



Land use consolidation in Rwanda: The experiences of small-scale farmers in Musanze District, Northern Province

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ARTICLE INFO

Keywords:

Agricultural intensification
Land use consolidation
Market-oriented agriculture
Small-scale farmers
Food security
Rwanda

ABSTRACT

The modernization and intensification of agricultural production in Africa has long been a policy goal, for increased productivity and food security. In 2008, the Rwandan government implemented various land and agricultural reforms to transform Rwandan agriculture from subsistence farming to market-oriented production. Central to this agricultural transformation was the Crop Intensification Programme, intended to increase the agricultural productivity of high-potential food crops and encourage land use consolidation, i.e., the joint cultivation of large areas, which was expected to deliver important economies of scale. This programme has been criticized, for example, for authoritarian implementation, negative effects on food security from sole-cropping a few selected crops, and increasing rural socioeconomic differentiation.

This paper analyses the effects of the land use consolidation programme at the household level, as experienced by small-scale farmers in Musanze District in the Northern Province of Rwanda. The paper draws on 45 individual and 22 collective qualitative semi-structured interviews with small-scale farmers and local key informants in five sectors, conducted in 2013 and 2014.

The findings show that there is satisfaction, dissatisfaction, and resistance to the programme, especially regarding the selected crops to be cultivated. The programme, including supporting mechanisms, seems to work well for the relatively better-off farmers, who have bigger and scattered land areas, whereas it does not work well for poor farmers with very small plots, which is common in rural Rwanda.

1. Introduction

Agriculture is the main economic activity of most people living in rural areas of Sub-Saharan Africa, where the level of agricultural development has been explained by the characteristics of small-scale subsistence farming based on the productive forces of the household unit and the use of simple production techniques, usually hand tools. This production system often leaves households both vulnerable and food insecure (Matunhu, 2011; Zhang and Donaldson, 2010). Agricultural modernization and productivity increases have therefore been central concerns in policies aiming at poverty alleviation and increased food security. These factors have renewed interest in what promotes or inhibits agricultural investment, including land tenure regularization for land tenure security (Place, 2009). Contemporary African “Green Revolution” narratives advocate the use of improved seeds, fertilizers, and new agricultural practices to replace traditional practices in order to increase productivity and food security, as well as the marketing of

surpluses to enhance rural income generation (Christianesen et al., 2011; Dawson et al., 2019; Matunhu, 2011). This pathway has been followed by most African countries to increase agricultural productivity, instead of ecological intensification based on producing more with fewer external inputs (Tittonell, 2010; Tittonell and Giller, 2013). Due to the many challenges of the modernization process encountered by small-scale farmers, including market competition, it has been argued that agricultural modernization should focus on resource-rich and commercially oriented farmers who can successfully tap into the new types of market chains (Diao et al., 2007, 2010).

Another component often linked to agricultural development is land consolidation policies to improve land management and agricultural productivity through technological adoption (Nilsson, 2019; Pašakarnis and Maliene, 2010). Such policies have especially been called for as long-term strategies to prevent further land fragmentation, which does not promote land use efficiency or help farmers benefit from economies of scale (Abubakari et al., 2016; Asiama et al., 2017a, 2017b). However,

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concerns have been raised regarding the suitability of land consolidation policies for Sub-Saharan Africa, where most farmers depend on rainfed agriculture and limited technologies, and face challenges related to low production, market imperfections, and high poverty rates (Collier and Dercon, 2014; Muzari et al., 2012). Furthermore, land tenure is strongly influenced by customary tenure systems, and most land consolidation policies implemented in customary lands in Sub-Saharan Africa have not succeeded as agricultural systems could not cope with their effects (Asiama et al., 2017a, 2019).

Since the economic crises of the 1980s and 1990s, interest in the agricultural sector has revived. Since the adoption of the Millennium Development Goals (MDGs) in 2000, there has been a shift in agricultural development thinking from a focus on economic growth to enhancing poverty reduction, including specific attention to rural areas. Promoting agriculture is seen as a prerequisite to reducing poverty and increasing food security – main goals of the MDGs (Byerlee et al., 2009; Wiggins, 2014; World Bank, 2008). Aiming to reach the MDGs and the Sustainable Development Goals, the Rwandan government announced ambitious development goals in its Vision 2020. Agricultural development is central to poverty reduction and long-term development, as over 80 % of the population depend on subsistence agriculture for their livelihoods (GoR, 2012a). The Economic Development for Poverty Reduction Strategy (EDPRS) envisions a societal transformation requiring agricultural reform to shift from subsistence farming to commercial agriculture (GoR, 2013; Kathiresan, 2012). While Rwandan agriculture has long been characterized by high population pressure, land holding fragmentation, and traditional cultivation techniques with few inputs, leading to over-cultivation and consequent soil degradation and erosion that negatively affect already low productivity levels (Bigagaza et al., 2002; Kathiresan, 2012; USAID, 2013), the purpose of the agricultural reform is to increase agricultural production and commercialization, thereby raising rural income to fight poverty and hunger (Christiansen et al., 2011; Wiggins, 2014). Central to this agricultural transformation is the Crop Intensification Programme (CIP) initiated in 2007, aiming at increasing the agricultural productivity of high-potential food crops for local and national markets. The main component of this programme is land use consolidation (LUC), i.e., the joint cultivation of large areas comprising multiple adjacent smallholder plots over which the farmers retain their individual land rights, which is expected to deliver important economies of scale in the production of selected crops (GoR, 2005). Instead of following the conventional land consolidation policy path, Rwanda chose a version of consolidation adapted to its national context (Muhinda and Dusengemungu, 2011).

In 2013, Bizoza and Havigumana (2013) stated that little was known about the impact of the LUC policy in Rwanda since its implementation in 2008, and they called for empirical research on its impact at both the macro and micro levels. Official reports indicate considerable increases both in land areas under the LUC programme and in yields of the selected food crops, but they also describe the challenges encountered during programme implementation (Bizoza and Havigumana, 2013; IFDC, 2010; Kathiresan, 2012). These reports provide information on a national level, so the Rwandan Agricultural Board (RAB) specifically called for considering “views from below” in order to evaluate the effectiveness and socioeconomic impact of the programme (Kathiresan, 2012; Muhinda and Dusengemungu, 2011).

