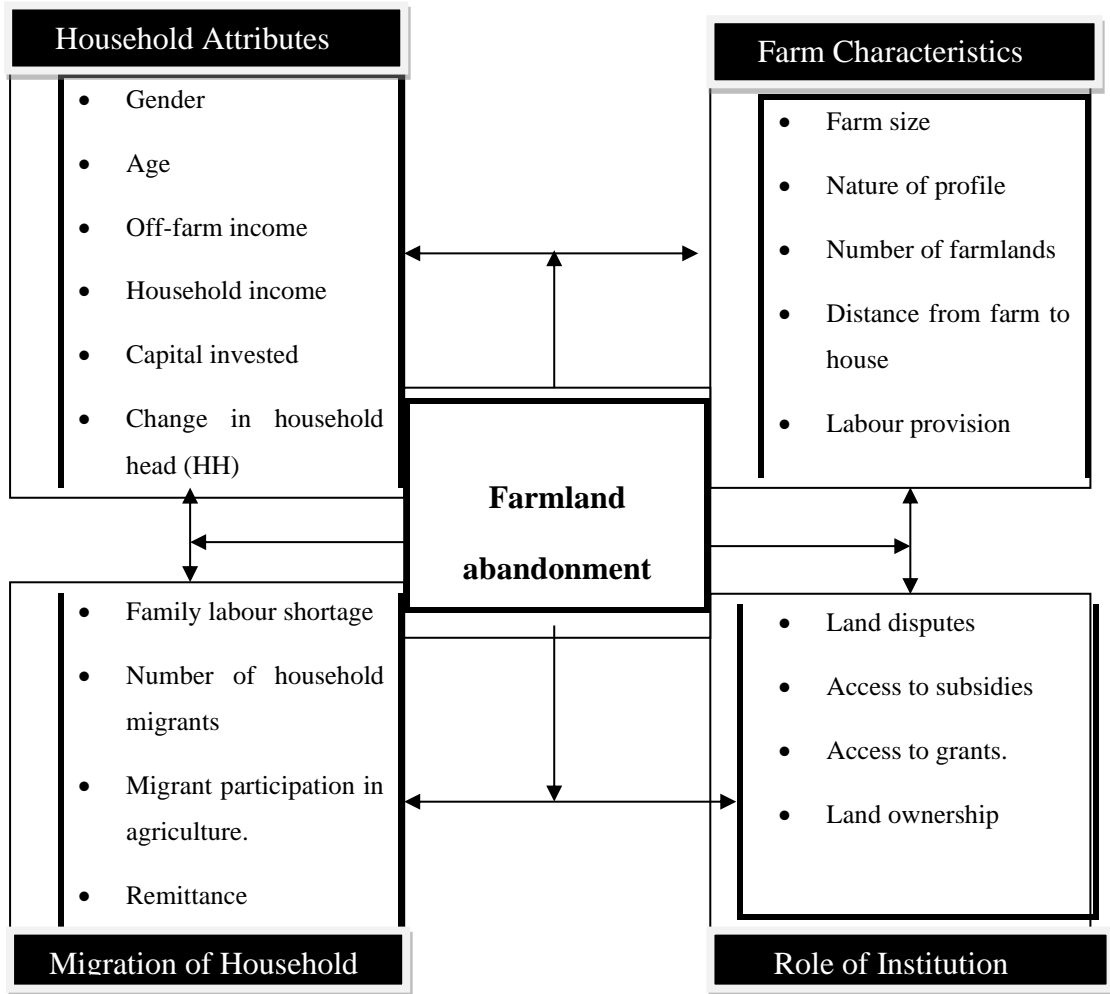
Figure 1 Conceptual framework showing variables influencing household agricultural farmland abandonment

2.4.2.   Consequences of farmland abandonment

The impact of migration on farmland abandonment in agriculture is multifaceted, as highlighted by (Orbelle et al. 2016). Across the globe, human populations are traversing, with individuals seeking new and sustainable economic opportunities in urban areas, driven by factors such as conflict avoidance and the rapidly evolving conditions in rural environments (Sanderson et al. 2018). Urbanisation, rural out-migration, environmental land degradation, and advancements in agricultural technologies have collectively contributed to a burgeoning global trend in farmland abandonment (Benayas et al. (2007). The large-scale out-migration leading to rural depopulation has emerged as a significant catalyst for farmland abandonment in numerous countries (Stellmes et al., 2013; Yan et al. 2016).

Presently, the trajectory of farmland abandonment appears less productive and often irrational (Yan et al. 2016). However, the abandonment of marginal farmlands could potentially promote the recovery of natural vegetation, ultimately enhancing agricultural productivity and improving infrastructure. Yan et al. (2016) highlighted that farmland abandonment is a global phenomenon primarily driven by rural-urban migration, presenting new business opportunities outside the farming sector. Although ecological conditions predominantly influence this trend, they emphasise that mismanagement is of secondary importance in understanding the underlying dynamics.

Biophysical factors, as internal influences, consistently play a role, serving as determinants for farmland productivity and, consequently, impacting the profitability and competitiveness of the agricultural product (Terres et al. 2015) Additionally, socio-economic factors and the characteristics of agricultural holdings contribute to elucidating the spatiotemporal variations in the process of farmland abandonment.

As per Lasanta et al. (2017), proximate causes of farmland abandonment involve human-related issues and local-scale direct actions (such as features of agricultural holdings and topography). In contrast, distant causes may be regional, national, or global, examined through individual responses to economic and technological changes. Some of these drivers function as mediators for large-scale or macro-driving forces of change, representing new economic opportunities optimally (Benayas et al. 2007). The mountains experience external causes for farmland abandonment, attributed to the integration of the national market economy. This integration leads to the emigration (external driver) of the youthful population seeking employment opportunities in cities. Consequently, goods that were once produced in the mountains are now imported, (Vliet et al. 2015). In the context of globalisation, migration, and land-use transition in Latin America, (Grau & Aide 2008) noted that agricultural farmland abandonment is a global phenomenon predominantly propelled by rural-urban migration, where improved economic prospects are available.

3.   **Aims of the thesis**

The main objective of this thesis is to understand the reason behind the recent increase in farmland abandonment in the North West Region of Cameroon and their effects on agricultural productivity. The main objective of the study is subdivided into the following specific objectives.

1.   To determine the impacts of migration on farmland abandonment.

2.   To investigate if female household head influences land abandonment.

3.   To analyse whether lack of labour leads to land abandonment.

3.1.   **Research questions**

Following the literature and the existing gaps, the research seeks to respond to the following questions.

1.   Does migration of farming household members influence farmland abandonment?

2.   Can female gender of household prompt farmland abandonment?

3.   Does lack of labour results in farmland abandonment in agriculture?

3.2.   **Research hypothesis**

The literature from existing knowledge on similar research has tried to answer the research questions above. The study proposes the following hypothesis:

1. H1: Household migration influences farmland abandonment (Paudel et al. 2020)

2. H2: Females as heads of households have higher farmland abandonment (Tamang et al. 2014)

3. H3: Lack of agricultural labour within and out of the family results in farmland abandonment (Bhawana & Race 2020).

4. Methodology

4.1. Study Area

4.1.1. Administrative Location

The study was conducted in selected communities of the hilly, mountainous North West Region of Cameroon. Geographically, the region is located in the western highlands of Cameroon, bordered in the Southwest by the Southwest region, Northwest by the Federal Republic of Nigeria, East by the Adamawa region and South by the Western region. The regional headquarters is Bamenda and is made up of seven divisions which are further divided into subdivisions (combination of villages). The divisions include; Boyo, Bui, Donga–Mantung, Menchum, Mezam, Momo and Ngokentunjia, with 34 subdivisions (Mugah 2015). The Northwest region has an estimated population of about 2.26 million inhabitants and a population density of 99 inhabitants per square kilometre.

A cold temperate-like climate, influenced mainly by its mountainous terrain and undulating topography also characterises the region. The average rainfall here is about 2400 mm with an average temperature of 23°C, ranging between 15°-32°C (Innocent & Fang 2017).

