



Agricultural Policy Research in Africa



AGRICULTURAL COMMERCIALISATION, GENDER RELATIONS AND WOMEN'S EMPOWERMENT IN SMALLHOLDER FARM HOUSEHOLDS: EVIDENCE FROM ZIMBABWE

Godfrey Mahofa, Chrispen Sukume and Vine Mutyasira

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Godfrey Mahofa is Post-Doctoral Research Fellow in the School of Economics at the University of Cape Town. Chrispen Sukume is an Economist at the Livestock and Meat Advisory Council. Vine Mutyasira is a Programme Officer, Policy Quantitative Modelling and Data Analytics, Alliance for a Green Revolution in Africa.

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ACRONYMS

HCI	household commercialisation index
LPM	linear probability model
LSCF	large-scale commercial farms
SSA	sub-Saharan Africa

EXECUTIVE SUMMARY



Agricultural commercialisation has been identified as an important part of the structural transformation process, as the economy grows from subsistence to highly commercialised entities that rely on the market for both inputs and for the sale of crops. However, this process is likely to leave some sections of society behind, particularly women. Little empirical evidence is available in sub-Saharan Africa that examines the relationship between commercialisation and women's empowerment.

This paper fills this gap and uses data from two rounds of surveys of smallholder farmers conducted in Zimbabwe to show that agricultural commercialisation reduces women's empowerment, while crop diversification improves women's empowerment.

The results imply that agricultural commercialisation imposes gender costs, thus strategies to promote structural transformation should look at agricultural commercialisation from a gender differentiated analysis to avoid the potential negative consequences highlighted in this study. One must look at the existing distribution of asset ownership by gender, since women in most cases do not have access to productive assets such as land, which are important for participating in commercial enterprises. The study recommends that if commercialisation is the main strategy, it should be accompanied by other strategies that look at gender issues, like restructuring land titling to encourage joint ownership of land by both husband and wife.

1 INTRODUCTION

Agricultural commercialisation is an integral part of the structural transformation process as the economy grows. Moving from subsistence farming, where the household only produces for its own consumption, towards market-oriented farming, where the households produce for the market, is associated with increased input use and improved agricultural productivity that benefits the whole economy. However, this process may leave some sections of the population behind, for example, women. Available anecdotal and empirical evidence has shown that agricultural commercialisation has increased gender inequality as women's control over the benefits of production decreased (Fischer and Qaim, 2012; Tavenner and Crane, 2018; Tavenner et al., 2019). Despite the evidence, the linkages between agricultural commercialisation and women's empowerment remain unclear and have received limited attention in literature, particularly in sub-Saharan Africa (SSA) countries where gender inequality is high and the process of commercialising smallholder farming is taking a centre stage.

In SSA, women account for 50 per cent of the agricultural labour force (FAO, 2011). However, women, either in female-headed households or within male-headed households, face limited access to productive resources, inputs, and services. In most cases, married women do not hold title to land and have no access to improved varieties of seeds and to extension and credit. This reflects a gender gap that is embedded in social norms that are specific to certain cultures and geographical regions (Gupta, Pingali and Pinstrip-Andersen, 2017). Gender disparities in access to productive resources, inputs, and services may result in lower agricultural productivity for women and consequently less control of household income and decisions by women. This may lead to reduction in economic benefits arising from smallholder agriculture, since there is evidence highlighting that empowering women in smallholder agriculture may improve agricultural productivity, reduce poverty and malnutrition, and increase household incomes (Anderson et al., 2021).

Characteristics of the farming systems in which women are involved may be important for determining the extent of the gender disparities observed. Particularly the

orientation of farm output, for example, for subsistence or commercial purposes, and the commercialisation pathways taken, have important implications for gender relations and women's empowerment. The emergence of agricultural commercialisation, as an important driver of structural transformation, presents different opportunities and challenges for women than they do for men (Gupta, Pingali and Pinstrip-Andersen, 2017). Limited research has examined the connection between agricultural commercialisation and the status of women, that is, their level of empowerment. Available empirical evidence has focused on the relationship between agricultural commercialisation and other outcomes such as income, food security and welfare (Govere and Jayne, 2003; Muriithi and Matz, 2015; Ogutu and Qaim, 2019). Fewer available studies in SSA that have looked at the relationship between agricultural commercialisation and women's empowerment have relied on cross-sectional data (Fischer and Qaim, 2012; Tavenner and Crane, 2018; Tavenner, et al., 2019). There are limitations in making conclusions from cross-sectional data because the data does not allow researchers to control for some unobserved effects that may bias the relationship between agricultural commercialisation and women empowerment.

This paper takes advantage of the existence of panel data on households from newly resettled farmers in Zimbabwe, to examine the relationship between smallholder agricultural commercialisation and women's empowerment. Specifically the study aims to characterise agricultural commercialisation, gender relations (for example, differences in market participation by women and men) and women's empowerment, and to examine the relationship between agricultural commercialisation and women's empowerment. An increase in commercialisation (movement from subsistence to food-based commercialisation and cash-crop commercialisation) is expected to increase women's disempowerment and more crop production diversity is expected to increase women's empowerment as most literature has noted.

It is important to study the relationship between agricultural commercialisation and women's empowerment in Zimbabwe from a policy perspective. The country has been grappling with issues of improving

women's empowerment in agriculture as part of its inclusive policies related to agricultural development. Women form 70 per cent of the labour force in Zimbabwe (FAO, 2017), however, gender disparities against women exist in terms of access to productive resources and other services such as finance, and in terms of decision-making (Kwaramba, Chigumira and Zimori, 2020). Increased commercialisation of agriculture in Zimbabwe's farming through cash crop farming, particularly tobacco, is likely to have detrimental effects on women empowerment. This is because tobacco farming requires more capital and, women in most cases, lack access to finance compared to men.

2 CONCEPTUAL FRAMEWORK

The general agreed definition of agricultural commercialisation is that it involves the progressive shifting from semi-subsistence agriculture to production mainly for the market (von Braun, 1995; Poulton and Chinsinga, 2018), changing land use patterns from low-value commodities to high-value crops (Pretty, Toulmin and Williams, 2011), as well as increasingly relying on the market for the acquisition of production inputs, including labour (Leavy and Poulton, 2007). This also includes the commercialising of food crops, as households market greater proportions of their food crops in response to market signals (Jaleta, Gebremedhin and Hoekstra, 2009). Following this definition, the most frequently used measure is the household commercialisation index (HCI) which is computed as the ratio of the gross value of all crop sales to the gross value of all crop production.

$$HCI = \frac{\text{Gross value of all crop sales}}{\text{Gross value of all crop production}} \times 100$$

The computed index ranges from 0 to 100, with 0 representing subsistence and 100 representing a fully commercialised household (where the household sells all of its output).

