

Gender Differentials for Participation in Producer Organization Among Smallholder Farmers: Evidence from Nigeria

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Abstract: Linking smallholder farmers to formal markets through producer organizations is increasingly becoming a pathway toward agricultural inclusivity. This study investigated the disparities in participation between male and female groups in Nigeria. Data was collected from 604 farmers and decomposition analysis for three gender categories was carried out using the Fairlie decomposition technique. The results showed a 24.2% higher actual mean probability of participation for males over females and a 20.1% actual mean probability higher for male-headed households compared to female-headed households. There was also a 27.59% actual mean probability higher for the *de facto* female-headed households over *de jure* female-headed households. Diverse factors were found to push the gender gap at various magnitudes. Interventions targeting gender equality should be entrenched in understanding the social and cultural practices and norms in Nigeria.

Keywords: Participation, Producer Organization, Gender, Fairlie Decomposition, Nigeria

1. Introduction

Agriculture remains the major livelihood for smallholder farming households (Khan et al, 2020, WHO, 2022) and the majority of the world's poor and low-resourced farmers belong to this class worldwide (Markelova & Mwangi, 2010). Smallholder agriculture is the main source of food consumed in many developing countries consisting of about 90% of the world's 570 million farmers and providing income sources for an estimated two billion people (IFAD, 2013; FAO, 2019). In Nigeria, smallholder agriculture contributes significantly to the economy, serving as an employer to over 70% of its population, especially in rural areas (Jos et al., 2016; Oluwatayo, 2019). More than half of this category of the population are women. (World Bank, 2014).

Linking smallholder farmers to the formal market has become an important part of global research and development goals. One of the approaches to achieve this is through increased participation in producer organizations (Njuki *et al.*, 2011; Mwambi *et al.*, 2021). Producer organizations help small-scale farmers to address market inefficiencies, product and resource coordination, and increase the bargaining power of the farmers (Shiferaw et al., 2011). However, one of the biggest challenges of producer organizations in meeting the needs of farmers is inequalities entrenched in community gender biases, norms, and expectations which disenfranchise some categories of people (Meinzen-Dick, *et al.*, 2004). Past studies showed that females are less likely to participate in producer organizations compared to their male counterparts and this includes female heading and within households (Sellare *et al.*, 2023).

Despite the significant contribution of smallholder farmers in Nigeria's agriculture, they are technically excluded from the formal market as over 65% of food sales are done through the informal market (Plaisier *et al.*, 2019). Worst still is the gendered pattern of smallholder agricultural exclusivity which reflects the overall gender disparities in Nigeria. In 2023, with a gender gap index of 0.637, Nigeria ranked 130th out of 146 countries, a decline from 123rd rank with an index of 0.635 in 2022. Although the basis or extent of gender inequality varies across different societies, of outstanding concern is that women tend to have less control over resources such as land, inputs, market access, and other inputs (Leder, 2022), as well as in decision-making (Gebre, 2019). Due to unequal access to major agricultural resources (Wambugu *et al.*, 2018; Farnworth *et al.*, 2016) and assumed homogeneity of female-headed households (Gebre *et al.*, 2019), women's participation in organizations providing market access in Nigeria was reportedly low (Technoserve, 2019).

While there is an increased participation of women in agriculture, the level of decision-making and access to tangible and intangible resources is low compared to men (Slavchevska et al., 2019). The increasing feminization of agriculture driven by the out-migration of males from rural areas has placed responsibilities on women to

become household heads, placing them in a position to make decisions (Kawarazuka *et al.*, 2022). This role shift potentially creates new gender dynamics and expectations, opportunities available for households, and the household decision-making process. This therefore pushes the rhetoric for a better understanding of gender dynamics among smallholder farmers.

In Nigeria, tomatoes and potatoes are well cultivated by smallholder farmers (Plaisier *et al.*, 2019). The country is the highest producer and fourth largest producer of tomatoes and potatoes respectively in sub-Saharan Africa (Obisesan, 2021; Ibrahim, *et al.*, 2021). However, due to the lack of producer organizations and business skills that could give the required bargaining power to interact on similar terms with other market intermediaries, smallholder farmers are subtly cut off from the growing formal markets in Nigeria (Pyburn *et al.*, 2015). The limited available producer organizations are faced with gaps in their gender inclusivity approaches. This study therefore investigated the gendered differentials for participation in producer organizations in Nigeria.

