

Impact of Agricultural Trade Credit Participation on Credit Access, Yield and Income among Rice Farmers in Northwestern, Nigeria

Abubakar Muhammad Bichi ; Hussaini Yusuf Ibrahim ; and Emmanuel Ada Ojoko 

Department of Agricultural Economics, Federal University Dutsin-Ma, Katsina State, Nigeria.

Corresponding author: ihussaini@fudutsinma.edu.ng

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Abstract

Access to finance remains a critical challenge for small and medium-scale farmers in Nigeria, despite various government and Central Bank of Nigeria (CBN) interventions. This study examines the role of trade credit extended by agro-input vendors as an alternative financing mechanism for rice farmers in Kano and Jigawa states. Using primary data from 481 farmers and employing the Augmented Inverse Propensity Weighted Estimator (AIPW) technique, the study assesses the impact of trade credit participation on credit access, rice yield, and income. Findings reveal participation in trade credit will lead to an increase of about ₦50684 in the amount of credit obtained. On the other hand, yield of rice will increase by 2.55bags per hectare, while the income from rice cultivation will also increase by ₦62864.82 per hectare. The results underscore trade credit's potential to enhance agricultural financing, particularly for smallholder farmers who face barriers to formal credit access. However, effective utilization requires targeted interventions, including financial literacy training and improved market access.

Keywords: Rice Farmers, Agricultural Trade Credit, Impact Evaluation, AIPW, Nigeria.

Introduction

For several years, successive administrations in Nigeria have attempted to make finance accessible for small and medium-scale farmers in order to promote productivity and enhance their welfare. To achieve this goal, several interventions were initiated by the government and the Central Bank of Nigeria (CBN) to make access to credit easier for farmers. Some of these interventions include; the Nigerian Agricultural and Cooperative Bank (NACB), Agricultural loan Guarantee Scheme Fund (ACGSF), Commercial Agricultural Credit Scheme (CACS), and more recently, the Nigerian Incentive-based Risk Sharing for Agricultural Lending (NIRSAL). However, despite these efforts, credit availability still eludes farmers in Nigeria. According to Kofarmata & Danlami (2021), the level of funding in the Nigerian agricultural sector is nothing to write home about and it hovers around 1-2 per cent of the total lending of banks. Due to low availability of credit in the Nigerian agricultural sector, Rice farmers may discontinue the adoption of relevant agricultural

inputs such as climate smart practices and use of improved seeds which obviously have dire implications for food security.

On the other hand, an alternative method of raising money for their farming activities needs to be sourced and trade credit seems to be a very promising alternative. Trade credit is a type of financing given by suppliers to their clients, enabling them to buy products or services on credit terms as opposed to paying up front in cash. It is an example of a brief loan given by suppliers to customers, usually in the form of a payment delay for products or services received. Agricultural trade credit is different from contract farming arrangements because it does not involve an agreement on supply of outputs of a specific quantity or quality at a specific or agreed time. It is simply and swift informal credit provided by agro input dealers to farmers and the cost of all inputs provided is repaid in cash with some interest after harvest.

Agro-input merchants are widely recognized as dependable sources of agricultural information for rural farming communities (Kumar et al., 2020). Their role goes beyond the distribution of farm inputs, as they also introduce farmers to modern technologies and offer practical guidance on the use of agricultural tools and products, thereby building strong relationships with their clients (Staudacher et al., 2021). These dealers play a crucial role in disseminating information, especially to farmers with limited literacy, by supplying clearly labeled inputs and translating technical knowledge into accessible formats (Rother, 2018). Moreover, they act as vital links between farmers and output markets, thereby enhancing the overall efficiency of the agricultural value chain (International Fertiliser Association [IFA], 2018). In many rural areas, agro-dealers provide localized extension services, assist in selecting appropriate agrochemicals and improved seed varieties, and communicate research-based solutions tailored to farmers' needs (Ogunlade et al., 2012). Their physical proximity and consistent availability make them highly trusted advisors, whose recommendations are often adopted by farmers (Alam & Wolff, 2016; Rutsaert & Donovan, 2020; Kwakye et al., 2019).