Women's empowerment, on the hand, is the ability of women to make or express strategic and meaningful choices and decisions related to one's own life (Anderson et al., 2021). There are three inter-related dimensions of this ability: resources (productive and social resources), agency (for example, decision-making and negotiation) and achievements (well-being outcomes) (Kabeer, 1999). Analysis in this study is based on agency, and specifically on intra-household decision-making power, as agency is arguably the most direct measure of empowerment (Malapit et al., 2019).

Increased agricultural commercialisation is expected to alter the existing gender relations within the household and empowerment of women. The ability of women to fairly participate in and derive benefit from market participation largely depends on socially-embedded norms and gendered-power dynamics (Tavener and Crane, 2018). In African agriculture, women generally have low social status and are dominated by men

due to their maternal obligations (Sorensen, 1996). Consequently, women's bargaining power is low in the household. However, women are not a homogeneous group because some educated women may have the power to influence decisions within the household. The concept of gendered commodity preferences, where men and women tend to control different crops, and the theory of social embeddedness help to explain the role of gendered power relations in shaping farmers' willingness to engage in agricultural markets. Traditionally, a gender division exists in agriculture, based on crops, tasks, or both. Cash and export crops are often controlled by men, because men are considered the family's major cash earners, whereas subsistence crops mostly fall under the women's sphere of control (Njuki et al., 2011; Fischer and Qaim, 2012). However, these gender relations can be complex and depend on the specific socio-cultural context. The gender relations are also dynamic and can change as a response to commercialisation (Gupta, Pingali and Pinstrup-Andersen, 2017).

It is argued that agricultural commercialisation and the adoption of cash crops, such as tobacco, are filled with gendered power and meaning, and that these play significant roles in transforming gender relations. The intersection of the gendered ideology around commercialised crops with cultural norms of masculinised headship generate socially-embedded, masculinised commodities and markets. Gendered ideology and socially-embedded market relationships influence farmer engagement and, in this case, delegitimise married women as formal participants and commercial beneficiaries in their own right (Tavener and Crane, 2018). Fafchamps (2017) notes that both economic choices and commodities themselves are embedded in complex networks of social relations, cultural values, and gendered norms which, in many cases, privilege men's control over certain commodities, particularly once they enter the formal marketplace. This suggests that increased commercialisation is likely to decrease women empowerment.

Another important related factor is asset ownership which may affect women's control of income and bargaining power in the household. Having access to particular assets, such as land and human capital (education), will improve women's bargaining power

because they will have control over the asset that improves the livelihoods of the household (Meinzen-Dick et al., 2011). This suggests that access to and control over assets are key determinants of individual agency. Within a household, there are assets that are held by women, some that are held by men, and others that are owned and/or utilised jointly. This distribution of ownership of assets in a particular household will influence how the household and its members use their assets to further their livelihoods and improve well-being, including empowerment (Meinzen-Dick et al., 2011). In most cases, men have control and better access to land, inputs, and other productive resources (Quisumbing et al., 2015) and this will lead to production decisions being centralised in the hands of the male household head. Against this background, agricultural commercialisation may weaken the role of women and their control over production and income. However, there are other factors, outside of the household, that may determine the level of bargaining power in negotiating intra-household compensation and these include income sources, laws, and customs regarding rights and obligations.

Empowerment of women may also indirectly lead to increased participation in agricultural markets through productivity improvements which lead to marketable surplus being produced. Anderson et al. (2021) note that prioritising women's empowerment in agriculture may improve overall agricultural productivity in the household. Under the common assumption of diminishing marginal returns, where initial input applications have a higher return than subsequent applications, and that women start from lower levels, marginal productivity gains from increasing women's use of inputs would be higher than investing in more of the same inputs for men (Anderson et al., 2021). This suggests that empowering women may have an indirect effect on agricultural commercialisation through productivity improvements.

The relationship between agricultural commercialisation and women's empowerment has been studied previously, with most results showing that smallholder commercialisation leads to reduction in women's empowerment, with other studies showing mixed results. Insufficient access to productive resources by women is one of the important drivers of women's disempowerment throughout the process of economic transformation. As noted earlier, if women do not have access to land and credit, it is difficult for them to be involved in agricultural enterprises that are highly commercialised. In most SSA countries, access to productive resources has been gendered. Findings have shown that participating in dairy and horticulture projects may increase women's control over production, income and assets (Quisumbing et al., 2015). However, in most cases, men's incomes increased more than

women's and the gender-asset gap did not decrease. This study highlights the importance of access to productive assets as an important driver of women benefiting from commercial enterprises.

Related evidence has shown that, because of the gender disparities in access to productive assets, commercialisation of smallholder agriculture has disadvantaged women in Kenya (Fischer and Qaim, 2012). The study showed that farmer groups that were formed as part of the process of commercialising agriculture have contributed to increasing male control over banana production and revenues, a previously women-managed crop. Similarly, qualitative evidence has shown that participation in cattle rearing and the dairy industry is filled with gendered hurdles, which also legitimises the perception that men should have control over dairy proceeds in Kenya (Tavener and Crane, 2018).

Mofya-Mukuka and Sambo (2019) show that agricultural commercialisation reduces women's control over income in rural Zambia. In Kenya, Ethiopia and Tanzania, increasing commercialisation, that is, increasing the importance of crop and livestock sales to farm households, resulted in an overall decline in female control across all farming systems (Tavener et al., 2019). However, crop and livestock diversification were positively associated with female control of production and revenue. In another related study in Uganda, Ntakyo and van den Berg (2022) showed that commercialisation had a significant and negative effect on women's empowerment in production and women's control over income. Some studies have shown that participation of women in commercial enterprises is positively associated with membership in farmer groups, young age, education, large number of female adults in the household, female ownership of assets and access to business (Muriithi, 2015). This suggests that women are likely to benefit from commercialisation if they are educated and young, have access to assets and are members of farmer groups.

