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RESEARCH PAPER

## Determinants of agriculture credit fungibility among smallholder farmers: The case of rural Ghana

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### Abstract

**K. N. Darfor, M.A. Twumasi, S. Akaba, M. Kwamega, G. Ntim-Amo, and S. Ansah. 2021. Determinants of agriculture credit fungibility among smallholder farmers: The case of rural Ghana. *Int. J. Agric. Nat. Resour.* 1-13.** This study examined the determinants of rural household agriculture credit fungibility (CF). The study found agricultural CF among farmers, with approximately 79% of farmers involved in agricultural CF. Household financial burden was found to be the main cause of CF among the studied farmers. Most fungible credit was used for clothing and food consumption. A probit model was employed to analyze survey data collected from four regions in Ghana. We employed an instrumental variable approach (IV-Probit) to test for robustness due to endogeneity issues. The econometric model results show that the variables of off-farm income and farm size inversely influenced agricultural CF, while those of education, household size, male farmer gender, and chronic disease variables had a positive effect on agricultural CF. Our findings have policy implications for alleviating agricultural CF.

**Keywords:** Agriculture credit fungibility, Ghana, instrumental variables, probit model, rural farm households.

### Introduction

From 1960–2017, Ghana's economy relied heavily on the agricultural sector for economic growth. The sector contributed an average of 40.3% of Gross Domestic Product (GDP) over this period, followed by the service sector with 35.6% (World

Bank, 2018). Despite losing its position to the service sector as the main contributor to GDP since 2010, the agricultural sector in 2017 accounted for approximately 40.6% of total employment. Hence, the sector plays a major role in food security, household welfare and rural poverty reduction (Baah-Boateng, Nketiah-Amponsah, & Alagidede, 2013; Diagne & Zeller, 2001). Agricultural growth has stronger effects on poverty reduction than other sectors in economies across

Sub-Saharan Africa (Dercon & Christiaensen, 2011; Bateman, 2010; van Rooyen, Stewart, & de Wet, 2012). Given the significance of agriculture for economics and households' welfare growth in a given country, it is imperative to investigate the financial behavior of the core players of the sector, i.e., smallholder farmers.

In most developing countries, including Ghana, the majority of rural households are poor due to low incomes. As such conditions are likely to be found everywhere in such countries, credit becomes a necessity for improving household welfare and farm production where poverty exists. Akudugu (2016) studied the agricultural productivity, credit and farm size nexus in Africa and revealed that there is a significant relationship between credit from formal and informal sources and agricultural productivity. Access to credit significantly influences the adoption of modern agricultural technologies among farmers in Ghana (Akudugu, 2016; Du *et al.*, 2019; Lin *et al.*, 2019). Schindler (2010) also showed that access to credit enhances investments in production activities among households with liquid constraints by giving them several alternative means of meeting expected expenditures. The availability of credit improves farm productivity (Chandio *et al.*, 2017; Dong, Lu, & Featherstone, 2012; Ma, Abdulai, & Ma, 2018; Twumasi, Jiang, & Acheampong, 2018; Twumasi, Jiang, & Danquah, 2019).

Acquiring agricultural credit to purchase farm inputs and making farm-related investments pose major challenges to agricultural productivity (Asante-Addo *et al.*, 2017; Dong, Lu & Featherstone, 2012; Hermes & Lensink, 2011; Tadesse, 2014). Farmers faced with credit constraints or rationing will invest in less risky strategies associated with less productivity (Baffoe & Matsuda, 2015; Coleman, 1999; Lin *et al.*, 2019). Modernizing agricultural activities requires credit and is an essential route to increased productivity in developing countries. With a small landholding size and insufficient capital investment as major constraints to high agricultural production, agricultural credit constraints must

be alleviated to improve farm production, which in turn will enhance food security (Fletschner & Kenney, 2014; Sekyi, Abu, & Nkegbe, 2017). Chandio and Jiang's (2018) study on determinants of credit constraints in Pakistan showed that major constraints to agricultural credit include distance to formal credit sources, lending procedures, time lags, and interest rates, whereas the ownership of land reduces constraints to formal credit. Some farmers are neglected due to ineffective repayment schedules and high transaction costs of lending to small farmers (Hermes & Lensink, 2011; Li, Gan, & Hu, 2011; Martinson, Yuansheng, & Monica, 2019). Many research findings and recommendations on the need to curb credit constraints and increase agricultural credit access have motivated governments in developing countries to develop policies aimed at subsidizing credit to smallholders to boost their productivity and increase the sector's productivity.