Problem Statement

Currently, in Nigeria, numerous studies (Osabohien et al., 2022; Ojo and Ayanwale, 2019) have been carried out to examine the impact of formal agricultural credit on agricultural production as well as the roles cooperatives and social capital play in enhancing farmers access to farm credits and enhance agricultural activities. Several studies have also been conducted to identify challenges associated with formal agricultural credits (Adejobi, & Atobatele, 2008; Adegbite, 2009; Badiru, (2010). Akiyama et.al (2015). Udoka et al. (2016). Awotide et.al (2015). These works have proven that formal credit plays a vital role in agriculture. However, in Nigeria, there is a dearth of studies specifically on agricultural trade credit. Little or no study have been conducted on the impact of agricultural trade credit by agro input vendors on crop production especially rice production in Nigeria. It is important to understand how trade credit works; policy makers need evidence on its intended and unintended impacts. The participation of rice farmers in trade credit programs is crucial for

their operational efficiency and productivity. However, there is limited understanding of how access to trade credit impacts the amount of credit received, yield and income of rice farmers.

The objectives of the study are to determine the impact of agricultural trade credit participation on amount of credit accessed, yield of rice and income from rice cultivation. The study will contribute to knowledge and literature on impact evaluation economics as well as agricultural financing in Nigeria. For policy makers, findings of the study can be used to design a sustainable and affordable model for financing agricultural production especially for small scale farmers.

Theoretical Framework

This study is grounded on random utility theoretical framework under the general utility maximisation framework. Rice farmer will only engage in trade credit extensively if it boosts output and adds significantly to the household's agricultural earnings and income. Therefore, if the utility gained from trade credit participation is higher than the utility gained from non-participation, a rational farmer is anticipated to engage in trade credit intensively. For instance, if the potential outcomes derived from intensive trade credit participation is R_{*1} and the expected outcomes anticipated from non-intensive trade credit participation is R_{*0} if we define the change between the anticipated outcomes from intensive participation in trade credit and non-intensive participation as R_{*i} , then $R_{*i} = R_{*1} - R_{*0}$; therefore, a rational farmer would choose to intensively participate in trade credit if $R_{*i} > 0$. However, it is impossible to observe R_{*i} , but it can be specified as a function of observable variables in the following latent mode:

$$R_{*i} = P_i\beta + \tau_i, \tau_i = 1 \text{ if } R_{*i} > 0$$

This implies that farmer choose to participate in the trade credit scheme that maximize utility, which is subject to their demographic/socioeconomic characteristics and other determinant factors. In order to evaluate the impact of trade credit participation in agricultural rice production, we can proceed by assuming that the vector of the outcome variable is a linear function of the explanatory variables P_i , and then specify an outcome as follows:

$$R_1 = P_i\alpha + L_i\sigma + \lambda_i$$

Where:

R_1 denotes a vector of the outcome variables;

P_i is a vector of the explanatory variables included in the model;

L_i is the treatment variable (participation) and is equal to 1 if the farmer participates intensively in trade credit and 0 otherwise;

α and σ are the parameters to be estimated; and

λ_i denotes the random error term.

Material and Methods

Study Area

The study was conducted in rural areas of Kano state and Jigawa State located in north-western Nigeria. Kano State is located between latitudes 10°3' and 12° 37' North and longitudes 7°3' and 9° 5' East of the Greenwich meridian. Kano State is commercial nerve centre of northern Nigeria. Jigawa State is situated between latitudes 11°.00 '° N to 13°.00' N and longitudes 8.00 ° E to 10.15 ° E.

Sampling Technique

The sampling frame of Rice farmers for the major Rice farming communities in the two states was obtained and using Raosoft sample size calculator, a total of 265 and 216 Rice farmers were randomly sampled from Kano and Jigawa states respectively. Primary data were used for the study, and these were collected using validated questionnaire through kobo collect application. The Rice farmers observed to be participating in trade credit were considered as the treatment group while those not participating were considered as the control group.

Analytical Techniques

To assess the impact of participation in trade credit on amount of credit obtained, rice yield, and income of rice farmers, the Augmented Inverse Propensity Weighted Estimator (AIPW) technique was employed.

The average treatment effects (ATE) can be estimated using the augmented inverse propensity weighted (AIPW) estimator. The augmented inverse probability weighted estimator provides a simple method for estimating average treatment effects that are more accurate compared to other propensity score-based methods such as propensity score matching, regression adjustment and inverse propensity weighting (King and Nielsen, 2019). According to Glynn and Quinn (2009) AIPW involves specifying a binary regression model (treatment model) for the propensity score and specifying a regression model for each of the outcome variable (outcome model) with and without the treatment. Each outcome is weighted using the propensity score from the binary regression model to produce a weighted average of the two outcome models. In this study, the treatment model is specified as follows:

$$y_{i*} = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_nX_n + U$$

$y_{i*} = 1$ if a rice farmer participates in trade credit and 0 if otherwise.