3 DATA AND ESTIMATION STRATEGY

3.1 Survey and sample description

To examine the relationship between agricultural commercialisation and women's empowerment, we used two rounds of survey data collected in April 2018 (reflecting the 2016 to 2017 growing season) and December 2020 (reflecting the 2019 to 2020 growing season). Since the target population for the study was A1 farmers from the Mazowe district, purposive sampling of farm schemes (villages) and households for interviewing in each of the two regions was carried out with the assistance of extension officers. This was done to reflect a balance in the different farming systems and gender, and to include a sufficient geographical spread. A1 resettlement farmers are beneficiaries of the country's fast track land reform programme in 18 resettled former large-scale commercial farms (LSCF).

Under the land reform programme, each household was allocated about 5ha of land to pursue agricultural livelihoods. We selected the Mvurwi area to represent the northern part of the district and this area had a higher population of A1 farmers. The area has sandy soils that are suitable for tobacco production. We chose 11 farming schemes (former LSCF) in this area and selection of these schemes was conducted in a way that we have a sufficient geographical representation of the area. In the southern part of the district, we selected the Concession area, particularly the area in the eastern part because the other western part of the region is populated by larger A2 farms. Concession has fewer A1 farms and is characterised by red clay soils that are suitable for soyabean and maize production. We selected seven farming schemes in the Concession area to ensure that we had sufficient geographical spread.

Prior to 2000, the Mvurwi and Concession areas were occupied by large-scale, mainly white commercial farmers involved in mixed farming activities. However, after 2000, most of the study area farms were acquired and subdivided into small- (about 5ha) to medium-scale (30 to 100ha) units. The A1 smallholder resettlement areas have been a focus for agricultural commercialisation over the past 17 years. Since 2007, there has been rapid growth in tobacco production as the dominant commercial crop among the resettled

farmers. This has occurred through engagement with various marketing arrangements, including through contract farming and direct sales via auction floors (Scoones et al., 2018). While tobacco has remained central to the patterns of commercialisation, farmers also engage in other value chains, such as maize, soybeans, and horticultural crops. Mvurwi has seen increased participation of smallholder farmers in tobacco production while in Concession area, soyabean has emerged as a key cash crop. In both areas, maize cultivation for food and sale plays a dominant role in the agricultural system. Both Mvurwi and Concession areas have high levels of participation of private-sector contracting companies, bulk traders, and aggregators (for maize, soyabeans and horticulture products); links to auction markets (for tobacco); and spot markets locally (for horticulture and maize).

Households were selected in each scheme with the assistance of extension officers and local leadership by also taking into consideration the need for geographical representation and gender within the farming schemes. Data was collected on 620 households in the first survey in 2018 and the list of farming schemes and the total number of households interviewed in each scheme is shown in Table A1 in the annex. In a follow up survey in 2020, 555 households were interviewed. A total of 533 households had matched responses across the two survey waves. Like the 2018 survey, the 2020 questionnaire gathered information on the production and marketing of various crops, on agricultural production, household demographics, land ownership and use, household assets including livestock and agricultural assets, off-farm income, food security indicators, remittances, market access and market characteristics, access to credit, and women's empowerment. We used this information to create our main outcome variable and explanatory variables of interest.

3.2 Commercialisation and women's empowerment indicators

Our HCI follows earlier approaches in the literature where the degree of market participation is used as a measure of commercialisation (von Braun and Binswanger, 1991). In these studies, market

Table 3.1: Women's empowerment dimensions based on decision-making variables

Dimension	Description
MP _{it}	Women involved in primarily managing plots in household i and year t.
OU _{it}	Women primarily involved in deciding how the outputs from the plot are used in household i and year t.
SC _{it}	Women primarily involved in deciding whether to sell crop in household i and year t.
RC _{it}	Women primarily involved in making decisions about how revenue from crop sales will be used in household i and year t.
SL _{it}	Women primarily involved in making decisions on whether to sell livestock.

Source: Authors' own

participation is calculated as the proportion of the value of crops sold to the total value of crop production. For each household *i*, we computed three types of crop output market participation, namely tobacco (*TbCom_i*), soyabean (*SyCom_i*) and food crops (*FoodCrop_i*):

$$TbCom_i = \frac{P_{i,tob} S_{i,tob}}{\sum_{k=1}^K P_k Q_{i,k}} \quad (1)$$

$$SyCom_i = \frac{P_{i,soy} S_{i,soy}}{\sum_{k=1}^K P_k Q_{i,k}} \quad (2)$$

$$FoodCom_i = \frac{\sum_j P_{i,j} S_{i,j}}{\sum_{k=1}^K P_k Q_{i,k}} \quad (3)$$

Where $S_{i,k}$ is the quantity of output *k* sold by household *i* evaluated at an average community level price (P_k). $Q_{i,k}$ is the total quantity of output *k* produced by the household.

For the women's empowerment variable, we considered the following measures of women's empowerment

that were available in our dataset. We used measures relating to power on decision-making, derived from variables such as, who in the household manages the plot, who primarily decides how the outputs from the plot are used, who primarily decides whether or not to sell the crop, who primarily decides how revenue was or will be used, who in the household primarily owns the livestock, and who in the household is responsible for feeding/taking care of livestock. The various dimensions measuring women's empowerment based on decision-making are defined in Table 3.1.

An indicator of women's empowerment was created by using a linear combination of all the dimensions on decision-making as follows:

$$Women\ Empowerment\ Index_{it} = (MP_{it} + OU_{it} + SC_{it} + RC_{it} + SL_{it})/5 \quad (4)$$

A dummy indicating whether a woman is empowered in the household was created using a threshold value of 0.75. Women are empowered in the household if the indicator is equal to and exceeds 0.75, and not empowered if less than 0.75.

4 ESTIMATION STRATEGY

To estimate the relationship between agricultural commercialisation and women empowerment, we specified the following panel regression equation:

$$Y_{it} = \theta_t + \gamma Com_{it} + x_{it}\beta + \alpha_i + \tau T + \mu_{it}, i = 1, 2, \dots, N; t = 0, 1; \quad (5)$$

The dependent variable (Y_{it}) is an indicator of women's empowerment (1=empowered and 0=not empowered) and the explanatory variable of interest will be household commercialisation (Com_{it}), and θ_t is a time-varying intercept. We also estimated models where the main explanatory variables of interest were food or cash crop-based commercialisation pathways using indicators (1) to (3). Our empirical strategy used methods that helped to reduce the problem of endogeneity arising from omitting variables that were jointly related with commercialisation and women's empowerment. We

minimised the effects of endogeneity using controls (x_{it}), household fixed effects (α_i), and time effects (T) in the panel data. Household fixed effects allowed us to control for time-invariant unobserved effects that were correlated with commercialisation and women empowerment. Time effects allowed us to control for unobserved economic shocks that were common to all households. We also included a wide range of time varying control variables that were available at both the household and scheme/community level to account for other time-variant factors that may be related to women's empowerment. These included age of household head, gender of household head, education level of household head, household size, marital status of household head, dependency ratio, crop count (measuring diversification), number of cattle owned, total value of assets, area planted and total household income.