Economically, 70% of the population of the region depend solely on subsistence agriculture as their main source of livelihood (Minang 2003). There are two main seasons; the rainy season which starts in April and ends around mid-October, and the dry season from early November to February. The dry season is characterized by dry Harmattan hot air and dry wind. The study area was chosen due to the recent trend in migration and farmland abandonment mostly by marginal farms.
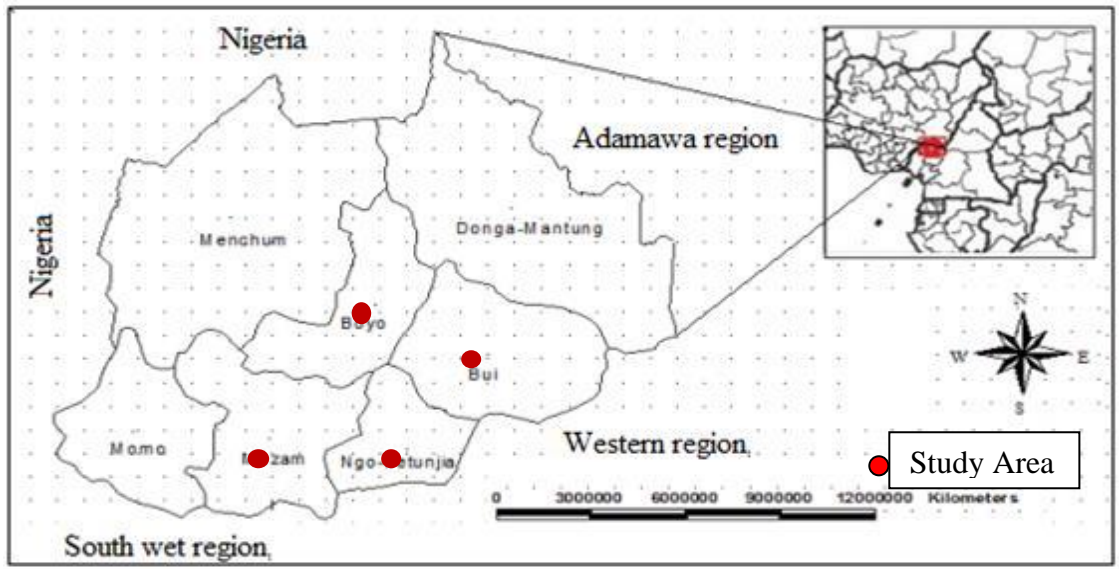
Figure 2 Location of the North West region of Cameroon showing the seven divisions that make up the region. Source: (Innocent & Fang 2017).

4.1.2.   Land tenure system

Land tenure encompasses the legally defined relationship among individuals or groups to land, including other natural resources such as water and trees (Forni 2001). This institutional framework consists of rules developed by societies to regulate the behaviour of occupants, determining the distribution of property rights, access, control, and transfer, as well as associated responsibilities and constraints. In essence, land tenure systems specify who can use specific resources, for how long, and under what conditions. Within the systems, rights may be sanctioned by either the formal legal structures or customary practices accepted by the majority of users (Forni 2001). In Cameroon, there has been a remarkable shift in the land tenure system, significantly affecting women's rights to land, food security, and sustainable development. Fonjong et al. (2010) working in a comparable location to our study, highlighted the historical practice where the Fon of Kom in North West Cameroon allocated land exclusively to men, with women requiring male intermediaries for access. However, during our study, this customary had changed, and women could now independently acquire land. Cameroon's formal law categorizes land as private, public, or national. Private land can be owned by individuals, corporate entities, groups, or the state, provided it is titled and registered. Public land, such as highways, parks, and waterways, is state-owned. All

31

other land falls under the classification of national land, which includes unoccupied land, grazing land, land governed by customary law and informal settlements. The state has the authority to allocate use rights on national land to individuals or groups or convert such land into either private or public property (République du Cameroun 1974). The formal law recognises the following tenure types: ownership, usufruct rights and leaseholds according to a study carried out by (USAID 2011) as follow;

Ownership is a situation in which the landowners have rights to exclusively possess and use their land, the right to mortgage the land, and the right to transfer it. All the ownership rights in the land must be registered. Most land privately-owned registered lands are in urban areas. Large commercial farms are also usually registered (République du Cameroun 1974; Laird et al. 2007).

Usufruct is a tenure system in which the state can issue or grant usufruct rights to occupants of national land. Community lands are generally considered to have usufruct rights (République du Cameroun 1974).

Leaseholds can be issued by private parties or the state under terms agreed to by the parties. In urban and peri-urban zones, leasing is common. In some agricultural areas with limited land, rental arrangements are common.

Sharecropping is an agreement in which the tenant pays the landowner a percentage of the production and is a common form of tenancy, particularly in the south. In one study in Southwest Region, 49% of cocoa farmers engaged sharecroppers (Schreckenberg et al. 2002).

Profit or license in the formal law provides that customary communities have the right to follow up and take products from unoccupied national land until when the state assigns the land to a particular use (République du Cameroun 1974) i.e. Government of Cameroon Land Laws 74-1 1974 and GOC Land Law 74-2 1974 respectively.

4.2.   Sampling strategy

Multistage sampling was used to capture household farmers. The area was purposively selected as it was affected by conflict, migration and land abandonment. Villages were

purposively selected to avoid dangerous zones in the conflict zone. The respondents in remote villages of Boyo, Bui and Ngoketunja divisions where crisis was intense, snowball sampling was used. Convenient sampling was chosen in Mezam division, the metropolitan area since we were interested to learn from respondents who work in a certain occupational domain, that is farmers who are directly involved in both farming and off-farm activities in urban-rural settlement.

4.3.   **Data collection and questionnaire design**

The pretesting of the questions in the questionnaire was conducted in the study area before finalising it for the survey. From the 18th of August 2022 to the 21st of September 2022, 157 semi-structured field interviews were conducted in different divisions in the region to capture some household farmers' socio-economic characteristics, migration and land abandonment (land-use management). Firstly, an online survey was conducted for the entire region using Google Forms in collaboration with agricultural engineers from the Ministry of Agriculture and Rural Development through their channels and 50 respondents were captured. Secondly, 107 respondents were interviewed using pen and paper-based. The study considers farmland abandonment as a piece of land which was formally used for cultivation with specificity on economic purposes but has been abandoned for one year or more.

With similarities in land use decisions and socio-economic characteristics of household farmers in some areas, only a few farmers were randomly selected for interviews. In case one of the male or female household heads was not available, the one at the moment was interviewed. At each selected farmer residence, we initially laid down our study purpose and held an oral interview for a time space of 10 to 15 minutes with one or both family members who were willing to jointly share ideas from the set of predefined questions. We made sure that the selected respondent(s) was familiar with our purpose. Field observations related to different land management practices by households were conducted at the time of the household surveys accompanied by interviews, with the lead researcher walking through the farmland with the household head/farmer during the interviews. Surveys, interviews, and field observation also included an informal discussion and walk around in the study area.

The questionnaire was designed to incorporate the most important factors that influence agricultural farmland abandonment as identified in the literature. The questionnaire consisted of 26 questions. The first section presents questions related to household socio-economic characteristics such as the age of respondent, gender, number of households, marital status, source of labour, number of years of education, household income, household head and more. The second section contributed questions related to household migration like the number of household migrants, remittance, labour availability, migrants' participation in agriculture etc. while the last section focused mostly on farmland characteristics (factors affecting farmland abandonment) such as farm size, cultivated parcel, land disputes, nature of landscape, distance of farmland and access to credit.

Table 2 Divisions where the study was conducted in the Northwest region**.**

Division	Number of respondents
Boyo	34
Bui	32
Mezam	60
Ngo-ketunjia	31

5. **Data analysis**

Descriptive statistics, charts and inferential statistics were used to analyse the data collected through paper-based and online surveys. The Microsoft Excel and IBM SPSS Statistics statistical software was used to analyse the data. Firstly, the data was entered into Excel and data cleaning was performed to remove incomplete data. To examine the factors that influence farmland abandonment among households we considered household socio-economic characteristics, migration related aspects of households and their farmland characteristics e.g. distance from farm to house, landscape profile and some institutional characteristics such as access to credit,

subsidies etc. The binary logistic regression was used to analyse the data and test the hypothesis.

5.1.   **Definition of model variables used**

Migration is the movement of people from one place to the other. It can be internal, or external and always accompanied by push factors which in this study leads to farmland abandonment. Farmland abandonment is defined as a parcel of land which has not been cultivated for at least one year. Thus, in this study, the dependent variable is farmland abandonment, defined as the existence of abandoned farmland areas for the past 2 or more years.

The independent variables in the study include household socio-economic characteristics, migration characteristics of households and farm characteristics such as farm size, location etc. as reviewed in previous research. According to Zhou et al. (2020), socioeconomic characteristics (gender, age, education, income) of households are very important for explaining farmland abandonment. To explain them, he added that, higher on-farm income is linked to lower farmland abandonment likewise higher education levels, have a positive and significant impact on abandonment.

Table 3 Variables, their descriptions and level of measurements.

Variable	Description	Measurement
Gender	What is your gender? Male=1 Female=0	Dummy
Age	What is your age? (years)	Continuous
Marital Status	What is your marital status? Married=1 Single=2 Widow=3 Divorced=4	Categorical
Household Income	What is your total household monthly income (FCFA)? 1=(00001-50000), 2=(50,000-99,999), 3=(100,000-149,999), 4=(150 000+)	Categorical
Family Labour	Are you are currently facing family labour shortage? YES=1 No=0	Dummy
Change in household head	Was there any change in household head? Yes=1 No=0	Dummy
Number of plots (parcels)	How much land (hectares) your family had in total?	Continuous
Labour availability	Do you witness a drop in labour availability in your region? 1=	Categorical

	To a Greater Extent 2= Somewhat 3= Rather Not 4=Not at All	
Capital invested yearly	How much capital do you invest in your farms yearly (1=Less than 100,000 2=100,000-149,999 3=150,000-199,999 4=200,000-249,999 5=500,000+)	Categorical
Migrant family labour availability	How many of your immediate household member that used to live with you migrated in the past 2 years?	Categorical
Household migrant participation in agriculture	How many of them used to work in the farm before they migrated?	Continuous
Migrant Remittance	How important are remittance (money gotten from migration) to you? 1= 1 2= Less Important 3=50-50 4= Important 5=Very Important	Categorical
Land dispute	Do you have disputes over a piece of land? YES=1 NO=0	Dummy
Landscape (terrain)	What is the nature of your farmland landscape? Steep=1 Sloppy=2 Flat=3	Categorical
Abandoned parcels for the past 2 years	Have you abandon any piece of land for the past 2 years? YES=1 No=0	Dummy
Access to subsidies	Have you received subsidies or grants for the past 2 years? YES=1=NO=0	Dummy
Land ownership	Do you have the land title of the farmland(s) you are currently farming? Yes=1 No=0	Dummy
Distance of farthest farmland from home	What is the distance from your home to your farthest farm? (Km)	Continuous
Access to Credit	Do you have access to credit? YES=1 No=0	Dummy

