

## **Impact of Microcredit on Agricultural Productivity and Food Security among Smallholder Farmers in Southeast Nigeria**

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### **Abstract**

*Smallholder farmers in Southeast Nigeria face persistent financial constraints that limit agricultural productivity and exacerbate food insecurity. This study evaluates the impact of microcredit on agricultural productivity and food security among smallholder farmers in Southeast Nigeria. Specifically, it assesses microcredit's effects on crop yields, farm income, and household food security. Employing a cross-sectional survey design, 360 households were sampled, comprising 180 microcredit beneficiaries (treated households) and 180 non-beneficiaries (comparison households), across Abia, Imo, and Anambra States. Households were identified using datasets provided by microfinance banks operating in the region, with propensity score matching applied to ensure comparability between the two groups. Data were collected on socioeconomic characteristics, crop yields, farm income, and food security metrics. Data obtained were analyzed using descriptive statistics, and inferential statistics such as Student's T-Test and the Foster, Greer, and Thorbecke (FGT) indices to capture the multidimensional effects of microcredit. Results indicated that microcredit access significantly enhances agricultural productivity, evidenced by higher crop yields and farm incomes among beneficiary households. Furthermore, treated households exhibited markedly lower food insecurity incidence, depth, and severity compared to their counterparts. The study concludes that microcredit enhances agricultural productivity and food security by bridging financial gaps, enabling investments in productivity-enhancing technologies, and fostering economic resilience. Scaling microcredit programs alongside targeted policies and capacity-building initiatives is recommended to maximize their impact on sustainable agricultural development.*

**Keywords:** Microcredit, Agricultural productivity, Food security, Smallholder farmers, Southeast Nigeria

### **1.0 Introduction**

Agriculture remains a cornerstone of Nigeria's economy, employing roughly 70% of the labour force and providing the bulk of the country's food supply (Ibebi, 2025). However, yields of major staple crops (such as rice, sorghum, cassava, and yam) are currently low in Nigeria, and most have been declining in recent years (Chiaka *et al.*, 2022). Smallholder farmers cultivate the majority of Nigeria's farmland and produce

around 80% of the nation's food, yet only about 4% have access to formal credit (Chiaka *et al.*, 2022). These credit constraints limit their ability to purchase inputs, adopt improved technologies, or expand their operations (Okon *et al.*, 2024). Such financing shortfalls have long hindered the sector's modernization and productivity (Ibebi, 2025). This situation is critical given Nigeria's persistent food insecurity: recent FAO estimates indicate that over 25 million Nigerians were food insecure even during the 2024 harvest season (FAO, 2024).

In Nigeria, microfinance banks (MFBs) have been established since 2007 to provide credit to low-income rural entrepreneurs, including smallholder farmers (Fadeyi *et al.*, 2021). Microcredit has been championed as a solution to rural credit shortages. By providing farmers with capital for seeds, fertilizers, and equipment, microcredit programs aim to alleviate poverty and boost agricultural output (Ibebi, 2025). Empirical evidence reports that digital microcredit significantly increased fish farm yields and farmers' incomes in Nigeria (Mukaila, 2024). These results suggest that when credit is effectively delivered, smallholder farmers can leverage microloans to enhance productivity and improve their livelihoods. However, reviews of Nigeria's microfinance banks caution that factors such as limited borrower awareness, high interest rates, and credit rationing can hamper smallholders' access to loans (Fadeyi *et al.*, 2021).

In Southeast Nigeria, where agriculture is largely smallholder and subsistence-oriented, farmers face particular challenges. Crops such as cassava, yam, and maize predominate, but production is often hampered by fragmented landholdings, reliance on rain-fed farming, and rising input costs. Recent surveys indicate that farmers in this region cite insecurity, climate change, and limited loan access as major constraints (Conable & Onwuka, 2024; Uche *et al.*, 2024; Damilola & Adesanya, 2022; Obisesan *et al.*, 2019). They report that these issues "hindered productivity and posed a threat to food security" in the South-East (Okojie, 2025). In some cases, farmers note that formal loans (e.g. from the Bank of Agriculture) are much harder to obtain in the South-East than in other regions (Okojie, 2025). Together, these factors suggest that improving financial inclusion, alongside investments in infrastructure and support services, is needed to bolster agricultural productivity and household food security in Nigeria (Okon, *et al.*, 2024).

Despite this potential, empirical research specifically addressing microcredit's impact in Southeast Nigeria remains scarce. Most existing studies on microfinance and agriculture have focused on national samples or other regions (Khan *et al.*, 2024; Mogbolu, 2024; Muhammad *et al.*, 2024; Mukaila, 2024), leaving the South-East under-studied. The South-East's socio-economic and agro-ecological conditions differ in important ways from other parts of Nigeria, so findings from those contexts may not generalize. Consequently, it is unclear whether microcredit effectively improves crop yields, farm income, and household food security among smallholders in Southeast Nigeria. Existing literature tends to examine either economic outcomes or technology adoption in isolation (Ogbonna *et al.*, 2023; Obiakor *et al.*, 2022; Nwachukwu *et al.*, 2020), without explicitly linking credit access to household nutrition or food security. Smallholders are central to the region's agricultural economy, so understanding how microcredit serves this group is crucial for achieving Nigeria's development objectives in agriculture and poverty reduction and ultimately guiding strategies toward sustainable development objectives, including poverty reduction and improved food security, in rural Nigeria. Therefore, addressing these gaps requires targeted investigation of microcredit's multidimensional effects among smallholder farmers in Southeast Nigeria.

The study specifically (a) evaluated the impact of microcredit on crop yields among smallholder rural farmers in the south east region of Nigeria; (b) analyzed the influence of microcredit on farm income as a measure of economic well-being for smallholder rural farmers in the south east region of Nigeria; (c) and assessed the contribution of microcredit to food security among rural farming households in the south east region of Nigeria. The following hypotheses were formulated for the study:

Ho<sub>1</sub>: Microcredit has no significant impact on the agricultural productivity of smallholder farmers in rural Nigeria in terms of their crop yields and farm income.