Since our dependent variable is an indicator variable, we estimated equation (5) using a linear probability model and a conditional logit random effects model.

5 DISCUSSION OF RESULTS

Table 5.1 shows women's empowerment dimensions by commercialisation pathway and survey year. It is clear from Table 5.1 that the proportion of households with women empowered is greater in 2017 compared to the drought year of 2019. Across regions, we notice that there are more households with women empowered in Mvurwi than there are in Concession areas. Results also show that women are not empowered in households that sell tobacco and soya alone, and in households that sell both tobacco and soya-beans. These results indicate that commercialisation is likely to reduce women's empowerment, highlighting observations in existing literature that crops such as tobacco and soya-beans are male-controlled in this region (Kwaramba, Chigumira and Zimori, 2020).

In terms of the various dimensions of women's empowerment, results show that the proportion of households with women involved in making decisions is greater in 2017 than 2019, except for women responsible for taking care of cattle. The proportion of households with women responsible for managing plots, deciding how the outputs from the plot are to be used, deciding whether to sell crop output and how crop revenue is to be used, is higher in those households that do not sell tobacco and soya.

5.1 Household and farm characteristics

Table A2 shows household characteristics by commercialisation status and region. We begin examining how commercialisation differs by region. The proportion of households who sell tobacco is high in Mvurwi for both survey years, about 71 per cent in 2017 and 63 per cent in 2019, whereas in Concession areas, it was 27 per cent in 2017 and 34 per cent in 2019. However, the proportion of households that sell soya beans was high in Concession compared to Mvurwi. About 40 per cent of the households in Concession sold soya beans in 2017 compared to just 4 per cent in Mvurwi in the same year. In 2019, about 23 per cent sold soya beans in Concession compared to just 3 per cent in Mvurwi. These differences in crops sold by region may be attributed to differences in soil types between the two regions. Mvurwi has soil types that are most suitable for tobacco, whereas

Concession has clay soil types that are suitable for soya-beans and maize. Descriptive results also show that the area coverage of clay plots is on average higher in Concession areas. It should also be noted that fewer households in Mvurwi sell both tobacco and soya beans, suggesting that Mvurwi farmers mainly sell tobacco. The proportion of subsistence farmers is high in Concession in survey year 2019. This is expected, since 2019 was a drought year and some farmers suffered crop losses and were not able to sell anything.

Table 5.2 shows the mean comparison of commercialisation pathways and household characteristics by empowerment status over the two survey periods. The results show that in both survey rounds, of the households who sell tobacco, a high proportion of those have women who are not empowered and the differences are statistically significant. In 2017, of the households who do not sell tobacco and soya-beans, a higher proportion of those households have women empowered. Those households who sell soya beans have a high proportion of households with women empowered in year 2019.

In terms of household characteristics, in households where women are empowered, the household head is relatively older, has fewer years of education, few are married monogamously and the household has a high dependency ratio. The crop count of households with women empowered is higher compared to those not empowered, suggesting that crop diversification may be associated with women's empowerment. In 2017, households with women empowered owned more livestock and they resided in regions that received relatively more rainfall in 2019.

The results of the study show that households with women empowered have more assets and are less commercialised. In 2017, the household commercialisation index for households with women empowered was 79.51 compared to 85.93 for those households with women not empowered. And in 2019, the household commercialisation index for households with women empowered was 74.63 compared to 81.94 for those households with women not empowered. Households with women empowered have less income and few are engaged in contract farming. These descriptive results suggest

Table 5.1: Women's empowerment and commercialisation pathways in Mazowe District

Women's empowerment dimension	Total		Sell tobacco		Sell soya beans		Sell tobacco and soya		No tobacco and soya		No sale		Mvurwi		Concession	
	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019
Women involved in primarily managing plots (1=yes)	0.35	0.28	0.34	0.26	0.36	0.40	0.25	0.19	0.49	0.28	0.18	0.35	0.39	0.30	0.27	0.25
Women involved in deciding how the outputs from the plot are used (1=yes)	0.36	0.29	0.33	0.25	0.39	0.44	0.25	0.22	0.51	0.30	0.18	0.35	0.40	0.30	0.27	0.26
Women involved in deciding whether to sell crops (1=yes)	0.34	0.32	0.32	0.27	0.34	0.50	0.25	0.22	0.48	0.42			0.38	0.35	0.24	0.25
Women involved in decisions of how revenue from crop sales will be used (1=yes)	0.48	0.35	0.50	0.34	0.37	0.37	0.33	0.19	0.66	0.43			0.56	0.38	0.28	0.25
Women responsible for taking care of cattle (1=yes)	0.07	0.10	0.05	0.08	0.05	0.24	0.08	0.06	0.18	0.10	0.25	0.09	0.07	0.09	0.07	0.10
Women responsible for decisions on whether to sell livestock (1=yes)	0.13	0.11	0.10	0.11	0.05	0.27	0.12	0.00	0.38	0.11	0.00	0.00	0.15	0.12	0.06	0.09
Women empowered in the household (1=yes)	0.26	0.22	0.22	0.16	0.27	0.38	0.19	0.08	0.44	0.26	0.09	0.35	0.29	0.23	0.19	0.20
Number of households	620	555	335	296	107	52	75	36	91	106	11	57	412	380	208	175