5.1.1. **Model specification**

The share of farmland abandoned by a household is linked by the dependent variable for the binary logistic regression as expressed by the model formula below;

$$\text{Log (odds)} = \text{logit}(P) = \ln \frac{(p)}{(1-p)} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (1)}$$

Considering farmland abandonment as the above dependent variable and adding a regression equation for the independent variables, we get a logistic regression:

$$\text{Logit(P)} = a+b1X1+ b2X2 + b3X3+\dots bnXn \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.(2)$$

Thus the relationship between logit(P) and X is considered to be linear

36

Where;

In the equation above: *P* can be calculated with the following formula

where :

P = high probability of a factor that farmland abandonment is likely to occur and *1-p* from equation 1 denotes the probability that farmland abandonment is likely not occurring.

a = the constant (or intercept) of the equation and *x1, x2...Xx* which are the possible independent variables.

b = the coefficient (or slope) of the predictor variable *b1, b2…*, and *bx* are partial regression coefficients. If the odd ratio is above 1, there is a positive relationship between the dependent and independent variables. When the value is equal to 1, there is no relationship at all; if the value is below 1, it indicates a negative relationship. To determine the accuracy of the model, Negelkerke's R^2 is calculated.

The Binary Logistic Regression was used to examine the factors that influence land abandonment within selected variables. In this model, the dependent variable is represented by a dummy value of 1 or 0. The household survey assignment was made as a binary variable and continuous independent variable in regards to previous literature reports regarding household farmland abandonment (Khanal & Watanabe 2006; Yan et al. 2016).

6.   **Results**

6.1.   **Descriptive analysis**

As seen in Table 4 below, most of the respondents were males (92), making up 59% of the total respondents while the remaining 41% was made up of women (64 respondents).

Looking at the age distribution of the respondents which was captured as a continuous variable but later recoded into two categories revealed that most of the

respondents were within twenty to forty years of age making up 69.9%, and the remaining respondents made up 30.1% of the total respondents.

With reference to the marital status of the respondents, it is observed that a dominant portion of the respondents are married, making up 57.1% of the total respondents), followed by singles making up 31.4%. The widowed made up 8.3% and lastly, the divorced made up 3.2% of the total respondents. When asked whether they were residing with their partners, 57.7% respondents said yes while 42.3% respondents replied with a no. In regards to the highest contributor in farming activities, 61 respondents stood for the husband while 95 said the wife was the highest making a percentage of 39.1% and 60.9% respectively.

Concerning the level of income of the respondents, it is seen that most of the respondents earn between 50,001 FCFA to 99,999 FCFA making up 37.2% of the total respondents, followed by those who earn between 100,000 to 149,999 making up 27.6% of the total respondents. Those who earned 150,000 FCFA and above were 29, making up 18.5% of the total respondents. And lastly, respondents who earn less than 50,000 FCFA made up the least proportion representing 16.7% of the total respondents.

Regarding financial investment in farmland as observed in the table below shows that only a few respondents, 11.5% have invested more than 500,000 FCFA (8 respondents) followed by 18 respondents who could afford 200,000 FCFA-249,999 FCFA (11.5%) which is the average of the maximum amount of 500,000 FCFA invested just by 8 farmers as earlier mentioned. About 42 respondents accepted that they invested between 150,000 FCFA to 199,999 FCFA recording 26.9% of the population. The highest number (52 respondents) agreed that they invested between 100,000 FCFA to 149,999 FCFA recording 33% of the population while the 36 respondents out of the 156 invested below 100,000 FCFA recording just 23.1% of the population.

It is also observed in Table 4 that a high proportion of the respondents stood for the fact that they have not had a change in the household head (112 respondents, making up 71.8% of the total respondents). The remaining 44 respondents (28.2% of the total respondents) were those who accepted to have changed household heads. Seeking to know the reason behind this change of household heads, it is observed that the

predominant reason is death, making up 69.9% of the total respondents, followed by other reasons 11.5%, illness 9.6%, followed by migration 7.7% and lastly off-farm employment 1.3%.

Looking at the quantity of land that has not been cultivated (abandoned), it is noticed that most of the respondents fall within those who have abandoned one hectare of farmland, making up 50.6% of the total respondents, those who have abandoned two to four hectares make up 41% and lastly, those who have abandoned five hectares and above make up 8.3% of the total respondents.

Out of the 156 respondents in the entire population, as seen in the table, 75% responded that they had farmland disputes while 25% do not have farmland dispute issues.

With a close look at the nature of the landscape results from the table, farm landscape was categorized into steep, sloppy and flat. 38 respondents said that their farmland profile was steep making just 24.4% of the respondents as opposed to sloppy and flat farms whose respondents made up 41% and 34.6% respectively.

Notwithstanding that most respondents have abandoned at least one piece of land, 21% of the respondents accepted that they have received subsidies from external sources while 78% of respondents have not received subsidies even though those who received had abandoned their farmland.

As seen in Table 4 below with land title possession which was captured as a dummy variable, those who have land titles make up 62.2% of the total respondents while the rest who responded that they do not have land titles make up 37.8%.

With little financial investment in farmland and limited access to credit, the results depict that only 37.8% respondents had the opportunity to receive credit.

Table 4 Socio-economic and farm characteristics of the farming households in the study area

Socio-economic profile of respondents		Frequency	Percent
Gender	Male	92	59%
	Female	64	41%
Age	20 – 40 years	109	69.9%
	41 years and above	47	30.1%
Marital status	Married	89	57.1%
	Single	49	31.4%
	Widow	13	8.3%
	Divorced	5	3.2%
Level of income (FCFA)	1-50000	26	16.7%
	50001-99999	58	37.2%
	100000-149999	43	27.6%
	150000+	29	18.6%
How much capital (CFA) do you invest yearly?	Less than 100000	36	23.1%
	100000-149999	52	33.3%
	150000-199999	42	26.9%
	200000-249999	18	11.5%
	500000+	8	5.1%
Change in household head	Yes	44	28.2%
	No	112	71.8%
Are you residing with your partner?	Yes	90	57.7%
	No	66	42.3%
Reason for change in household head	Death	109	69.9%
	Illness	15	9.6%
	Migration	12	7.7%
	Off-farm employment	2	1.3%
	others	18	11.5%
Size of abandoned land	One hectare	79	50.6%

	Two to four hectares	64	41%
	Five hectares and above	13	8.3%
Labour Provision	Husband	61	39.1%
	Wife	95	60.9%
Land dispute	Yes	117	75%
	No	39	25%
Farmland Landscape	Steep	38	24.4%
	Sloppy	64	41%
	Flat	54	34.6%
Subsidies	Yes	34	21.8%
	No	122	78.2%
Land title possession	Yes	97	62.2%
	No	57	37.8%
Access to credit	Yes	59	37.8%
	No	97	62.2%

Exchange rate $1=550 FCFA

Household migrant characteristics

As seen in Figure 3 below, a drop in labour availability in the region has been largely witnessed by many respondents, followed by those who have somehow witnessed a drop in labour availability (40 respondents making up 25.6% of the total respondents). 3.2% of the respondents say they have not witnessed a drop in labour availability and 2.6% said that labour availability has not dropped at all. It is also observed that a higher proportion of the respondents are currently facing a family labour shortage (138 respondents making up 88.5% of the total respondents), and a lesser proportion of 11.5% (18 respondents) said that they were not facing a family labour shortage.

Again, 52.6% of the respondents strongly agree that migration has increased farmland abandonment, followed by 34.6% who agreed. 8.3% of the respondents were undecided followed by those who disagreed making up 2.6% of the total respondents and lastly, 1.9% who strongly disagreed. It is noticed that 87% that most of those who migrated were participants in agriculture (137 respondents), and 12.2% of the respondents said that the migrants were not participants in agriculture.