Despite the benefit of agricultural credit to rural households and efforts made by national government and policymakers, many researchers have argued that access to credit adds no value to household welfare or farm productivity (Adams & Von Pischke, 1992; Annim, Dasmani, & Armah, 2011; Coleman, 1999). According to Adams and Von Pischke (1992) and Atakora (2016), the negative impact of credit on rural households is associated with a misappropriation of funds due to financial literacy. Additionally, (Hussain & Thapa, 2016; Saqib *et al.*, 2017) posit that where agricultural credits are used for nonfarm purposes, this results in low and poor farm production, affecting farm income. Bashir *et al.* (2009) stressed that a smallholder farmer's ability to disburse accessed credit efficiently plays a significant role in achieving the expected benefits in increased productivity, increased income, and rural poverty reduction. This principle implies that the mere provision of and access to adequate agricultural credit does not guarantee desired positive results. Findings from several researchers show that a substantial quota of agricultural credit has been spent on nonagricultural purposes, namely, repaying previous loan

facilities; household expenditures on consumption; and healthcare, education and festival expenses (Chandio, Jiang, & Rehman, 2018; Hussain & Thapa, 2012, 2016). In Nigeria, microcredit given to farmers to purchase farm inputs and increase productivity was found to have been diverted to other nonagricultural needs (Enimu, Eyo, & Ajah, 2017). The use of credit from an expenditure for other purposes aside from its purpose is known as CF (Cohen, 1968). Therefore, diverting agriculture credit (i.e., credit for purchasing farm inputs and land preparation) to nonagriculture purposes (e.g., household utilization for education, healthcare, and daily consumption) is termed agricultural CF and is the focus of this study.

Although many research scholars have widely discussed the role of credit in agricultural productivity and economic growth, the determinants of agricultural CF among farmers, especially in developing countries such as Ghana, are poorly understood. We extend the agricultural credit literature by using survey data collected from rural Ghana to examine why farmers do not use agricultural credit for its designed purposes. The objectives of the study are twofold. First, we examine the determinants of agricultural CF; second, we determine the causes and uses of fungible credit. The contributions of this study are twofold. First, this is the first study to examine the determinants of agricultural CF in Ghana. Second, this study takes into account potential endogeneity issues associated with off-farm employment by using an instrumental variable-based probit (IV-probit) model. The study's findings will contribute significantly to the existing literature on agricultural credit in developing countries by providing a new reference for improving credit use efficiency and solving the problem of food and nutrition insecurity.

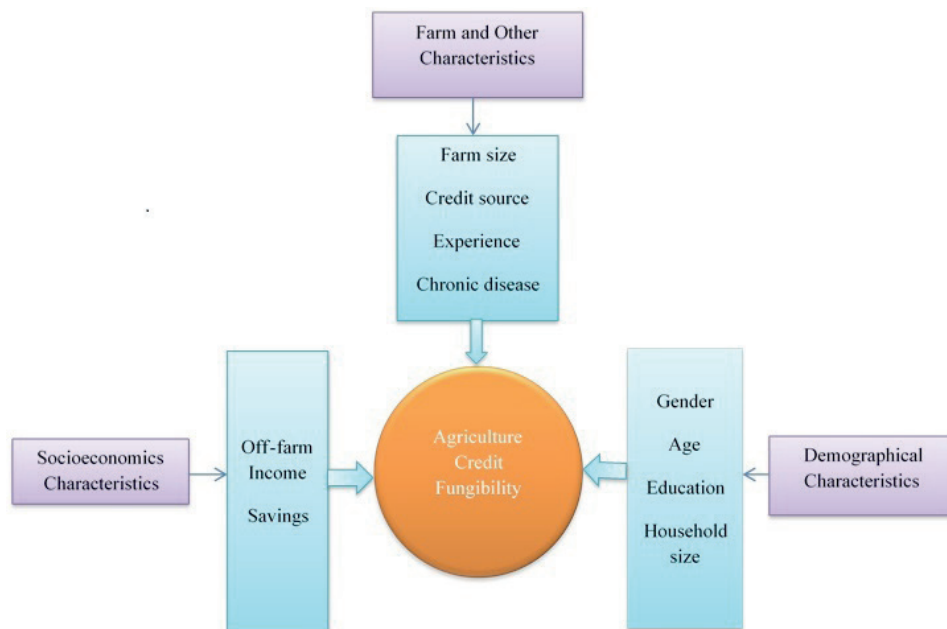
### **Theoretical analysis and framework**