The X s represent the explanatory variables for the model while the b s represent the parameters to be estimated. The error term is specified as U . The independent variables that are hypothesized to determine participation in trade credits by Rice farmers are as follows: gender, age years, level of education, household size, cooperative participation, farming experience, value of Rice yield, other source of credit, financial inclusion, transport cost, previous experience with credit and distance to market. The dependent variable in this model was also a binary variable which takes a value of 1 if a Rice farmer participates in

trade credit arrangements and a value of 0 if otherwise. This model was estimated using a Logistic Regression Model.

Three outcome variables were considered in this study (Amount of credit accessed, yield of rice per hectare and the income obtained from rice cultivation per hectare). The amount of credit is the monetary value of inputs obtained via trade credit while the yield of rice is the number of bags of rice obtained in a hectare. The income from rice cultivation is the gross margin obtained per hectare from rice cultivation. Participation in agricultural trade credit is expected to lead to an increase in the three outcomes.

The outcome model for rice yield was specified in the equation below.

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + U$$

Where;

Y = Rice Yield (Bags), X_1 = Farm size (hectares), X_2 = Quantity of seed used (kg), X_3 = Labour input used (both family and hired labour) (man days), X_4 = Quantity of fertilizer (kg)

X_5 = quantity of agrochemicals (Litres), U = Error term.

The terms b_1 to b_5 are the coefficients of parameters estimated for the variables X_1 - X_5

The Gross margin and Net Farm Income analysis was used to determine the income from rice cultivation. Gross margin was the difference between the gross farm income (GFI) and the total variable cost (TVC) per hectare that was,

$$GM = GFI - TVC$$

Where:

GM = Gross Margin (Naira/hectare).

GFI = Gross Farm Income (/Naira/hectare)

GFI = Revenue from Rice sales + Subsidy from government + other related income

TVC = Total Variable Cost (Naira//hectare)

TVC = Cost of seed + Cost of fertilizer + Cost of Agro chemicals + Cost of fuel + Cost of other variable inputs. The Net Farm Income was used for respondents with significant fixed cost.

$$NFI = TR - TC$$

Where:

TR = Total Revenue = Price x Quantity of Rice sold

$$TC = TVC + TFC$$

TFC = Value of assets depreciated using the straight-line method.

Quantity of output = Rice harvested in Kg/Ha

The outcome model for income from Rice is specified below.

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + U$$

Y = Income from rice (N)

X_1 = Yield of rice paddy per Hectare in Bags

X_2 = Total cost of inputs (N)

X_3 = House hold size of respondent (numbers)

X_4 = Educational status of respondents (years)

X_5 = Farm size (hectares)

X_6 = Access to extension agent (Yes = 1, No = 0)

U = Error term

The terms b_0 to b_6 = are parameters to be estimated

The outcome model for amount of trade credit obtained is specified as:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + U$$

Y = Amount of trade credit obtained (N). For participants in trade credit, this is the actual amount of trade credit obtained from agro input vendors as well as others sources. While for those not participating in trade credit it is the amount of credit obtained from any formal or informal sources of credit.

X_1 = Total cost of input (N)

X_2 = Yield of paddy per hectare (kg)

X_3 = Farm size (hectares)

X_4 = Off farm income (naira)

X_5 = Commercialisation index (Quantity of rice paddy sold/Quantity of rice paddy harvested)*100

X_6 = Years of farming experience (Years)

X_7 = Extension visits per year

X_8 = Educational status

X_9 = Membership of cooperative

U = Error terms

The terms b_0 to b_6 = parameters to be estimated.

The reliability of the AIPW results depends on the quality of matching between the covariates or independent variables in the treatment model. Therefore, the overall covariate was assessed using the total bias reduction, the significance of the p-values of the likelihood ratio test after matching and pseudo- R^2 . A high total bias reduction, the insignificant p-values of the likelihood ratio test after matching, low pseudo- R^2 , and significant reduction in the mean standardized bias are indicative of successful balancing of the distribution of covariates between participants and non-participants in trade credit.