At the time of the field work for this paper, there were some qualitative studies highlighting “views from below” on the impacts of the LUC programme during the early stages of implementing the new agricultural policy (e.g., Ansoms, 2010; Huggins, 2010; Pritchard, 2013; Van Damme et al., 2013). It was therefore of interest to seek more qualitative information about the impact of LUC programme implementation at the local and household levels at a later stage of implementation. Recent studies of the LUC programme have mainly been quantitative, although some studies supplement their quantitative emphasis with qualitative data, focusing on various aspects of participating in the LUC programme, including crop yield, food security, and nutrition (e.g., Chigbu et al.,

2019; del Prete et al., 2019; Hakorimana and Akcaoz, 2018; Nilsson, 2019).

The aim of this paper is to analyse the effects of the land use consolidation programme at the household level, as experienced by small-scale farmers in Musanze District in the Northern Province of Rwanda. The paper specifically examines the farmers’ experiences of LUC programme implementation in terms of three critical themes: (i) the processes of decision-making and implementation, (ii) the provision and use of agricultural inputs and support mechanisms, and (iii) LUC programme effects on agricultural production, food security, and household needs.

This paper is based on a qualitative study conducted in one district in northern Rwanda in 2013 and 2014. The next section presents the agricultural and land use reform in Rwanda, followed by an account of the methodological considerations. The fourth section presents the empirical findings of the study according to the three main themes, followed by a concluding discussion in which the findings are analysed.

2. Agricultural reform in Rwanda

2.1. The African context

In the early 1960s, the African agricultural sector was seen as a driver of economic growth (Wiggins, 2014; World Bank, 2008). Since then, policies inspired by modernization thinking, including the dissemination of information about efficient production techniques, have aimed at increasing productivity as well as improving the standard of living of the poor. Since then, agricultural modernization efforts have consisted of encouraging African farmers to try new crops and new production techniques, and to develop their marketing skills. This has resulted in the introduction of new seeds, the use of chemical fertilizers, and the application of scientific knowledge to replace traditional agricultural production techniques (Matunhu, 2011; Wiggins, 2014; World Bank, 2008).

Two African initiatives focusing on agriculture for development are the Framework and Guidelines for Land Policy and Land Reforms initiated in 2006 by the African Union Commission (AUC), the UN Economic Commission for Africa (ECA), and the African Development Bank (AfDB), as well as the Comprehensive Africa Agriculture Development Programme (CAADP) under the New Partnership for Africa’s Development (NEPAD). These initiatives emphasized the importance of economic development that reduces poverty through agricultural sector growth and improved food security (AUC-ECA-AfDB, 2011; Booth and Golooba-Mutebi, 2014). Through CAADP, in 2003 African leaders targeted a minimum of 10 % of national budgets for public investment in agriculture, and agricultural production growth of 6% per year (AUC-ECA-AfDB, 2011; Milz, 2011). Despite recent economic and social progress, investments in infrastructure and in institutional capacity to provide various services to farmers, such as subsidies of inputs required to support the growth of small-scale agriculture, are still low in most African countries (Booth and Golooba-Mutebi, 2014; Poulton et al., 2010).

Historically, rates of poverty reduction have been strongly linked to agricultural sector growth, and to improved agricultural productivity in particular. Most countries in which agricultural productivity improved also achieved the greatest reductions in poverty rates (DFID, 2004; Diao et al., 2007). Despite decades of new technology and rural development, poverty and hunger continue to occur, most severely in rural Africa, where 70 % of the continent’s population rely on rain-fed agriculture for their livelihoods (AGRA, 2017; Gabre-Madhin and Haggblade, 2004; World Bank, 2008).

2.2. Agricultural reform for poverty reduction in Rwanda

The post-genocide Rwandan government set ambitious goals for economic development and poverty reduction in the country. The main

long-term development plan has been Vision 2020, implemented through EDRS, the aim of which was to eradicate poverty by striving for national food security and to reach per capita income of USD 900 by 2020 (GoR, 2009a). Vision 2020 considers the agricultural sector an engine of economic growth, as it is the main source of income for nearly 80 % of the labour force and accounts for about a third of GDP (GoR, 2017; USAID, 2015). The Rwandan government increased the share of the national budget for the agricultural sector from 3% in 2006 to 10.7 % in 2013, resulting in annual agricultural growth of 6% on average (USAID, 2015). Agricultural sector growth in Rwanda was 4% in 2016, increasing to 7% in 2017 (Xinhua, 2018).

The agricultural sector has, however, continued performing poorly with low productivity, and rural areas are still generally affected by poverty due to land scarcity. In 2009, 85 % of households with access to under 1 ha of land fell below the national poverty line (GoR, 2009a). The average household land holding was under 0.7 ha, while 0.9 ha has been regarded as the minimum to be economically viable in Rwanda (Bruce, 2007). The annual agricultural seasonal report of 2016 indicated that the national average size of farmland per season was even less economically viable, at 0.25, 0.26, and 0.17 ha, respectively, in the three growing seasons. During the same agricultural seasons, the average size of farm land per season in Musanze District was 0.5 ha (GoR, 2016).

According to Musahara et al. (2014), having too little land is linked to poverty, as food security cannot be guaranteed, resulting in low consumption and threatened subsistence. In view of this, Vision 2020 envisaged the development of new agricultural policies intended to replace subsistence-based agriculture with a modernized, market-oriented agricultural sector (GoR, 2000, 2013) based on the perception that “Rwanda’s land resources are utilized in an inefficient and unsustainable manner, which limits the profitability of land” (GoR, 2000:18). Given the importance of the agricultural sector to the economic development of the country, a National Agricultural Policy was adopted in 2004. This policy emphasizes the importance of small-scale farmers and aims at helping them contribute to the modernization and professionalization of Rwandan agriculture, and at making the agricultural sector a pillar of economic growth, poverty reduction, and food security (GoR, 2009b). To implement the National Agricultural Policy, a Strategic Plan for the Transformation of Agriculture (PSTA), which is embedded in the EDRS, was adopted in 2005. The overall objective of PSTA is “to contribute in a sustainable way to poverty reduction and to sustain economic growth of the country through increased productivity, maximization of profits for agricultural production, diversification of incomes and the protection of environment and natural resources” (GoR, 2009b:7).