The theory of consumer choice forms the basis for this study. According to this theoretical

framework, consumers want to maximize their utility by choosing a preference set that affords more satisfaction while being constrained by their budgets. For this theory, farmers are expected to make a rational decision by employing credit in their efficient use in production. With credit acting as a major constraint to desired consumption preferences for agricultural inputs to increase yields, farmers are expected, as postulated by economic theory, to efficiently allocate the credit received to the most important agricultural sectors that can maximize their satisfaction of obtaining desired results in terms of increased outputs. In developing countries such as Ghana, farmers are likely to violate this theory by utilizing agricultural credit for other nonagricultural activities due to low incomes and significant family financial burdens, thus acting irrationally in this case. This study will test consumer choice theory among farmers and examine causes of the inefficient allocation of credit through agricultural credit fungibility and how farmers' utility is positively or negatively affected by credit swaps.

The theoretical framework of the study is shown in Fig. 1. Given the background discussed, the authors argue that householders, households and some social characteristics influence agricultural CF.

Previous studies have identified socioeconomic and demographic characteristics of a household, such as gender, household assets, household size, and education, and farm and social characteristics, such as credit sources, farm size, and off-farm work, as determinants of agricultural CF (Hussain & Thapa, 2016; Saqib *et al.*, 2017). Following previous studies, we explored some householder and household (socioeconomic, e.g., off-farm income, savings and demographic, e.g., gender, age, education, and household size) characteristics as well farm and other characteristics (e.g., experiences of farming, farm size, credit sources, and chronic disease) that could influence agricultural CF (see Fig. 1).



**Figure 1.** Theoretical framework of agricultural CF determinants

## Methods and Data

### *Empirical model specification*

In this study, the authors investigated the determinants of agricultural CF among rural farm households in Ghana. Following (Chandio & Jiang, 2018; Twumasi *et al.*, 2018), a probit model

was employed due to the nature of our dependent variable, agricultural CF. An econometric probit regression model assumes that only values of 0 and 1 can be obtained for dependent variable  $Y_i$ , which is a latent, unobservable continuous variable  $Y_i^*$  that determines the value of  $Y_i$ . The model is expressed as:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \dots + \beta_n X_{ni} + v_i \quad (1)$$

$$Y_i = \begin{cases} 1 & \text{if, } Y_i^* > 0 \\ 0 & \text{if, otherwise} \end{cases} \quad (2)$$

The basic model is estimated as:

$$Y_i = \theta_0 + \theta_1 X_1 + \theta_2 X_2 + \theta_3 X_3 + \theta_4 X_4 + \theta_5 X_5 + \theta_6 X_6 + \theta_7 X_7 + \theta_8 X_8 + \theta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \varepsilon \quad (3)$$

$Y_1$  is a dummy variable for which a value of 1 denotes a farmer involved in CF and 0 denotes otherwise;  $\emptyset_0$  is a constant;  $X_1$  represents off-farm income,  $X_2$  represents savings,  $X_3$  represents age,  $X_4$  represents age squared,  $X_5$  represents gender,  $X_6$  represents education,  $X_7$  represents chronic disease,  $X_8$  represents credit sources,  $X_9$  represents household size,  $X_{10}$  represents experience and  $X_{11}$  represents farm size (see Table 1 for more detailed descriptions),  $\emptyset_1, \emptyset_2, \emptyset_3, \emptyset_4, \emptyset_5, \emptyset_6, \emptyset_7, \emptyset_8, \emptyset_9, \emptyset_{10},$  and  $\emptyset_{11}$ , are the parameters of the model to be estimated and  $\varepsilon_1$  is a random disturbance term.