Ho<sub>2</sub>: Microcredit has significant impact on the food security of smallholder rural farmers in rural Nigeria

Microcredit is broadly defined as the provision of small, often collateral-free loans to low-income individuals or groups who are typically excluded from formal banking systems. In agriculture, microcredit is intended to ease financial constraints faced by smallholder farmers, enabling them to purchase inputs such as fertilisers, improved seeds, and farm equipment (Tria *et al.*, 2022; Imran *et al.*, 2023). Agricultural productivity, measured as output per unit input, is closely linked to access to capital and improved technologies. In rural economies where capital markets are imperfect or inaccessible, credit becomes essential to expand production and adopt innovations (Omowole *et al.*, 2024; Ukpe & Saidu, 2023). Food security, as defined by the FAO (2020), entails regular access to sufficient, safe, and nutritious food. In Nigeria, where agriculture sustains the livelihoods of the majority, smallholders play a central role in national food security (Ukpe & Saidu, 2023). However, the full benefits of microcredit are sometimes undermined by issues such as high default rates, poor financial literacy, and limited access to extension services (Babar *et al.*, 2024; Nakano & Magezi, 2020).

Empirical research has examined how microcredit influences agricultural productivity and household welfare. For instance, Awotide *et al.*, (2015) found that cassava farmers in Nigeria with credit access recorded significantly higher yields than non-borrowers. Similarly, Osabohien *et al.*, (2020) applied a propensity score matching (PSM) model and showed that agricultural credit beneficiaries achieved triple the yields of non-beneficiaries. Imran *et al.*, (2023) linked microcredit to improvements in energy efficiency and input use, while Rasheed *et al.* (2017) reported that microcredit improved wheat farm efficiency in Pakistan. In terms of household welfare, Adebayo (2012) assessed a UNDP microcredit scheme in Kaduna and found no significant effect on food security. This suggests that the success of microcredit depends heavily on implementation context. In contrast, Berhanu *et al.*, (2021) found positive impacts of microcredit on household food security in Southwest Ethiopia, as did Haque (2021) in Bangladesh, particularly among rural women. These mixed outcomes reflect regional and structural variations in credit systems, institutional support, and market conditions.

Although the literature is expanding, significant gaps remain, especially for Southeast Nigeria. Much of the existing research is based on national datasets or focused on other regions, such as the Southwest (e.g., Adewale *et al.*, 2022; Kehinde & Ogundej, 2022). These studies often concentrate on either productivity (yields or income) or welfare outcomes (such as food expenditure), but seldom explore both dimensions together. Moreover, they rarely apply multidimensional food security measures like the Foster-Greer-Thorbecke (FGT) indices, which account for incidence, depth, and severity of food insecurity. Consequently, these studies provide only a partial understanding of how microcredit affects rural livelihoods. In addition, they frequently overlook the spatial and institutional contexts that shape microcredit access and utilisation. For example, access to credit in Southeast Nigeria is shaped by factors including ethnic disparities in credit approval, limited financial infrastructure, and cultural barriers to group lending schemes (Okojie, 2025).

This study seeks to address these limitations by focusing explicitly on Southeast Nigeria and analysing both economic outcomes (crop yields and farm income) and welfare outcomes (food security) using a robust quasi-experimental approach. By applying propensity score matching to generate comparable treatment and control groups, the study isolates the effect of microcredit on beneficiary households. Furthermore, it applies the FGT indices to provide a nuanced understanding of food insecurity. This approach contributes to existing literature by incorporating multiple outcome dimensions, concentrating on an under-researched region, and generating policy-relevant insights. These contributions are particularly timely, given ongoing efforts in Nigeria to scale financial inclusion and revitalise the agricultural sector for sustainable development and food security.

## 2.0 Methodology

### 2.1 Study Area

This study was conducted in the Southeast agro-ecological zone of Nigeria, comprising Abia, Anambra, Ebonyi, Enugu, and Imo States. This region, located within the South-East rainforest zone, has a population of approximately 21.96 million, with Imo and Anambra States being the most populous and economically vibrant (NPC, 2017). The South-East zone is densely populated, with an average population density of 247 persons/km<sup>2</sup> compared to the national average of 96 persons/km<sup>2</sup> (NPC, 2017). The area experiences a tropical humid climate characterized by two distinct seasons-rainy and dry-and temperatures ranging from 18°C to 34°C. Credit institutions, including commercial banks, microfinance banks, cooperatives, the Bank of Agriculture, and the Bank of Industry, provide financial services to farmers in this region.

### 2.2 Sampling Technique and Sample Size

A multistage sampling technique was employed. In the first stage, three states were purposively selected, Abia, Imo, and Anambra, based on the prevalence of microfinance institutions and the concentration of smallholder farming households. The second stage involved the random selection of two Local Government Areas (LGAs) from each state. In the third stage, three farming communities were randomly selected from each LGA, resulting in a total of 18 communities. In the final stage, a list of 607 microcredit beneficiary households was obtained from three microfinance banks (MFBs) operating in the study area.

To determine the required sample size, first, Cochran's formula for finite populations was applied. Using a confidence level of 95% ( $Z = 1.96$ ), a margin error of 5% ( $e = 0.05$ ), and a population proportion ( $p$ ) of 0.5 for maximum variability, the ideal sample size for an infinite population was calculated as:

$$n_0 = \frac{Z^2 \times p \times (1-p)}{e^2} = \frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.05)^2} = 384.16 \quad \text{.....Equation 2.1}$$

This was then adjusted for the finite population of 607 using:

$$n = \frac{n_0}{1 + \frac{n_0-1}{N}} = \frac{384.16}{1 + \frac{384.16-1}{607}} \approx 236 \quad \text{.....Equation 2.2}$$

Thus, a minimum sample size of approximately 236 microcredit households would have been ideal. However, due to financial and logistical constraints, a practical sample size of 180 microcredit beneficiary households was selected using stratified random sampling with proportional representation across the 18 communities. Although slightly below the statistical optimum, this sample was considered adequate for robust analysis, especially with the application of bias-reducing methods.

To establish a comparison group, 180 non-beneficiary farming households were also randomly selected from the same communities. This allowed for geographic, social, and economic comparability between the two groups, enabling a quasi-experimental evaluation of microcredit impacts.

Secondly, to ensure the study was sufficiently powered to detect differences between groups, a statistical power analysis was conducted. Assuming a moderate effect size (Cohen's  $d = 0.5$ ), a significance level of 0.05, and 80% statistical power, the minimum required sample size was determined to be 64 households per group, or 128 in total, based on a two-sample T-test. The actual sample size of 180 per group therefore

exceeds this minimum requirement, indicating that the study is adequately powered to detect statistically meaningful differences in key outcomes such as crop yield, income, and food security.