41

Lastly, 26.3% of the respondents fell under undecided on whether remittance from migration is important to them, followed by those who say the remittance is very important making up 20.5% of the total respondents. Those who said remittance is less important made up 19.2% of the total respondents and finally those who said the remittance is not important only 9.6% of the total respondents were registered.
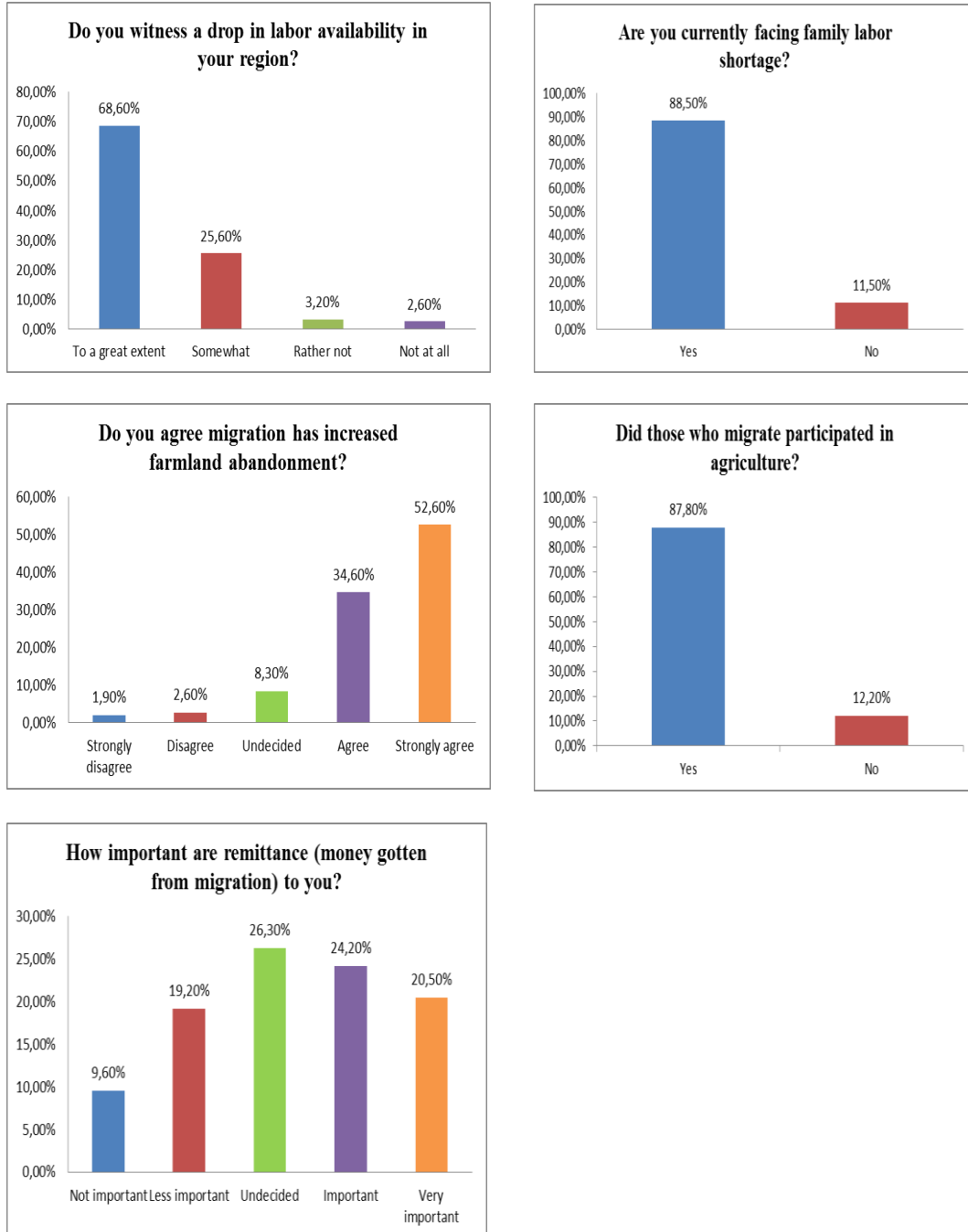

Figure 3 Perceptions about migration and labour shortage in the study area

As observed in the table above, 62.8% of the respondents stood for the fact that crisis is a very important factor that affects land abandonment, followed by 22.4% who said it is important, 10.3% said it is somehow important, 3,2% said it is less important and 1.3% said it is not important.

It is also noted that 41% of the respondents stood for the fact that desertification is not an important factor that affects land abandonment, followed by 35.3% who said it is less important, 10.9% said it is somehow important, 7.1% said it is important and 5.8% said it is very important.

Also, it is observed that 34% of the respondents stood for the fact that distance from farm to house is an important factor that affects land abandonment, followed by 30.1% who said it is somehow important, 21.8% said it is very important, 9.6% said it is less important and 4.5% said it is not important. Looking at better off-farm opportunities as a factor of land abandonment, 29.5% of the respondents saw it as an important factor, followed by 23.7% who said it is somehow important, 18.6% said it is less important, 16.7% said it is very important and 11.5% said it is not important.

Land disputes as a factor of land abandonment shows that 30.1% of the respondents saw it to be a less important factor, followed by 22.4% who said it is important, 17.3% said very important and the same proportion said it is not important, while 12.8% said it is somehow important.

Looking at low productivity, it is seen that 42.3% of the respondents stood for the fact that it is an important factor that affects land abandonment, followed by 36.3% who said it is very important, 15.4% said it is somehow important, 5.1% said it is not important and 1.9% said it is less important.

Lack of money to buy inputs as a factor of land abandonment shows that 59.6% of the respondents saw it to be a very important factor, followed by 32.7% who said it is important, 5.8% said it is somehow important, 1.3% said it is less important and 1.3% said it is not important.

Lastly, Lack of machinery and equipment as a factor of farmland abandonment, shows that 42.9% of the respondents saw it to be a very important factor, followed by

36.5% who said it is important, 14.7% said it is somehow important, 3.8% said it is less important and 1.9% said it is not important.

Figure 4 Farmers' opinion on factors influencing farmland abandonment

Key: VI=Very Important, I=Important, SI=Slightly Important, LI=Less Important NI, Not Important

6.2.   **Binary Logistic regression results**

A binary logistic regression analysis was performed to find out the effects of the factors influencing farmland abandonment. To evaluate if the model fits in to explain the effects of the predators on the dependent variable, the Chi-square test was performed. The Chi-square value of the binary logistic regression is 50.285 with a degree of freedom of 17. The p-value of 0.000 at 95% level means the model has an explanatory power and the level of significance helps in explaining this.

Table 5 The Omnibus test of general significance of the model

		Chi-square	df	Sig.
	Step	50.285	17	0.000
Step 1	Block	50.285	17	0.000
	Model	50.285	17	0.000

In Table 6, it is observed that the coefficient of determination of the Cox & Snell R2 and that of Nagelkerke R2 are 0.276 (27.6%) and 0.386 (38.6) respectively. This means that changes in the independent variables in the model account for 27.6% of change in the dependable variable (Cox &Snell), and 37.6% (Nagelkerke)

Table 6 Model summary (coefficient of determination)

Model	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	145.418[a]	0.276	.386

Dependent variable: Farmland abandonment.

6.3.   **Household and migration characteristics of the household**

The result in the Table 7 shows that household income having an odd ratio of 2.795 with a positive slope depicts with increasing household income, farmland abandonment is likely to occur. Household income is statistically significant and has a positive relationship with farmland abandonment. Being a male has an odd ratio of 0.904 which is less than one (1). This means that being a male reduces the likelihood of farmland abandonment; that is, it is unlikely for males to abandon their lands as

45

compared to females. This is expected because of the negative slope of the predictor. However, this test is not statistically significant.

Change in household head (HH) with an odd ratio of 3.934 which is above 1 and a positive slope means an increasing likelihood of farmland abandonment.

Unexpectedly, Labour shortage as a factor of farmland abandonment is seen to have an odd ratio of 0.411 which indicates a negative effect. This means that it is less likely to have farmland abandonment, given the labour shortage, as compared to when there is no labour shortage. This is expected because of the negative slope of the predictor. However, this result is not statistically significant.

The capital invested by the household is not statistically significant, the age of the respondents, gender of the respondents, migrants' participation in agriculture and remittance from migrant households were all insignificant and hence do not play any major role in farmland abandonment. Generally, the research findings indicate that some of the household and migrant characteristics variables included in the model are statistically insignificant and hence not relevant as factors influencing farmland abandonment except household income and a change in household head.

6.4. **Farm characteristics and the role of the institutional factors**

The most important farm characteristics and role of institutions according to our model are the number of plots and labour provisions which are all statistically significant at 5% level. The number of plots is explained by a positive slope with an odd ratio of 1.806. This means that households with many plots might likely abandon their farms more than households with fewer farmlands. However, households with many plots have been found to abandon distant and less productive farms due to insufficient household labour to cultivate therefore prefer fewer and productive farm holdings in accessible areas (Zhou et al. 2020). Labour provision among male and female households has a p value of 0.008 at 5%. This means that being a male has an odd ratio of 0.760 which is less than one (1) and a negative slope of the predictor. Thus, male gender of household increases the likelihood of farmland abandonment; that is, it is unlikely for female gender to abandon their lands as compared to males. This is in line

with the result from the study by (Tamang et al. 2014), who found that increased male migration in search of off-farm income sources for food security and livelihood, has led female members to take added responsibilities for agricultural roles. Surprisingly, institutional roles such as access to credit, access to subsidies and land ownership were all statistically insignificant and hence cannot be used as determinants of household farmland abandonment in the Northwest region of Cameroon.

Looking at the constant term, it is observed that it has a positive slope and an odd ratio of 1.208. This means that in the absence of the variables in this model, other variables will account for an increased likelihood of farmland abandonment. However, this test is not significant.