### Data

In this study, 505 rural households from four regions in Ghana were selected as survey data employing the multistage sampling technique. In the first stage, four (4) regions, namely, the northern region in northern Ghana, the Brong Ahafo region in central Ghana, the central region in southwestern Ghana and the eastern region in southeastern Ghana, were selected. These regions were chosen because they cover some of the lead-

ing suppliers of domestic foods in the country. Thus, many rural areas (farmers) are found in these regions. In the second stage, one district was randomly chosen from each selected region. These regions include the East Gonja District in the northern region, the Atebubu Amantin District in the Brong Ahafo region, the Ekumfi District in the central region and the Kwahu Afram Plains District in the eastern region. In the third stage, three (3) communities were randomly selected from each selected district: Yankanjia, Akyenteteyi, and Salaga in the East Gonja District; Asempanye, Dobidi Nkwanta and Atebubu in the Atebubu Amantin District; Essarkyir, Otuam, and Kontankore in the Ekumfi District; and Tease, Bumpata, Ahiatroga in the Kwahu Afram Plains District. Finally, a simple random procedure was employed to select the respondents. With the help of farmers' association and community opinion leaders, 40–45 farm households were randomly selected from each community.

Interview schedules and questionnaires were used for the collection of data from rural farm households in Ghana. An in-depth interview was conducted due

**Table 1.** Description of model variables

Variables	Definitions and assignments	Mean	S.D.
Agricultural CF	1 if the farmer is involved in agricultural CF and 0 otherwise	0.79	0.41
Agricultural CF amount (GH¢)	Amount of fungible agriculture credit	600.35	637.17
Margin of farm investment amount (GH¢)	Amount of agriculture credit for farm investment	826.05	603.11
Credit received (GH¢)	Amount of agriculture credit received	1426.40	1029.73
Household income (GH¢)	Respondent household income	1307.23	702.07
Off-farm income (GH¢)	Respondent off-farm income	208.36	157.30
Savings (GH¢)	Respondent savings amount	928.44	460
Age	Respondent age (years)	41.72	12.20
Gender	1 if a respondent is a male and 0 otherwise	0.70	0.46
Education	1 if a respondent has a high school education or above and 0 otherwise	0.43	0.49
Chronic disease	1 if a respondent has a relative with a chronic disease and 0 otherwise	0.56	0.49
Household Size	Number of members in a household (number)	4.68	1.97
Credit source	1 if a respondent has obtained credit from formal source and 0 otherwise	0.64	0.47
Experience	Years of farming experience (years)	13.65	7.84
Farm size	Respondent farm size (in acres)	3.34	1.87
Social network	1 if a respondent has connections to relatives in the city and 0 otherwise	0.57	0.49

Source: Survey results. USD\$1= GH¢4.9, GH¢ denotes Ghana cedis.

to the complex nature of the questionnaire. A pretest of the questionnaire was conducted to eliminate all uncertainty. The survey data questionnaires covered information on socioeconomic characteristics, agricultural credit, and various other variables addressing the aims of the study. Here, agricultural credit is defined as the kind of credit secure from either formal (e.g., banks) or informal (e.g., money lenders) sources or both for agricultural purposes. Data were edited and coded to ensure accuracy, validity, uniformity, consistency and completeness using Stata 14.

