RESEARCH ARTICLE

Agricultural transformation in Rwanda: Can Gendered Market Participation Explain the Persistence of Subsistence Farming?

Chantal Ingabire[1, 2*], Patience M. Mshenga[2], Michèle Amacker[3], Jackson K. Langat[2], Christine Bigler[3], and Eliud A. Birachi[4]

[1]Rwanda Agriculture Board (RAB), Kigali, Rwanda
[2]Department of Agricultural Economics and Agribusiness Management, Egerton University, Kenya
[3]University of Berne, Interdisciplinary Centre for Gender Studies, Bern, Switzerland
[4]International Centre for Tropical Agriculture (CIAT), Kigali, Rwanda

Abstract

Despite the efforts to agricultural transformation in Rwanda, farming systems are predominantly still in subsistence production. Women are more involved than men, and their number has even increased in the past decade. The reasons for this remain unclear, given the country's efforts for gender mainstreaming towards market-oriented agriculture. Guided by the current debate on feminization of agriculture, we base this study on the thesis that higher market participation among women farmers could contribute to the so-called transformation. The study uses the case of the Northern Province of Rwanda. It involved 368 smallholder dual-headed households among which 208 and 160 were respectively producing beans and potato. It used a mixed method approach by sequential exploratory design, involving a quantitative survey households followed by Focus Group Discussions (FGDs). Both Household Commercialization Index (HCI) and Thematic Analyses were used. Findings showed a high degree of commercialization for potato, with 75% of farmers participating in output markets, and 72% among them being market oriented. In contrast, only 26% of bean farmers sold their production. The commercialization of potato is in the hands of men, while beans are mainly sold by women. This was also confirmed with the findings from FGDs. Three issues were identified as hindrances to agricultural transformation and likely to keep households in subsistence production: the low participation of women in input and output markets; their limited control over agricultural income; and their increased workload that combines on-farm and reproductive works. Therefore, despite the efforts at policy level, there are still gender inequalities within dual-headed farming households, and the agricultural transformation risks increasing the gap through all or some of the three identified issues. Removing these inequalities could increase households' market participation and contribute in the process of agricultural transformation.

Keywords

Agricultural transformation, markets, women, gender, mixed methods

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Corresponding author:
Chantal Ingabire, Department of Agricultural Economics and Agribusiness Management, Egerton University, Kenya
E-mail:c.ingabire001@gmail.com

Introduction

Background

As countries around the world strive to achieve the Sustainable Development Goals (SDGs), most of African countries put agricultural transformation at the heart of their efforts. Agriculture remains the backbone of the economy in rural Africa where the majority of the

population lives. The Sub-Saharan Africa (SSA) alone, accounts for 89 percent of the rural population in agriculture-based nations (World Bank, 2007). The sector also employs more than 70 percent of the poor and accounts between 30 to 40 percent of the SSA countries' gross domestic product while involving a considerable number of women as farmers, entrepreneurs or wage workers (Muyanga & Jayne, 2014; O'Sullivan et al., 2014). However, the sector has been characterized by poor performance that has kept the continent at the lowest level of agricultural productivity and food self-sufficiency among other developing regions (Diao, Hazell, & Thurlow, 2010). The growing population that also increases pressure on arable land, has progressively worsened the situation, resulting to the predominance of smallholder farmers in most of the countries, including Rwanda (Gladwin et al., 2001; Holden & Otsuka, 2014). Hence attempts to end poverty, hunger and food insecurity in Africa must reconsider the transformation of agriculture, tackling the issue of poor productivity and giving high priority to smallholders. This was also highlighted in the Comprehensive Africa Agriculture Development Program (CAADP), an initiative by Africa's leaders for agriculture-led economic growth and sustainable food security (New Partnership for Africa's Development [NEPAD], 2018).

In CAADP, African countries renewed their commitment to the transformation of agriculture while focusing on smallholder farmers and women in particular (NEPAD, 2018).The attention to these categories of farmers is in line with the SDGs on achieving gender equality and promoting inclusive, sustainable economic growth and productive employment for all. In fact as described by Collier and Dercon (2014), smallholder farmers are generally poor, producing at the lowest level of productivity. They have limited participation to agricultural markets particularly due to institutional challenges that include lack of sufficient and timely information on the quality, quantity and pricing of produce but also to poor access to agricultural technology and financial services (Gebremedhin et al., 2009; Mmbando et al., 2015). Consequently, they pay high cost for poor production which does not only perpetuate their problem of food and income poverty but also prevent them from shifting from subsistence farming to market oriented production[1] (Chamberlin & Jayne, 2013; Delaney, Livingston, & Schonberger, 2011; Onyemah & Akpa, 2016).Thus, the envisioned transformation in CAADP primarily concerns improving agricultural productivity for more marketable surplus and higher market participation[2] among the smallholder farmers. In the same way, facilitation of better access and integration to agricultural markets is also considered in order to improve farmers' income for further commercialization (NEPAD, 2018; Olwande et al., 2015).

Along with the common limitations to smallholders, women farmers are more affected by gender norms in the struggle to improve their agricultural productivity and market participation. As particular institutional challenges, gender norms shape how women should behave or interact with other actors in marketing systems. For example, women's time constraints that is caused by their reproductive gendered roles limit their capacity to wait for remunerative prices for their produce (Fischer & Qaim, 2012). The time constraint and the perception of how women should behave towards men for example, limit their possibilities to successfully work with other farmers for collective marketing or deal with suppliers of financial services and agricultural inputs such as seeds, fertilizers and pesticides (Fischer & Qaim, 2012; Selhausen, 2016). A study conducted in Malawi showed that women need permission from their husbands in order to participate in farmers' groups. When the permission is not granted, they are forced to not participate or to participate but being labelled as insubordinate to their husbands (Mudege et al., 2015). In other studies conducted in Ethiopia, Ghana and outside Africa, particularly depending on the type of crops, women are not perceived as farmers but helpers to husbands which constrain their access to services like training or other extension services (Doss, 2002; Mersha & Van Laerhoven, 2016; Twyman et al, 2015). In Rwanda, there is still a knowledge gap on the specific constraints faced by women. Yet, they are recognized as being the backbone of agriculture by providing labor for production, harvesting and processing (Ministry of agriculture and animal resources [MINAGRI], 2010). The present study contributes on this by particularly focusing on smallholders.

[1] Subsistence farming consists in producing for household consumption while in market oriented farming, the agricultural production is predestined to be commercialized and generate income.