Notes: Sample includes all respondents in both rounds

Source: Authors' own

Table 5.2: Household characteristics and women's empowerment

Characteristics	2017			2019		
	Not empowered	Empowered	T-test	Not empowered	Empowered	T-test
Sell tobacco (1=yes)	0.57	0.47	**	0.58	0.40	***
Sell soya beans (1=yes)	0.17	0.18		0.07	0.17	***
Sell tobacco and soya (1=yes)	0.13	0.09		0.08	0.03	**
No tobacco and soya (1=yes)	0.11	0.25	***	0.18	0.24	
No sale (1=yes)	0.02	0.01		0.09	0.17	***
Age of household head (years)	51.13	53.55	**	52.84	55.90	**
Years of schooling of head	9.39	8.02	***	9.58	7.92	***
Head married monogamously (1=yes)	0.87	0.45	***	0.85	0.36	***
Female-headed household (1=yes)	0.03	0.58	***	0.04	0.67	***
Household size	6.11	5.91		6.34	5.94	
Dependency ratio	0.81	1.00	***	0.88	0.88	
Households with children out of school (1=yes)	0.14	0.14		0.11	0.12	
Household distance to nearest road (km)	9.49	7.36		6.55	5.18	**
Crop count	2.55	2.95	***	2.54	2.55	
Poultry count	22.15	18.38		25.78	22.25	
Tropical Livestock Units	6.33	4.88	**	5.64	4.76	
Household member worked for wage (1=yes)	0.15	0.14		0.10	0.12	
July-June total rainfall (mm), current season	726.23	722.85		569.95	579.38	**
Asset index	0.11	-0.23	*	0.14	-0.44	***
HCI	85.93	79.51	***	81.94	74.63	***
Maize commercialisation index	25.69	27.80		27.44	32.23	
Tobacco commercialisation index	69.14	67.30		75.71	73.75	
Soya commercialisation index	24.67	23.61		21.37	29.76	
Remittances and gifts	511.87	424.65		201.88	217.63	
Total household income	4694.96	4119.12	*	1863.80	1266.32	***
Engaged in contract farming (1=yes)	0.41	0.30	**	0.58	0.43	***
Access to extension (1=yes)	0.85	0.86		0.89	0.88	
Access to credit (1=yes)	0.12	0.16		0.04	0.06	
Land-own cultivated (ha)	3.98	3.97		3.70	3.37	*
Land-rented in (ha)	5.39	3.97		8.29	6.00	
Area of sandy plot (ha)	2.93	2.98		2.82	2.81	
Area clay plot (ha)	4.34	3.74		4.76	3.48	
Area of sandy-clay plot (ha)	3.88	3.87		3.72	3.19	
Area of stony plot (ha)	1.80	2.00		1.10	1.00	
Area of plot (forest soil) (ha)	3.15	1.13		2.93	4.00	
Gender of plot manager by land quality-area managed						
Sandy plot (ha)-male	2.91	2.70		2.86	5.00	
Sandy plot (ha)-female	1.20	2.29		0.88	2.40	**
Clay plot (ha)-male	4.37	3.78		4.88	3.22	
Clay plot (ha)-female	1.48	2.48		1.75	3.26	
Sand/clay (ha)-male	3.74	3.46		3.68	3.03	
Sand/clay (ha)-female	1.86	2.52	*	1.49	2.42	**
Stony plot (ha)-male	1.80			1.10		
Stony plot (ha)-female		2.00			1.00	
Forest soil plot (ha)-male	3.15	2.00		2.93		
Forest soil plot (ha)-female		0.47			4.00	
Number of households	461	159		428	120	

Notes: Sample is restricted to households who appeared in both rounds

Source: Authors' own

that agricultural commercialisation is associated with reductions in women's empowerment, and crop diversification is associated with an improvement in women's empowerment. However, these results are just correlations, which do not control for other confounding factors that may be associated with women's empowerment in a household. The next section discusses the empirical results from the regression analysis that uses the fact that we have repeated observations of each household.

Before proceeding with the regression results, some additional descriptive results are shown in Table A1 and A2 in the appendix. These results show the women's empowerment transition matrix and characteristics of households by empowerment transition status. Table A1 demonstrates that in about 89 per cent of the households, women were never empowered, and 54 per cent were never disempowered. About 11 per cent moved from disempowerment to empowerment, and 46 per cent moved from empowerment to disempowerment, suggesting there was a loss in empowerment between the two periods. Household characteristics of those households who moved from empowerment to disempowerment reveal that the majority of the households sell tobacco, have more poultry, the household head is likely to be married monogamously, and households are relatively younger compared to those who were disempowered and those who moved from disempowerment to empowerment.

5.2 Econometric results

Table 5.4 presents the results of our specification in equation (5). In the first column, we assume that agricultural commercialisation is exogenous, that is, the choice to produce crops for the market is independent of any other factors that are jointly related to commercialisation and women empowerment. So, we pooled data for households over the two survey rounds of 2017 and 2019. In this case, the study used the cross-sectional variation in commercialisation across households to explain the relationship between commercialisation and women's empowerment. In column (1), we present results from a linear probability model (LPM) and column (2) presents results with household fixed effects and time effects. Household fixed effects account for unobserved and time-invariant household level characteristics which may affect both commercialisation and women's empowerment.

The results in column (1) show that agricultural commercialisation is negatively associated with women's empowerment, and this is statistically significant at 1 per cent. This result is likely to be biased

because of potential endogeneity of commercialisation, emanating from omitting important variables that are jointly related with commercialisation and women empowerment. Controlling for time-invariant unobserved effects and other shocks common to all households by including household fixed and time effects, our negative relationship is still robust, and it is still statistically significant at 1 per cent. Column (3) and (4) show results from a conditional random effects logit model, and we still find that our relationship is still negative and statistically significant at 1 per cent.

Our discussion of the results is based on the LPM in column (2), because the marginal effects from logit model are comparable to those of the LPM. Concerns with the LPM are that it produces estimated probabilities that lie outside the 0 and 1 range, and the residuals are heteroscedastic. The first is a big problem when the covariates only include continuous variables rather than discrete, and if one is interested in forecasting. However, in our case, we have a combination of continuous and discrete variables as covariates. The second problem is solved by estimating standard errors that are robust to heteroscedasticity.

Our results show that commercialisation is negatively associated with women's empowerment, implying that women have less power in making decisions regarding agricultural production and marketing, when the household produces more for the market. An increase in commercialisation by a percentage point will decrease the probability that women will be empowered in the household by 0.26 percentage points, all else being equal. These findings are consistent with empirical literature that has highlighted that smallholder agricultural commercialisation is negatively associated with women losing control of income and management of commercialised crops (Fischer and Qaim, 2012; Tavenner et al., 2019). Results also show that crop count, a measure of crop diversification, is positively related to women's empowerment, implying that growing a diversity of crops will increase women empowerment by 7 percentage points, all else being equal. This finding is also consistent with literature that has shown that crop diversification improves women's empowerment (Tavenner et al., 2019). Our results are generally consistent with our hypotheses and literature highlighting that increased commercialisation of smallholder agriculture leads to disempowerment of women.