Grounded in the neo-classical theory of marketing cooperative firm, this study represented the producer organization as the decision maker who paid optimized prices to its members for the produce sold via the organization as its objective. The organizations explored by this study purchase tomatoes and potatoes from their members and sell outputs to processing firms and, food retail outlets after assembling and grading the commodity. The excess fund after the deduction of the transaction cost is shared among members as patronage refunds (Royer, 2014). To reflect a gendered perspective, this theory was integrated with the Women's Empowerment (Longwe) framework which argues that development should enable people to take charge of their own lives and escape from poverty not necessarily from lack of productivity but from exploitation and oppression. This framework hinges the development process on women's equality with men.

Several studies examine gender disparity as a binary option but this study utilized the Fairlie decomposition which beyond showing the gender gap shed light on the variable contribution to the gap between two groups within the multivariate models (Fairlie, 2005). The method became necessary given the criticism against the Blinder-Oaxaca Decomposition Analysis as it failed to manage non-linear regressions such as the logit and probit model (Fairlie, 2017).

2. Methodology

2.1 Study Design

A cross-sectional design was employed for the study. Primary quantitative data were collected using a semi-structured interviewer-administered questionnaire via an electronic data collection platform (Kobocollect toolbox).

2.2 Study Area

The study area was Kano and Plateau states, Nigeria. The choice of the two states was based on their relatively high production of tomatoes and potatoes respectively in the country. Kano, accounting for 20% of national production is the second largest producer state of tomatoes in Nigeria while Plateau State accounts for 45% of potato production in Nigeria (Plaiser *et al.*, 2019).

2.3 Sample Size

The sample size for this study was calculated using the Cochran method (Kotrlík & Higgins, 2001).

$$n_0 = \frac{Z^2 pq}{e^2} \quad (1)$$

e= Margin of error

p= estimate of variance (0.05)

q= 1-p

Z=value for selected alpha level (1.96)

If this sample size exceeds 5% of the population, Cochran (1977) correction formula will be used to calculate the final sample size as follows:

$$n_1 = \frac{n_0}{(1+n_0/Population)} \tag{2}$$

n_0 =required returned sample size

n_1 = required return sample size because sample>5% of the population

A total of 604 respondents, consisting of 289 participants and 315 non-participants of producer organizations.

2.4 Sampling Technique

Using a multi-stage sampling technique, 604 farmers (259 producer organization participants and 345 non-participants) in Kano and Plateau States of Nigeria were sampled. The first stage involved the purposive selection of tomato and potato farmers from Kano and Plateau states. The second stage involved the selection of four Local Government Areas (LGAs) from each state based on the presence of producer organizations. The third stage involved the random selection of two communities in each LGA making a total of sixteen communities for the study. This consists of both the participants and non-participants in producer organizations with similar characteristics. The final stage involved the selection of participants and non-participants from each community. The selection strategy involved the selection of at least 40% female and 40% participants in producer organization where possible.

2.5 Data Collection

The data collection exercise was carried out over eight weeks between January and March 2020. The research instrument was developed from a comprehensive review of the literature. The reliability and validity were enhanced through pilot testing before deploying on Kobo toolbox, an electronic data collection platform that was used in this study. Ten experienced research assistants (RAs) with a minimum of Bachelors were engaged in each state. These RAs were trained for three days on the study objectives, research ethics, data collection, and data protection. Farmers were approached on the farms or in their houses where the interview was carried out.

2.6 Analytical Procedure

The socioeconomic characteristics of the respondents and group dynamics were analyzed using descriptive statistics. A t-test which is a parametric test of differences was employed to test the significance of the mean differences between the participation groups.