[2] Market participation refers to when households sell their agricultural production even when it was not a priori planned. It is assumed to be either a result (then an indicator) or a driver of the so-called agricultural transformation from subsistence to market oriented farming (Biénabe & Vermeulen, 2011; Okezie et al., 2012). In this study, market participation is considered to be a proxy indicator and key step towards a transformed agriculture.

Agricultural transformation in the context of Rwanda

In Rwanda, agriculture is the major source of livelihood in the rural area. The sector involves 82 percent and 63 percent of employed women and men, respectively (National Institute of Statistics of Rwanda [NISR] & Ministry of Finance and Economic planning [MINECOFIN], 2014). This make agriculture the major employer of women in Rwanda. Furthermore, available statistics show that women highly participate in agriculture, particularly by supplying labor in production. A recent report showed that for 44 percent of farming households, agricultural production is a livelihood activity for both husband and wife, while in more than a quarter of these households, only women are engaged in agriculture (Hjelm et al., 2016). The same report reveals that in 27 percent of farming households, the labor is supplied by women only. Besides, there are particular activities such as sowing, weeding, wind winnowing[3] and sun drying which are traditionally considered as women's tasks. Rwandan women farmers are thus considered to be more intimately linked to agricultural production and the current agricultural policy and strategies are gender mainstreamed.

The plan for agricultural transformation was already in place even before the country signed CAADP agreement. Since 2000, Rwanda reinforced the efforts in the transformation from largely subsistence to market-oriented agriculture with gender equality as a cross-cutting element (MINAGRI, 2010; Verhofstadt & Maertens, 2014). The plan for agricultural transformation mainly includes an intensification program through which the farmers' access to production inputs particularly fertilizers, seeds and pesticides is to be increased. Some crops including rice, maize, beans, potato, soya, wheat and horticulture have been identified as priority of this program for higher productivity and income among the smallholders (MINAGRI, 2004). The country has also facilitated access to improved agricultural techniques involving the use of improved seeds, crop specialization and diversification depending on agro-climatic zones. Moreover, the government made some institutional changes such as land tenure reforms, ensuring equal land rights for women and men (Daley & Englert, 2010).

There has been some good achievement attributed to the transformation plan. These are for instance , the recent increase of the number of farmers' cooperatives that allowed collective access to inputs and output markets[4], the improved crop productivity particularly for beans and potato as well as agricultural income and commercialization of some staple crops (Harrison, 2016; MINECOFIN, 2013; Verhofstadt & Maertens, 2015). Nevertheless, the farming systems remain predominantly subsistence oriented, and recent reports show that this particular system involves more women than men. The number of women has even increased in the past decade (MINECOFIN, 2013). Moreover as observed by MINAGRI (2010), there have been competition issues between food and cash crops at household level. It was considered as a gender issues since women are traditionally involved in food production. From this arises the question about the reasons that keep women in subsistence production and contributing to the persistence of this system, despite the gender main streaming efforts in the transformation plan.

Considering the figures on the growing number of women in agriculture, the present study aimed at explaining the persistence of subsistence production, drawing on the current feminist debate. The study is based on the idea that market participation leads to more commercialization and further, to the transformation from subsistence to market-oriented farming. It uses the case of the northern province of Rwanda and considers dual-headed (commonly called male headed) households in order to answer the following questions:

- What is the level of market participation among dual-headed households?
- How do gender roles and relations influence the women's participation to markets?

Agricultural transformation and the feminization concepts

The CAADP as well as Rwanda's plan for agricultural transformation give a priority to women as a particular category of farmers. The direct raison for this consideration is that women make the majority of smallholders, supplying labour in production of food and cash crops (MINAGRI, 2010; NEPAD, 2016). Their contribution in terms of energy, time and/or innovation in various agricultural activities has increased and it is sometimes even outstands that of men(Rubin & Manfre, 2014). Already in 1970s, the important contribution of women in

[3] The process of separating grains and their hulls or husk using wind.

[4] This refers to the place where production factors such as fertilizers, seeds and pesticides are exchanged while the output market consists in the place where farm produce are exchanged.

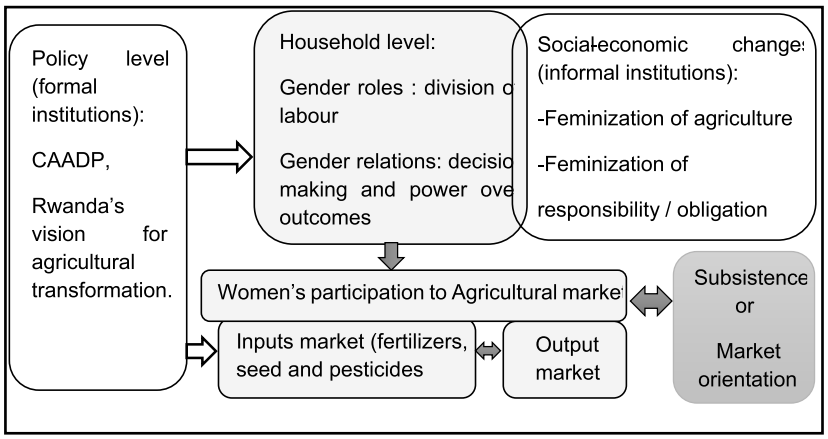
agriculture has been highlighted by Boserup who also argued that gender roles have an influence on this. Women are more responsible of the reproductive work and the agricultural sector is more flexible than other sectors for them to combine productive and reproductive work (Boserup, 1970; Roncolato, 2016). Furthermore, Boserup pointed out that women are more involved in subsistence crop production while men grow cash crops or work outside the own farm.

In the current debate on gender, this growing share of women's labor participation is referred to as "feminization of agriculture". There two common explanations of the feminization of agriculture. On the one hand, it is caused by the increasing number of non-farm opportunities in the rural area as well as the out-migration that benefits men and causes them leave their agricultural tasks to women (De Schutter, 2013). In this case, the feminization of agriculture can be interpreted as a consequence of gender inequality in terms of access to economic opportunities outside the sector. On the other hand, the feminization of agriculture can be conceptualized as a consequence of agricultural transformation. In the process of transformation, women increase their time on agricultural activities by working with men (husbands/partners) on cash crops while keeping their roles in subsistence crops production (Jiggins, 1998; Lastarria-Cornhiel, 2006). They share the responsibility of producing for markets, but they also continue to supply labor in food production and unpaid reproductive works.