The results for most control variables are not statistically significant except in female-headed households, which is expected, education level and marital status. An additional year of schooling for the household head will lead to a reduction in women's empowerment in the household by 2.2 percentage

Table 5.3: Smallholder commercialisation and women's empowerment

	Dependent variable: women empowered in the household=1			
	LPM (Pooled)	LPM	Logit	Marginal effects
	(1)	(2)	(3)	(4)
HCI	-0.00230*** (0.000456)	-0.00255** (0.000976)	-0.0262*** (0.00532)	-0.00216*** (0.000423)
Log of age of household head	0.00404 (0.0508)	0.0539 (0.253)	0.205 (0.620)	0.0169 (0.0506)
Years of schooling of household head	-0.00703* (0.00386)	-0.0218** (0.00784)	-0.0788* (0.0420)	-0.00648* (0.00383)
Log of household size	-0.00399 (0.0294)	-0.118 (0.0722)	-0.0332 (0.330)	-0.00273 (0.0269)
Head is married monogamously	-0.00773 (0.0365)	0.131* (0.0708)	-0.00373 (0.383)	-0.000307 (0.0315)
Female-headed household	0.708*** (0.0413)	0.963*** (0.0933)	4.950*** (0.506)	0.407*** (0.0329)
Dependency ratio	0.0207* (0.0117)	-0.0135 (0.0384)	0.212* (0.127)	0.0175 (0.0107)
Crop count	0.0706*** (0.0165)	0.0676*** (0.0178)	0.753*** (0.135)	0.0619*** (0.0142)
Tropical livestock units	0.000895 (0.00247)	0.00469 (0.00565)	0.00864 (0.0262)	0.000711 (0.00219)
Value of production assets	-0.0132 (0.0116)	-0.0214 (0.0294)	-0.167 (0.135)	-0.0138 (0.0113)
Log of total household income	0.0268*** (0.00859)	-0.00323 (0.0169)	0.223* (0.133)	0.0184 (0.0114)
Number of cattle owned	-0.00314 (0.00224)	-0.00194 (0.00489)	-0.0341 (0.0227)	-0.00280 (0.00211)
Area planted	0.00140 (0.00709)	0.00647 (0.0163)	0.0159 (0.0769)	0.00131 (0.00634)
Constant	0.0642 (0.239)	0.386 (1.010)	-2.912 (2.832)	
Observations	957	957	957	957
R-Squared	0.443	0.172		
Household fixed effects	No	Yes	Yes	Yes
Time fixed effects	No	Yes	Yes	Yes

Notes: Sample is restricted to households who appeared in both rounds. Robust Standard errors, clustered at the region level (we have 18 farm schemes) are in parentheses. * p<0.10, ** p<0.05, *** p<0.010

Source: Authors' own

points and the relationship is statistically significant at 5 percent. Results also show that women are likely to be empowered in households where the head is married monogamously, however, the relationship is marginally significant at 10 percent.

The study also explored the relationship between commercialisation and women's empowerment by

gender of household head to see the differences in the relations for women in male- and female-headed households. Our results in Table 5.4 show that increased commercialisation reduces women's empowerment in male-headed households. An increase in commercialisation by a percentage point will reduce women's empowerment by 0.28 percentage points in male-headed households.

Table 5.4: Smallholder commercialisation and women's empowerment by gender of household head

	Dependent variable: women empowered in the household=1	
	LPM	LPM
	Female	Male
HCI	-0.00179 (0.00191)	-0.00276** (0.000983)
Log of age of household head	-1.449 (1.724)	-0.327 (0.323)
Years of schooling of household head	-0.0243** (0.0111)	-0.0228 (0.0142)
Log of household size	-0.270 (0.162)	-0.0931 (0.0750)
Head is married monogamously	0.214* (0.114)	0.130 (0.0845)
Dependency ratio	0.0513 (0.0637)	-0.0171 (0.0408)
Crop count	0.0587* (0.0332)	0.0669*** (0.0224)
Tropical livestock units	-0.00108 (0.0306)	0.00447 (0.00554)
Log of total value of assets	0.00757 (0.0663)	-0.0211 (0.0313)
Log of total household income	-0.0208 (0.0363)	0.00419 (0.0176)
Number of cattle owned	0.00948 (0.0298)	-0.00104 (0.00549)
Area planted (ha)	-0.0706* (0.0340)	0.0193 (0.0179)
Constant	7.497 (6.470)	1.768 (1.486)
Observations	156	801
R-Squared	0.268	0.0882

Notes: Sample is restricted to households who appeared in both rounds. All estimates include household and time fixed effects. Robust Standard errors, clustered at the region level (we have 18 farm schemes) are in parentheses.

* p<0.10, ** p<0.05, *** p<0.010

Source: Authors' own

6. CONCLUSIONS

The emergence of agricultural commercialisation as one of the important strategies to improve agricultural productivity and help economies transform has left some sections of society disadvantaged, particularly women. This is because of the existing gender disparities in terms of access to productive assets and services such as finance. Women, in most cases, do not hold title to land and have limited access to financial services, and this results in men controlling production and revenues of highly commercialised crops such as tobacco. This paper analysed the relationship between commercialisation and women's empowerment in Zimbabwe, and the results show that agricultural commercialisation is negatively associated with women's empowerment. This suggests that in those households that produce crops for the market, women are likely to be disempowered. Crop diversification, on the other hand, is positively associated with women empowerment, implying that those households that produce a variety of crops are likely to have women empowered. The findings are consistent with our hypotheses and also literature highlighting that increased commercialisation of smallholder agriculture leads to disempowerment of women.

The results from this study have important implications for economic policy. First, our main findings imply that smallholder agriculture commercialisation may lead to negative gender outcomes, which are in most cases embedded in the socio-cultural context. This study concludes that approaches to promote structural transformation through agricultural commercialisation should also consider the gender disparities in ownership of productive assets such as land. For example, with regards to land titles, joint ownership between husband and wife should be considered. In the presence of unpredictable weather shocks due to climate change, policies usually advocate for increasing commercialisation of agriculture. These strategies to adapt to or mitigate climate change will likely intensify men's control over benefits from production. The study recommends that when commercialisation is the main strategy, it must be accompanied by an analysis disaggregated by gender to show the trade-offs and risks to mitigate the potential negative consequences shown in this study. Thus, strategies promoting increased diversification will likely have a more positive effect on women smallholders than commercialisation alone.