Results

The summary of the amount of credit and yield obtained by rice farmers is presented in Table 1. The result shows that some non-participants have no minimum credit, which suggests that some in this group may not have received any credit at all (possibly zero). The maximum credit extended to participants is N90, 000, indicating a significant amount of credit support available to them. Interestingly, non-participants have a higher maximum credit of N92, 535.25. This could imply that a few non-participants still receive substantial credit, possibly from non-agricultural or informal sources (Adebayo & Ayodele, 2021). On average, participants receive N23, 074.53, which is higher than the average for non-participants. The Non-participants receive an average credit of N18, 000, which is lower than the participants' average, even though their maximum credit is higher. The participants generally have more consistent access to credit, reflected in their higher average credit amount and non-zero minimum.

Table 1: Amount of credit accessed and rice yield for participants and non-participants in Agricultural Trade credit

Parameters	Participants		Non participants	
	Cred Credit (N)	Yield (Bags)	Credit (N)	Yield (Bags)
Minimum	5000	10.00	0	17.0
Maximum	90000	32.00	92535	27.0
Mean	23075***	18.5***	18000	12.75

Source: Field survey 2024

*** Significant ($p < 0.01$)

The average amount of credit obtained and yield for participants are significantly higher for the participants with a p-value less than 0.01, indicating strong statistical significance (Table 1). On the other hand, the income from rice range for participants spans from 125,000.00 to 350,000.00 Naira, yielding a wide range of 225,000.00 Naira (Table 2). The income range for non-participants is from 150,000.00 to 256,000.00 Naira, a narrower range of 106,000.00 Naira. This indicates more consistent but generally lower incomes compared to participants. There is a significant difference in mean income ($p = 0.05$) and this may represent a considerable additional revenue stream that can improve participants' financial resilience and capacity for reinvestment in their farming operations. A valid attribution of the impact of participation in trade credit on the three outcome indicators without a suitable counterfactual cannot be made. Secondly, the observed mean differences cannot be used to infer any casual inference without controlling for confounding variables. To circumvent this challenge, the AIPW technique was used in this study.

Table 2: Income per hectare from Rice production for participants and non-participants in Agricultural Trade credit

Parameters	Participants	Non participants
	Rice income(N)	Rice income (N)
Minimum	125000	150000
Maximum	350000	256000
Mean	297823**	273763.30

Source: Field survey 2024

** Significant ($p = 0.05$)

The reliability of the AIPW results depends on the quality of matching between the covariates or independent variables in the treatment model. Hence, the Propensity Score Matching (PSM) technique was used to create a valid counterfactual on the basis of which attribution of the outcome variables can be made with respect to the participation in agricultural trade credit by Rice farmers in the study area. Furthermore, the PSM technique was also used for robustness check of the AIPW results.

Out of the twelve variables in the treatment model, only the combination of five variables gave a good balance for the covariates as presented in Table 3.

Table 3: Covariate balancing test before and after matching

Variables	Standardized differences		Variance ratio	
	Raw	Matched	Raw	Matched
Age	.23	-.090	1.15	1.09
Household size	.02	-.006	1.10	1.01
Farm Experience	.14	-.087	1.12	1.08
Fin Inclusion	.042	-.022	1.15	1.06
Participation in Contract farming	-0.11	-0.58	1.13	1.07

Source: Field survey 2024

The results reveal before matching (Raw), the standardized differences for all variables are positive or negative, implying some imbalance between the groups. After matching (Matched), the differences are much closer to zero, indicating improved balance for most covariates. Before matching (Raw), the variance ratios for all variables are close to 1, indicating moderate balance in terms of variability. After matching (Matched), the ratios remain close to 1 for most variables, showing that the variability between the treated and control groups is fairly similar after matching (Stuart, 2010). The matching procedure has significantly improved the balance between treated and control groups, particularly in terms of standardized differences, which are now much closer to zero for most variables. This suggests that the groups are now more comparable in terms of their covariates. Most importantly, the AIPW analysis can be done having obtained a reliable balance for the covariates.

Using the treatment model for participation in trade credit, the propensity scores were generated. The summary of the propensity scores for Rice farmers that are participants and non-participants in trade credit by their mean, standard deviation, minimum and maximum values are presented in Table 4.