The explanations of the feminization of agriculture reflect what is described by Sylvia Chant in the discussion on women and poverty; the "feminization of responsibility and obligation". According to Chant (2014), feminization of responsibility refers to the fact that women have increased their contribution to the survival of households, becoming more responsible of poverty management through their growing participation in productive work. Based on data from developing countries, she argues that while women diversify and intensify their contribution to households' survival, men do not change and sometimes reduce or withdraw theirs. Women are progressively pushed to compensate the declining contribution of men but the latter do not even support in reproductive works. Additionally, she noted that women's higher contribution does not necessarily improve their position to negotiate over obligations and entitlements. Men keep their traditional position on decision making and control over household resources including those earned by women. This situation leaves women with fewer choices other than combining remunerative productive activities and their unpaid reproductive tasks that are imposed to them as gender norms or through formal contracts (Chant, 2014). This is what Chant describes as feminization of obligation.

The "feminization of responsibility and obligation" concept is adopted and used with that of "feminization of agriculture", as theoretical background of this paper. We acknowledge the growing contribution of women in agricultural production both for household subsistence and commercialization. Using the case of Rwanda, we show that despite women's high engagement in agriculture, their market participation as well as negotiation and decision making power over agricultural income remain very limited. We hypothesize that gender roles in smallholder households as well as the power relation between husband and wife are contributing to the predominance of subsistence production in Rwanda. This is particularly reflected by the limited access to agricultural markets among women farmers. In other words, gender gaps at household level is considered as one of the factors that slow down the progress from subsistence to market oriented agriculture (through limited market participation of women). Hence as illustrated in Figure 1, market orientation is conceptualized as a consequence of access to agricultural markets among women farmers which is itself affected by the gender norms within their households, in addition to their specific challenges discussed previously. Furthermore, since agriculture remain the major source of income for the smallholder households, low level of market participation contributes to the persistence of subsistence farming and vice versa.

Figure 1. Conceptual framework



Source: Authors' conceptualization based on Chant (2014) and Jiggins (1998)

Methodology

The study used a mixed method approach involving a quantitative survey and Focus Group Discussion (FGDs). In this approach, a sequential exploratory design was used to gain more insight on gender norms that could explain the progress towards market-oriented farming in the study area. Following Creswell (2009) on this design, a quantitative survey was first conducted, and the FGDs were held to explore more about the quantitative findings.

Regarding the quantitative survey, a semi-structured questionnaire was used for data collection in October 2015 in three districts of the Northern Province of Rwanda. A multistage sampling technique was used. In the first stage, the Northern Province was selected, in the second stage the 3 out of the 5 districts, namely Gakenke, Musanze and Burera were selected (a map showing the study area is attached). The province as well as the districts have been purposively chosen based on the predominance of farming activity, the level of agricultural commercialization and their proximity to important local markets and to the border with Uganda for cross-border trade (Bigler et al., 2017).

In the third and fourth stages, two sectors from each district, two cells from each sector and 2 villages from each cells were randomly selected. Finally, lists of farming households were obtained from the village leaders, and this made a sampling frame from which the 368 farming households were randomly selected. In all the cases, the random sampling was done, using Microsoft Excel function by which the localities and households from the same sampling frame had equal chance to be selected. Among these households 208 and 160 were respectively producing beans and potato as their major crops.

For the qualitative part, 7 Focus Group Discussions (FGDs) were held in November and December 2016. Among these, four were conducted with women and three were conducted with men from dual-headed farming households. Each of the FGDs counted 7 farmers selected from bean and potato farmers who participated in the quantitative survey. According to Ritchie and Lewis (2003), a group of 4 to 10 participants is appropriate in social context research to understand people's perception of a specific topic. Despite their weakness of not giving detailed information at individual level, the FGDs are recommended for their advantage in allowing diversity of opinions and consensus on a specific issue (Morgan & Hoffman, 2018). This was useful in generating views of men and women as the intra-household gender roles and relations were not judged being too sensitive for public discussions. Moreover, as individual information was already collected during quantitative surveys the FGDs were preferred over in-depth interviews. As supported in Morgan and Hoffman (2018), FGDs were used to complement the quantitative survey. The focus group participants were purposively chosen from the households that have participated to potato and beans markets. A checklist of questions on the challenges faced in the process of commercialization guided the discussion. The focus group discussion was moderated by the first author of this paper and were held in Kinyarwanda, being simultaneously recorded. Later on, they have been transcribed and then translated to English by the researcher.

The qualitative data were analyzed using a Thematic Analysis following an inductive processin which codes and themes were created directly with MAXQDA software program. By

this approach, coded themes were derived from the actual transcripts instead of any other study or theory (Vaismoradi et al., 2013). In the quantitative analysis, the Household Commercialization Index (HCI) and descriptive statistics were calculated using STATA. The index was proposed by Strasberg *et al.* (1999) and researchers including Bekele *et al.*(2010) and Carletto *et al.* (2017) have used it in their studies on agricultural commercialization. The HCI was adapted for each of the two crops, as a proxy for the degree of households' commercialization, and it is given by the following formula:

where HCI_i is the commercialization index of the household for the crop of interest (Bean and Potato in seasons A and B of 2015, respectively). S_i is the gross value of the crop sales and Q_i is the gross value of the total production. A household is said to be market oriented if the HCI is superior or equal to 50%.

$$HCI_i = \frac{\sum_{i=1}^{n} S_{bi}}{\sum_{i=1}^{n} Q_{bi}} \times 100 \quad 0 \le HCI_b \le 100$$

Findings and Discussion

Participation to agricultural markets

Household participation to output markets

Results showed that the level of market participation among potato producersis higher compared to that of beans farmers. As given in Figure 2, around 75% of households that consider the potato to be one of their main crops have participated to potato market and sold their production. For these farmers, the calculation of Household Commercialization Index (HCI) revealed that 72% sold half or more of their potato output. They can be therefore qualified as market-oriented farmers (Bekele et al., 2010).

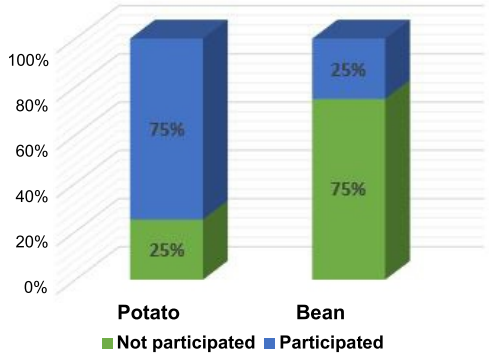


Figure 2. Level of households' participation in potato and bean markets

In the same Figure 2, the findings about market participation of bean producers are also displayed. Among these households, 25% have participated to output market by selling their production and the HCI calculations for those who participated showed that 56%sold half or more of their production and can be considered as market oriented. These results are relevant with those by Carletto *et al.,* (2017), who found the same level of commercialization among bean farmers in Tanzania.