## Results

### *Descriptive Evidence*

The results of our analysis of the descriptive statistics of the variables employed in the study are shown in Table 1. The results show a high degree of agricultural CF (79%) among smallholder farmers in the study area. An average of GH¢1426.4 was received as total agricultural credit with 64% of this amount being obtained credit. The share of a household's agriculture credit for nonfarm purposes (CF) was 42% (GH¢600.3), whereas a household's margin of farm investment reached 58% (GH¢826.05). Respondents received an average of GH¢208.36 as income from off-farm activities. Household income averaged at GH¢1307.23 annually, and GH¢928.44 in annual savings was achieved. The average age of the respondents was 41.72 years with the majority (70%) being males and 43% having a high school education or above. Approximately 57% of the respondents had connections to relatives living in cities, and 56% had a relative living with a chronic disease. The average household size was 4.68, and the average farm size was 3.34 with 13.65 years of farming experience.

Table 2 summarizes the differences between the means of the variables used in the analysis for the whole sample according to the respondents' fungibility status. The P-value was used to determine whether the mean values of variables

between CF farmers (CFFs) and non-CF farmers (NCFFs) were significantly different. The test results are statistically significant at 1% for the amount of credit received, the amount of credit invested, off-farm income, and annual savings, showing a significant difference between the two groups of farmers' values. The CFFs received more credit than the NCFFs but only invested 48% for farming purposes of the average of GH¢1822.556 received. NCFFs also had higher average off-farm incomes and annual savings than farmers who engaged in credit fungibility. The means of the remaining variables (age, farm size, household size, education, and chronic disease) and of gender also show differences between the two groups of farmers at the 10% and 5% levels of significance, respectively.

Moreover, Figure 2 depicts the usage of fungible credit. Farmers reported that the majority of their fungible credits were spent on clothing and food consumption (27%), education and health (21%), and off-farm investment (17%). The lowest proportion was used for other purposes (9%), such as gifts, travel expenses, rituals, and settling court cases. As their agricultural income is insufficient, the farmers try to invest in off-farm activities to increase household income.

In addition, Figure 3 reveals the causes of CF adoption by farmers. As shown in Fig. 3, a heavy household financial burden (28%) and low farm incomes (24%) were identified as major causes of CF by the farmers. Unforeseen events (20%) and loan default prevention (16%) were identified as the next most common causes of CF. The least among cause was peer pressure (12%). Sometimes, farmers are encouraged by their peers to participate in rapid-income-generating activities such as lotteries. In summary, it can be deduced that CF is practiced by the surveyed smallholder farmers on an ongoing basis. Therefore, investigating agricultural CF among these farmers is worthwhile because an increase in agricultural fungible credit is more likely to have a detrimental effect on food production, which

**Table 2.** Differences between the means of CF farmers (CFFs) and non-CF farmers (NCFFs)

Variables	Total	CFFs	NCFFs	P-value
Annual amount of credit received by farmers	1426.405 (1029.722)	1822.556 (943.793)	836.792 (379.805)	0.0000***
Annual amount of credit margin of farm investment	826.124 (603.129)	961.905 (591.949)	836.792 379.805	0.0001***
Annual amount of credit used for non-farm purpose	600.300 (437.138)	-	-	-
Off-farm Income	208.363 (157.295)	184.679 (131.891)	229.5977 (174.665)	0.0021***
Annual Savings	928.446 (460)	508.33 (407.012)	922.47 (475.237)	0.0001***
Annual income	1307.229 (702.065)	879.73 (613.094)	1008.059 (713.677)	0.0308*
Age	41.721 12.202	41.879 (12.173)	40.387 (12.745)	0.0000*
Farm size	3.335 (1.874)	3.077 (1.820)	3.258 (1.808)	0.0001*
Household size	4.68 (1.97)	5.303 (2.131)	4.224 (1.271)	0.0000*
Education	0.432 (0.492)	0.511 (0.501)	0.311 (0.465)	0.0673*
Chronic disease	0.563 (0.493)	0.591 (0.492)	0.443 (0.50)	0.0691*
Gender	0.701 (0.461)	0.722 (0.451)	0.516 (0.487)	0.0389**

Source: Survey results, \*, \*\*, and \*\*\* represent statistical significance at the 10%, 5%, and 1% alpha levels, respectively. All numbers shown in parentheses are robust standard errors.

in turn will affect food security, which must be improved internationally.