The non-linear decomposition of participation in producer organization for three gender categories (male/female, male-headed/female-headed households, and *de jure/de facto* female-headed households) was carried out using the Fairlie decomposition (which is a B-O decomposition technique for probit models). Following Gebre *et al.*, 2020 and Fairlie 2005, the non-linear decomposition of participation in producer organization only is expressed as:

$$\text{Gap} = \bar{P}_m - \bar{P}_f \left\{ \frac{1}{N_m} \sum_{i=1}^{N_m} \Phi(X_{im}\beta_f) - \frac{1}{N_f} \sum_{i=1}^{N_f} \Phi(X_{if}\beta_f) \right\} + \left\{ \frac{1}{N_f} \sum_{i=1}^{N_f} \Phi(X_{if}\beta_m) - \frac{1}{N_f} \sum_{i=1}^{N_f} \Phi(X_{if}\beta_f) \right\} + \left\{ \frac{1}{N_m} \sum_{i=1}^{N_m} \Phi(X_{im}\beta_m) - \frac{1}{N_m} \sum_{i=1}^{N_m} \Phi(X_{im}\beta_f) \right\} + \left\{ \frac{1}{N_f} \sum_{i=1}^{N_f} \Phi(X_{if}\beta_m) - \frac{1}{N_f} \sum_{i=1}^{N_f} \Phi(X_{if}\beta_f) \right\} \tag{1}$$

$\bar{P}_m - \bar{P}_f$ = the average probability of participation in producer organization by the gender groups.

Φ =the cumulative normal distribution function from the probit distribution

N_m = the sample size of male participants

N_f = the sample size of the female participants

The Fairlie model was formulated to decompose the mean outcome difference between the two groups.

As identified in the literature, the following variables highlighted in Table 1 influence gender differentials among smallholder farmers. The variables considered for study analysis are:

- X_1 Age of household head (Years)
- X_2 Educational status (Years)
- X_3 Size of landholding (Hectares)

- X_4 Married (1= married, 2=unmarried)
- X_5 Distance to market center (Kilometer)
- X_6 Transportation facility (1=Yes, 2=No)
- X_7 Access to remittance (1=Yes, 2=No)
- X_8 Farming experience (years)
- X_9 Household size (Number)
- X_10 Off-farm activities
- X_11 Market information (1= Yes, 2=No)
- X_12 Formal savings (1=Yes, 2=No)
- X_13 Informal savings (1=Yes, 2=No)
- X_14 Hired labour (1=Yes, 2=No)
- X_15 House chore time use (hours)
- X_16 Productive activities time use (hours)
- X_17 Adult Male
- X_18 Adult female
- X_19 Wet season production
- X_20 Dry season production (1=Yes, 2=No)
- X_21 Region (1=Kano state, 2=Plateau state)

3. Results and Discussion

3.1 Socioeconomic Distribution of Respondents

3.1.1 Distribution of Respondent by Participation in Producer Organizations

The mean age of the farmers was 40.13 ± 0.94 and their average years of education was 8.42 ± 0.23 . The average household size was 7.15 ± 0.14 . A total of 289 (47.85%) of the 604 households sampled were participating in producer organizations. Table 2 presents the t-test results for participants and non-participants in producer organizations. Age, household size, adult female in the household, educational status, size of land for production, distance from farm to the market, and access to formal and informal savings were found to be statistically different for participants and non-participants in producer organizations in the study area.

The household head is important in decision-making and could influence participation in collective actions (Doss et al, 2015). Figure 2 showed that 11.75% were headed by a female. This is in line with the findings of Nwaka et al., (2020) reinforcing the patriarchal nature of households in Nigeria, especially in the northern parts. Also, poor participation in the producer organization was found among the female-headed households. Further disaggregation of the female-headed households showed that 70.73% were *de jure* female-headed households while 29.27% were *de facto* female-headed households. This is also consistent with the findings of Joshi and Ramnarain (2020).

The participants were more educated than the non-participants (9.36 against 7.54 years of education). Household size was larger for participants than non-participants with adult female presence statistically different for both groups. This is in line with findings from an Ethiopian study where cooperative participants have slightly higher family sizes than non-participants (Leza & Kabule, 2019). The average land cultivated for tomatoes and potatoes was estimated at 2.03 hectares. This results emphasized that the farmers are smallholder farmers. Participants also had a larger land area for cultivation compared to the non-participants. While the findings of Kidane et al., 2018 were found to be in support of this submission, Leza & Kabule, 2019 negate it.

Comparing the distance of the farm to the market, participants had mean distance of 21.46 km while non-participants have 9.74km. This indicates that most of the non-participants were nearer to the traditional market

and this may increase the patronage of such sales markets instead of selling through the producer organizations. Participants also have more access to remittance, and formal and informal savings compared to their non-participants counterparts.