The initial CIP of 2008 included the provision of improved seeds, seed potatoes, or cuttings of six selected crops (i.e., maize, wheat, rice, beans, potatoes, and cassava). Improved seeds of maize and wheat were distributed free of charge to small-scale farmers as an incentive to increase the productivity of these “priority crops”, while chemical fertilizers were subsidized for maize only. CIP also included the provision of extension services, and the improvement of post-harvest handling and storage mechanisms (Kathiresan, 2011, 2012). From 2012, the Rwandan government started to phase out subsidies (GoR, 2013). According to PSTA, in 2018–2024 (GoR, 2018a), sweet potatoes and bananas were added to the LUC programme as selected crops, while wheat was excluded. CIP and LUC are regarded as key strategies for increasing production of the selected crops across the country, reducing poverty, and eradicating hunger and malnutrition through improved land use management (Bizoza and Havugimana, 2013; Kathiresan, 2012).

2.3. Implementing the LUC programme at the national level

Overall, the government, represented by the Ministry of Agriculture and Animal Resources (MINAGRI), coordinates and supports the LUC implementation process together with other government institutions (Willoughby and Forsythe, 2011), while local government bodies

implement the programme and then report to higher administrative levels. MINAGRI is responsible for planning the areas to be consolidated, based on broad agro-ecological zones identified in each sector by RAB. However, the selected crops may vary due to microclimatic conditions.

Agricultural and land management policies are implemented through a decentralized administrative structure from below, starting at the village, *umudugudu*, cell (the lowest administrative level), sector, district, province,¹ and finally central government levels.

The LUC programme involves village chiefs heading teams of 20–25 farmers, who coordinate programme implementation in practice. At the sector and district levels, agronomists are responsible for implementing and monitoring the programme. Agronomists at the sector level organize village meetings with the local population, in which village chiefs participate, in order to agree on the selection of LUC sites and on the crops to be rotated. In collaboration with village chiefs, the agronomists and executive secretaries at the cell level make lists of people who will benefit from agricultural inputs. These lists are submitted to the agronomist at the sector level, who then distributes the agricultural inputs to the beneficiaries in the different cells. The village chief and two selected farmers are in charge of monitoring the use of agricultural inputs (Kathiresan, 2012).

2.4. Impact of implementing the LUC programme

2.4.1. National level

The land areas under the LUC programme have gradually increased. Taking into account one agricultural season, the total consolidated land area under CIP increased 18-fold between 2008 and 2011 (Kathiresan, 2012). Up to 2016, the cultivated land area under LUC increased by almost another 350,000 ha (GoR, 2018b). Crop yields increased significantly with the start of CIP and LUC (GoR, 2018c; Ndushabandi et al., 2018). The total production of CIP-selected crops increased by over 150 % between 2007 and 2013 in LUC areas. Since 2013, additional benefits have been harder to achieve, and most selected crop yields in 2016 were similar to those of 2013 (GoR, 2018b). The Integrated Household Living Conditions Survey (EICV)² indicated that the share of households participating in the LUC programme increased from 22.4 % in 2010/11–29.6% in 2013/14 (GoR, 2015). The percentage of households cultivating the selected crops under LUC increased between EICV3 and EICV4: households producing potatoes as a selected crop increased from 53 to 61 %, and those producing maize from 75 to 81 %. On the other hand, the percentage of households cultivating non-selected crops decreased slightly: households producing sweet potatoes declined from 76 to 73 %, and those producing sorghum from 43 to 41 %. The use of chemical fertilizers also increased from 12 % of households in 2005/06, to 33% in 2010/11 and 41 % in 2013/14 (GoR, 2012b, 2015). Based on the above information, the agricultural land area under the LUC programme has increased as selected and “priority” crops have replaced non-selected crops cultivated before LUC. As the areas under LUC increase, it is expected that the production of both selected and “priority” crops will also increase.

There has been progress in reducing poverty levels: poverty incidence dropped from 57 % in 2005/06–38% in 2016/17 (GoR, 2012a, 2018b), while extreme poverty dropped from 24 % in 2011/12 to 16% in 2016/2017 (GoR, 2015, 2018b). According to EICV4, 85 % of Rwandan households depend on rain-fed subsistence agriculture and livestock. With low incomes, farm households are at greater risk of food insecurity as they consume less food than do households with non-farm job opportunities (GoR, 2015; USAID, 2018). Even though the national

¹ Administratively, Rwanda comprises four provinces and Kigali City, 30 districts, 416 sectors, and 2,146 cells.

² Enquête Intégrale sur les Conditions de Vie des Ménages (EICV) is based on a sample of 14,308 households surveyed in Rwanda and is intended to monitor poverty reduction programmes (GoR, 2015).

food consumption score improved from 65 % in 2006 to 74 % by 2015 (GoR, 2018b), food security and nutrition indicators show that overall stunting rates remain high (38 %) by international standards (USAID, 2018). Although progress in poverty reduction has occurred during the period of agricultural reform and the LUC programme, Musahara et al. (2014) argued that it is not yet clear whether the level of poverty reduction at the national level is attributable to the effects of LUC in isolation from other factors, such as non-farm employment and technical and vocational education/training.