Table 7 Factors influencing farmland abandonment

Predictors	B	S.E	Wald	df	sig	Exp(B)
Household characteristics						
Male (Gender)	-0.101	0.435	0.054	1	0.815	0.904
Age	0.013	0.024	0.287	1	0.592	1.013
Capital Invested	0.042	0.471	0.008	1	0.929	1.043
HH income	1.028	0.468	4.814	1	0.028**	2.795
Change in HH head	1.370	0.455	9.060	1	0.003***	3.934
Family labour shortage	-0.888	0.476	1.726	1	0.189	0.411
Household migrant characteristics						
Household Migrants	0,000	0.132	0.000	1	1.000	1.000
Migrants participation in agriculture	-0.118	0.636	0.035	1	0.853	0.889
Remittance	-0.662	0.431	2.363	1	0.124	0.516
Farm characteristics						
Farm size	-0.091	0.076	1.413	1	0.235	0.913
Nature of profile	22.069	23011.831	0.000	1	0.999	
Number of plots	0.591	0.195	9.180	1	0.002***	1.806
Distance from house to farm	-0.002	0.476	0.000	1	0.997	0.998
Labour provision	-1.228	0.464	7.005	1	0.008***	0.293
Institutional factors						
Access to subsidies	-0.272	0.508	0.286	1	0.593	0.762
Access to credit	-22.415	23011.831	0.000	1	0.999	0.000
Land title ownership	0.707	0.570	1.540	1	0.215	2.027
Constant	0.189	1.455	0.017	1	0.879	1.208

Dependent variable: Farmland abandonment.

Significance codes: ***=0.01 **=0.05 *=0.10

Keynote: B is the estimated coefficient (slope); SE is standard error; Exp(B) is the odds ratio; *** indicates probability level $p \leq 0.01$, ** indicates $p \leq 0.05$ and *indicates $p \leq 0.10$ without asterisks; the value is non-significant; Some variables were not assigned for the model analysis.

7.   **Discussion**

The research underscores the issue of agricultural farmland, which serves as the primary income source for over 70% of residents in the North West Region (NWR) of Cameroon, which has been facing abandonment as suggested to have been driven by household migration, change of household head and labour shortage. That is why this research seeks to determine the impacts of migration on land abandonment investigate if females as households can influence land abandonment and finally analyse whether lack of labour can influence farmland abandonment. The literature from existing knowledge on similar research has tried to propose answers to the research questions above. This study earlier proposed the following hypothesis as seen in the literature:

H1: Household migration influences farmland abandonment (Paudel et al. 2020)

H2: Females as heads of households have higher farmland abandonment (Tamang et al. 2014)

H3: Lack of agricultural labour within and out of the family results in farmland abandonment (Bhawana & Race 2020).

Thus, binary logistic regression was used to determine the aims and objectives of this present research and to answer the research questions.

7.1.   **Household socio-economic and migration characteristics**

Most families in the Northwest region of Cameroon depend on agriculture for survival measured in terms of the income accrued from the cultivated parcels of farmland. More so, if farming income seems sustainable in both rural and sub-urban areas of the region farmers will keep cultivating rather than abandoning their farmlands. According to 11 rice cultivators in the Ngoketunja division of the region, "*the cost of a hectare has price decrease and we have acquired more farmland because many people have migrated to other cities across the country with some in need of new sources of income. They sold us many parcels of land at cheaper rates to quickly relocate. But most of us who acquired these new farmlands unknowingly are facing a lot of problems because people are not ready to work at cheaper rates per day or hour as before where*

a daily work was $3 (1500 Fcfa) and today stands at $6 (3000 Fcfa). Most of us farmers cannot afford that's why some farmlands are still uncultivated for one or two years". The risk of farmland abandonment increases when farmland starts to generate insufficient income. In this study, emigration is closely related to low income from agriculture and might easily bring about farmland abandonment and if household income becomes reasonable many farmers will not abandon their farms (Zhou et al. 2020). This finding is also in line with the study by (Paudel et al. 2020) in the ecological villages of the Koshi Rivers in the Central Himalayas which they realized that the of rate migration increased after 2010 due to less agricultural production and a large number of the youthful population moving abroad in search of other opportunities or internal migration, such as rural to urban migration and high-land to low-land (Tarai region). Thus, household with less income will likely have higher chances of abandoning their farmland, which is also in line with (Huang et al. 2011) who also found a positive relationship between household income (income was mainly from subsidies) and farmland abandonment.

Migration in most cases increases the likelihood of farmland abandonment. This data presents an odd ratio of migration of 1.118 which is greater than one (1). This is expected because of the positive slope of the predictor. However, this test is not statistically insignificant with a P-value of 0.323 surprisingly, our results show that migration does not increase farmland abandonment as initially indicated by the H1 hypothesis that migration brings about farmland abandonment which is opposite to the work of (Paudel et al. (2020) whose results were significant. However, it should also be taken into consideration that remittance from migration might also promote farmland cultivation which aligns with those who accepted that they benefit from remittance. On the one hand, the increase in rural out-migration might raise agricultural inputs, such as fertilizer, pesticide, or agricultural machinery, among others.

During the survey in the study area, we noticed a good number of families with females as household heads (69.9%) and most of the female respondents whose male partners were not around responded that their husbands migrated due to the current political crisis in the region while others responded that their male partners were in search of off-farm opportunities in the city, others dead, making them heads of households which they were unable to cultivate the parcels they used to cultivate

together. This means that being a female reduces the likelihood of land abandonment; However, this test is statistically insignificant but not in line with the work of (Tamang et al. 2014) who found out from sample households in a study in rural Nepal that 74% had reduced their cropping cycle due to the absence of the male partner, whereas earlier they used to grow two or three seasonal crops, a direct effect that has decreased production and cultivation of larger agricultural lands.

According to this result, a change household head has an odd ratio of 3.934 which is more than one (1) and a positive slope of 1,370 thus statistically significant. This finding is similar to the findings of (Shi et al. 2018) who found out that families with a change in household head with enough household incomes also involved in non-agricultural activities likely abandoned their farms. Similarly, (Rai et al. 2019) also found out that household heads with other occupations and household head age were found to play significant roles in farmland abandonment in the Tarai region.

Labour shortage would likely influence farmland abandonment, and farmers might not withstand labour shortage with the background of an immature rural labour market as in the case of the Northwest region. This would produce a loss of the labour force effect. Our finding shows that the lack of agricultural labour in and within the family was insignificant and the H2 hypothesis was rejected but similar to the study of (Liu et al. 2016), whose results revealed that with the rising labour scarcity in the agricultural sector, many agricultural cultivation methods have been developed with agricultural production and crop types too to increase farming profits. On the other hand, an increase in rural out-migration might raise agricultural technical inputs, such as fertilizer, pesticide, or agricultural machinery, among others. We suggested that those who migrated might have contributed in the form of remittance making family labour irrelevant to this study.

7.2.   **Farm characteristics and role of the institution**

With farm size as a factor that affects farmland abandonment, results showed that farm size is an insignificant determinant of farmland abandonment; an increase in the farm size of households might lead to farmland abandonment. This can be explained by the fact that larger size farms might not be easily mechanised due to low income but

with a high rate of rural-urban migration, there is a labour shortage and mechanization might be needed to replace manpower (Du et al. 2019) but our results were insignificant with a negative value meaning that farm size did not play an essential role in farmland abandonment. Farm size, farm productivity and farming intensity are the major farm characteristics that determine the extent of its abandonment. Instead, Yan et al. (2016) suggested that there is a high probability that agricultural farmland abandonment increases with a decrease in the size of land parcels.

Our findings showed that distance from farm to house was insignificant meaning that farmers might have overcome this factor over time but Bavorová et al. (2023) found out that the input cost of farming and farmers' challenges in getting their produce to market far from transportation networks to the houses or markets resulted in farm abandonment. Thus, high transport costs can reduce farm income and eventually economic shortages leading to its abandonment.

This study found that the impact of credit access on farmland abandonment was not significant and had a negative slope similar to the findings of (Du et al. 2019). This can be supported by the fact that most farmers had once been credited for farming purposes but their farmland was later abandoned. Thus access to credit did not play a significant role in influencing farmland abandonment. Thus credit unions in the Northwest region of Cameroon should pay more attention before validating credit to farmers.

Most farmers in the region do not have access to government subsidies and grants to fund their agricultural costs. Unexpectedly, our findings showed that access to subsidies is not a significant driver of farmland abandonment in our studied area.

Land ownership is an important driver of farmland abandonment and can influence productivity and food security positively or negatively. From our findings, legally owned parcels of land in the Northwest region of Cameroon did not affect farmland abandonment. Finally, we discovered that even those with land titles also abandoned their farmland as well as those without, meaning that other factors might have caused them to abandon their parcels.

A question on household labour provision was asked on who provides more labour with males (1) or females (0) the result of the study revealed that labour

provision was significant meaning that males in the study area contributed to farmland abandonment in the study area as opposed to females. Similar to (Njikam et al. 2021), agriculture is the backbone of Cameroon's economy and the sector is mostly dominated by subsistence farming where the majority involved are female farmers, dominating and playing an indispensable role in the food production. This is an opportunity for stakeholders to provide more opportunities for women in agriculture for sustainable agriculture while encouraging their male counterparts to be involved in the sector. This can be done through credit and subsidies though the study findings did not consider them relevant.

From a general perspective, the cost of farm input, land-use management and a decreasing profit (Blair et al. 2018; Bhwana & Race 2020) have demoralized most farmers from farming. The region also faces the problem of price stabilization of agrifood products which has further accelerated the farmland abandonment process.