Table 4: Summary statistics of the propensity score for Rice farmers in the study area

Respondents	Mean	Standard Deviation	Minimum	Maximum
Participants	0.60	0.072	0.45	0.73
Non-participants	0.62	0.072	0.37	0.72
All	0.61	0.073	0.37	0.73

Source: Field survey 2024

Participants in trade credit have an average propensity score of 0.60, meaning that on average, their likelihood of participating in agricultural trade credit with input vendors is 60%. The minimum score is 0.45, indicating that some participants had a lower probability of participation; while the maximum is 0.73, suggesting that others had a higher likelihood. The mean propensity score of 0.62 for the non-participants suggests that, on average, non-participants had a slightly higher probability of program participation than participants.

However, the overall difference is small. This suggests that, based on observable characteristics, non-participants and participants are quite similar in terms of their likelihood of participating in the program. The overlap in scores also supports the validity of matching methods that would use these propensity scores to compare participants and non-participants. The mean score of 0.61 for all respondents (participants and non-participants) indicates that, on average, the probability of participation in trade credit across the entire sample was 61%. The standard deviation of 0.073 is similar to both groups individually, suggesting that the variation in propensity scores is consistent across the whole sample.

Impact of participation in agricultural trade credit on the amount of credit used

The AIPW results for the impact of trade credit are presented in Table 5. The average treatment effect ATE shows how much an outcome is higher for the participants compared to the non-participants as a result of participation in trade credit. The potential outcomes mean (POM) is the expected value of an outcome for the participants without trade credit. The results show that the average treatment effect (ATE) for the participation in trade credit is statistically significant ($p < 0.01$). The result implies that participation in trade credit will lead to an increase of about N50684 in the amount of credit obtained for farm operations by Rice farmers in the study area. However, if none of the Rice farmers had participated in trade credit with agro input vendors, their (POM) would be lower (N30065). In essence, the results have clearly shown that participation in agricultural trade credit has a positive and significant impact on the amount of credit use by Rice farmers.

Table 5: AIPW results for impact of participation in trade credit on amount of credit obtained

Outcome (Amount of trade credit N)	Standard Error	Prob.
ATE	50684.00	101.2
POM	30065.07	251.4

Source: Field survey 2024

Impact of participation in agricultural trade credit on yield of Rice/hectare

The AIPW results show an estimated increase in yield, but the overall effect (ATE) is not statistically significant. However, the Potential Outcome Mean (POM) in Table 6 for trade credit participants is statistically significant, indicating some positive association for those who took part in trade credit. The Potential Outcome Mean (POM) for those who participated in trade credit (2.16 bags) is statistically significant ($p\text{-value} = 0.04$). This indicates that farmers who took advantage of trade credit had a higher yield, suggesting that credit access improves productivity when available to those who need it most.

Table 6: AIPW result for impact of participation in trade credit on yield of Rice/hectare

Outcome (Yield of Rice in number of bags)		Standard Error	Prob.
ATE	2.55	21.24	0.13
POM	2.16**	11.48	0.04

Source: Field survey 2024

Impact of participation in agricultural trade credit on income from Rice/hectare

The results in Table 7 suggest that for those who participated in trade credit, the average increase in income from rice were N62864.82 Naira compared to those who did not. On the other hand, the result indicates a statistically significant positive impact of participation in trade credit on income from rice. The substantial income increase suggests that farmers who received trade credit from agro input dealers earned significantly more from rice production compared to those who did not. The AIPW results suggest that agricultural trade credit can enhance income from rice farming. This finding supports the argument for policies that improve access to trade credit for farmers, especially if accompanied by training or support systems to ensure effective utilization of the credit.

Table 7: AIPW result for impact of participation in trade credit on income from Rice/hectare.