The comparison of potato and bean producers shows a difference in terms of households' market participation, revealing that potato is highly commercialized with more households being market-oriented. From the FGDs, the trends of market orientation for potato have also been emphasized, and farmers showed that one of the recent changes experienced in the agricultural production was that potato has started to be grown purposively for market.

> "*… In the past, we used to grow Irish potatoes on a small scale, but now we grow with a purpose to commercialize the production,….Whatever the quantity produced, it goes and we remain with a small proportion to sustain the family"*. FGD, Women.

Compared to potato, the harvested and sold quantities were less in the case of beans, and when talking about beans, farmers quickly think about home consumption, referring to family food and commercialization of small quantities, such as in the "narrative" below:

> *"If I need to pay like a health insurance I would have to sell part of my bean production; this might take like a bag of 20 Kg and I have five people to feed …."* FGD, Women

From the different discussions with men and women, the findings show that bean

commercialization mainly occurred when households needed to buy small items such as soap, salt or when they want to pay health insurance. This would justify the smaller HCI for bean crop and the lower percentage of bean farmers who participated to the market in comparison to those who produced potato. Another possible cause of the low participation in bean market may be the farmers' perceptions about the crop. Culturally, beans have a great implication for household food security and having a granary of beans has been perceived as a sign of wealth (Ingabire et al., 2017). So some households may prefer to store it instead of taking it to the market. Additionally, when this is sold, it is taken to local markets which may not be offering good price, another factor that discourage farmers' participation.

Potato commercialization is more advanced and follows a more structured marketing channel. Majority of these farmers sold their produce through cooperatives or potato collection centers. The higher market participation of potato farmers may be also explained by the study area's comparative advantage in producing this crop. In fact, the area is part of the most suitable region for potato production, and this contributes to its high degree of commercialization. The studied area even supplies all the domestic as well as some regional markets.

Regarding the degree of commercialization, the results that showed considerable levels of HCI among those who participated indicates that households have started selling both crops though at different extent. This may be a result of the various efforts towards agricultural transformation in Rwanda. It is also an indicator that farmers rely on agricultural income to cover even their small household expenses such as buying salt. These findings are consistent with the research conducted Uganda, Kenya and Malawi by Carletto *et al.* (2017).

Households' participation to input markets

The findings in Figure 3 show the percentage of households who participated in input market per type of input and crop. Potato farmers showed a higher level of participation compared to bean producers. The figures show that in the group of potato farmers, 84% of the households applied bought pesticides and approximately 95% and 60% used mineral and organic fertilizers, respectively. For beans, only 5% used pesticides and approximately 8% and 40% applied mineral and organic fertilizers, respectively. For both crops, hired labor was used by approximately 44% and 22% of potato and bean producing households, respectively. The low percentages of households with hired labor reveal the importance of family labor even for potato which is becoming highly commercialized. Moreover, the use of improved seed has been low, with approximately 33% and 61% of households producing beans and potato with improved seed, respectively. Generally, fewer households bought inputs for the production of beans than for the production of potato, which may be a result of farmers' limitations in reaching inputs markets as expressed in the FGDs.

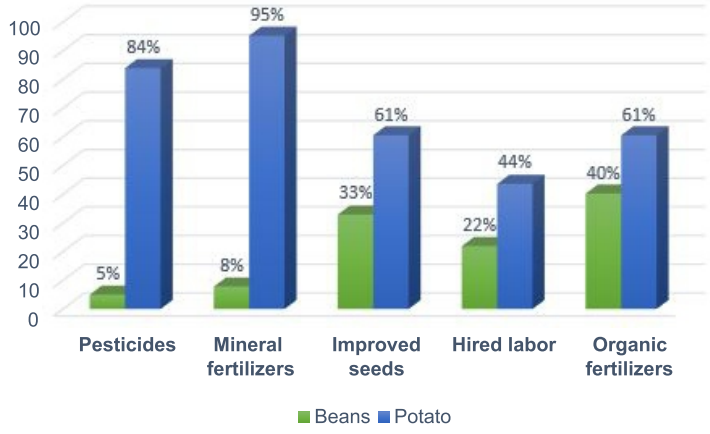


Figure 3. Households' participation in input market per types of inputs

For potato crop, local agro-dealers have mainly supplied pesticides and mineral fertilizers to approximately 97% and 93% of households, respectively. Approximately 64% of households used potato seeds bought from local seed producers, and 46% of potato farmers used bought manure from other farmers. Among these households, 33% and 54% used their own organic fertilizers and seeds from previous season, respectively.

Similarly, the local agro-dealers were the major suppliers to the few households that applied

pesticides and fertilizers on bean crop. The main source for bean seeds was not the input market, given that 67% of households used their own seeds from the previous season. Regarding the organic fertilizers, 86% of the households that applied it on bean crop used their own fertilizers.

As expressed by farmers during the FGDs, the challenges in participating in input markets were mainly related to high prices particularly due to the poor infrastructure in some villages:

> *"The transport for fertilizer is expensive, as we have one seller in the whole sector, and the road to reach there is bad…. it becomes unusable, particularly in rainy seasons, and it becomes difficult to get a motorcycle [mostly paid] to reach home on time"*. FGDs, Men

It was noted that the use of bought input was mostly dependent on previous agricultural production and commercialization: *"By the time I fail to get enough production to sell, I fail to buy inputs such as fertilizers"*. FGDs, Women.

The difference in the use of bought inputs between bean and potato farmers is consistent with a study by Riwthong *et al.* (2016) in Thailand. The authors found that farmers with higher level of output commercialization tend to use large quantities of bought inputs such as pesticides. In the present study, potato farmers were more commercialized and thus had higher participation in the fertilizers and pesticides markets. The importance given to this crop as a cash crop lead farmers to make more investment in its production by applying more bought inputs. The higher level of income among potato farmers can also explain their participation to inputs market as they generally use agricultural income in buying inputs.