7.3. **Limitations**

This study has fewer limitations that can easily be handled by future researchers. Many respondents did not want to fill out the questionnaire for fear of the unknown. They suspected that our team was in search of information for either the separatist fighters who to date are fighting to break away from Cameroon to form an independent state called Ambazonia or the Cameroon military who may term them as aliens with the separatists to destabilize the nation. Many areas we visited were ruled by chiefs and those who supported the government were either murdered or they earlier escaped for fear of being killed by the fighters seeking an independent state. We had to collect data without authorization from those risky localities. Future researchers can consider a larger sample size by considering the entire region when the region regains its state as before 2016. Thus, the study was limited to 4 selected divisions (Boyo, Bui, Mezam and Ngoketunijia) to represent the entire region. Visiting long-distance farms was a challenge. Most farmlands have been abandoned in the study area and the roads leading to those farms were covered by grass and herbs while trees have fallen and crisscrossed the footpaths and most wooden bridges decayed. In two instances, our phones were checked to verify if were working on a hidden agenda and we decided to print paper-

based questionnaires which became more complicated and time-consuming. In 5 instances we had to hide for more than 5 hours during gunshots exchanges.

Internet connection and electricity have been limited in most sub-divisions and divisions in the Northwest regions and they were available only at specific hours of the day making online data collection unfavourable. We noticed that different farmers had different status of their farmland with some farmers having fewer areas or hectares of abandoned farmland; this shows that some farmers had more abandoned farmland area than others. Even though our questionnaire required the exact number of hectares and the number of farmlands abandoned, we noticed that it is very difficult for a farmer to physically measure the abandoned farmland and quantify the area accurately. Generalizing this result for another division might almost be the same or similar because the entire region almost has the same climatic conditions, soil types and topography.

Due to limited funding, the study's sample size was limited to one region in Cameroon, the Northwest region and in 4 out of 7 divisions of the region.

8.   **Conclusion**

8.1.   **General remarks**

Our study found that acute increases in food shortage and declining livelihood options, especially among marginal farming households, are some of the socioeconomic consequences of farmland abandonment in the Northwest region of Cameroon. The results of the social survey conducted during this study were analyzed to determine the factors that influence farmland abandonment in the Northwest region of Cameroon. The study collected information on farmers' knowledge with respect to the leading factors of farmland abandonment in the region and 4 important factors were captured namely; household income ($p = 0.028$), change in household head ($p = 0.003$), number of farms (parcels) ($p=0.002$) and labour provision among male and female households ($p=0.008$) .50.6% of the respondents abandoned at least one hectare of farmland, those who abandoned two to four hectares made up 41% and lastly, those who abandoned five hectares and above made 8.3% of the total respondents.   In terms of farmers'

perceptions of what pushed them to abandon their farmlands, we found out that lack of money to buy inputs (92.30%); lack of machinery (79.40%); low productivity (78.60%) and crisis (62.8%) were classified as very important and important respectively. Our study did not specifically address the impact of farm subsidies on sustaining farmland in production, but during the interviews, several farmers stated clearly that they considered subsidies to be very low and might not influence their farming practices. This is in line with earlier research that indicated that farmland subsidies only offer a minor addition to the farming income (Huang et al. 2011). Farmers reiterated that the Anglophone crisis, low productivity, land disputes, inadequate capital, and labour shortage due to off-farm occupations contributed as determinants of farmland abandonment in the region. These determining factors vary slightly across different divisions in the region and elsewhere in the country.

8.2.   **Recommendations**

The findings of this study are potentially useful for improving governmental policies to prevent farmland abandonment by improving farmland management and farmers' living conditions. Generally, many households with numerous plots have abandoned their agricultural lands. If a consolidation policy is employed by the Ministry of Agriculture and Rural Development and or Non-Governmental Organizations aimed at alleviating poverty in which household farmers in local communities can exchange their unused plots, this would ensure food security at local, regional and national levels and in regions with similar topography, climate and geography across the country. Therefore, a deeper analysis of socioeconomic, migration and farm characteristics influencing farmland abandonment is required to update the policy processes. Similarly, policymakers and institutions must attend to the issue of farmland abandonment through improved local production channels where improved technology can easily detect farmland abandonment changes in the fast-developing environment.

References

Akeju OD. 2013. Agriculture and migration. The Encyclopedia of Global Human Migration DOI: 10.1002/9781444351071.wbeghm023.

Angelsen A, Jagger P, Babigumira R, Belcher B, Hogarth NJ, Bauch S, Börner J, Smith-Hall C, Wunder S. 2014. Environmental Income and Rural Livelihoods: A Global-Comparative Analysis. World Development **64**:S12–S28.

Arrey MA. 2020. Explaining Wellbeing and Inequality in Cameroon: A Regression-base Decomposition. Available from https://www.africaportal.org/publications/explaining-wellbeing-and-inequality-cameroon-regression-base-decomposition/.

Asaha S, Deakin L. 2016. Land-use change and it influence on rural livelihood, food security and biodiversity conservation in the Southwest Region of Cameroon. Agrarian change in tropical landscapes:1689–1699.

Azong M, Kelso CJ, Naidoo K. 2018. Vulnerability and resilience of female farmers in Oku, Cameroon, to Climate Change. African Sociological Review **22**:31–52.

Baliyan K. 2018. Use of Female Family and Hired Labour in Agriculture : An Empirical Study in Western Uttar Pradesh , India Keywords Review of Literature **2**:1–20.

Bavorová M, Ullah A, Nyendu D, Prishchepov A V. 2023. Determinants of farmland abandonment in the urban–rural fringe of Ghana. Regional Environmental Change **23**:1–12. Springer Berlin Heidelberg. Available from https://doi.org/10.1007/s10113-023-02117-z.

Benayas JMR, Martins A, Nicolau JM, Schulz JJ. 2007. Abandonment of agricultural land: An overview of drivers and consequences. CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources **2**.

Biswas S, Kim IH. 2022. Evaluation of distillers dried grains with solubles to partially replace soybean meal in the diet of growing-finishing pigs. Page Journal of Animal and Feed Sciences.

Blair D, Shackleton CM, Mograbi PJ. 2018. Cropland abandonment in South African smallholder communal lands: Land cover change (1950-2010) and farmer

perceptions of contributing factors. Land **7**. MDPI AG.

C. Harden. 1996. Interrelationships between Land Abandonment and Land Degradation : A Case from the Ecuadorian Andes Author (s): Carol P . Harden Published by : International Mountain Society Stable URL : https://www.jstor.org/stable/3673950 REFERENCES Linked references **16**:274–280.

Campbell JE, Lobell DB, Genova RC, Field CB. 2008. The global potential of bioenergy on abandoned agriculture lands. Environmental Science and Technology **42**:5791–5794.

Chaudhary S, Wang Y, Khanal NR, Xu P, Fu B, Dixit AM, Yan K, Liu Q, Lu Y. 2018. Social impact of farmland abandonment and its eco-environmental vulnerability in the high mountain region of Nepal: A case study of Dordi River Basin. Sustainability (Switzerland) **10**.

Chen R, Ye C, Cai Y, Xing X, Chen Q. 2014. The impact of rural out-migration on land use transition in China: Past, present and trend. Land Use Policy **40**:101–110. Elsevier Ltd. Available from http://dx.doi.org/10.1016/j.landusepol.2013.10.003.

Collantes F. 2009. Rural Europe reshaped: the economic transformation of upland regions, 1850–2000 1 **2**:306–323.

De Haas H. 2010. Migration and development: A theoretical perspective. International Migration Review **44**:227–264.

Deotti L, Estrusch E. 2016. Addressing rural youth migration at its root causes: A conceptual framework. Page Food and Agriculture Organization of United Nations. Available from www.fao.org/publications.

Depledge J. 2006. Recent developments. Environmental Policy and Law **36**:278–279.

Ding C, Lichtenberg E. 2010. Using Land to Promote Urban Economic Growth in China. Working Paper. Available from http://purl.umn.edu/36748%5Cnhttp://search.ebscohost.com/login.aspx?direct=true&db=ecn&AN=1071998&site=bsi-live.

Domguia N, Noubissi Domguia E, Njangang H. 2019. Munich Personal RePEc Archive

Agricultural Growth and Environmental Quality in Cameroon: Evidence from ARDL Bound Testing Approach Agricultural Growth and Environmental Quality in Cameroon: Evidence from ARDL Bound Testing Approach.

Doorn AM Van, Bakker ÆMM. 2007. The destination of arable land in a marginal agricultural landscape in South Portugal: an exploration of land use change determinants:1073–1087.

Du J, Zeng M, Xie Z, Wang S. 2019. Power of agricultural credit in farmland abandonment: Evidence from rural China. Land **8**.

Ekah ER. 2019. The Anglophone Crisis in Cameroon: A Geopolitical Analysis. European Scientific Journal ESJ **15**:141–166.

Eluke EJ. 2020. the Role of the Us in Finding a Solution To the Current Anglophone Crisis in Cameroon. Філософія Та Політологія В Контексті Сучасної Культури **12**:189–94.

Falco C, Donzelli F, Olper A. 2018. Climate change, agriculture and migration: A survey. Sustainability (Switzerland) **10**:1–21.

FAO. 2016. AGRICULTURE AND RURAL Addressing the root causes. AGRICULTURE AND RURAL Addressing the root causes.

