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# WHAT DRIVES FEMALE FARMERS' PARTICIPATION IN OFF-FARM ACTIVITIES? THE CASE OF RURAL NIGERIA

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**Abstract:** *Women often lack access to productive resources such as land and capital in most developing countries. This forces them to take part in off-farm activities to augment their little farm income. This study investigated factors that affect the involvement of women farmers in different types of off-farm entrepreneurial livelihood activities in rural Bauchi state, Nigeria. A purposive sampling method was used in selecting three local government areas in the western agricultural zone of the state and a random sampling method was used in selecting ten wards. 5% registered women farmers in each selected ward, making 134 respondents. Semi-structured questionnaires were administered to women farmers in 2017. The results revealed that food processing, farm product sales, trading and tailoring are the major off-farm livelihood activities engaged in by rural female farmers. Logit regression results revealed, as expected, that different factors affect their involvement in various types of off-farm activities. Food processing and tailoring required relatively high start-up capital and access to electricity as an investment and the use of machines was needed. Thus, access to credit or remittances and to electricity increases the probability of being involved in these activities. The requirements of trading being lower and access to market increases the probability of being involved. Provision of extension services, rural credit facilitation programmes, rural electrification, road and market structure development are instruments*

***Keywords:*** *Women farmers, non-farm enterprises, rural Nigeria, electricity and roads.*
(JEL code: Q12, J16, R20)

## INTRODUCTION

Reliance on agricultural growth and agricultural strategies alone as the primary vehicle for poverty reduction in rural areas in developing countries seems not to be sustainable (FAO 2019a). Factors such as very small landholdings, risks due to drought, floods, crop loss due to pest and/or disease, poor road infrastructure and gaps in market access in rural areas decreases the ability of agriculture to entirely safeguard the livelihood of the rural population. Farmers' engagement in off-farm activities can help to overcome these problems and increase smallholder households' incomes (Alabi et al., 2022).

Off-farm income refers to all income-generating activities except crop and livestock production (Ahmadzai, 2020; Barette et al., 2001; Lanjouw and Lanjouw, 2001) such as tailoring, food processing, sale of farm products, petty trading etc. The rural poor often lack access to insurance services; so many individuals prefer to engage in a wide range of income generating activities to avoid risk (Tucker et al. 2010).

The present study is devoted to understanding the patterns of off-farm activity involvement of women farmers. Women have relatively lower influence in household decisions in most developing countries compared to males (Achandi et al., 2018; Ragsdale et al., 2018; Sell and Minot, 2018). Studies reveal that women have inadequate access to and control over productive resources such as land, capital, agricultural inputs and technology, such as improved crop varieties, training, information as well as marketing services (Fletschner and Kenney, 2014, SDG, 2018). Evidence also suggests that women have an unmanageable workload, they lack access to credit or have no decision-making power over credit and are poorly represented in agricultural groups and organizations (Alkire et al., 2013; Akter et al., 2016).

Off-farm employment gives a wife more influence in

household decision making (Braun et al., 2019; Nyabaro et al., 2019). It reduces dependence of the household on forest resources (Hussain et al., 2019) and improves the level of household forest conservation management (Xie et al., 2019a). Off-farm employment increases household income and reduces poverty-vulnerability among farmers (Isshaku and Abdul-Rahaman, 2019). An off-farm income reduces child malnutrition and household food insecurity (Broeck and Kilic, 2019; Dzanku, 2019). Thus, women's off-farm activities contribute to the achievement of several Sustainable Development Goals (SDGs), particularly to the goals "No poverty", "Zero hunger", "Gender equity" and "Life on land".

African women farmers participate in off-farm activities mainly to augment their small agricultural income to ensure they meet their household livelihood responsibilities and needs (AfDB, 2015). They tend to be entrepreneurs of necessity, rather than opportunity, driven into small business by the lack of alternatives. Women in Africa are more likely to be running microenterprises in the informal sector, engaging in low-value-added activities that reap marginal returns (AfDB, 2015).

This study builds upon previous literature that estimated the determinants of off-farm participation among farmers regardless of the gender (Lanjouw and Lanjouw, 2001; Xia and Simmons, 2004; Isgut, 2004; Dary & Kuunibe 2012; Akaakohol & Aye 2014; Iqbal et al., 2015; Rizwan et al., 2017; Nazir et al., 2018) (see Chapter 2.3.). Despite the growing importance of off-farm activities, very little is known about their drivers in developing economies like Nigeria (Ibekwe et al., 2010). This is in particular true for the off-farm activities of women farmers.