Gender and women's market participation

Women's participation to output market

Findings showed that in 45% of the households participating in potato markets, only husbands were involved in the transactions while in 27%, only wives have participated to the markets. A statistical test[5] showed that the proportion of households which involved men was significantly higher than those which involved women in potato commercialization and this was significant at 1% level. For the case of bean, the results showed that women have highly participated, as in 52% of the households that sold bean, only wives have participated and engaged the transactions. In contrary, 23% of the households have involved only men and this proportion is significantly (5% level) lower than that of women. This means that the level of women's market participation is higher for beans than potato. Stated differently, the commercialization of potato is mainly in the hands of husbands, while beans are mainly sold by wives. The first explanation which is consistent with the research conducted in other countries, is that men tend to take control of crops when an opportunity for their commercialization emerges (Fischer & Qaim, 2012; Quisumbing & Pandolfelli, 2010).However, a further analysis of the qualitative data showed another possible cause of this gender difference in crop market participation. It also reveal the linkages between gender differentials in resources management within households. The discussions with women showed that their role in agriculture is perceived to be more associated to food production rather than cash crop management. This was understood during FGDs, when participants emphasized that bean, which is mainly produced for consumption is considered as a woman's crop while potato is for men:

> *"There are villages, near the forest where it is known and indisputable that potato crops are men's property and beans are for women. When a woman has planted beans, a man won't ask about it, and for potato, the wife will not ask the husband".* FGD, Women.

This has been also observed by MINAGRI (2010), that in farm households in Rwanda, women tend to manage food crops while men manage cash crops. As highlighted by the author, this situation shows the gendered aspect of agriculture and it sometimes cause conflicts due to the competition between the two categories of crops (MINAGRI, 2010). In this study, there was no particular conflict reported but with the fact that farmers tend to appropriate cash crops to men has been confirmed based on the example of potato. This is interpreted as the result of farmers' perception of the role of men as breadwinner for his household. In such case, husbands remain the principal members of households who are

[5] This is a two-sided proportion test that was done to check whether the proportion of men is not statistically different from the proportion of women.

expected to handle the various source of income including cash crop production. This was also noted when the participants were asked whether wives can sell any of the two crops, the answers from women showed that for beans, it can be possible particularly when they want to buy some small items for the household's daily needs or sometimes for their personal needs. The findings about bean is consistent with the observation from previous research in Rwanda that that women do most of the bean production and their level of bean commercialization is likely to outstand that of men (Ingabire et al., 2017; Waldman et al., 2014).

In the case of potato, the findings show that women rarely participate in its marketing except when the husband works in a different sector or when he is not around:

> *"…those who do it [sell potato] are those whose husbands are busy with other works …, otherwise a husband cannot ask his wife to take the production to the selling point. Most often it is the responsibility of men. How many women can you find at the collection center [laughing]? Very few"*. FGD, Women.

And from the discussion with men, women supply labor on most ofcrops including potato but for the latter, their husband think they are more responsible, particularly when it comes to activities related to production and harvest activities as well as paying workers. However, in the "narrative" below, men tend to consider the activity of selling potato as their responsibility while:

> *"Nowadays we work together,… I cannot go to harvest alone; I go together with her, even with workers who carry the potatoes to the selling point,… after selling, she comes and helps me in paying workers. She must come to help me, she is actually more responsible"*. Faustin, FGD Men.

Women and men have contradictory views on the extent at which wives engage in the activities related to potato crop. While men considered that their wives are even more responsible for potato, the opinion from women was that wives are not fully involved. They said that wives do not sell potato, though they may be involved in its production. The exception is only when the husband has other duties outside agriculture and far from home, which required women to double their efforts in agricultural activities. This situation is relevant to the concept of feminization of agriculture in which women are pushed to increase their contribution in farming activities as men look for work in off-farm activities. The increase contribution of women in farming is also perceived in the previous "narrative" where men described them as "being actually more responsible" and that "nowadays, they work together". However, at the same time these men consider wives as "helpers", in the activities like harvesting, supervising and paying workers. This reflects the thesis by Chant (2014) on the feminization of responsibility. Women though considered as being more responsible are considered as helpers on the other hand, and their contribution does not improve their position in terms of decision making either in production or over agricultural income:

> *"A husband is the one who determines what to plant …., still he is the one who determines what to give his wife, maybe thanking her for what she does on the farm…"*. FGD, Women.

Wives' access to agricultural income was even perceived as an reward from their husbands for their contribution in farm activities, just like the quotation above. In extreme cases, husbands may decide not to compensate their wives and the latter choose to keep quiet in order to avoid conflict:

> *"…it would be better working together and sharing [the income]. …when he sellsproduce, the wife expects him to bring something home, and then, whatever he brings, the wife accepts and keeps quiet to have peace at home…in the case where she gets nothing, she has to keep calm, too. There is nothing else she can do"*. FGD, Women (Gakenke).

These findings on the access and control of agricultural income revealed gender gap in power relation. The "narratives" from FGDs show that husbands have more the power to decide on income and wives though not happy, they keep quiet to avoid conflict. Just like in Chant's feminization of obligation, they are obliged to "do nothing"[6] and accept the situation to have peace at home. This unbalanced power relation suggest that increased women's contribution in agriculture that accompany household's market participation, may also cause emotional stress (Arora & Rada, 2017).Though these women try to avoid direct conflicts,

[6] Doing nothing implies that they keep their contribution intact.

research in other African countries confirmed that such situations where wives do not have access to income negatively impact market-oriented production. Some examples are the cases of chili pepper and French beans production in Kenya, where women withdrew their labor, disturbing the supply chain and the quality of these commodities (Dolan, 2001; Rubin & Manfre, 2014). In these cases, the labor was diverted to subsistence production or to social work in women groups and churches. In the Rwandan case, women in the FGDs considered this lack of economic incentive for their labor as an impediment to agricultural development. They were not able to withdraw their labor or any other type of contribution, but they are conscious that the inequality in income sharing has a negative effect on their progress towards market-oriented farming. Like expressed below:

> *"...there are times when money from harvest is given, the husband takes it all and does not even give his wife a single coin and forgets that she is the one who struggled hard with the land... That is an impediment to agricultural development"* FGD, Women.

Women's participation in input markets

The results from quantitative survey showed that for both crops, the husbands are the major actors dealing with inputs markets. For instance, in potato production, 58% of the households reported that only husbands bought the inputs, while wives from 20% of the households were involved. In 22% of households, both spouses were involved. Results from the proportion test comparing the households which involved only involved men and those which involved women was performed. The percentage of households which involved men was found significantly (1% level) superior to those from which only women have participated to inputs market. The number of men who participated in the inputs market was also significantly higher than that of households which involved both spouses.