Outcome (Income from Rice N)		Standard Error	Prob.
ATE	62864.82***	0.95	0.00
POM	28321.3	0.52	0.00

Source: Field survey 2024

Discussion

The yield obtained for both categories of respondents is comparable to the average yield of about 1700 (1.7bags) kg per hectare for Rice in Kano. This result suggests that participation in agricultural trade credit is associated with higher rice yields per hectare (Beaman, *et al.*, 2021). Furthermore, the broader range in yield among participants could indicate that while agricultural trade credit with input vendors helps increase yields, the benefits might not be uniformly distributed among Rice farmers participating using trade credit from input vendors (Abdul-Rahaman and Abdulai, 2020). This difference could be essential for farmer profitability, possibly helping them reinvest in more productive practices and inputs. Participants in Agricultural Trade Credit experience a broad spectrum of income per hectare. However, without a valid a counterfactual, the higher income may be due to variability in yields, market access, or input efficiency (Gómez-Ramos and Lloret, 2019). Rice farmers that participate in trade credit with agro input vendors are very likely to obtain higher amount of credit for use in their farm operations. This agrees with a study by Adjei and Fosu (2021) on the impact of trade credit on smallholder farmers in Ghana finds that farmers who utilize trade credit are more likely to invest in productivity-enhancing inputs and have better access to financial resources, leading to improved farm performance. The

results also demonstrates that access to trade credit increases farmers' ability to purchase inputs and invest in technology, resulting in significant productivity gains (Bafekries *et al.*, 2023). According to Nur *et al.*, (2021) the fact that the ATE is insignificant while the POM is significant for yield of Rice suggests that trade credit might be more effective when targeted to certain groups of farmers, rather than all farmers generally. It may imply that farmers who already have certain characteristics such as access to resources, knowledge, or networks can benefit more from trade credit. Previous studies (Amaechina 2017); Ogundele *et al.*, 2019) also made similar observations across different states in Nigeria. However, the result suggests that participation in trade credit with agro input vendors is beneficial for increasing rice yield. It is important to note that trade credit alone may not be a silver bullet for increasing productivity across all farmers. More targeted and supportive interventions could enhance the benefits of credit with agro input marketers in the study area.

Research has shown that access to agricultural credit significantly enhances productivity and income levels among farmers. For instance, Okwu and Akintola (2023) demonstrated that improved access to agricultural credit directly correlates with increased rice yields and higher incomes. Furthermore, Akpan and Udo (2024) analysed various agricultural credit schemes and found that participation in these programs leads to improved financial outcomes for farmers, reinforcing the notion that agricultural trade credit is a vital input for enhancing income. Eze and Nwachukwu (2023) highlighted that agricultural credit not only boosts individual farmer incomes but also contributes to broader economic growth within the agricultural sector in Nigeria, which aligns with the findings from the AIPW analysis. This finding underscores the significance of agricultural trade credit in improving farmers' income from rice production in Nigeria.

Beyond financial resources, the effectiveness of agricultural trade credit is often enhanced when accompanied by access to information and support services. Studies by Ayegba and Ikani (2013) have shown that farmers who receive training in financial literacy and crop management, alongside credit, experience greater productivity gains. This is also supported by findings from Eze and Nwachukwu (2023), who emphasize the importance of education and advisory services in maximizing the benefits of agricultural credit.

Conclusion

Trade credit is an important tool for supporting agricultural production, especially for buying agrochemicals among rice farmers. The rice farmers participating in trade credit enjoy significantly greater access to credit, leading to higher income levels and enhanced productivity compared to their non-participant counterparts. This underscores the critical role of trade credit as a catalyst for agricultural growth, enabling farmers to invest in essential inputs and adopt innovative practices that can transform their operations. The findings suggest that not only does trade credit empower individual farmers economically, but it can also contribute to the overall sustainability and competitiveness of the agricultural sector in Nigeria. Additional insights on the impact of trade credit can be obtained using panel data. This study relied on cross sectional data which obviously cannot

provide adequate insights. Furthermore, future studies can focus on the heterogeneous impact of participation in trade credit.

Recommendations

- State governments should implement partnerships with input vendors to streamline credit processes. This could involve creating agreements that allow for the direct extension of credit based on the farmers' past performance or guarantees from the input vendors.
- The AIPW results suggest a correlation between credit access and increased income, to maximize these benefits, it is imperative that policymakers and agricultural stakeholders implement targeted strategies aimed at increasing participation in trade credit programs with input vendors.
- Since some non-participants have no access to credit at all, targeted outreach programs should be developed to engage these farmers. Providing education on the benefits of trade credit and how to apply could help increase participation rates, thus improving their access to financial resources.

Data Availability

The data for this study are from the first author's PhD thesis and cannot be shared.

Competing interests:

The authors have declared that no competing interests exist.

Ethical considerations

The authors complied with the Statement of Ethical Principles in survey research. The consent of all respondents was obtained prior to the survey.

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