### *Empirical Evidence*

Table 3 presents the results of the probit regression analysis used to identify factors influencing farmers' agricultural CF status. The log-likelihood value is -215.24425 in the probit model. The entire model is significant at 1%. In Table 3, the first column shows the various determinants of agricultural CF with their baseline probit model coefficients, robust standard errors and marginal effects. The independent variables considered in this study include off-farm income, savings, age, age squared, household size, gender, education, farm size, experience, chronic disease, and credit size. It is evident from Table 3 that off-farm income and farm size have a negative effect on CF at the 1% significance level. In addition, gender, education, household size, and

chronic disease show positive and statistically significant relationships with agricultural CF at the 10%, 5%, 1%, and 10% significance levels, respectively. The remaining variables are not significant.

### *Robustness check*

This study employed two empirical regressions to test the robustness of the results (Table 4). First, we considered off-farm income as an endogenous variable and employed an IV-probit regression model (where the instrumental variable is defined as the social network, i.e., whether the respondents have relatives or friends living in the city who can recommend an off-farm job); thus, we have Model (1).

We assume that off-farm employment is not randomly distributed among households (selection bias); thus, farm households choose whether to

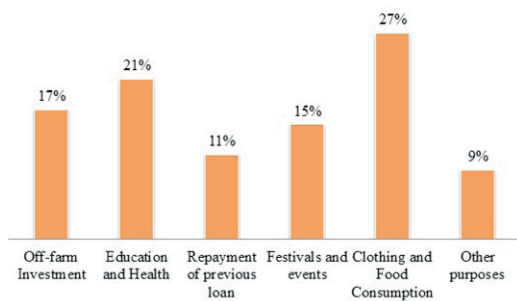


Figure 2. Fungible credit usage

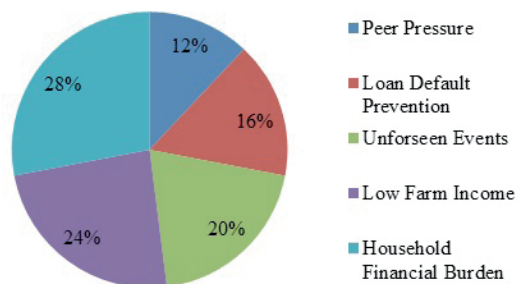


Figure 3. Causes of agriculture credit fungibility

Table 3. Determinants of agriculture credit fungibility

Variables	Coefficient	Std. Error	Marginal effect
Off-farm income	-0.6150398	0.1474141	-0.147504***
Savings	-0.0011916	0.0002376	0.0006475
Age	0.0495647	0.0335014	0.0118781
Age2	-0.0004924	0.0003824	-0.000118
Household size	0.1271116	0.0377811	0.0304622***
Gender	0.2162033	0.1476422	0.0540339*
Education	0.3664317	0.149415	0.0868368**
Farm Size	-0.2636929	0.0625981	-0.0631938***
Experience	-0.0005831	0.0197566	-0.0001397
Chronic disease	0.2867992	0.1562892	0.0721974*
Credit source	0.1457556	0.1445984	0.0352407
Constant	-0.5129551	0.7006748	
Regions	Yes	Prob > chi2	0.0000
Number of obs.	505	Pseudo R2	0.1705
Log-likelihood	-215.24425	Wald chi2(13)	76.20

Source: Survey results, \*, \*\*, and \*\*\* represent statistical significance at the 10%, 5%, and 1% alpha levels, respectively. All numbers shown in parentheses are robust standard errors.

engage in off-farm activities for additional income (Burgess, Dudbridge, & Thompson, 2016; Ma, Zhou, & Renwick, 2019; Pfeiffer, López-Feldman, & Taylor, 2009).

Second, we replace the dependent variable (whether a farmer practices agricultural CF) with the share of agriculture credit fungibility and employ the Tobit estimation model to produce Model (2). Table 4 shows that using different measurement methods for the dependent variable or econometric models did not change the significance level of the estimated results for off-farm income shown in Table 3. The only difference is found in the value of the coefficients.