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APPENDIX

Table A1: List of schemes and total sample in 2017

Region	Scheme	Sample
Concession	A of Cranham Extension	A of Cranham Extension
	Cranham Extension	Cranham Extension
	Ardura	Ardura
	Barwick M	Barwick M
	Falling Waters	Falling Waters
	Glegrey	Glegrey
	Glendevon	Glendevon
	Total	208
Mvurwi	Blighty	30
	Chipanza	33
	Edmonston	26
	Forrester J	27
	Forrester K	33
	Four Streams	45
	Lucknow Estate	37
	Lucknow Extension	34
	Omeath B	64
	Omeath E	31
	Stockbury	52
	Total	412
Total sample	620	

Source: Authors' own

Table A2: Household characteristics by commercialisation pathway and region

Characteristics	Total		Sell tobacco		Sell soya beans		Sell tobacco and soya		No tobacco and soya		No sale		Mvurwi		Concession	
	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019
Sell tobacco (1=yes)	0.57	0.54	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.63	0.27	0.34
Sell soya beans (1=yes)	0.15	0.10	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.03	0.40	0.24
Sell tobacco and soya (1=yes)	0.12	0.06	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.07	0.05	0.24	0.09
No tobacco and soya (1=yes)	0.14	0.20	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.16	0.21	0.09	0.18
No sale (1=yes)	0.02	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.02	0.07	0.01	0.16
Age of household head (years)	51.66	53.37	50.18	51.82	54.98	54.92	50.08	49.18	54.81	56.71	56.67	57.15	50.51	52.11	54.24	56.18
Years of schooling of head (years)	8.89	9.15	8.83	8.95	8.84	9.53	9.33	9.79	8.86	9.11	8.44	9.54	8.95	9.21	8.76	9.02
Head married monogamously (1=yes)	0.77	0.74	0.81	0.78	0.77	0.65	0.80	0.88	0.59	0.69	0.89	0.65	0.77	0.75	0.79	0.73
Female-headed household (1=yes)	0.16	0.18	0.12	0.12	0.20	0.33	0.13	0.03	0.34	0.27	0.11	0.27	0.17	0.18	0.15	0.16
Household size	6.14	6.20	6.45	6.65	5.54	5.92	6.56	6.50	5.21	5.51	5.78	5.63	6.20	6.22	5.99	6.17
Dependency ratio	0.87	0.89	0.86	0.83	0.77	0.77	0.91	1.01	0.97	1.00	0.98	1.07	0.88	0.91	0.86	0.84
Households with children out of school	0.14	0.11	0.14	0.12	0.17	0.04	0.13	0.15	0.10	0.11	0.22	0.08	0.15	0.11	0.11	0.11
Distance to nearest road (km)	9.14	6.12	8.56	6.33	9.45	5.97	10.14	8.15	10.81	5.07	6.08	5.78	6.68	4.75	14.73	9.16
Crop count	2.68	2.52	2.76	2.72	2.41	2.40	3.50	3.91	2.08	2.10	1.67	1.77	2.78	2.61	2.46	2.32
Poultry count	19.52	25.02	17.15	24.64	21.67	22.50	31.43	36.03	17.89	26.14	11.50	20.89	19.26	24.58	20.13	26.03

Characteristics	Total		Sell tobacco		Sell soya beans		Sell tobacco and soya		No tobacco and soya		No sale		Mvurwi		Concession	
	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019
Tropical livestock units	5.96	5.41	5.92	5.59	5.36	6.40	8.71	7.02	4.76	4.37	2.53	4.66	5.71	4.83	6.55	6.76
Household member worked for wage (0/1)	0.14	0.10	0.12	0.06	0.22	0.20	0.09	0.09	0.14	0.10	0.22	0.19	0.13	0.09	0.16	0.13
July-June total rainfall (mm), current season	723.33	572.08	714.03	571.55	750.57	571.12	733.60	551.90	725.14	578.14	698.85	579.56	712.71	578.03	747.01	558.80
Asset Index	0.06	-0.06	0.20	0.19	0.08	0.22	0.81	1.17	-0.90	-0.53	-2.36	-1.12	-0.10	-0.19	0.41	0.22
Remittances and gifts	467.39	209.77	488.36	229.47	403.33	135.00	255.00	155.00	563.04	256.92	430.00	95.00	481.57	164.41	440.53	381.11
Total household income	4452.46	1691.90	4567.34	2328.59	5034.04	1295.77	5290.77	2869.50	2988.83	700.44	482.89	0.00	4169.28	1751.36	5084.03	1559.62
Engaged in contract farming (0/1)	0.39	0.54	0.45	0.75	0.35	0.30	0.47	0.68	0.16	0.31	0.00	0.08	0.33	0.57	0.52	0.48
Access to extension (0/1)	0.86	0.87	0.84	0.92	0.90	0.90	0.95	0.97	0.81	0.82	0.78	0.75	0.82	0.89	0.94	0.85
Access to credit (0/1)	0.13	0.04	0.13	0.04	0.18	0.04	0.07	0.00	0.12	0.01	0.00	0.13	0.13	0.03	0.12	0.06
Land-own cultivated (ha)	3.97	3.63	3.67	3.62	5.02	4.50	5.05	4.61	3.41	3.42	2.07	2.62	3.71	3.51	4.58	3.89
Land-rented in (ha)	5.16	8.08	2.36	3.48	15.67	10.50	5.07	9.50		17.33		1.50	2.71	5.23	8.10	11.50
Area of sandy plot (ha)	2.94	4.53	3.08	3.82	2.42	5.04	1.58	4.15	2.00	5.69	3.40	3.13	2.96	3.70	2.78	5.76
Area clay plot (ha)	4.17	3.60	3.43	3.49	5.45	5.06	4.77	4.89	3.16	3.36	1.83	2.47	3.34	3.35	5.06	4.17
Area of sandy-clay plot(ha)	3.87	1.09	3.55	1.42	5.16	1.00	5.13		3.43	0.98	1.34	0.75	3.63	1.17	4.58	0.50
Area of stony plot (ha)	1.82	3.28	2.14	2.07	0.40			5.50		4.00	1.00		1.82	2.23		4.33
Area of plot (forest soil) (ha)	2.60	2.90	2.00	2.97	2.25		4.41	2.80	2.44	2.67	2.00	2.73	2.14	2.97	3.83	2.08