To address potential selection bias, Propensity Score Matching (PSM) was applied. Propensity scores were estimated using a binary response model based on observable covariates such as age, gender, educational attainment, household size, farm size, extension contact, and cooperative membership. Each microcredit beneficiary was matched with a non-beneficiary household using nearest-neighbour matching with a caliper of 0.05. This approach ensured covariate balance between the groups and improved the validity of the estimated impact of microcredit on outcome variables. Post-matching comparisons were made by calculating the Average Treatment Effect on the Treated (ATT), which represents the mean difference in outcomes between matched beneficiary and non-beneficiary households. These covariates were not included in the final outcome comparisons, as the matching process ensured balance on them prior to ATT estimation.

### 2.3 Method of Data Collection

Primary data were collected through structured questionnaires administered by trained enumerators. The questionnaire captured information on household demographics, farm characteristics, credit access, income sources, crop yields, and food security indicators.

Descriptive statistics (means, frequencies, standard deviations) were used to summarise household characteristics. To assess the impact of microcredit, inferential statistics were employed. Student's t-tests were used to test for statistically significant differences in crop yields, farm incomes, and food security indicators between beneficiary and non-beneficiary households.

The T-test is specified thus:

$$t = \frac{\bar{X}_1 + \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \dots \dots \dots \text{Equation 2.3}$$

$\bar{X}_1$  = mean of beneficiaries

$\bar{X}_2$  = mean of non-beneficiaries

$s^2$  = variance

$n$  = sample size

To measure food security, the study adopted the Foster–Greer–Thorbecke (FGT) poverty index framework. This multidimensional measure enables analysis of the incidence (headcount ratio), depth (poverty gap), and severity of food insecurity.

The FGT index is computed as:

$$F_x = \frac{1}{N} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right)^x \dots \dots \dots \text{Equation 2.4}$$

Where:

$N$  = total number of households surveyed,

$q$  = number of food-insecure households (i.e. households where  $y_i < zy_i < zy_i < z$ ),

$y_i$  = per capita food expenditure of household  $i$ ,

$z$  = food insecurity line,

$\alpha$  = sensitivity parameter (0 = incidence, 1 = depth, 2 = severity).

Food security was operationalised using the Mean Per Capita Household Expenditure (MPCHE) on food. The food insecurity line was set at two-thirds of the 75th percentile of MPCHE across the sample, following FAO guidelines and recent applications in Nigerian food security studies.

The values of  $y_i$  and  $z$  were derived from monthly food expenditure data reported by households, adjusted for household size using adult equivalence scales. Households falling below the food insecurity line were categorised as food insecure.

To estimate aggregate crop productivity across multiple food groups, standardised conversion factors were applied to translate physical yields into grain-equivalent units. These internationally accepted factors, adopted from Ojo (1991) and recognised by the Federal Ministry of Agriculture, are as follows: cereals were multiplied by 0.96, grain legumes by 1.06, roots and tubers by 0.26, vegetables and fruits by 0.08, and livestock and fish by 0.46. These conversion factors allowed the computation of a consistent measure of agricultural output across diverse crop types.

All statistical analyses were performed using STATA 15 at a 5% significance level.

### 3.0 Results and Discussion

#### 3.1 Socioeconomic Profile of Treated (Beneficiaries) and Comparison (Non-beneficiaries) Households in Southeast Nigeria

The summary statistics of the socioeconomic characteristics of treated households (microcredit beneficiaries) and comparison households (non-beneficiaries) in Southeast Nigeria are presented in Tables 3.1 and 3.2.

##### 3.1.1 Socioeconomic Profile of Treated Households (Beneficiaries) in Southeast Nigeria

The summary statistics of the socioeconomic characteristics of treated households (microcredit beneficiaries) in Southeast Nigeria are presented in Table 3.1. In Abia, Imo, and Anambra states, the average ages of microcredit beneficiaries were 45.6 years, 46.8 years, and 44.2 years, respectively, with a pooled average of 45.5 years. This indicates that smallholder farmers in the region are predominantly middle-aged. This demographic suggests a balance between youthful vigour and seasoned experience, which is advantageous for adopting innovative farming techniques. Individuals in this age bracket are often open to integrating new methodologies that enhance productivity. Majorities (66.7% in Abia state, 55.0% in Imo State, 63.3% in Anambra State, and 61.7% for the pooled average) of the microcredit beneficiaries are married. This highlights the significance of family structures in agricultural ventures. Marital partnerships contribute to labour availability and shared decision-making, thereby strengthening farm operations and ensuring sustainability. This finding aligns with Egbetokun and Siyanbola (2021), who emphasized the importance of marital status in resource access, farming efficiency, and the adoption of innovative agricultural practices. The average years of education among beneficiaries were 14.2, 15.3, and 14.8 years in Abia, Imo, and Anambra, respectively, with a pooled average of 14.8 years. This is equivalent to possession of post-secondary education qualification. This educational attainment equips farmers with the cognitive skills required to comprehend and implement advanced agricultural practices,

efficiently manage farm records, and navigate complex market dynamics. Empirical evidence indicates that higher education levels among farmers positively correlate with increased productivity and income. Similar conclusions were drawn by Adepoju and Obayelu (2020), Adebayo and Owolabi (2022), and Abdulraheem and Oladipo (2022), who found that education significantly enhances the adoption of improved agricultural practices and climate-smart agriculture, thereby underscoring its pivotal role in promoting productivity and innovation.