To close this gap, the paper analysed the determinants of women's participation in selected off-farm livelihood activities. This study shed light on underdeveloped rural areas in northern Nigeria where information about the off-farm activities of women is very scarce but needed to derive appropriate policy recommendations. It provides evidence that female farmers without access to resources tend to engage in easy-to enter entrepreneurial activities, such as sales, rather than in activities that require higher starting costs, electricity access and knowledge and skills, such as food processing and tailoring.

The paper has four sections: the first section contains the introduction; the second part provides literature review; the third part describes the methodology; the fourth part presents the results and discussion and the last part provides conclusions and policy recommendations.

## LITERATURE REVIEW

The literature review of studies on off-farm entrepreneurial activities of farmers was conducted to develop a conceptual framework for the study. In the following, factors were identified that potentially affect the involvement of off-farm activities.

Regarding age, young farmers are more likely to participate in off-farm livelihood activities and to migrate to augment their agricultural income (Rizwan et al., 2017; Yusuf et al., 2016; Eshetu and Mekonne, 2016 and Apind et al., 2015). Age influences participation, reaching some point then declining (Beyene, 2008, Corsi and Salvioni, 2012; Bouchakour and Saad, 2019). Beyene (2008) found a positive effect of age on the off-farm participation decisions of farm households among male household heads in Ethiopia and the same model found a negative effect of age squared which implies that effect of age on off-farm participation is not linear but hump-shaped. Corsi and Salvioni, (2012) arrived at a similar hump-shaped result as they reported a positive effect of age and a negative effect of age squared in the assessment of determinants of off-farm participation of Italian farm households for workers, spouses and their eldest children of working age, using a five equation multivariate probit. This is quite similar to Bouchakour and Saad (2019), who hypothesized that age would have a positive effect on young farmer participation and a negative effect on old farmer participation in off-farm participation in Algeria by making a quadratic equation of age and testing same.

Education is expected to have a positive effect on off-farm work decisions for female farmers if the effects of human capital on off-farm wages outweigh the increase in the shadow value of labour on the farm, (Lass et al., 1991). Increases in education have a significant positive effect on self-employment and public service off-farm livelihood activities (Iqbal et al., 2015, Akaakohol and Aye, 2014, Akhtar et al., 2019).

Land ownership can affect the participation in off-farm livelihood activities as it may be used as collateral when borrowing capital for business initiation and development (Taverner et al., 1997; Woldehanna et al., 2000; Kousar and Abdulai, 2016).

The unitary model predicts that farm size affects participation in off-farm livelihood activities in a positive way when it does not compete with farming for productive resources, especially labour and capital but only serves to augment and complement it (Dedehouanou et al., 2018; Akhtar et al., 2019). In the profit maximisation model, the use of farming inputs and resources are tailed always to more profitable or less risky activities which may affect participation in off-farm activities negatively (Matse and Young 2004; Serra et al., 2005). Several previous studies reported the significant negative effect of farm size on participation in off-farm livelihood activities. This is the case in particular in areas with non-favourable climate conditions where agriculture is less profitable and farmers are pushed to allocate their resources to off-farm activities for the sake of profit maximization and risk aversion (Akhtar et al., 2019; Rizwan et al., 2017; Corsi and Salvioni, 2012; Beyene, 2008). Differently, Rizwan et al. (2017) reported a significant positive effect of land size on participating in self-employment off-farm livelihood activities. This can be explained by the fact that the owner of a large farm may benefit from economies of scale and this provides him with higher income and the opportunity to hire labour for the farming activities

Most of the off-farm livelihood activities require capital and investment. If a female farmer has access to credit or to microfinance then the probability of engagement in off-farm activities increase (Hitayezu et al., 2014, Akaakohol and Aye, 2014; Beyene, 2008).

Lack of market access or a long distance from the production point to the nearest market reduces the probability of n

participation in off-farm livelihood activities (Beyene, 2008; Akaakohol and Aye, 2014).