Table 2: Summary statistics for variables

Variable	Participants(n=315)	Non-participants (n=289)	Combined (n=604)	t-test
Sex of household head (Female)	25	57	82	2.5***
De jure female-headed households	13	45	24	
De facto female headed-households	12	12	58	2.53 **
Age	43.04 (0.65)	37.46 (0.68)	40.13 (0.94)	-5.89***
Years of education	9.36 (0.34)	7.54 (0.31)	8.42 (0.23)	-3.96***
Size of landholding	2.41 (0.75)	1.8 (0.50)	2.03 (0.45)	-0.82***
Distance to market	21.46 (1.17)	9.74 (0.46)	15.35 (0.61)	4.14***
Farming experience	11.31 (0.57)	9.77 (0.44)	10.51 (0.36)	-2.15
Household size	7.83 (0.22)	6.52 (0.18)	7.15 (0.14)	-4.72***
Household composition (Adult male)	0.93 (0.02)	0.90 (0.02)	0.92 (0.01)	0.02
Household composition (Adult female)	0.95 (0.02)	0.92 (0.01)	0.93 (0.01)	0.006**
Access to remittance	0.39 (0.03)	0.46 (0.03)	0.42 (0.02)	1.81*
Access to market information	0.97 (0.01)	0.93 (0.01)	0.95 (0.01)	-0.0049
Access to formal savings	0.75 (0.03)	0.66 (0.03)	0.71 (0.02)	-2.18**
Access to informal savings	0.80 (0.02)	0.70 (0.03)	0.75 (0.02)	-2.80***
Access to hired labour	0.93 (0.01)	0.94 (0.01)	0.94 (0.01)	0.44
Off farm activities	0.94 (0.01)	0.93 (0.01)	0.94 (0.01)	-0.22
House chore time use	0.02 (0.004)	0.02 (0.004)	0.02 (0.002)	-0.25
Productive activities time use	0.04 (0.007)	0.03 (0.004)	0.036 (0.004)	-1.05
Region	1.50	1.51	1.51	-0.26

Significant at the 10% level (*), 5% level (**) and 1% level (***)

Values in parentheses are the standard errors.

Source: Author’s Computation, 2023

4. Gender Differential of the Participation in Producer Organization in Nigeria

4.1 Male versus Female

The results (Table 3) showed that there was an existence of membership gap in the probability of producer organization membership between males and females. The decomposition results indicate that males have a 0.56 likelihood of being a member of the producer organization compared to a 0.32 likelihood for females. The actual mean probability of participating in producer organization was 0.24 higher for the males when compared to their female counterparts. This implies that men were more likely to participate in producer organizations than their female counterparts. An estimated 0.17 (70.83%) of the gender gap was explained by the variables in the model. The detailed decomposition showed that years of education, access to remittance, presence of an adult male in the household, male family labour, and being married reduced the gap at various significant levels while wet season production and awareness of the existence of producer organization in the locality increased the gender gap.

Motivation for participating in collective action is higher among the educated (Evans & Nambiar, 2013). An increase in years of education reduced the probability of the gender gap in producer organization participation by 4.87%. A year increase in education will close the participation gap by 4.87% in favour of females. Access to remittance also reduced the gender differences in favour of the female. Access to remittance closed the gender gap and helped women to access productive assets thereby, closing the membership gap by 4.80%. The presence of an adult male in the household also reduced the gender gap by 9.17%. These adult males can also serve as family labour and as well assist with activities on the farm that are labor-intensive. Being married also reduced the gendered membership gap by 9.92% in favour of females. Wet season production increased the gender gap by 2.44%, significant at 10%. The wet season is the main production season and welcomes the glut season. The price of selling produce was relatively low during this season. Awareness of the existence of the producer organization in the locality increased the gendered membership gap by 20.58%.

4.2 Male-Headed vs. Female-Headed Households

Table 3 shows that there is the existence of membership difference between male and female-headed households in producer organizations indicating a 0.5057 likelihood of male-headed households participation in producer organization compared to 0.3049 for female-headed households. The actual mean difference is 0.20 higher for male-headed households than female-headed households, with 0.18 (91.90%) of the gap explained by the variables in the model. The detailed decomposition by several variables showed that the presence of an adult male in the household reduced the gap while wet season production, being married and awareness of the existence of producer organization in the locality increased the participation gap.