2.4.2. Local level and grassroots voices

Some studies have highlighted grassroots views and voices regarding the impacts of the LUC programme during the initial stages of implementing the new agricultural policy. These studies raise serious criticisms, such as the authoritarian implementation of the new policy, negative effects on food security from the sole-cropping of a few selected crops, and increasing rural socioeconomic differentiation (Ansoms, 2008, 2010; Ansoms and Rostagno, 2012; Huggins, 2010, 2014; Pritchard, 2013; Van Damme et al., 2013). More recent studies of LUC have found similar and additional effects. Although the use of improved seeds and chemical fertilizers has led to crop yield increase, this has not yet been sufficient to improve rural livelihoods and food security at the household level (Habyarimana and Nkunzimana, 2017; Nilsson, 2019). Negative effects on food and nutrition security were found due to the sole-cropping and other agricultural practices of the programme (Cioffo et al., 2016; Del Prete et al., 2019; Isaacs et al., 2016; Hakorimana and

Akcaoz, 2018). Some selected crops were found to be inappropriate to the agro-ecological conditions and therefore less economically valuable for local farmers than the non-selected crops grown before LUC (Chigbu et al., 2019; Cioffo et al., 2016; Ntuhinyurwa et al., 2019), and some studies have emphasized resistance to the LUC programme due to its failure to meet food security challenges. There are also indications that small-scale farmers, particularly poorer ones, will benefit little from the LUC programme, while better-off farmers with extensive land will gain several advantages (Cioffo et al., 2019; Nilsson, 2019; Muyombano et al., 2018).

3. Method

The paper draws on 45 individual and 22 collective qualitative semi-structured interviews with small-scale farmers (both women and men) and local key informants in five sectors in Musanze District conducted in August 2013 and August 2014. To capture possible geographical differences, the study area comprises three sectors located mainly in the highland, i.e., Shingiro, Gataraga, and Kimonyi, and two sectors located mainly in the lowland, i.e., Muko and Gacaca (see Fig. 1). The three highland sectors were initially selected for being in different stages of implementing the Land Registration and Titling (LRT) programme at the time of the first field work campaign in 2011. The LRT programme was central to the rural transformation on which the LUC programme was based. The two lowland sectors were added to widen the analysis of the effects of LUC implementation, since many criticisms of the programme

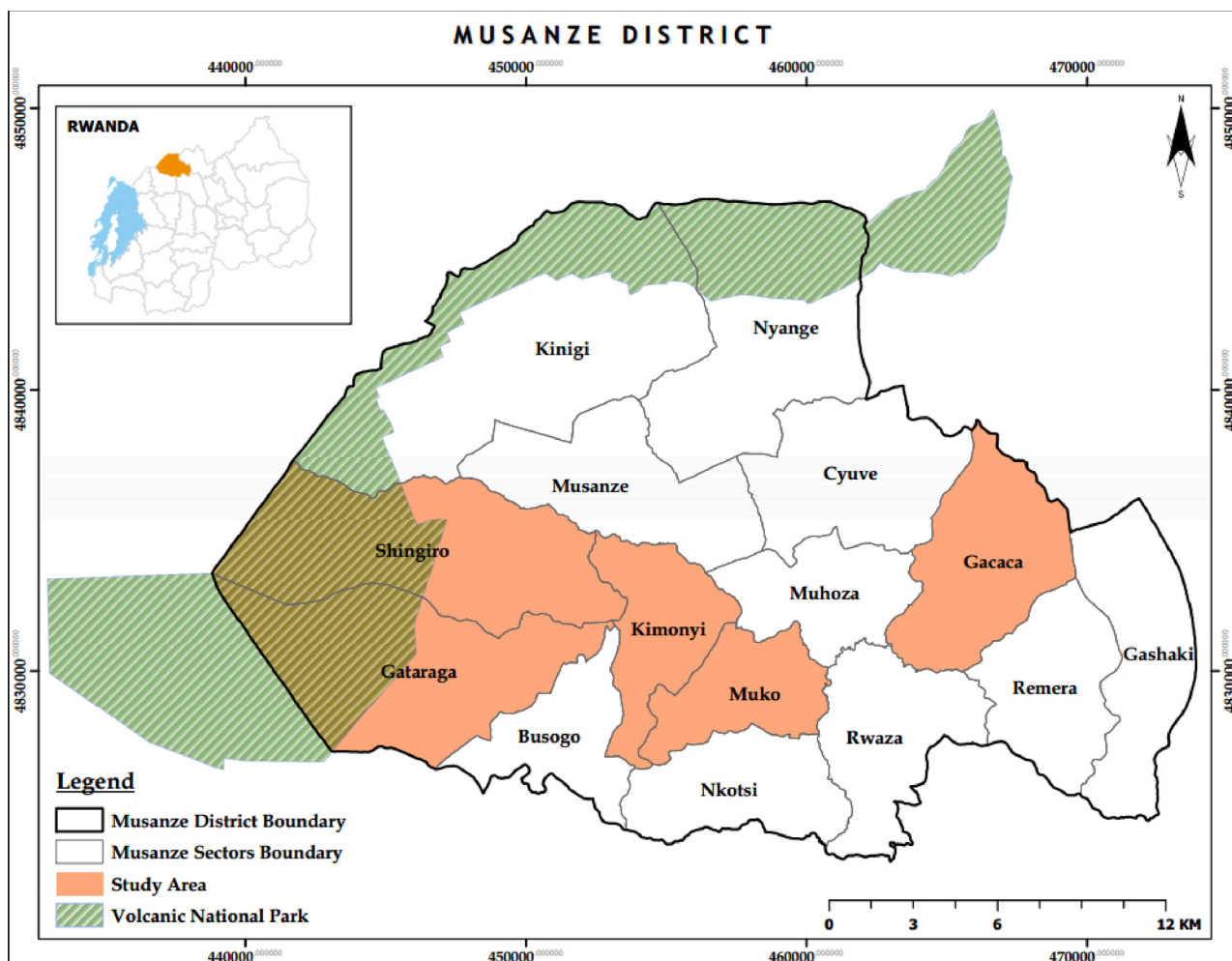


Fig. 1. The study area: the five sectors in Musanze District. Source: Centre for Geographic Information Systems and Remote Sensing, University of Rwanda (CGIS/UR); adapted by the first author.

had been expressed in the highland sectors where the field work began.