In bean production, the participation to input markets also has mainly involved husbands (44% of households), then wives (34%) and both (22%). Again, these figures show that men remain more involved in input markets than their wives. However, the results from statistical test showed no significant difference between the proportion of households which involved husbands and those which involved wives only. The results from the test suggests that even for the crop that is known to be a woman's crop, the participation of women in inputs market is not significantly different from that of men. Unexpectedly, women's participation in inputs market for bean was not more important than that of men. In general, the participation of households in inputs market for bean was low and this had a repercussion on the use of inputs on bean crop and its productivity. Similar patterns were found by Sheahan and Barrett (2017) in their study on agricultural input use in six SSA countries. They found low use of bought inputs in plots managed by women. For the case of Rwanda, this low participation to inputs market and low use of purchased input can be explained by the low commercialization of this crop as well as its production orientation. Moreover in FGDs, women showed that they have limited financial capacity to afford production inputs which limit their market participation. The example given by Kanyange[7] from a FGDs in Gakenke exposes this financial limitation:

> *"…the quantity of fertilizer I need for my farm may cost 10,000 Rwf, yet we do not have anything at home that I can use to generate such an amount, so I decide not to apply it"*. FGDs, Women.

Women and labor input supply

From our findings, the participation in either input or output markets of potato was mainly the domain of husbands. However, in terms of labor supply, women have equally or sometimes more contributed than men as from the FGDs. In some discussions, husbands considered their participation in farm work to be supporting or helping their wives. This may sounds like the burden of agricultural work is on women whose role in productive works did not change, reflecting the "feminization of responsibility". A man from FGDs in Gakenke share his time use, on his typical working day. We met in the afternoon and he was planning to go to a center nearby for a drink, in the morning he was on field with his wife:

"We usually work together on the farm: planting potatoes, beans, almost everything. But, ..you see yourself that I have just taken a bath, I'm now heading to Murambo [village center] for a bottle. If I spent the whole day[8] helping my wife on the farm, and she sees me leaving…, she

[7] The names have been modified for privacy.
[8] In this context the farmers was referring to the time spent in field (Between 6am and 1 pm in that area).

does not argue." FGDs, Faustin.

In the "narrative" from Faustin, it was understood that time use after field activities differ between women and men. They may both work together on field, but after that, men have more time particularly in the afternoon, while women undertake their usual reproductive tacks in the household. This is confirmed in a study by Bigler *et al.,* (2017) in our research area, showing the increased work burden among women and how men have more time for leisure and social networking. Women do not argue on how their husbands use their time or negotiate their gender roles. In one discussion, they told us that "a man is a man in his household" which indirectly show the power reserved to that man in using or deciding over household' resources including time.

Surprisingly, the increased workload among women is perceived by their husbands who confirmed that women work many more hours than men given their other responsibilities:

> *"…after spending the whole day together in the field, the time use differs between wife and husband. From the field, women go home to fulfill other responsibilities like cooking and bathing the children, and men do not do such work. Women work many more hours than men"*. FGDs, Men.

In response to the question whether husbands can participate in household tasks that are traditionally for women, some men, mostly in couples without children, testified that they usually help their wives. However, the majority of the men remained skeptical of that idea, and the fear of criticism from their neighbors or relatives was expressed as the major reason:

> *"… helping women does not occur everywhere, approximately 20% can be helping their wives in their homes duties because people may think that this husband is being ruled by a wife. A man cannot sweep or clean dishes while his wife is doing other things"*. FGDs, Men.

The difference in workloads between women and men from farming households was found by Arora and Rada (2017) in Mozambique. By combining qualitative and quantitative approaches, they concluded that time constraint resulting from the workload among women and unequal burden in household chores have a negative effect on agricultural output. In Rwanda, despite the limited knowledge on how this affects agricultural productivity, women emphasized that inequality in responsibility sharing is a constraint to agricultural transformation. In contrary to men, they do not have time to recover from their daily productive work or even socialize with others and this has consequences on their productivity agriculture.

Conclusion

Despite the policy efforts in mainstreaming gender in agricultural transformation, the case of Northern Province of Rwanda show some gaps within dual-headed smallholder households. First, the analysis of market participation level among these households showed that they are not yet market oriented. For both input and output markets, the participation is high among potato producers, and the majority of them can be qualified as being market oriented. In contrast, the market participation of bean farmers remains lower, with fewer producers who are market oriented. Second, as the opportunities for agricultural commercialization emerge, the crop which is more commercialized (potato) is perceived to be a husbands' crop, while bean remains under the management of wives. Analysis at individual level showed that participation in both output and input market is higher among men than women.

With this, the study identified three gender-related hindrances that maybe contributing to the low market participation and the persistence of subsistence farming. First is the low participation of women in input and output markets. Women's contribution in production is considerable and compared to men, they are sometimes considered as being more responsible of this. Their limited participation in purchasing inputs and being in contact with the agro-dealers would reduce their ability to handle these products (e.g., dosage and storage) at the expense of agricultural productivity. Similarly, their low participation in output markets limits their access to other agribusiness opportunities. For example, little experience with output markets could limit the commercialization of beans (considered as women's crop) and further commercialization initiatives for other crops. Second is the lower participation of women in decision making on agricultural activities and income. From the findings, there is gap in power relations when it comes to agricultural income and men are more privileged. This can be a source of demotivation to fully engage in cash crop production and market orientation

in the long run. Experiences from chili pepper and French beans value chain in Kenya showed that in such circumstances, women may withdraw their labor from producing for market and concentrate on subsistence production.Third, there is a gender inequality in farm and household work. The work burden for women is higher as they combine farm work (perceived as productive) and their usual reproductive work. On the other hand, men's role of working in productive activities (agriculture) has not changed. They become physically and emotionally exhausted and have no time for rest or networking. This affect their capacity to innovate and improve their contribution in agriculture. They considered this as an impediment to agricultural transformation in their households.