FAO, IFAD, UNICEF, WFP, WHO. 2023. The State of Food Security and Nutrition in the World 2023, International Fund for Agricultural Development. Italy. Available from https://www.fao.org/3/cc3017en/cc3017en.pdf.

Fonjong L, Sama-Lang I, Fon FL. 2010. An assessment of the evolution of land tenure system in Cameroon and its effects on women's land rights and food security. Perspectives on Global Development and Technology **9**:154–169.

Food and Agriculture Organisation. 2017. Gender and Land Statistics:2. Available from http://www.fao.org/3/a-i5488e.pdf.

Forbanka DN. 2021. Post-Harvest Storage Practices and Insect Pests of Maize and Beans in the North West Region of Cameroon. African Entomology **29**:133–141.

Forni N. 2001. Land Tenure Systems Structural Features and Policies.

Goldsmith PD, Gunjal K, Ndarishikanye B. 2004. Rural-urban migration and

agricultural productivity: The case of Senegal. Agricultural Economics **31**:33–45.

Grau HR, Aide M. 2008. Globalization and land-use transitions in Latin America. Ecology and Society **13**.

Gray CL. 2009. Rural out-migration and smallholder agriculture in the southern Ecuadorian Andes. Population and Environment **30**.

Gray CL, Bilsborrow RE. 2014. Consequences of out-migration for land use in rural Ecuador. Land Use Policy **36**:182–191.

Haas H De. 2009. 评估数字游戏的教育价值 **44**:423–436.

Haddaway NR, Styles D, Pullin AS. 2013. Environmental impacts of farm land abandonment in high altitude / mountain regions : a systematic map of the evidence:1–7.

Hagen-Zanker J. 2008. Why do people migrate? Review. Mpra:25. Available from http://mpra.ub.uni-muenchen.de/28197/.

Huang J, Wang X, Zhi H, Huang Z, Rozelle S. 2011. Subsidies and distortions in China's agriculture: Evidence from producer-level data. Australian Journal of Agricultural and Resource Economics **55**:53–71.

IMF. 2015. and Request for Waiver of Nonobservance of Performance Criterion — Staff Report ; Press Release ; and Statement By the Executive Director.

Innocent NM, Fang BAR and KE. 2017. World Journal of Engineering WJERT FROM CLIMATE RISK ANALYSIS TO AN ENVIRONMENTAL **3**:449–471.

International Fund for Agricultural Development. 2022. Remittances, investments and the Sustainable Development Goals:1–8. Available from https://www.ifad.org/documents/38714170/39148759/Remittances%2C+investments+and+the+Sustainable+Development+Goals.pdf/680f2e3f-38dc-42c2-9857-df9580d35a45.

K.C. Bhawana, Race D. 2020. Outmigration and Land-Use Change : A Case Study. Land **9**:1–19.

Kastner T, Rivas MJI, Koch W, Nonhebel S. 2012. Global changes in diets and the

consequences for land requirements for food. Proceedings of the National Academy of Sciences of the United States of America **109**:6868–6872.

Khanal U, Alam K, Khanal RC, Regmi PP. 2015. Implications of Out-Migration in Rural Agriculture: A Case Study of Manapang Village, Tanahun, Nepal. The Journal of Developing Areas **49**:331–352.

Laird SA, Awung GL, Lysinge RJ. 2007. Cocoa farms in the Mount Cameroon region: Biological and cultural diversity in local livelihoods. Biodiversity and Conservation **16**:2401–2427.

Lasanta T, Arnáez J, Pascual N, Ruiz-Flaño P, Errea MP, Lana-Renault N. 2017. Space–time process and drivers of land abandonment in Europe. Catena **149**:810–823. Elsevier B.V. Available from http://dx.doi.org/10.1016/j.catena.2016.02.024.

Lendzele SS. 2018. DIVISION , NORTH WEST REGION OF CAMEROON.

Liu G, Wang H, Cheng Y, Zheng B, Lu Z. 2016. The impact of rural out-migration on arable land use intensity: Evidence from mountain areas in Guangdong, China. Land Use Policy **59**:569–579. Elsevier Ltd. Available from http://dx.doi.org/10.1016/j.landusepol.2016.10.005.

Mberu BU, Pongou R. 2016. Crossing Boundaries: Internal, Regional and International Migration in Cameroon. International Migration **54**:100–118.

Merfeld JD. 2021. Sectoral Wage Gaps and Gender in Rural India. SSRN Electronic JournalDOI: 10.2139/ssrn.3855955.

Meva'a Abomo D, Abessolo Nguema JR, Begoumenie B, Ba'ana Etoundi ML, Manga Engama E, Fotso Wougaing J, Nkouandou Njiemessa M. 2013. Internal migration in Cameroon: Constraint for or driver of urban and health development?86. Available from http://publications.iom.int/system/files/pdf/cameroon_en.pdf.

Minang PA. 2003. Assessing Participatory Geo- graphic Information Systems for Community Forestry Planning in Cameroon : A Local Governance Perspective.

Nagayets, A. and Danielou, M. and Cruz D. 2005. The Future of Small Farms: Proccedings of a Research Workshop. The future of small farms: Proceedings of a research workshop. 2005. Wye, UK, June 26-29, 2005:362. Available from

http://pdf.usaid.gov/pdf_docs/Pnado609.pdf#page=362.

Nahuelhual L, Carmona A, Lara A, Echeverría C, González ME. 2012. Land-cover change to forest plantations: Proximate causes and implications for the landscape in south-central Chile. Landscape and Urban Planning **107**:12–20. Elsevier B.V. Available from http://dx.doi.org/10.1016/j.landurbplan.2012.04.006.

Njikam O, Abdelkrim |, Therese A|, Elomo Z, Researcher AA, Elomo TZ. 2021. The Gender Gap in Smallholder Agricultural Productivity: The Case of Cameroon. The Gender Gap in Smallholder Agricultural Productivity: The Case of Cameroon Acknowledgements. Available from www.pep.net.org.

Nkomoki W, Bavorová M, Banout J. 2018. Adoption of sustainable agricultural practices and food security threats: Effects of land tenure in Zambia. Land Use Policy **78**.

Orbelle EDC, Afael RICOR, Aseda CRM. 2016. Land abandonment : Concept and consequences CONCEPT AND CONSEQUENCES.

P. Mugah FE. 2015. FARMER ORGANISATION IN THE NORTHWEST REGION OF CAMEROON: ACTUAL STATE OF AFFAIRS **4**:74–79.

Paudel B, Wu X, Zhang Y, Rai R, Liu L, Zhang B, Khanal NR, Koirala HL, Nepal P. 2020. Farmland abandonment and its determinants in the different ecological villages of the Koshi river basin, central Himalayas: Synergy of high-resolution remote sensing and social surveys. Environmental Research **188**:109711. Elsevier Inc. Available from https://doi.org/10.1016/j.envres.2020.109711.

Quisumbing AR, Doss CR. 2021. Gender in agriculture and food systems. Page Handbook of Agricultural Economics, 1st edition. Elsevier B.V. Available from http://dx.doi.org/10.1016/bs.hesagr.2021.10.009.

Rai R, Zhang Y, Paudel B, Khanal NR. 2019. Status of farmland abandonment and its determinants in the transboundary gandaki River Basin. Sustainability (Switzerland) **11**:1–18.

Raj Khanal N, Watanabe T. 2006. Abandonment of Agricultural Land and Its Consequences. Mountain Research and Development **26**:32–40.

République du Cameroun. 1974. Regime Foncier et Domanial.

Riedel JL, Asensio MA, Blanco M, Sanz A, Revilla R, Casasu I. 2005. An integrated approach to studying the role of grazing livestock systems in the conservation of rangelands in a protected natural park (Sierra de Guara , Spain) **96**:75–85.

Ruskule A, Nikodemus O, Kasparinskis R, Bell S, Urtane I. 2013. The perception of abandoned farmland by local people and experts: Landscape value and perspectives on future land use. Landscape and Urban Planning **115**:49–61.

Sama-lang I et A. 2013. Large-Scale Land Acquisition and its Implications for Women ' s Land Rights ights in Cameroon:179. Available from https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/56904/IDL-56904.pdf.

Sanderson EW, Walston J, Robinson JG. 2018. From Bottleneck to Breakthrough: Urbanization and the Future of Biodiversity Conservation. BioScience **68**:412–426.

Schreckenberg K, Degrande A, Mbosso C, Baboule B, Boyd C, Enyong L, Kanmegne J, Ngong C. 2002. The social and economic importance of dacryodes edulis (g.Don) H.J. Lam in southern cameroon. Forests Trees and Livelihoods **12**:15–40.

Schuh B, Dax T, Andronic C, Derszniak-Noirjean M, Gaupp-Berghausen M, Hsiung CH, Münch A, Machold I, Schroll K, Brkanovic S. 2020. The Challenge of Land Abandonment after 2020 and Options for Mitigating Measures. Research for AGRI-Committee; European Parliament, Policy Department for Structural and Cohesion Policies, Directorate-General for Internal Policies: Brussels, Belgium.

Shi T, Li X, Xin L, Xu X. 2018. The spatial distribution of farmland abandonment and its influential factors at the township level: A case study in the mountainous area of China. Land Use Policy **70**:510–520. Elsevier. Available from https://doi.org/10.1016/j.landusepol.2017.10.039.