In 2013, 20 individual interviews were conducted with farmers and 14 collective interviews with three types of informants. Individual interviews were undertaken to collect detailed data on small-scale farmers' experiences of LUC programme implementation. Individual interviews were conducted with four household heads – two poor and two relatively better-off, one of each gender respectively – in each of the five sectors. The selection was based on household economic status estimated according to local perceptions and on observations at home-steads; this assessment was triangulated with the information given during interviews. To contextualize the information given by individual household heads, collective interviews were conducted with one group of male and one group of female small-scale farmers in each of the five sectors, for 10 collective interviews in total involving some 70 people. The focus of these interviews was also on the farmers' experiences of LUC implementation.

To get an administrative view of how the LUC programme had been implemented and of the challenges that had emerged in the five sectors, one collective interview included key informants in programme administration: two executive secretaries and two agronomists from two selected cells in each of the five sectors were interviewed jointly (20 people). In addition, a third type of collective interview was conducted with representatives of local organizations involved in activities related to land use consolidation, to find out details of how these organizations were working with local farmers and of the challenges they perceived. A collective interview was conducted with one Savings and Credit Cooperative (SACCO) representative from each of three sectors, another with one farmer cooperative representative from each of three sectors, and yet another with one women's association head from each of three sectors. Participants were selected for the third type of interview based on their availability.

In 2014, 25 individual and eight collective semi-structured interviews were conducted to follow up on previous fieldwork, to test preliminary findings and add information to fill gaps. These collective interviews were undertaken with one group of two men and one of two women in each of four sectors, excluding Gataraga, where more detailed individual follow-up interviews were conducted. In Gataraga, the land areas and land use of five households in each of four geographical zones were mapped and the household heads were interviewed in 2012. These 20 household cases were revisited and interviewed in 2014 with a particular focus on LUC. Additionally, the agronomists in each of the five sectors were interviewed individually in 2014.

Thematic analysis was used to identify and analyse patterns in the qualitative interview data. The interviews were translated from Kinyarwanda to English, transcribed, and thematically coded.

4. Findings

4.1. The LUC programme in the study area

The study area comprises five sectors with different geographical characteristics, though all five sectors are characterized by individual small-scale farming. The LUC programme had been implemented for several years in these sectors at the time of fieldwork (see Table 1).

Shingiro, Gataraga, and Kimonyi are highland areas with some hilly zones, but Gataraga and Kimonyi also have some lowland areas (see Fig. 1). In Shingiro sector, the selected crops to be rotated were maize and potatoes, in addition to wheat in some zones. In Gataraga sector, there are three "sub-agro-ecological zones": in the lowland zone, maize was rotated with potatoes and sometimes with beans; in the highland zone, wheat was rotated with potatoes; and in the upper highland zone, near Volcanoes National Park, wheat was rotated with pyrethrum. In highland areas of Kimonyi sector, the selected crops were potatoes and wheat, while in the lowland areas they were maize and beans. Maize and beans were also the selected crops in the lowland areas of Muko and Gacaca.

Table 1

The LUC programme in the five sectors.

Sector	Year of implementation	Agricultural land under LUC in 2014
Shingiro	2008	About 60 %
Gataraga	2008	96 %
Kimonyi	2009	About 80 % 066 %
Muko	2008	70 %
Gacaca	2010	66 %

(Source: Interviews with agronomists, 2014).

According to interviews with local leaders and agronomists, the LUC programme was initiated similarly in the five sectors. In collaboration with the sector agronomist, local leaders called for meetings with the population, village by village. At these meetings, the agronomist explained LUC to the farmers, describing the joint cultivation of selected crops in selected sites, with the aim of increasing production both to feed households and supply the market, in order to earn income and reduce poverty. The land areas to be consolidated, i.e., the selected sites, were chosen based on the suitability of the soil and the agro-ecological zone for the selected crops. The farmers whose land was located within the selected sites *had to* join the programme. Through discussions with local farmers in the villages, the farmers themselves selected the crops they wanted to grow in each agricultural season, from the six crops selected for the programme. Maize was emphasized as a main crop, because it can be stored for a long period, thereby improving food security in local communities.

The system for distributing agricultural inputs within LUC was described as follows: The farmers got maize seeds for free at the sector offices, but had to buy fertilizers themselves via a voucher system in which the farmer paid half the price and the government subsidized the other half. Farmers outside the selected LUC sites could not access inputs on the same terms. During fieldwork, changes in this distribution system were noted. It was argued that in the future the farmers would have to pay for the seeds and fertilizer themselves, according to a government policy called *twigire* (self-reliance), which would replace the *nkunganire* (subsidies) (see GoR, 2009c). In some sectors, a gradual shift towards full payment had already started in 2014. Considering the high poverty incidence in the Rwandan countryside, paying for fertilizers and seeds was regarded as a critical issue. One agronomist said that this was a challenge for poor people, and that they instead "will use seeds of bad quality without fertilizers and the production will definitely decrease" (individual interview, 2014). Local leaders and agronomists argued that the costs of agricultural inputs could be shared among farming association/cooperative members.

According to interviewed representatives of farming associations/cooperatives, local farmers organize themselves in farming associations cultivating the same crops in selected LUC sites by rotating crops between the growing seasons. Associations, each based on approximately 1 ha of land, were then grouped into cooperatives. There were many more women's associations than men's associations, since most rural women work in agriculture. Farmers were also encouraged to join associations and cooperatives as a way of accessing loans as a group through SACCOs. The interviewed SACCO representatives said that SACCOs provided loans to farming cooperatives rather than individuals. These loans could be used to buy seeds and fertilizers or to rent land. They said that very few individual farmers requested loans. Most farmers were said to be afraid that they would not be able to repay the loans from their limited production. Local farmers were thus incentivized to join cooperatives, so that expenses could be shared.

According to local leaders and agronomists, LUC programme implementation faced some challenges. Some years, the provision of maize seeds was delayed until after the agricultural season had started. Another problem was that poor-quality maize seeds had been provided to the farmers some years back. By 2014, however, the quality and provision of seeds had improved. A great challenge was resistance to the

programme among some farmers, particularly among those with small land areas, mainly because they were obliged to grow the selected crops when their land was in selected sites. These farmers had no land on which to grow other non-selected crops preferred for their food security, mostly vegetables, potatoes, and various cereals. The agronomists said they continued to sensitize these farmers about the advantages of being in the programme, and about the positive role of farming cooperatives in which farmers shared production after harvesting, sold together, and could save money from the income. Another challenge mentioned was the variation in implementation between neighbouring sectors, leading to complaints from farmers.