## Discussion

To better understand the relationship between agricultural credit usage and the financial behavior of smallholder farmers, we explored the factors that influence rural farm households' agricultural CF. The results from Table 3 indicate that off-farm income is associated with agricultural CF. The off-farm income variable shows a negative but significant relationship with agricultural CF. The coefficient for off-farm income is large for agricultural CF, which means that farmers who have other sources of income, i.e., income not from their agricultural activities, are less likely to use agricultural credit for nonagricultural purposes. The marginal effect of off-farm income indicates



**Table 4.** The estimated results of the robustness check

Variables	Model 1	Model 2
Off-farm income	-1.544611 (0.1597948)***	-0.3989398 (0.0346555)***
Savings	0.1980978 (0.1757713)	0.0494704 (0.0294028)
Age	0.0444045 (0.0315404)	0.0101651 (0.0051979)
Age2	-0.0004299 (0.0003601)**	-0.0001092 (0.0000576)
Household size	0.0900406 (0.0349057)**	0.0083151 (0.00511)**
Gender	0.2715403 (0.1412382)**	0.0425651 (0.0240707)*
Education	0.2658261 (0.1441046)*	0.0262253 (0.0233951)*
Farm Size	-0.1784006 (0.0635435)***	-0.0414367 (0.0074305)***
Experience	-0.0067147 (0.018349)	-0.0012621 (0.0021234)
Chronic disease	0.3171755 (0.1485793)**	0.0107275 (0.0252941)*
Credit source	0.1343408 (0.1363183)	0.0385548 (0.0226697)
Constant	-0.0470974 (0.652996)***	0.3491667 (0.1151261)***
Regions	Yes	Yes
Number of obs.	505	505
Endogenous Wald $\chi^2$	36.34***	

Source: Survey results, \*, \*\*, and \*\*\* represent statistical significance at the 10%, 5%, and 1% alpha levels, respectively. All numbers shown in parentheses are robust standard errors.

that the likelihood of using agricultural credit for nonagricultural purposes by farmers who earn income besides income from their agricultural activities is 14.75 percentage points lower than that from their farming activities. This finding implies that farmers with higher earnings from off-farm activities may use no or less credit for nonagricultural purposes. Thus, a farmer could use off-farm income to meet his or her daily household needs for food and expenditures on health and clothing, hence refraining from CF practices. This finding is consistent with Hussain and Thapa's (2016) finding that off-farm income is a significant determinant of CF.

Furthermore, the gender variable and agricultural CF have a positive and significant relationship, sug-

gesting that males are more likely to use agricultural credit for other purposes. The significant positive relationship found between these two variables is not surprising because income needs and uses vary among females and males, i.e., males tend to have greater financial responsibilities than their female counterparts (Ullah, 2017). Males thus harbor greater burdens from home expenditures than their female counterparts in Sub-Saharan Africa and more precisely in Ghana.

In addition, agricultural CF was found to be significantly and positively affected by the farmers' education level in this study. Interestingly, the marginal effect found shows that farmers who have more education are 8.68% more likely to engage in credit fungibility than farmers who are less educated. These results may be surprising because one would have expected more educated farmers to strictly use agricultural credit for agricultural purposes. The reason for this trend may lie in negative perceptions of farming as an activity for the uneducated. Alternatively, educated farmers may be more aware of the opportunity costs of investing in agricultural activities at a particular time, causing them to divert agricultural credit to other nonfarm opportunities to improve their households' welfare.

The results further show that variables such as household size, farm size, and chronic diseases are significant determinants of credit use for non-agricultural purposes. From the results presented in Table 3, household size and chronic diseases have a positive relationship with agricultural CF. This result indicates that farmers who have larger households are more likely to use agricultural credit for nonagricultural purposes, as the required expenditures for such households may force them to divert agricultural credit to household expenditures. This finding confirms the findings of Hussain and Thapa (2016), who reported that household size is a significant determinant of agricultural credit fungibility. Regarding the issue of chronic diseases, our results show that farmers who have relatives living with chronic diseases

are more likely to engage in credit fungibility, as they may be forced to divert agricultural credit to the treatment of such chronic diseases, which are nonagricultural purposes (Twumasi, 2020).