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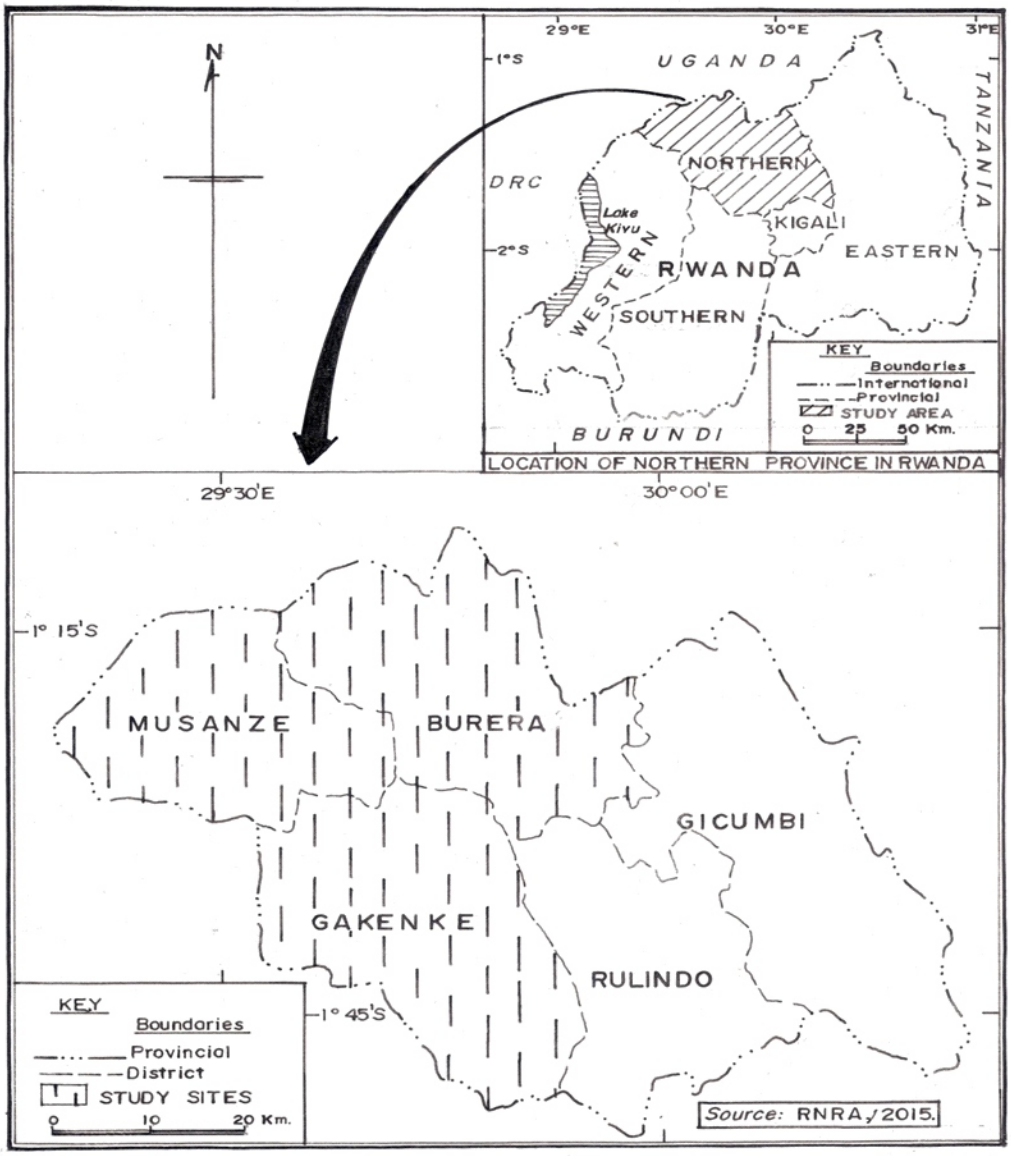
Appendix

Appendix1.Map of Rwanda showing the study area



Appendix 2.Questionnaire for household survey

Module A: Household identification

Household Identification	Number/CodeNimero/Kode		Interview details		Code
A01: Household identification			**A13:** Start time of interview (hh:mm)		:
A02: GPS coordinates Ibipimo bya GPS **Lat …… ……Lon……**			**A14:** Date of visit (dd/mm/yy)		
A03: Listing number			**A15:** Name and code of enumerator		
A04: District					
A05: Sector:					
A06: Cell					
A07: Name of primary respondent Surname First name			**Code 1 Kode 1** 11 Household head (man) 12 Household head (woman) 21 Children above 18		**Code 2** 1 = male and female headed 2 = female headed only 3 = male headed only
A08: Status in household in relationship to the household head: **Code 1**					
A09: Cell phone number :					
A10: Type of household : **Code 2**					

Module B: Household listing and demographics.

(The respondent should be the one most knowledgeable about the age, completed education, and other characteristics of household members).

B01: How many people are living in this household during the last 12 months?

B02: We would like to ask you about each member of your household. *[Respondent ID in relation to the household head (Code 2)]:*

Name of household member [start with primary respondent, continue with the secondary respondent, and other members in descending order of age]	What is [NAME's] sex?	What is [NAME's] relationship to the head of household?	What is [NAME's] age? (in complete years)	What is [NAME's] marital status?	What is [NAME's] main occupation	Can [NAME] read and write?	Is [NAME] currently attending school?	What is the highest level of education completed by [NAME
	Code 1	**Code 2**		**Code 3**	**Code 4**	**Code 5**	**Code 6**	**Code 7**
B03	**B04**	**B05**	**B06**	**B07**	**B08**	**B09**	**B10**	**B11**

Code 1 1 = female 2 = male 98 = I don't know 99 = No answer	**Code 2** 11 Household head (man) 12 Household head (woman) 21 Children above 18 22 Children below 18 31 Grandson 41 Mother 42 Father 43 Mother in Law 44 Father in Law 51 Nephew/ nieces 61 Brothers and sisters in law 71 Other relatives 81 Maid 91. Others (specify)	**Code 3** 1. Single/never married 2. Divorced 3. Separated 4. Widowed 5. Religious marriage 6. Civil marriage 7. Cohabiting, single partner 8. Offical marriage (civil and religiouse) 9. Child under 18 years	**Code 4** 1.Self-employed Farming 2.Trade 3.Handcraft 4.Casual labor (farm) 5.Casual labor (Non-farm) 6.Touristic guide 7.Formal job 8.Others 9. Student 10. Family labour	**Code 5** 1. Cannot read and write 2. Can read and write	**Code 6** 1 = yes 0= = no	**Code 7** 0. Less than P1 (or no school) 1. Primary level 1 2. Primary level 2 3. Primary level 3 4. Primary level 4 5. Primary level 5 6. Primary level 6 7. 9 years education 8. Senior Secondary 15. Univeristy degree or above 16. Technical or professional training	17. Adult literacy only (no formal education) 18. Koranic/religious school only Ishuri