4.2. Experiences of small-scale farmers of the LUC programme

4.2.1. Processes of decision-making and implementation

Interviews with farmers in the five sectors confirmed that the LUC programme had been introduced and explained at village meetings called by the local leaders and agronomists, during which the LUC sites and the crops to rotate were selected. All farmers with land within the LUC sites were required to rotate only the selected crops, one at a time, not mixing them. The farmers had to cultivate the selected crop jointly, but all farmers cultivated their own plots, meaning that it was the crop that was “consolidated” in the sites, not the land. The agricultural seasons were strictly followed and the sector agronomist would tell the farmers when to start cultivating which crop. Farmers were also told when to harvest and were not allowed to begin harvesting before that time.

The crop selection was supposed to be made in consultation with the local population, and most farmers said that this was the case, though some contested this. In the lowland sectors, farmers seemed quite content, since they had been cultivating the same crops before the programme, only in a different way. In the highland areas, in contrast, many farmers were critical of the switch from cultivating sorghum or potatoes to growing maize. In one highland sector, male farmers were very upset about not being allowed to cultivate the crops they wanted:

We wanted to rotate sorghum and potatoes. That is what we wished to grow. But the local authorities said the decision had been taken to grow maize and beans here. We can't do anything else ... We don't have rights to our land because we can't cultivate what we want. (collective interview, Kimonyi, 2013)

In Gataraga, another highland sector, female farmers also complained about the selected crops: they had proposed growing potatoes, but maize was selected as the main crop in the sector. The agronomist in one highland sector confirmed that some farmers were very reluctant to grow the selected crops. He said that farmers had small plots and would prefer to grow crops that produced abundantly in a short period. Maize had been selected as a “priority crop” in the sectors, but it was not valued by all farmers as much as potatoes or vegetables, which grow quickly and provide a good yield and income to the farmers. Even in a lowland sector it was noted that many farmers wished to grow other crops than the selected ones. In Muko, for example, many farmers would have preferred to grow sorghum instead of maize, but they had to follow the decisions made.

There was obviously a strong emphasis from the local authorities on strictly following the agricultural policy and implementing the LUC programme, which was noted through the frequent mentioning of the authorities' ongoing education of the farmers about the benefits of the programme and that they should join. However, many farmers were reluctant to accept the limited crop selection, as noted above, and some even resisted and cultivated non-selected crops in the LUC sites, with the following consequences. During individual interviews, we were told that non-selected crops planted in selected sites would be removed. A better-off female farmer in Muko said that she knew farmers who had tried to cultivate sorghum in selected sites and that their crops had been removed by the agronomist (individual interview, 2013). In another sector, female farmers said that they preferred to cultivate non-selected

crops, such as potatoes, vegetables, and sorghum, that could be harvested within a shorter period and would bring in more money in the local market than the selected crops. By doing this, they could pay school fees and better feed their families. They said: “Here we are in conflict with the agronomist and we accept the consequences ... he says that we have to pay a fine of 5,000 RWF each. We don't care about this fine because we know that we will earn a lot of money from the sorghum and feed our families” (collective interview, Shingiro, 2014).

The cultivation of crops other than the selected ones in the LUC sites was a sensitive issue. This was especially a problem for farmers with small land areas, all located within LUC sites. We were told that most farmers had small land areas and did not have anywhere else to grow non-selected crops, which was a serious problem for their households' food security. Some farmers had several small or very small plots in different locations, some outside LUC sites, where they could grow non-selected crops. The most common way for farmers to expand their agricultural land area was to rent land within or outside the LUC sites. For others, the only place to grow fruits and vegetables was around their houses, in the *akarima k'igikoni*.³

4.2.2. The provision and use of agricultural inputs and support mechanisms

In all five sectors, there was a strong focus on the production of maize as a “priority crop”. The farmers had to buy fertilizers, provided through a subsidized voucher system in which the farmers and government each paid half the cost. When showing their vouchers for fertilizers, the farmers were given improved maize seeds for free by the sector offices. In Gataraga, wheat seeds were also provided for free. For the other selected crops, farmers had to find seeds themselves, usually by saving seeds from the harvest to be used during the following agricultural season. Although fertilizers were subsidized, many farmers found them too expensive: “We cannot pay for fertilizers because we don't have money” (individual interview, poor woman, Muko, 2013). Some farmers used their own organic fertilizers instead of buying chemical fertilizers. Others resisted using the chemical fertilizers and expressed uncertainties about their effects on the soil and their production. The incentives from the local authorities were only provided to farmers who had own or rented land within the LUC sites and were participating in the programme.

Many farmers in the five sectors complained about the late delivery and poor quality of the maize seeds distributed during two successive agricultural seasons. This meant that many farmers planted late and had much smaller harvests than usual, since they were not allowed to plant crops other than the selected ones within the LUC sites. Some farmers said they did not harvest anything for the same reasons, and therefore started to resist the programme. This problem was confirmed by the agronomists, so the local authorities in some sectors had allowed the farmers to plant their own maize seeds, instead of waiting for the improved ones. In 2014, it was noted that the distribution of seeds and fertilizers had improved and inputs were available on time. In August 2014, the distribution system was also changing so that, in the future, the farmers would have to pay for all inputs, including maize seeds and fertilizers. This change was regarded as a serious problem by the farmers, especially the poor ones.

In terms of support mechanisms, the local authorities in the five sectors strongly emphasized that farmers should be encouraged to form associations and/or cooperatives for their farming activities, so that production, harvest, marketing, and sales could be jointly organized. Farmers explained that associations were organized among those who were jointly cultivating a particular LUC site. A cooperative was made up of several associations. Among the farmers interviewed, it varied whether they belonged to an association, cooperative, or neither.