Education increased the membership differences in the probability of participation for female-headed households and was significant at 1%. This implies that educated female household heads are less likely to participate in producer organization. Being married increased the membership differences between the group by 55.5%, and significant at 1%. This implies that being married increases the likelihood of women not participating in producer organizations.

4.3 De facto vs. De jure Female-Headed Household

Table 3 also shows that there is the existence of a gender gap in the probability of participation in producer organization between the two groups. The decomposition results indicate that *de facto* female-headed households have a 0.50 likelihood of participating in producer organization compared to 0.2241 for *de jure* female-headed households. The actual mean probability of *de facto* female-headed households participating in producer organization is 0.28 higher than for *de jure* female-headed households with 0.25 (89%) of the gap explained by the variables in the model. The detailed decomposition by several variables showed that years of education, the presence of a male adult, wet season production, and state of residency reduced the gap at various significant levels. Access to remittance, availability of male member and hired labour, married status, and awareness of the existence of producer organizations increased the gender gap.

The presence of males in the household increased the gender gap in probability of participation for *de jure* female-headed households and this was significant at 5%. Availability of male family and hired labours increased the gender gap in the probability of participation for *de jure* female-headed households at 16.25% and 12.19% respectively and these were significant at 5%. Being married increased the gender gap in the probability participation for *de jure* female-headed households by 85.33% and this was significant at 1%. This implies that if *de jure* female household heads were married, they were more likely to participate in producer organization.

Table 3: Fairlie decomposition of producer organization membership gap by gender decomposition

Variables	Male vs. female	Male vs. Female-headed households	De facto vs. De jure FHH
		Coefficient	
Years of education	-0.0487(0.0095) ***	0.0337 (0.0075) ***	-0.0584 (0.0129) ***
Age of respondent	0.0184 (0.0124)	0.0090 (0.0069)	-0.0034 (0.0059)
Farming experience	0.0237 (0.0187)	0.0173 (0.0141)	-0.0107 (0.0051)
Household size	-0.0022 (0.0060)	-0.0031 (0.0086)	0.0033 (0.0160)
Land area cultivated	0.0115 (0.0133)	0.0088(0.0106)	-0.0014 (0.0037)
Access to remittances	-0.0118 (0.0041) ***	-0.0008 (0.0033)	0.0349 (0.0142) **
Access to formal savings	0.0008 (0.0118)	0.0002(0.0041)	-0.0008 (0.0043)
Access to informal savings	0.0007 (0.0013)	0.0007 (0.0025)	0.0184 (0.0126)
Off-farm activities	0.0005 (0.0031)	0.0002 (0.0024)	-0.0005 (0.0088)
Access to market information	0.0022 (0.0025)	0.0014 (0.0026)	0.0012 (0.0047)
House chore time use	0.0012 (0.0020)	0.0022 (0.0036)	-0.0025 (0.0034)
Productive activities time use	0.010 (0.0059) *	0.0062 (0.0045)	-0.0020 (0.0020)
Adult Male	-0.0223 (0.0103) **	-0.0513 (0.0242) **	-0.0585 (0.0251) **
Adult female	-0.0003 (0.0011)	-0.0005 (0.0022)	0.0004 (0.0030)
Male family labour	-0.0183 (0.0066) ***	0.0041 (0.0038)	0.0432 (0.0199) **
Access to hired labour	-0.0133 (0.0081)	-0.0049 (0.0036)	0.0323 (0.0157) **
Wet season production	0.0059 (0.0023) *	0.0063 (0.0035) *	-0.0183 (0.0072) **
Dry season production	0.0033 (0.0035)	0.0035 (0.0041)	-0.0040 (0.0054)
Region	0.0011 (0.0022)	0.0004 (0.0026)	-0.0091 (0.0109) **
Married	-0.0228 (0.0068) ***	0.1047 (0.0273) ***	0.2096 (0.0530) ***
Awareness of the existence of producer organization	0.0500 (0.0045) ***	0.0422 (0.0057) ***	0.0566 (0.0196) **
Number of obs =	604	604	604
N of obs G=0	219	522	24

	Male vs. female	Male vs. Female-headed households	De facto vs. De jure FHH
N of obs G=1	385	82	58
Pr (Y! =0 G=0)	.5662	.5057	0.5
Pr (Y! =0 G=1)	.3242	.3049	0.2241
Difference	0.242	0.2009	0.2759
Total explained	0.1691	0.1846	0.2461

Significant at the 10% level (*), 5% level (**) and 1% level (***)

Values in parentheses are standard errors.