**Table 3.1 Summary statistics of the socioeconomic characteristics of treated households (beneficiaries of microcredit) in Southeast Nigeria**

Variable	Abia State (n = 60)	Imo State (n = 60)	Anambra State (n = 60)	Pooled (n = 180)
Mean age (years)	45.6	46.8	44.2	45.5
Marital status (%)				
i. Married	66.7	55.0	63.3	61.7
ii. Unmarried	33.3	45.0	36.7	38.3
Mean years of schooling	14.2	15.3	14.8	14.8
Sex (%)				
i. Female	60.0	65.0	63.3	62.8
ii. Male	40.0	35.0	36.7	37.2
Mean household size (Count)	6.9	5.8	5.5	6.1
Mean farm size (Hectares)	0.87	0.95	0.73	0.85
Mean farming experience (Years)	15.4	16.2	14.8	15.5
Mean annual income (₦)	380,000	350,000	341,000	323,333
Mean distance to microcredit bank (km)	6.2	5.8	6.5	6.2
Type of labour utilized (%)				
i. Family labour	26.7	24.4	29.2	26.8
ii. Hired labour	27.8	32.8	21.4	27.3
iii. Both family and hired labour	45.5	42.8	49.4	45.9
Extension contacts (%)				
i. Yes	86.7	81.7	83.3	83.9
ii No	13.3	18.3	16.7	16.1
Cooperatives membership (%)				
i. Yes	73.3	76.7	55.0	68.3
ii No	26.7	23.3	45.0	31.7

**Source: Field Survey Data, 2024.**

The sex composition of the beneficiaries reveals that female beneficiaries constituted 60.0%, 65.0%, and 63.3% of the sampled population in Abia, Imo, and Anambra states, respectively, with a pooled average of 62.8%. This female predominance underscores the critical role women play in the agricultural sector of Abia State. Women are integral to farming activities, particularly in subsistence agriculture and value addition processes. This finding mirrors a broader national trend, emphasizing the need for intentional support and recognition of women's contributions to enhance agricultural output and foster state development. The average household sizes were seven members each in Abia and Imo states and six members in Anambra state, with a pooled average of seven members. This reflects the prevalence of large households among farming communities, which can be advantageous as they provide a readily available labour force for various agricultural tasks. However, larger household sizes also necessitate higher food production to meet consumption demands, influencing decisions regarding crop selection and farm

intensification strategies. The mean farm sizes were 0.87 hectares in Abia, 0.95 hectares in Imo, and 0.73 hectares in Anambra, with a pooled average of 0.85 hectares. This indicates the dominance of smallholder farming systems in Southeast Nigeria, where most farmers cultivate less than one hectare of land. This trend may result from land fragmentation due to population pressures. While small farm sizes constrain large-scale production, they encourage crop diversification to maximize output per unit area. This finding aligns with Oladejo *et al.* (2019), who noted that smallholder farming is prevalent among Nigerian farming households. On average, microcredit beneficiaries had 15.4, 16.2, and 14.8 years of farming experience in Abia, Imo, and Anambra states, respectively, with a pooled average farming experience of 15.5 years. This extensive experience signifies a deep reservoir of practical knowledge and resilience. Extensive farming experience is invaluable for effective farm management, adaptation to environmental changes, and mentoring younger farmers, ensuring the continuity and evolution of agricultural practices. These findings are consistent with Adzawla *et al.* (2023) and Olayide *et al.* (2022), who observed that experienced farmers possess profound knowledge of traditional practices and can better predict crop productivity under varying conditions.

The average annual incomes of microcredit beneficiaries were ₦380,000 in Abia, ₦350,000 in Imo, and ₦341,000 in Anambra, with a pooled average annual income of ₦357,000. This reflects a relatively high-income level that provides a robust economic base for agricultural development. Understanding income levels is crucial for designing interventions aimed at improving rural livelihoods. This aligns with studies by Lawal *et al.* (2020), Mohammed *et al.* (2022), and Yusuf *et al.* (2021), which demonstrate that financial interventions enable farmers to invest in farming inputs, thereby enhancing productivity and income levels. The average distances to microcredit banks were 6.2 km, 5.8 km, and 6.5 km for Abia, Imo, and Anambra states, respectively, with a pooled average of 6.2 km. Proximity to financial institutions is essential for farmers, as it facilitates access to credit, enabling investments in quality inputs, adoption of new technologies, and production expansion. Furthermore, shorter distances allow banks to monitor how farmers utilize credit facilities for productive investments, ultimately enhancing agricultural outcomes.

Regarding labour utilization, the data reveals diverse labour sources among beneficiaries. Approximately 45.5%, 42.8%, and 49.4% combined both family and hired labour, with a pooled average of 45.9%. This represents a balanced approach that maximizes labour efficiency and productivity. A combined family and hired labour, represents a balanced approach that maximizes labour efficiency and productivity. These findings align with Adeyemo and Akintola (2019), who highlighted the benefits of combining labour sources in enhancing farm output and addressing labour shortages during peak farming periods. In terms of extension contacts, 86.7%, 81.7% and 83.3% of microcredit beneficiaries in Abia State, Imo State, and Anambra State reported interactions with agricultural extension services. Overall, 83.9% of the entire sampled population of microcredit beneficiary households in southeast Nigeria had contact with extension workers. These services play a crucial role in disseminating knowledge, skills, and innovative farming practices, thereby improving productivity. Oladele (2018) underscored the importance of extension services in equipping smallholder farmers with information and resources critical to agricultural development.

Finally, cooperative membership is prevalent among beneficiaries, with 73.3% in Abia State, 76.7% in Imo State, 55.0% in Anambra State actively participating in cooperatives. Overall, 68.3% of the respondents in southeast Nigeria are member to one form of cooperative or another. Cooperatives serve as vital platforms for accessing credit, input supplies, and shared knowledge. They also strengthen collective bargaining power, enabling farmers to negotiate better prices for their produce and secure favourable terms for agricultural inputs. This finding aligns with Ezech *et al.* (2023), who highlighted the transformative role of cooperatives in empowering farmers through resource pooling and advocating for better agricultural policies.

### 3.1.2 Socioeconomic profile of comparison households (non-beneficiaries) in Southeast Nigeria

The socioeconomic characteristics of the comparison households (non-beneficiaries) in Southeast Nigeria are detailed in Table 3.2.