³ The local authorities encourage communities to cultivate vegetables and fruits in gardens (called *akarima k'igikoni*) around their houses to improve food security and nutrition in particular.

Joining was voluntary, but farmers had to buy a share to join a cooperative and not everyone could afford to do so. Many poor farmers said that they were farming individually, since they could not afford to join cooperatives. Many farmers who were not in cooperatives said that they could not farm in cooperatives since their plots were too small. Cooperatives were perceived as “more practical for people who have extensive land, like those who grow potatoes” (collective interview, men, Gacaca, 2013). The relatively better-off farmers interviewed commonly belonged to cooperatives and were very content with the joint production and sales. A better-off female farmer in Shingiro, who had milk cows, forest land, and six plots totalling 2 ha, told us that they did everything jointly in her cooperative, and that harvesting, storage, and marketing processes were much easier for them as cooperative members than for individual farmers (individual interview, 2013).

It was clear that farmers in cooperatives and in some associations saved part of their income in a SACCO or a bank. It was also common that the cooperatives could easily access loans from the SACCOs or banks, which they used to rent land within or outside LUC sites, depending on which crop they wanted to cultivate. Many cooperatives rented land to cultivate potatoes, since they mature relatively quickly and there was a good market for them:

In our cooperative, we request loans to buy seed potatoes and fertilizers. We manage to pay back the loans because potatoes here produce very well in a short period. We rent plots for one year and we farm jointly. ... The good thing about being a member of a cooperative is the facility to get quick loans when we need to buy seeds or fertilizers. We pay back the loan within one year to the SACCO at 2% interest.

(individual interview, better-off man, Gataraga, 2014)

We were told that land was always available to rent, since there are always people who need money to pay school fees or meet other household needs. On the other hand, it was generally believed that individual farmers who were not in associations or cooperatives found it very difficult to access loans, since many people did not have anything to put up as collateral. It was often stated that SACCOs, and even banks, had greater trust in cooperatives and registered associations than in individual farmers. It was also noted that since people obtained land certificates, farmers with more land would use their certificates as collateral to request loans. However, many poor and elderly farmers did not earn enough income to request loans and would not mortgage the little land they had for fear of losing it (Muyombano et al., 2018).

4.2.3. Effects on production, food security, and household needs

Overall, farmers said that the LUC programme had a very positive effect in terms of increased yield, mainly of maize. Many also expressed satisfaction with cultivating one crop jointly with others, saying that this collaboration had improved their ability to protect their crops. Jointly, they could hire people to tend and guard the crops. Before the programme, farmers farmed on their own without using fertilizers, mixing crops; both male and female farmers said that the programme and the agronomists' advice had positively affected productivity. However, for many poor farmers the situation was often very different, since they could not afford to buy fertilizers and their production had not increased. In general, poor farmers with small land areas were the ones least equipped to earn income from producing the selected crops. To meet their household needs, poor farmers said that they would have to cultivate crops for others in order to earn income.

Some farmers said that they were content with the selected crops, since increased production of them meant increased income. Some also said that the programme had had a positive effect on their food security. The most satisfied farmers were the relatively better-off ones with larger and multiple plots in different locations, and farmers in cooperatives. This corresponds to what many farmers pointed out, namely, that it was mainly better-off farmers with extensive land scattered in different areas

who gained the most from the LUC programme, and that these farmers further benefitted from joining cooperatives. However, as pointed out during interviews, the problem was that most of the population owned very small amounts of land. Farmers with one or a few small or very small plots in the LUC sites were mostly critical of growing and depending on one crop only, as it adversely affected the food security of their households:

Let me tell you something. Here either we have a little land or we are landless. We can't survive by cultivating one crop as stipulated in the land use consolidation programme. It is impossible! We need to mix crops in our small land holdings. (collective interview, women, Shingiro, 2013)

Another critical issue raised regarding sole-cropping was that if a particular crop was affected by disease, the whole area would be contaminated, negatively affecting crop production and food security. The argument was that the situation was better before the LUC programme, when farmers were mixing crops. A further criticism concerned the market prices of the selected crops. Since all farmers in an area were producing the same crops and harvested at the stipulated time, the same crops were plentiful and marketed at the same time, leading to lower prices for the producers. Many farmers claimed that the market was better before the LUC programme, when they could grow any crop for which there was good local demand, giving them better income.

The general opinion of the interviewees was that the LUC programme did not benefit poor farmers with little land, the landless, and old people – the most vulnerable groups in a community. Many interviewees said that the programme should only be for farmers with extensive land – by definition better-off farmers. From the individual interviews with relatively better-off farmers, it was clear that they were doing well and were content with the programme. They usually had several plots within or outside the LUC sites, and they often had other resources that further strengthened their position. Related to land, better-off farmers had a great advantage over poorer farmers in need of money, who at times were forced to sell all or part of their land for money to meet various household needs. Even among the better-off farmers, a few commented that the LUC programme was better suited to those with access to extensive land areas. One example was a better-off female farmer, who had some education (individual interview, 2013):

It is a good programme for people with a lot of land because they can produce enough. In general, I can say that there is no benefit for local communities. It is not easy here: many people have small scattered farming areas and they are forced to grow maize and wheat. These crops are not good for food security for our children ... We don't have rights to our land at all. If we had rights, they could not tell us to remove our crops from the fields. It is very bad! ... People are afraid to criticize this programme, they just do what they are told to do. We are traumatized, we fear to talk ...

5. Concluding discussion

The aim of this paper was to analyse the effects of the land use consolidation programme at the household level, specifically focusing on the experiences of small-scale farmers in a northern district of Rwanda. With such a focus, we found a qualitative approach with face-to-face encounters valuable for capturing personal accounts of experiences, as well as for capturing how complex issues related to the LUC programme were interlinked in the everyday lives of the small-scale farmers in rural Rwanda. The present findings therefore both complement and build on previous qualitative and the many quantitative studies conducted.