Module Da: Land and Land tenure

Land and access to land for production		Size / area of land in hectare	Unit 1.Ha 2.m2 3.Are	Type of ownership	How did you acquire this Land
				Code 2	Code 3
				1	2
Da1	Do you own any land?(Total owned land) Code 1				
Da2	if yes, what is the total surface that you own for agricultural production?				
Da9	Do you have any home gardens? **Code 1**				
Da10	Do you have any land GIVEN or LEASED to a cooperative? If yes, give the size of land?				
Da11	Do you rent out (LEASE) some land to other people? If yes, give the size of said land?				
Da12	Land given to land consolidation				

Module Db: Production and Marketing: Season 2015

Three main crops cultivated by the household during Season 2015B If no crops cultivated skip to next page	Who was in charge of this crop?	Areas cultivated (in hectares, indicate if other measures)	Total production (in kgs)	Production kept by the household for own consumption (in kgs)	Production kept for seed and donation (in kgs)	Production sold (in kgs)	What was the Price per kg sold?	How was the price negotiated?	Where was it sold? (more than 1 answer are possible)	To whom was it sold?	Who from the household sold the crops?
Code 1	**Code 2**							**Code 3**	**Code 4**	**Code 5**	**Code 2**
Db1	**Db2**	**Db3**	**Db4**	**Db5**	**Db6**	**Db7**	**Db8**	**Db9**	**Db10**	**Db11**	**Dd12**

Code 1	**Code 2**	**Code 3**	**Code 4**	**Code 5**
1: Maize 2:Irish Potatoes 3: Wheat 4 Rice 5: Pyretrum 6: Plantain 7. Cassava 8. Cabbages/tomato/ other vegetables 9.Beans 10.Sweet potato 11.Other (specify)	1 Male household head 2 Female household head/wife 3 Both spouses 4 Other male's household members 5.Other female household members	1: Prices negotiated **BEFORE** the harvest (contract farming) 2. Prices negotiated **AFTER** the harvest 3. Fixed prices set up yearly (for example cooperatives) current price of the market for this commodity	1 At farm/field 2 Local Market 3 Regional Market 4 National Market 5 Export) 6.Cooperative	1.Local market 2. Cooperative 3. State - regional authority 4. Private company 5. Other intermediary (local traders) 6. Family / friends or other personal relations. 7.Cross-boarding traders 8. Others (specify)

Dd. Detailed use of main inputs in crops production (maximum 3 crops)

Code/name of the crop Kode / (Code1)	Type of inputs	Source of this input	If bought, by who?	Estimated amount/number per season	Unit	Approximated cost per season
Dd1	Dd2	Dd3	Dd4	Dd5	Dd6	Dd7
Code 1	**Code 2**	**Code 3**	**Code 4**		**Code 5**	
Code 1 1: Maize 2:Potatoes 3: Wheat 4. Rice 5: Pyretrum 6: Plantain 7. Cassava 8. Cabbages/Tomato/other vegetable 9.Beans 10.Other (specify)	**Code2:** 1.Pesticide 2.Chemical fertiliser 3.Seeds 4.Manure 5.labour	**Code3:** 1.Local market 2.Own 3.Cooperative 4.Other farmers(donation) 5. RAB 6.NGO 7.Family members 8. Hired labour 9.Other specify	**Code4:** 1 Male household head 2 Female household head/wife 3 Both spouses 4 Other males household members 5.Other	**Code5:** 1.Kg 2. L 3. Number		

FGDs on Transformation to Commercial agriculture and Marketing systems

Thematic section	Narrative Questions	Supplement Question	"Checklist" questions
1.Transformation to commercial agriculture	1. Could you describe how the transformation to agricultural commercialisation is going in this location?	1.1. If you think about the last 10 years have there been any changes in references to agricultural commercialization?	1.1.a.What does the transformation towards commercialization means for you? 1.1.b. In reference to agricultural commercialization, what have changed in your households (production, harvesting, processing, and commercialization, consumption relationship with others and within household)? 1.1.c. Are there crops reserved for this transformation If yes which ones and why?).
		1.2. Could you describe the current situation about agricultural commercialization in your household?	1.2.a. What is the current level of commercialization in your household 1.2.b. What is the current impact on livelihoods (job, income) and food security? 1.2.c. What are the constraints do you face in the process of this transformation from outside the household (Production, processing, commercialization) ? 1.2.d. What are the constraints do you face in the process of this transformation from inside the household (some disagreement, time management, …) ?
		1.3.What do you think about the agricultural transformation policy in our Country?	1.3.a. What do you know about the agricultural transformation policy? 1.3.b. From where/whom do you have this information? 1.3.c. Do you think it is the best option to combat poverty and food insecurity?
2.Marketing Channels	2.1. Could you describe the process of commercialization of your products? (Where commercialization occurs and please specify the crop you are talking about)	2.1. How do you sell (seek to know the channels) your agricultural products?	2.1.a. To whom do you sell your agricultural production? 2.1.b. How often do you sell your products (also the quantity taken to the market)? 2.1.c. In the household, who mostly deals with the buyers and why? 2.1.d. Do you sometimes negotiate the price before harvest (When do they negotiate price)?
	2.2. Could you describe your relationship with the buyer of your agricultural products (specify crops)?	2.2.a. Could you describe your relationship with the buyers of your products?	2.2.a. Do you know them even before the harvest of your products ? 2.2.b. Do you have any kind of agreement related to production, processing or commercialization (includes transport) of your products? 2.2.c. Do you receive any support from them?
		2.2.b. What do you observe in your village about the relationship between buyer and farm household sellers?	
		3.1.b. Could you describe their roles in the agricultural transformation in your area(describing other farmers case)?	
4. Gender	Could you tell us what you think should be done for to accelerate the transformation to commercial agriculture in your area?	4.1. Could you tell us what you think should be done to increase the market participation and commercialisation level in your household (seek to understand the need)? 4.2. Could you tell us what you think should be done to increase the market participation and commercialisation level in this area (seek to understand the need)? 4.3.Do women and men have the same needs ?	4.1. Within household: at Production, processing and commercialization level? 4.2. At community level: Production, processing and commercialization level? 4.3.a. Please describe what you think are the women' needs. 4.3.b. Please describe what you think are the men' needs.

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