Sluiter R, De Jong SM. 2007. Spatial patterns of Mediterranean land abandonment and related land cover transitions. Landscape Ecology **22**:559–576.

Stellmes M, Röder A, Udelhoven T, Hill J. 2013. Mapping syndromes of land change in Spain with remote sensing time series, demographic and climatic data. Land Use

Policy **30**:685–702. Elsevier Ltd. Available from http://dx.doi.org/10.1016/j.landusepol.2012.05.007.

Su Y, Araral E, Wang Y. 2020. The effects of farmland use rights trading and labor outmigration on the governance of the irrigation commons: Evidence from China. Land Use Policy **91**:104378. Elsevier. Available from https://doi.org/10.1016/j.landusepol.2019.104378.

Sundaravaradarajan KR, Sivakumar P, Jahanmohan KR. 2011. Determination of Key Correlates of Agricultural Labour Migration in Less Resources Endowed Areas of Tamil Nadu. Agricultural Economics Research Review **24**:467–472.

Tamang S, Paudel KP, Shrestha KK. 2014. Feminization of Agriculture and its Implications for Food Security in Rural Nepal. Journal of Forest And Livelihood **12**:20–32.

Terres JM et al. 2015. Farmland abandonment in Europe: Identification of drivers and indicators, and development of a composite indicator of risk. Land Use Policy **49**:20–34. Elsevier Ltd. Available from http://dx.doi.org/10.1016/j.landusepol.2015.06.009.

Terres JM, Nisini Scacchiafichi L, Anguiano E. 2013. Assessing the risk of farmland abandonment in the EU. Page Joint Research Centre Scientific and Policy Reports. Available from https://www.ag-press.eu/sites/default/files/resources/fulltext_en_2.pdf.

The World Bank Goup. 2018. Cameroon City Competitiveness Diagnostic. Cameroon City Competitiveness Diagnostic:108.

United N. 2019. The Sustainable Development Goals Report 2019. United Nations publication issued by the Department of Economic and Social Affairs:64. Available from https://unstats.un.org/sdgs/report/2022/%0Ahttps://www.un-ilibrary.org/content/books/9789210018098%0Ahttps://www.un-ilibrary.org/content/books/9789210478878.

USAID. 2011. Property rights and resource governance: Cameroon. USAID Country Profile:1–30. Available from https://www.land-links.org/wp-content/uploads/2016/09/USAID_Land_Tenure_Cameroon_Profile.pdf%0Ahttp://

usaidlandtenure.net/sites/default/files/country-profiles/full-reports/USAID_Land_Tenure_Cameroon_Profile.pdf.

V. Pinilla, Sáez-pérez, Luis Antonio MIA. 2008. Rural depopulation in mediterranean western Europe : a case Study of Aragón RURAL DEPOPULATION IN MEDITERRANEAN WESTERN EUROPE : A CASE STUDY OF ARAGON VICENTE PINILLA * MARÍA-ISABEL AYUDA LUIS-ANTONIO SÁEZ Faculty of Economics and Business Studies Univer.

Valera HGA, Yamano T, Puskur R, Veettil PC, Valer HGA. 2018. WOMEN ' S LAND TITLE OWNERSHIP AND EMPOWERMENT : EVIDENCE FROM INDIA ADB ECONOMICS WORKING PAPER SERIES ship and werment t : m India Evide nce from.

van Vliet J, de Groot HLF, Rietveld P, Verburg PH. 2015. Manifestations and underlying drivers of agricultural land use change in Europe. Landscape and Urban Planning **133**:24–36. Elsevier B.V. Available from http://dx.doi.org/10.1016/j.landurbplan.2014.09.001.

Walker ST. 1990. Innovative Agricultural Extension for Women:53.

Wang X, Xin L, Tan M, Li X, Wang J. 2020. Impact of spatiotemporal change of cultivated land on food-water relations in China during 1990–2015. Science of the Total Environment **716**:137119. Elsevier B.V. Available from https://doi.org/10.1016/j.scitotenv.2020.137119.

Weissteiner CJ, Boschetti M, Böttcher K, Carrara P, Bordogna G, Brivio PA. 2011. Spatial explicit assessment of rural land abandonment in the Mediterranean area. Global and Planetary Change **79**:20–36. Elsevier B.V. Available from http://dx.doi.org/10.1016/j.gloplacha.2011.07.009.

World Bank. 2019. Leveraging Economic Migration for Development: A Briefing for the World Bank Board.:106. Available from www.worldbank.org.

Yadav P, Agarwal PK, Chandel BS. 2016. Gender Issues in Indian Agriculture: The Structural Changes in Agriculture Labour Force Participation. Agricultural Situation in India **LXXII**:27–33.

Yan J, Yang Z, Li Z, Li X, Xin L, Sun L. 2016. Drivers of cropland abandonment in mountainous areas: A household decision model on farming scale in Southwest China. Land Use Policy **57**:459–469.

Zhou T, Koomen E, Ke X. 2020. Determinants of Farmland Abandonment on the Urban–Rural Fringe. Environmental Management **65**:369–384. Springer US. Available from http://dx.doi.org/10.1007/s00267-020-01258-9.

Appendices

List of the Appendices

Appendix 1:

Questionnaire:

My name is NSHING ROONEY. I am a student at Czech University of Life Sciences - Prague, pursuing a Master's degree in Agrifood Systems and Rural Development. I am here to request for your participation in my survey whose purpose is to evaluate the factors influencing farmland abandonment in agriculture in the North West Region of Cameroon. This research would enable me to complete my studies as it is a requirement for the study programme. Your contribution is voluntary and the information you give will be treated confidential and anonymous. The questionnaire will take approximately 15 minute to complete.

I: HOUSEHOLD SOCIO-ECONOMIC CHARACTERISTICS

1.   What is your gender?   Male ☐   Female ☐

2.   What is your age?   ☐

3.   What is your marital status?   Married ☐   Single ☐   Divorced ☐
          Widow ☐

     Is it difficult to find labour outside of family?

     Very difficult ☐   Difficult ☐   Neutral ☐   Easy ☐   Very easy ☐

4.   Are you residing with your partner?   ☐   YES   ☐   NO

5.   What is your total household monthly income (FCFA)?

     1-50,000 ☐   50000-99,999 ☐   100,000-149,999 ☐   150,000+ ☐

6.   Who manages the farm? My Husband   ☐   My wife ☐

7.   Was there any change in the household head?   Yes ☐   No ☐

     If there was a change in household head, what was the reason?

     Dead ☐   Illness ☐   Migration ☐ Off-farm ☐   Employment ☐

     Other-Please state with reason   ☐

8.   Did you lose some direct family members in the conflict? Yes ☐   No ☐

9.   How much land (hectares) your family had in total?

    a) About 5 years ago? ☐   b) In 2022? ☐

10.   How many hectares of your total farmland you did not cultivate (Was   abandoned for more than one year)

    a) About 5 years ago? ☐

    b) This year (2022) ☐

11.   How much capital (FCFA) do you invest on your farms yearly?

    Less than 100,000 ☐   100,001-149,999 ☐   150,000-199,999 ☐

    200,000-249,999 ☐

II. MIGRATION OF HOUSEHOLD

12.   How many of your immediate household member that used to live with you migrated in the past 2 years? ☐

13.   Do you witness a drop in labour availability in your region?

    To a Great Extent ☐ Somewhat ☐   Rather Not ☐   Not at all ☐

14.   Are you are currently facing family labour shortage? Yes ☐   No ☐

15.   Do you agree migration has increased farmland abandonment?

Strongly agree ☐   Agree ☐   Undecided ☐   Disagree ☐ strongly disagree ☐

16.   Did those who migrate participated in agriculture? Yes ☐ No ☐

17.   How important are remittance (Money gotten from migration) to you?   Important ☐
Very Important ☐   50-50 ☐ Less important ☐   Not Important ☐

PART III: FARM CHARACTERISTICS

18. Have you abandon any piece of land for the past 2 years? Yes ☐ No ☐

19. Do you think migration has led to increase land abandonment. Please select one option: Strongly Agree ☐ Agree ☐ Strongly Disagree ☐ Uncertain

Disagree ☐

20. Who provides more labour for the farming activities? Husband ☐ Wife ☐

19 In case you do not cultivate the entire farmland, which of the following factors affect land abandonment in your household?
1= Very Important and 5= Not important.

Rank / Factor	1 Very Important	2 Important	3 Somehow Important	4 Less Important	5 Not Important
Crisis (Political unrest)					
Desertification					
Shortage of manpower					
Distance from farm to house					
Nature of profile (steep, slopy, e.t.c…)					
Better off-farm opportunities					
Land disputes					
Low Productivity					
Poor soil fertility					
Lack of money to buy inputs					
Lack of machinery/Equipment					

21. Do you have disputes over a piece of land? Yes ☐ No ☐

22. What is the nature of your farmland landscape?

Steep ☐   Sloppy ☐   Flat ☐

23. Have you received subsidies for the past 2 years? Yes ☐   No ☐

24. Do you have the land title of the farms you are currently farming? Yes ☐   No

25. What is the distance from your home to your farthest farm? ☐

26. Do you have access to credit? Yes ☐ No ☐

Appendix 2

Some of the visited farms in the study area