The purpose of the Rwandan agricultural reform is to increase agricultural production to ensure food and nutrition security, on one

hand, and to increase the commercialization of this production to raise rural incomes and fight poverty, on the other. Overall, the interviewed farmers described a very positive effect of the LUC programme in terms of production increase, especially of the prioritized crop of maize, supporting the findings of national reports and quantitative studies (GoR, 2015, 2018a, 2018c; Habyarimana and Nkunzimana, 2017; Hakorimana and Akcaoz, 2018; Nahayo et al., 2017; Ndushabandi et al., 2018; Nilsson, 2019). However, our study found that many poor farmers could not afford to buy the subsidized fertilizers, as also found by Cioffo et al. (2016) and Nahayo et al. (2017), and therefore reported no production increase.

While farmers were generally positive regarding the production increase, they were much less so regarding the food and nutrition security aspect of the LUC programme. Our study found that many small-scale farmers were very critical of the limited number of crops in the LUC programme. This was especially the case with maize, which was regarded as the main crop by the local authorities, but which was not highly valued by small-scale farmers, many of whom would have preferred to grow other crops. This position was recognized by local authority study participants. One of the most critical aspects in this regard concerned the cultivated land area, which was also highlighted by Nilsson (2019). This point was raised again and again during our study, by both poor and relatively better-off farmers. In addition, our study found that the number of plots a farmer's household had access to and their locations were also very important, corresponding to the findings of Chigbu et al. (2019) and Ntihinyurwa et al. (2019). Since most of the Rwandan rural population have very small pieces of land, usually one or two plots, their locations become vital for what crops farmers can grow. If land is located within a selected LUC site, the farmer has to abide by the programme and rotate the selected crops, and there is no or very little land where non-selected crops can be grown to secure household food supply and nutrition. Our study found that some farmers resisted the programme by growing non-selected crops within the LUC sites, despite knowing that they might get fined and the crops could be removed by local authorities. The LUC crop limitation and its enforced implementation was the most criticized aspect of the programme, mainly for its negative effects on household food and nutrition security, but also because it deprived small-scale farmers of the right to make decisions concerning their land and livelihoods, undermining farmers' land tenure security. Other studies have found similar effects of the compulsory crop limitation (Chigbu et al., 2019; Huggins, 2010; Ndushabandi et al., 2018; Ntihinyurwa et al., 2019; Pritchard, 2013). The authoritarian and enforced implementation of the LUC programme and the negative effects of the sole-cropping of a few crops on food and nutrition security were problems raised by previous qualitative studies, some of which also found that farmers resisted the programme by cultivating non-selected crops (e.g., Huggins, 2010; Pritchard, 2013; Van Damme et al., 2013). The negative effects of the crop limitation on food and nutrition security have also been highlighted by several more recent quantitative and mixed-methods studies (Cioffo et al., 2016; Del Prete et al., 2019; Hakorimana and Akcaoz, 2018; Isaacs et al., 2016; Nahayo et al., 2017).

The policy aim of increased commercialization to raise rural incomes in order to fight poverty is strongly linked to the aim of agricultural production increase, as presented above. This study found that the LUC programme had positive effects mainly for the relatively better-off farmers and for cooperative members who could access several larger plots in different locations and who, therefore, could cultivate selected crops in LUC sites and non-selected crops elsewhere for both household food security and the market. Cooperative membership had many advantages, including enhanced savings and access to credit. Credit could be used to rent or buy land and purchase agricultural inputs to extend agricultural activities. This allowed farmers to produce more and earn higher incomes from their commercialized agricultural production, thereby improving their living conditions. In addition, by renting land farmers could access land both inside and outside LUC sites to produce both selected and non-selected crops. Poor farmers with very small land

areas, on the other hand, reported little if any production increase, and they could not sell any of their production since it was not enough to meet household food needs. Instead, poor farmers said they had to work for others to earn income to meet their household needs. With meagre income they could not afford to buy the "share" needed in order to join a cooperative, which is why many poor farmers farmed individually, without the possibilities of saving or of accessing credit to invest in their agricultural activities. The LUC programme therefore seems to reinforce the existing socioeconomic differentiation in rural areas, where some better-off farmers were renting big land areas, while poorer farmers were forced to rent out or sell off their land to meet various household needs, a pattern corresponding to the findings of other studies (Ansoms, 2008, 2010; Ansoms and Rostagno, 2012; Cioffo et al., 2016; Huggins, 2010, 2014; Van Damme et al., 2013).

The LUC programme had a strong focus on market-oriented production, with a gradual shift to a fully-fledged market-based input distribution system. Several studies have looked at how small-scale subsistence farmers respond to market-oriented agriculture using improved seeds and industrial fertilizers. Their findings indicate that, in general, such programmes have positively affected agricultural productivity. However, small-scale market-oriented producers have been identified as vulnerable to changes brought about by such programmes (Bellon and Hellin, 2011; Jayne et al., 2016; Oya, 2010).

The LUC programme fits well within the modernization paradigm of agricultural development, creating economic opportunities for a resource-rich, entrepreneurial group of farmers to become a "middle class" of farmers within a market-oriented production system (Christiaensen, 2017; Christiaensen et al., 2011; Diao et al., 2007, 2010; Jayne et al., 2016; Huggins, 2014; Van Damme et al., 2013). Such programmes are good for those with sufficient resources to tap into the established system of incentives and support mechanisms, while marginalizing those who cannot access the same resources. The strict programme set-up was not well-suited for creating opportunities for poor farmers with little land, in order to reduce poverty among the poorest in the rural communities. Instead of focusing solely on maximizing the agricultural productivity of predetermined, high-value market crops, the policy approach could be more flexible in implementing the programme, considering the socioeconomic context, local knowledge, and local voices, especially in relation to the obligation to participate, the process of selecting crops to be grown in various regions and regarding poor farmers with small land holdings.

Author statement

Emmanuel Muyombano and Margareta Espling certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript.

Acknowledgements

This work was supported by the National University of Rwanda - Swedish international Development Cooperation Agency (Sida)/Sarec Research Cooperation, funded by Sida, Sweden. The article has also benefited from the insightful comments of three anonymous reviewers.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.landusepol.2020.105060>.

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