**Table 3.2: Summary statistics of the socioeconomic characteristics of comparison households (non-beneficiaries of microcredit) in Southeast Nigeria**

Variable	Abia State (n = 60)	Imo State (n = 60)	Anambra State (n = 60)	Pooled (n = 180)
Mean age (years)	48.3	47.5	46.1	47.3
Marital status (%)				
i. Married	60.0	65.0	56.7	60.6
ii. Unmarried	40.0	35.0	43.3	39.4
Mean years of schooling	13.9	14.1	14.7	9.5
Sex (%)				
i. Female	55.0	61.7	56.7	57.8
ii. Male	45.0	38.3	43.3	42.2
Mean household size (Count)	5.5	5.3	5.7	5.5
Mean farm size (Hectares)	1.52	1.61	1.43	1.52
Mean farming experience (Years)	13.5	14.0	13.2	13.6
Mean annual income (₦)	240,100	220,200	230,900	230,400
Mean distance to microcredit bank (km)	6.4	5.7	6.8	6.3
Type of labour utilized (%)				
i. Family	25.5	26.1	21.7	24.4
ii. Hired	22.9	29.3	19.2	23.8
iii. Both family and hired	51.6	44.6	59.1	51.8
Extension contacts (%)				
i. Yes	40.0	33.3	25.0	32.8
ii No	60.0	66.7	75.0	67.2
Cooperatives membership (%)				
i. Yes	16.7	45.0	35.0	32.2
ii No	83.3	55.0	65.0	67.8

**Source: Field Survey Data, 2024.**

In Abia, Imo, and Anambra states, the average ages of non-beneficiaries of microcredit were 48.3 years, 47.5 years, and 46.1 years, respectively, with a pooled average of 47.3 years. This demographic indicates that smallholder farmers in the region are predominantly middle-aged, suggesting a wealth of farming experience but potentially lower adaptability to innovative agricultural technologies compared to younger cohorts. Middle-aged farmers often balance traditional practices with moderate openness to new techniques, a crucial factor in enhancing agricultural productivity.

Regarding marital status, majorities (60.0% in Abia, 65.0% in Imo, 56.7% in Anambra, and 60.6% for the pooled sample) of the non-beneficiaries are married. Marital status is a significant determinant of farm labour availability and household decision-making. Married individuals often have access to family labour, which can reduce costs and enhance the efficiency of farm operations. This aligns with findings by Egbetokun and Siyanbola (2021), who emphasized the role of marital status in resource allocation and adoption of innovative farming practices.

The average years of schooling for non-beneficiaries were 13.9 years in Abia, 14.1 years in Imo, and 14.7 years in Anambra, with a pooled average of 9.5 years. While these figures reflect a relatively educated farming population, lower pooled averages highlight disparities in educational attainment across regions. Education equips farmers with cognitive and managerial skills necessary for adopting improved farming methods and understanding market dynamics. Studies by Adepoju and Obayelu (2020), and Abdulraheem and Oladipo (2022) corroborate that education significantly enhances agricultural productivity by fostering the adoption of advanced farming techniques.

The sex composition of the non-beneficiaries shows that females constituted 55.0% in Abia, 61.7% in Imo, and 56.7% in Anambra, with a pooled average of 57.8%. This demonstrates the essential role women play in agricultural activities, particularly in subsistence farming and processing. Supporting women in agriculture through training and credit access could significantly boost productivity. These findings resonate with national trends, underscoring the critical contribution of women to the agricultural sector.

The average household sizes were 5.5 members in Abia, 5.3 in Imo, and 5.7 in Anambra, with a pooled average of 5.5 members. This reflects smaller household sizes compared to microcredit beneficiaries, which may influence labour availability. Smaller households might face labour shortages, necessitating reliance on hired labour, thus increasing operational costs. Farm sizes among non-beneficiaries were notably larger than those of beneficiaries, with means of 1.52 hectares in Abia, 1.61 hectares in Imo, and 1.43 hectares in Anambra, and a pooled average of 1.52 hectares. Larger farms provide an opportunity for more significant production output but may also require more substantial investment in inputs and labour. This finding contrasts with the smaller farm sizes observed among beneficiaries, possibly indicating a need for credit to optimize larger farm operations.

The farming experience of non-beneficiaries averaged 13.5 years in Abia, 14.0 years in Imo, and 13.2 years in Anambra, with a pooled average of 13.6 years. While this experience suggests familiarity with traditional farming practices, the absence of credit support may hinder their ability to transition to more innovative techniques. These findings align with Adzawla *et al.* (2023) and Olayideet *al.* (2022), who noted that experienced farmers possess valuable knowledge but require external support to enhance productivity. Average annual incomes were lower for non-beneficiaries, with ₦240,100 in Abia, ₦220,200 in Imo, ₦230,900 in Anambra, and a pooled average of ₦230,400. These figures underscore the role of microcredit in boosting household incomes and economic stability. Financial limitations among non-beneficiaries may restrict their ability to invest in inputs and technology, further perpetuating low productivity. Distances to microcredit banks were relatively consistent across states, with averages of 6.4 km in Abia, 5.7 km in Imo, and 6.8 km in Anambra, and a pooled average of 6.3 km. While proximity facilitates access to financial services, non-beneficiaries may face additional barriers such as lack of collateral or awareness, limiting their ability to utilize credit facilities. Labour utilization patterns reveal that 51.6% of non-beneficiaries in Abia, 44.6% in Imo, and 59.1% in Anambra combined both family and hired labour, with a pooled average of 51.8%. This balanced approach suggests efforts to maximize labour efficiency despite financial constraints. These findings align with Adeyemo and Akintola (2019), who emphasized the productivity benefits of combined labour sources. In terms of extension contacts, the percentages of non-beneficiaries with access to extension services were strikingly low-40.0% in Abia, 33.3% in Imo, and 25.0% in Anambra, with a pooled average of 32.8%, which is similar to the 30.74% that was observed in Antia-Obong, *et al* (2021) This underscores a significant gap in access to critical agricultural knowledge and support, which could hinder productivity. Extension services play a pivotal role in technology transfer and skill development, as highlighted by Oladele (2018). Finally, cooperative membership was also low among non-beneficiaries, with 16.7% in Abia, 45.0% in Imo, and 35.0% in Anambra, with a pooled average of 32.2%. This limited participation in cooperatives may further restrict access to credit, inputs, and collective bargaining benefits. Strengthening cooperative systems could provide a pathway for improving the livelihoods of non-beneficiary farmers, as emphasized by Ezech *et al.* (2023).

### 3.1.3 Crop Yields of Treated and Comparison Households in southeast Nigeria

Table 3.3 presents the crop yields for both microcredit beneficiary households (treated group) and non-beneficiary households (comparison group) in southeast Nigeria.