Source: Authors’ Computation, 2023

In this study, factors influencing the probability of participation in producer organizations were different for the gender groups at diverse magnitudes. For instance, education closed the gender gap for male vs. female and de facto vs. de jure FHH, but it increased the gap for FHHs vs. MHH. Again, access to remittance and availability of male family labour significantly influenced the participation of all the groups at different magnitudes except MHH vs. FHH.

Although awareness of innovations increased its adoption (Skaalsveen et al., 2020), awareness of the existence of the producer organization increased the gender gap in participation for all the gender groups in this study. This may be driven by the gendered perception that is widely upheld in the northern part of Nigeria where this study was conducted (Madama, 2013). The gender norms sustain the assumption that females are inferior to males and should be relegated to the care of the household and not accepted in the public sphere where information on producer organization are likely to be shared.

The presence of males in the household reduced the gender gap in participation in producer organization for all the gender groups. Patriarchy in Nigeria confers the males with leadership and the females with submission to an older male. This does not only affect females in male-headed households, widows are subjected to every male in her late husband’s household (Para-Mallam, 2017). Again, cultural constraints are placed on the mobility of women through the mechanism of social segregation and purdah. These limit women's movement and restrain them from interacting in public, and from going out without a male escort or permission (Madama, 2013). While this was found to reduce the gender gap for Male vs. Female and De facto vs de jure FHH, it increased the gap for MHH vs. FHH. This may be because participation in producer organization includes several meetings which increases the double burden and triple role of women. This is in line with the findings of Mwambi et al. (2021). Although education has been shown to increase participation in producer organizations (Coleman & Mwangi, 2013, Kaaria et al., 2016), singlehandedly carrying the entire household burden, where survival is the main drive, may drown the effect of increased years of education.

5. Conclusion and Recommendation

The study separately examined the characteristics and causes of the disparities between males and females; MHHs and FHHs; *de jure* FHHs and *de facto* FHHs. The study revealed a significant disparity in producer organization participation using the Fairlie decomposition model.

From the analysis, we found a significant aggregate gender difference in the probability of group participation within the sampled households. Placing the sampled respondents into diverse gender categories, it was also found that the factors driving the gap differ for each gender category with awareness of the presence of producer organizations and the presence of a male adult found to be significant across the groups. The highest probability of gender gap was exhibited by the male vs. female category when compared to the other categories.

From the decomposition results for each category, the presence of a male adult was found to close up the gender gap in the probability of participating in producer organizations in favour of the females and the de jure FHHs. Improving education, especially for the de jure FHHs and female categories, reduces the participation gap likelihood but increases the gap for FHHs. Access to remittance was found to reduce the participation gap for females but increase the gap for the de jure FHHs. Again, being married tends to close up the gap for the female categories but increases the gap for the FHHs, especially the de jure FHHs. While wet season production reduces the gap for de jure FHHs it was found to increase the gap for the other female categories. This study showed lower female membership in producer organizations compared to their male counterparts.

Interventions targeted at closing the gender gap should consider the heterogeneous nature of female households and should be entrenched in understanding of the social and cultural practices and norms in Nigeria. Interventions aimed at female education, women's access to remittance and taking advantage of crop production during the wet season could be effective in increasing female participation in producer organizations in Nigeria.

6. Limitations

Similar to other research, this study has limitations. Firstly, it was difficult to verify claims made by the respondents, therefore elements of social desirability could not be ruled out from the farmers' responses. The study was also limited to tomato and potato farmers, hence generalization to all farmers should be done with caution. and as. However, the strength of this study is that it examined the heterogenous dimension of gender study of participation in producer organizations in Nigeria, which to the best of our knowledge, the first of such study in Nigeria.

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