Characteristics	Total		Sell tobacco		Sell soya beans		Sell tobacco and soya		No tobacco and soya		No sale		Mvurwi		Concession	
	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019	2017	2019
Gender of plot manager by land quality-area managed																
Sandy plot (ha)-male	2.89	2.02	3.08	2.02	1.11	3.50	1.58	0.50	1.00	3.40	3.00	3.01	1.92	1.72	3.50	
Sandy plot (ha)-female	1.83	4.80	1.73	4.01	2.53	6.00		4.06	2.00	6.09	3.07	1.73	3.78	2.34	6.43	
Clay plot (ha)-male	4.29	2.88	3.32	2.75	5.88	3.70	4.97	1.00	3.42	1.83	2.19	3.33	3.22	5.33	2.62	
Clay plot (ha)-female	2.30	3.63	1.76	3.43	3.09	5.47	2.13	4.63	2.11	3.65	2.46	1.85	3.39	2.90	4.18	
Sand/clay (ha)-male	3.71	2.22	3.28	1.83	5.62	3.39	5.24	1.18	2.99	1.20	2.16	3.38	1.92	4.63	3.11	
Sand/clay (ha)-female	2.31	1.10	2.09	1.42	2.55	1.00	2.63		2.75	0.95	0.75	2.21	1.20	2.80	0.50	
Stony plot (ha)-male	1.80	1.00	2.17		0.40				1.00	1.00		1.80	1.00			
Stony plot (ha)-female	2.00	2.93	2.00	2.07				5.50				2.00	2.35		3.50	
Forest soil plot (ha)-male	3.03	4.00	2.00		4.00		4.41		3.20	2.00		2.32	2.00	5.50	6.00	
Forest soil plot (ha)-female	0.47		0.50		0.45		0.45		0.50			0.45		0.50		
Number of households	533	533	304	284	82	50	64	34	73	9	52	368	368	165	165	

Notes: Sample is restricted to households who only appeared in both rounds
Source: Authors' own

Table A3: Transitions in empowerment between the two waves

Women empowered in the household in 2017	Women empowered in the household in 2019	
	0	1
0	89.18	10.92
1	46.38	53.62

Notes: Sample is restricted to households who appeared in both rounds. Figures represents proportion of households by empowerment status

Source: Authors' own

Table A4: Household characteristics by empowerment transition status

Characteristics	Disempowered to empowered		Empowered to disempowered		Never empowered		Never disempowered	
	2017	2019	2017	2019	2017	2019	2017	2019
Sell tobacco	0.55	0.43	0.59	0.61	0.61	0.57	0.39	0.40
Sell soya beans	0.21	0.17	0.11	0.03	0.14	0.08	0.20	0.16
Sell tobacco and soya	0.05	0.07	0.08	0.08	0.14	0.08	0.09	0.00
No tobacco and soya	0.12	0.19	0.22	0.23	0.09	0.18	0.30	0.27
No sale	0.07	0.14	0.00	0.05	0.01	0.09	0.01	0.16
Age of household head	54.43	55.32	52.23	53.49	50.61	52.52	55.18	56.84
Years of schooling of head	9.19	8.90	8.69	9.46	9.21	9.52	7.32	7.29
Head married monogamously	0.88	0.68	0.78	0.75	0.89	0.87	0.20	0.16
Female-headed household	0.05	0.27	0.19	0.16	0.02	0.02	0.86	0.89
Household size	6.93	6.41	6.11	6.51	6.15	6.28	5.86	5.71
Dependency ratio	0.89	0.93	0.93	0.94	0.82	0.88	1.06	0.89
Households with children out of school	0.17	0.12	0.13	0.16	0.14	0.10	0.15	0.12
Distance to nearest road (km)	7.12	5.24	6.01	5.87	10.28	6.50	8.16	4.87
Crop count	2.67	2.83	3.40	2.83	2.57	2.48	2.65	2.42
Poultry count	17.46	28.83	22.30	27.14	19.92	25.57	16.67	19.08
TLU	6.97	6.41	5.56	4.77	6.29	5.77	4.12	3.88
Household member worked for wage (0/1)	0.19	0.17	0.14	0.13	0.13	0.09	0.12	0.08
July–June total rainfall (mm), current season	705.01	580.33	716.48	573.05	726.55	569.20	725.29	581.09
Asset Index	0.14	-0.24	0.25	0.07	0.18	0.12	-0.51	-0.62
Remittances and gifts	708.89	168.13	314.62	120.00	480.38	218.81	452.69	253.64
Total household income	4616.01	1873.04	4385.32	1800.74	4668.47	1813.71	3527.07	926.61
Engaged in contract farming (0/1)	0.45	0.45	0.34	0.66	0.42	0.56	0.27	0.43
Access to extension (0/1)	0.93	0.86	0.89	0.91	0.84	0.88	0.82	0.89
Access to credit (0/1)	0.05	0.03	0.16	0.03	0.12	0.03	0.16	0.08
Land-own cultivated (ha)	4.17	3.60	4.26	3.84	3.96	3.67	3.76	3.24
Land-rented in (ha)	1.50	6.00	4.17	4.95	5.88	9.13	4.00	
Area of sandy plot (ha)	3.49	1.69	2.93	2.94	2.83	2.79	3.28	3.19
Area clay plot (ha)	3.91	3.45	4.00	3.80	4.34	5.00	3.49	3.50
Area of sandy-clay plot (ha)	4.09	3.52	4.33	3.42	3.88	3.77	3.46	2.99
Area of stony plot (ha)	0.40			1.25	2.00	0.73	2.00	1.00
Area of plot (forest soil) (ha)	3.00	6.00	1.50		3.20	2.93	0.40	2.00
Gender of plot manager by land quality-area manged								
Sandy plot (ha)-male	3.49		3.17		2.80	2.82	2.00	
Sandy plot (ha)-female	0.05		1.72	3.05	1.36	0.50	2.71	5.00
Clay plot (ha)-male	3.91	1.69	3.89	2.00	4.38	5.12	2.00	2.63
Clay plot (ha)-female		3.22	1.36	3.86	1.48	1.33	3.40	
Sand/clay (ha)-male	3.82	2.53	3.85	3.00	3.76	3.74	2.30	3.50
Sand/clay (ha)-female	2.15	3.19	1.83	3.38	1.78	1.30	3.13	2.51

Characteristics	Disempowered to empowered		Empowered to disempowered		Never empowered		Never disempowered	
	2017	2019	2017	2019	2017	2019	2017	2019
Stony plot (ha)-male	0.40	1.80		2.08	2.00	0.73		2.78
Stony plot (ha)-female				1.25			2.00	
Forest soil plot (ha)-male	3.00		2.00		3.20	2.93		1.00
Forest soil plot (ha)-female			0.50				0.40	
Number of households	42	42	64	64	346	346	74	74

Notes: Sample is restricted to households who appeared in both rounds

Source: Authors' own

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