**Table 3.3: Crop yields of microcredit beneficiary households (treated group) and non-beneficiary households (comparison group) in southeast Nigeria**

Crop	Treated Households (kg/ha)	Comparison Households (kg/ha)	Difference (kg/ha)	t-value	p-value
Cassava	5432.31	4414.75	1017.57	6.585***	0.000
Maize	5779.65	4613.38	1166.27	7.436***	0.000
Melon	5938.24	4113.82	1824.42	11.606***	0.000
Rice	5558.97	4775.43	783.55	4.821***	0.000
Cocoyam	5716.28	4717.29	998.99	6.127***	0.000
Vegetables	5413.94	4216.70	1197.25	7.332***	0.000
Yam	5887.04	4463.40	1423.65	9.391***	0.000
Beans	5625.88	4146.00	1479.89	9.598***	0.000
Plantain	5823.33	4310.08	1513.25	9.691***	0.000
Banana	5550.43	4088.14	1462.29	9.356***	0.000
Cowpea (Akidi)	5470.59	4215.66	1254.93	8.205***	0.000
Cucumber	5877.80	4140.20	1737.60	11.331***	0.000
Potatoes	5481.88	4303.10	1178.78	7.525***	0.000
Soup thickener (Ofor and Ukpo)	5423.47	5076.44	347.03	2.208**	0.028
Aggregate yield (grain-equivalent)	2609.93	2112.91	497.02	3.764***	0.002

**Source: Field Survey Data, 2024**

Note: \*\*\* and \*\* represents 1% and 5% levels of significance

The crop yields of treated households (microcredit beneficiaries) and comparison households (non-beneficiaries) in southeast Nigeria, as presented in Table 3.3, reveal significant differences in productivity across various crops. Treated households consistently achieved higher yields compared to their counterparts, with all differences statistically significant at either the 1% or 5% levels. For cassava, treated households produced 5432.31 kg/ha, exceeding the 4414.75 kg/ha recorded by comparison households. It exceeded by 1017.57 kg/ha ( $t = 6.585$ ,  $p < 0.01$ ). Similarly, maize yields were 5779.65 kg/ha for treated households versus 4613.38 kg/ha for comparison households, with a difference of 1166.27 kg/ha ( $t = 7.436$ ,  $p < 0.01$ ). Substantial yield gaps were also observed for melon (1824.42 kg/ha), yam (1423.65 kg/ha), beans (1479.89 kg/ha), plantain (1513.25 kg/ha), and banana (1462.29 kg/ha), with all differences highly significant ( $p < 0.01$ ). Crops such as cocoyam, vegetables, cowpea, cucumber, and potatoes also exhibited significant yield advantages for treated households, with yield differences ranging from 998.99 kg/ha to 1737.60 kg/ha. Notably, even for crops like soup thickeners (Ofor and Ukpo), where the yield difference was smaller at 347.03 kg/ha, the impact of microcredit remained significant at the 5% level ( $t = 2.208$ ,  $p = 0.028$ ). The aggregate grain-equivalent yield further underscores the productivity advantage of treated households, which achieved 2609.93 kg/ha compared to 2112.91 kg/ha for comparison households, resulting in a significant difference of 497.02 kg/ha ( $t = 3.764$ ,  $p = 0.002$ ). This outcome suggests that credit access may be **associated** with higher yield performance among sampled smallholder farmers. The observed yield difference could be influenced by credit-facilitated acquisition of

farm inputs or services. This productivity boost indicates the potential of microcredit as a tool for improving crop yields among smallholder rural farmers in the southeast region of Nigeria. This finding aligns with Samson & Obademi, (2018) who noted that access to microfinance bank credit positively impacts crop yields in Nigeria among beneficiaries compared to non-beneficiaries.

### 3.1.4 Average Farm Income per Farmer for Microcredit Beneficiary and Non-beneficiary Households in Southeast Nigeria

Table 3.4 presents the average farm income per farmer for both microcredit beneficiary households (treated group) and non-beneficiary households (comparison group) in southeast Nigeria as well as the t-test result of the comparison between them. Table 3.4 reveals the significant role of microcredit in enhancing the farm income of households in Southeast Nigeria, as evidenced by the comparative analysis between treated (microcredit beneficiaries) and comparison (non-beneficiaries) households across various income sources. The aggregate farm income per farmer for treated households (₦419,562.99) is substantially higher than that of comparison households (₦306,716.21), with a difference of ₦112,846.78, demonstrating statistical significance at a 1% level ( $p < 0.001$ ). This finding highlights the transformative impact of microcredit in bridging financial gaps, enabling farmers to invest in improved inputs, adopt modern technologies, and optimize productivity, as supported by studies like Ahmed *et al.*, (2021) and Ezech *et al.*, (2023). In the category of root and tuber crops, treated households earned significantly higher income across all products. For instance, cassava income for microcredit beneficiaries averaged ₦35,393.41 compared to ₦26,043.19 for non-beneficiaries, with a significant difference of ₦9,350.23 ( $p < 0.001$ ). Similarly, yam production yielded ₦41,923.57 for treated households, surpassing the ₦30,248.69 of comparison households, indicating a positive influence of microcredit in addressing capital-intensive crop cultivation. These results align with Ogbonna *et al.* (2023), who emphasized that access to credit enhances farmers' ability to scale up production in capital-demanding enterprises.

The same trend is evident in cereal crops, where microcredit beneficiaries earned significantly higher income from maize (₦30,042.63 vs. ₦21,551.63) and rice (₦47,522.14 vs. ₦34,940.01). The income differences of ₦8,490.99 and ₦12,582.13, respectively, underscore the pivotal role of credit in facilitating timely planting, quality seed acquisition, and irrigation investments. Such findings resonate with Ajah *et al.*, (2018), who demonstrated that credit access correlates strongly with increased cereal productivity and income. For leguminous crops, beneficiaries outperformed non-beneficiaries in income derived from beans, cowpea, and soup thickeners (e.g., *ofor* and *ukpo*). The aggregate sub-total income from leguminous crops for treated households was ₦80,684.77, significantly higher than the ₦58,059.75 for comparison households, with a difference of ₦22,625.02. These outcomes suggest that microcredit empowers farmers to diversify their crop portfolio and invest in value-added production practices, as corroborated by Obiakor *et al.*, (2022).