Farm size, on the other hand, decreases the odds of practicing agricultural CF, which implies that farmers with larger farms are less likely to engage in CF. Farmers with larger farms may have higher farm surpluses and incomes as a result of using integrated farming systems including crops, livestock, and poultry, which will enable them to meet their daily needs from their income. Chandio et al. (2018) revealed from their study conducted in Pakistan that owning vast land for agricultural cultivation leads to higher incomes due to high levels of productivity.

Additionally, some limitations of this study may require future research attention. First, this study used cross-sectional data from four (4) of the ten (10) regions in Ghana due to credit constraints. Thus, future research could consider all regions in Ghana and determine if our findings are again confirmed. Second, this study only focused on the determinants of agricultural credit without considering its impact on farm productivity. Future studies mere investigate this aspect as well. Finally, this study only focused on agricultural credit, though credit is used for various different purposes, such as small and medium-sized enterprise (SME) operations. Future studies can address the determinants of CF in the business market.

### **Conclusions and policy implications**

Using household survey data from four regions in Ghana (the northern, eastern, central, and

Brong Ahafo regions), this study explored the determinants of agricultural CF. Based on the above analysis, we draw the following main conclusions. First, the study shows that farmers engage in agricultural CF with approximately 79% of the studied farmers in involved in the activity. Household financial burdens were found to be the main cause of CF among the surveyed farmers. Most of the fungible credit was used for clothing and food consumption. Again, the study reveals some mean significant differences between CFFs and NCFFs. Finally, our econometric model results show that off-farm income and farm size inversely influence agricultural CF, while education, household size, male farmer gender and chronic disease have a positive effect on agricultural CF.

From the above results, this study has several policy implications. First, the negative relationship between off-farm incomes reveals that it is essential for governments and policymakers to create off-farm income-generating opportunities for rural inhabitants. Therefore, policymakers should prioritize designing policies that create income-generating opportunities. The “One-District-One-Factory” program initiated by the current government must be prioritized. Household income is likely to be increased through off-farm income. Second, the government should intensify the flexibility of the country’s health insurance scheme, most importantly for rural households, to reduce costs for relatives living with chronic diseases. When household members are free from sickness, they may contribute significantly to household welfare. Policies for this channel will relax the burdens of household expenditures and reduce agricultural CF, thereby increasing agricultural productivity.

## Resumen

**K.N. Darfor, M.A. Twumasi, S. Akaba, M. Kwamega, G. Ntim-Amo, y S. Ansah. 2021. Determinantes de la fungibilidad del crédito agrícola entre los pequeños agricultores: el caso de las zonas rurales de Ghana. *Int. J. Agric. Nat. Resour.* 1-13.** Este estudio examinó los determinantes de la fungibilidad del crédito a la agricultura de los hogares rurales. El estudio encontró fungibilidad de crédito agrícola entre los agricultores, con aproximadamente el 79% de los agricultores involucrados en la fungibilidad del crédito agrícola. Se encontró que la carga financiera de los hogares era la principal causa de fungibilidad crediticia entre los agricultores estudiados. La mayoría del crédito fungible se utilizó para el consumo de ropa y alimentos. Se empleó un modelo de probit para analizar los datos de encuestas recopilados de cuatro regiones de Ghana. Empleamos un enfoque variable instrumental (IV-Probit) para probar la robustez debido a problemas de endogeneidad. Los resultados del modelo econométrico muestran que las variables de ingresos fuera de la granja y tamaño de las granjas influyeron inversamente en la fungibilidad del crédito agrícola, mientras que las de educación, tamaño del hogar, género de los agricultores masculinos y variables crónicas de enfermedades tuvieron un efecto positivo en la fungibilidad del crédito agrícola. Nuestros hallazgos tienen implicaciones políticas para aliviar la fungibilidad del crédito agrícola.

**Palabras clave:** Fungibilidad del crédito agrícola, Ghana, hogares rurales agrícolas, modelo probit, variables instrumentales.

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