A similar income advantage for beneficiaries is observed in vegetable and fruit crops. Treated households recorded ₦66,862.92 from vegetables and ₦63,149.39 from fruit crops, compared to ₦49,917.34 and ₦44,661.14, respectively, for non-beneficiaries. The significant differences in income highlight the importance of credit in supporting agriculture, where high-quality seeds, pest control measures, and efficient market access are critical. This aligns with Odoemenam and Olufemi's (2019) findings that microcredit fosters investment in high-value crop production. Other farm income sources, such as firewood sales and crop residue sales, also demonstrated significant differences, albeit lower than crop-related income. This result suggests that microcredit recipients were likely able to expand the scale of their operations or engage in more profitable agricultural activities. With credit, farmers may have purchased better inputs, hired labour, or diversified into high-value crops, all of which can increase income-generating potential. These results are consistent with the theoretical framework of financial inclusion and empirical evidence from studies as Okoro *et al.*, 2022; and Onwuka *et al.*, 2021. Osabohien

*et al.* (2020) also established that microcredit was linked to improved farm returns, especially when combined with extension services.

**Table 3.4 Average farm income per farmer for treated and comparison households (₦/Year)**

Income Source	Treated Households (₦)	Comparison Households (₦)	Difference (₦)	t-value	p-value	Remark
<b>1. Root and Tuber Crops</b>						
Cassava	35,393.41	26,043.19	9,350.23	26.218	0.000	S***
Cocoyam	15,669.22	11,170.61	4,498.61	32.864	0.000	S***
Yam	41,923.57	30,248.69	11,674.88	31.936	0.000	S***
Potatoes	22,731.10	17,330.92	5,400.18	24.901	0.000	S***
Sub-Total	115,717.30	84,793.41	30,923.89	54.415	0.000	S***
<b>2. Cereal Crops</b>						
Maize	30,042.63	21,551.63	8,490.99	30.485	0.000	S***
Rice	47,522.14	34,940.01	12,582.13	27.403	0.000	S***
Sub-Total	77,564.76	56,491.64	21,073.12	39.379	0.000	S***
<b>3. Leguminous Crops</b>						
Beans	20,625.08	14,705.83	5,919.25	30.841	0.000	S***
Cowpea	23,868.50	18,502.99	5,365.51	23.292	0.000	S***
Soup thickener (ofor and ukpo)	36,191.19	24,850.93	11,340.26	32.684	0.000	S***
Sub-Total	80,684.77	58,059.75	22,625.02	50.447	0.000	S***
<b>4. Vegetable Crops</b>						
Cucumber	21,931.15	17,117.91	4,813.24	23.352	0.000	S***
Melon	24,821.05	17,872.41	6,948.65	29.164	0.000	S***
Vegetables	20,110.71	14,927.02	5,183.69	27.658	0.000	S***
Sub-Total	66,862.92	49,917.34	16,945.57	45.079	0.000	S***
<b>5. Fruit Crops</b>						
Plantain	35,309.06	24,687.06	10,622.01	33.228	0.000	S***
Banana	27,840.33	19,974.08	7,866.25	29.121	0.000	S***
Sub-Total	63,149.39	44,661.14	18,488.25	42.025	0.000	S***
<b>Other Farm Income</b>						
Firewood Sales	8,052.54	6,021.42	2,031.12	26.750	0.000	S***
Selling Crop Residues	7,531.31	6,771.52	759.80	10.003	0.000	S***
Sub-Total	15,583.85	12,792.93	2,790.92	25.683	0.000	S***
<b>Aggregate Farm Income</b>	<b>419,562.99</b>	<b>306,716.21</b>	<b>112,846.78</b>	<b>107.851</b>	<b>0.000</b>	<b>S***</b>

**Source: Field Survey Data, 2024.**

Note: \*\*\* represents 1% level of significance. S = significant.

### 3.1.5 Food Security Status of Treated and Comparison Households in southeast Nigeria

Table 3.5 presents the comparative food security status of treated households (microcredit beneficiaries) and comparison households (non-beneficiaries) in southeast Nigeria as well as the t-test result of the comparison between them.

**Table 3.5 Food security status of treated and comparison households in southeast Nigeria**

Parameters	Treated Households	Comparison Households	Difference	t-ratio	P-value
Frequency of food secure	112 (62.2%)	82 (45.6%)	30	6.01**	0.000
Frequency of food insecure	68 (37.8%)	98 (54.4%)	-30	-5.89**	0.000
MPCHE(₦)	95,959.34	69,937.56	26,021.78	5.28**	0.000
Food insecurity line (₦)	63972.89	46625.04	17,347.85	5.78**	0.000
Food insecurity Incidence	0.3778	0.5444	-0.17	-3.49**	0.008
Food insecurity Depth	-0.1889	-0.4986	0.31	6.24**	0.000
Food insecurity Severity	0.0944	0.2486	-0.15	-3.66**	0.003

**Source: Field Survey Data, 2024.**

MPCHE = Mean Per Capita Household Expenditure. \*\* = 1% level of significance.

The findings indicate substantial differences between the two groups across all parameters examined, suggesting that access to microcredit significantly enhances food security outcomes. These differences are statistically significant at the 1% level ( $p < 0.01$ ). The frequency of food-secure households is notably higher among the treated group, with 62.2% (112 households) being food secure compared to 45.6% (82 households) in the comparison group. The observed difference of 30 households is statistically significant ( $t = 6.01$ ,  $p = 0.000$ ). Access to financial resources, particularly microcredit, has been shown to significantly enhance food security by enabling households to invest in income-generating activities and improve their food acquisition capabilities. This finding aligns with Obadimu *et al.*, (2023) and Berhanu *et al.* (2021), who noted that access to financial resources, such as microcredit, enables households to invest in income-generating activities and purchase adequate food, thereby enhancing food security. Conversely, the frequency of food-insecure households is significantly lower in the treated group (37.8%) than in the comparison group (54.4%), with a difference of 30 households ( $t = -5.89$ ,  $p = 0.000$ ). This result implies that microcredit could play a vital role in mitigating food insecurity, corroborating the findings of Ogbonna & Kaine (2023), Adamou & Zenabou, (2024), and Ilesanmi *et al.* (2024), who demonstrated that microcredit access reduces the vulnerability of households to food shortages by increasing their purchasing power. The mean per capita household expenditure (MPCHE) further highlights the economic advantage conferred by microcredit. Treated households have a significantly higher MPCHE of ₦95,959.34 compared to ₦69,937.56 in the comparison group, with a difference of ₦26,021.78 ( $t = 5.28$ ,  $p = 0.000$ ). This reflects the ability of microcredit to enhance household income and expenditure levels, as noted by Jettah *et al.* (2024) and Ayeni *et al.* (2024), who found that increased household income positively impacts dietary diversity and overall food security. The food insecurity line, representing the minimum expenditure required to meet basic food needs, is significantly higher among treated households (₦63,972.89) than the comparison group (₦46,625.04), with a difference of ₦17,347.85 ( $t = 5.78$ ,  $p = 0.000$ ). This disparity suggests that microcredit beneficiaries may have better access to resources that enable them to meet and surpass the threshold for food security. This observation aligns with the work of Ilesanmi *et al.*, (2024), who highlighted the role of credit in improving access to quality food and mitigating the effects of poverty on food security. Food insecurity incidence, depth, and severity further emphasize the improved food security outcomes among treated households. The incidence of food insecurity is significantly lower in the treated group (0.3778) compared to the comparison group (0.5444), with a difference of -0.17 ( $t = -3.49$ ,  $p = 0.008$ ). This indicates that fewer households in the treated group fall below the food insecurity line. This is consistent with findings by Olarinre *et al.* (2024) and Ilesanmi *et al.*, (2024), who reported that microcredit programs reduce the prevalence of food insecurity in rural communities. The depth and severity of food insecurity are also significantly reduced among treated households. Microcredit interventions have been empirically shown

to reduce food insecurity prevalence and alleviate its intensity among affected households. Various studies highlight the positive impacts of microcredit on food security through increased income and improved access to resources, which ultimately enhance household food consumption. The food insecurity depth, representing the average shortfall from the food insecurity line, is -0.1889 for treated households compared to -0.4986 for the comparison group, with a difference of 0.31 ( $t = 6.24$ ,  $p = 0.000$ ). Similarly, the severity of food insecurity, which places greater weight on households far below the food insecurity line, is 0.0944 for treated households and 0.2486 for the comparison group, with a difference of -0.15 ( $t = -3.66$ ,  $p = 0.003$ ). These findings align with Olarinre *et al.*, (2024) and Boltana *et al.*, (2023), who emphasized that microcredit interventions not only reduce the prevalence of food insecurity but also alleviate its intensity among affected households.

### 3.2 Propensity Score Matching (PSM) Analysis

Table 3.6 presents the matched group means and the estimated Average Treatment Effect on the Treated (ATT) for each outcome.

**Table 3.6 PSM results for outcome variables**

Outcome	Beneficiaries	Non-beneficiaries	ATT
Crop Yield (kg/ha)	2,580	2,120	460
Farm Income (₦/month)	68,500	54,500	14,000
Food Security Index (FGT $\alpha=0$ )	0.26	0.39	-0.13

**Source: Field Survey Data, 2024**

The results indicate that access to microcredit had a positive and significant impact on crop productivity and household income. Beneficiaries recorded an average yield increase of 460 kg/ha compared to non-beneficiaries. Likewise, farm income was ₦14,000 higher per month among beneficiaries, suggesting that access to microcredit enabled farmers to invest in inputs and expand production.

In terms of food security, the incidence of food insecurity (measured by the FGT headcount index,  $\alpha = 0$ ) was 13 percentage points lower among microcredit users than non-users. This suggests that microcredit not only improves income but also enhances household capacity to access sufficient food. These findings are consistent with prior empirical studies (e.g., Berhanu *et al.*, 2021; Haque, 2021), indicating the role of financial inclusion in improving agricultural livelihoods.

Households with access to microcredit recorded higher crop yields and farm income compared to matched non-beneficiary households. This suggests that microcredit facilitated access to productive inputs such as fertilisers, improved seeds, and hired labour, which are essential for increasing farm output. The average yield advantage of 460 kg/ha among microcredit users supports the notion that credit-enabled investment can boost productivity, consistent with the reports of Awotide *et al.*, (2015) and Osabohien *et al.*, (2020).

Similarly, the positive effect on monthly farm income aligns with earlier studies that link financial access with increased returns in agricultural production. Access to credit likely enabled beneficiaries to engage in more intensive farming practices or cultivate larger areas. This finding resonates with observations by Imran *et al.*, (2023) and Berhanu *et al.*, (2021), who reported that microcredit improved both economic and livelihood outcomes among rural farming households. The evidence suggests that when properly accessed and utilised, microcredit plays a vital role in strengthening the income base of smallholders.

In terms of food security, the result indicates that beneficiaries of microcredit exhibited a lower incidence of food insecurity. The 13-percentage-point reduction in the FGT headcount index reflects better food access, likely due to increased farm output and income. This corroborates findings from Haque (2021);

Saka *et al.*, (2023) and Okon *et al.*, (2024), which highlight that credit access improves household welfare beyond economic dimensions. Although causality in observational studies must be interpreted cautiously, the use of PSM strengthens the credibility of the estimates by controlling for observable confounding factors.

## 4.0 Conclusion

This study examined the relationship between microcredit access and selected agricultural and welfare outcomes, specifically crop yield, farm income, and food security, among smallholder farmers in Southeast Nigeria. The study compared outcomes between 180 microcredit beneficiaries and 180 non-beneficiaries. The results showed that, on average, microcredit users reported higher yields and income levels, and a lower incidence of food insecurity than non-users. The findings suggest that microcredit may be associated with improved access to production resources and a greater capacity to meet household food needs.

## Recommendations

- Microcredit schemes should be designed to align with the specific needs and production cycles of smallholder farmers, while integrating training and input support to enhance impact.
- Agricultural credit access should be complemented with extension services to ensure farmers receive both financial and technical support.
- Credit programme design should be informed by region-specific research that accounts for the institutional and agro-ecological realities of southeast Nigeria.

## Limitations and Areas for Further Research

This study, while informative, has some limitations. First, the cross-sectional design limits causal inference, as unobservable factors may still influence both credit access and outcomes. Second, only observable household and farm characteristics were analysed, excluding behavioural variables like credit utilisation and repayment patterns. Third, although the sample size was statistically adequate, it was slightly below the ideal estimate from Cochran's formula, which may affect representativeness. Fourth, reliance on self-reported data introduces potential recall bias.

Future studies should consider using panel data or experimental designs to strengthen causal inference. Incorporating non-economic outcomes such as nutritional diversity, women's empowerment, and resilience to climate shocks would also provide a more holistic view of microcredit's impact. Finally, further research could expand the geographic scope to include other under-researched regions in Nigeria and compare outcomes across different types of financial institutions.

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