Access and distance to a road can affect participation in off-farm livelihood activities as this facilitates the movement of inputs and products from the producer/provider to the consumer. Rizwan et al. (2017), for example, reported a significant positive effect of access to a road on participating in off-farm self-employment livelihood activities among rice farmers of the Punjab in Pakistan.

Access to electricity creates an opportunity for female farmers participation in off-farm activities as it provides a chance of using electronic machines and facilities (Hitayezu et al., 2014; Chowdhury 2010; Gibson & Olivia, 2010).

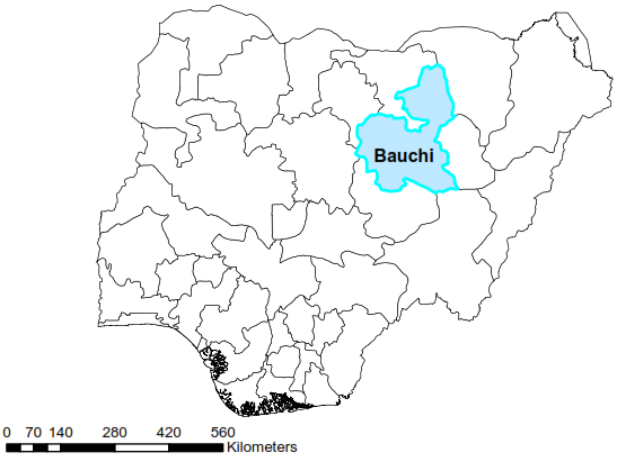
## MATERIALS AND METHODS

### Study Area

Nigeria is the 7th most populated country in the world and it is projected that the population of the country will reach 401 million by the 2050, which will make it the 3rd most populated country in the world after China and India (NBS, 2018). The GDP of the country was 375.745 billion US dollars in 2016, with an annual growth rate of 2.4% dominated by the oil industry; while agriculture, forestry, and fisheries contributed 20.8%, industry (including construction) constituted 22.3% and goods and services contributed 13.2%. The population of working age was 115 million while only 69.5 million were fully employed. Rural population in Nigeria continues to decline (from 59% in 2008 to 48% in 2018) (World Bank, 2020). School enrolment for primary school reached 84.7% and for secondary school this was 42.0% in 2016 (NBS, 2018).

The study was carried out in Bauchi state in north east Nigeria (Figure 1) with a total land area of 49,119km2 which constitutes 5.3% of the total Nigerian land mass (BASG, 2018). The state has a population of 6 million inhabitants with 46.73% of the age group of 4-9 years. Adult literacy among female reaches 85.92%. The state has 55 different tribal groups with different occupational patterns and beliefs, Hausawa and Fulani are the most prominent tribes and Hausa language is the common language used in the area (NBS, 2018).

**Figure 1: Map of Nigeria showing Bauchi state**




### *Status of rural women*

In rural Nigeria, a patriarchal structure of society is prevalent. Men's role is generally more highly valued and rewarded than women's roles. Women bear the primary responsibility for childcare and domestic work, while men are responsible for providing the family livelihood that makes them the head of the household, thus woman can only be a household head when they become a widow or are divorced (Ufuoma et al., 2010). Female participation in political activities and public governance is limited in most rural areas. Women are among the poorest groups in rural Nigeria with limited access to land, capital, including credit (due to lack of collateral) and education. About 10% of registered farmers are women and only 7% of them own land, 30% of them have access to agricultural loans, and 15% have a bank account (FAO, 2018). Even though women have access to land in northern rural Nigeria, men receive double the share compared to a woman during inheritance (FAO, 2018). In the southern part, access is determined by the influence of the husband in the rural community and the position of the wife in polygamous household settings (e.g. first wife, second wife, etc. or mother of the first male child) (Ufuoma et al., 2010). Average land size owned by women in north eastern Nigeria is 0.8 ha compared to 7.5 ha by men (FAO, 2018).

Women make up 60% of the labour force in the informal sector and 70% of agricultural farm labour (Ufuoma et al., 2010; Kanpmann, 1999; Kwesiga, 1998). Mining, hunting, and black smithery are occupations predominantly occupied by men while gathering of non-timber forest products, weaving, tailoring traditional clothes, trading of cosmetics and jewelry as well as craft making are occupations predominantly occupied by women. Women are also involved in the marketing of agricultural products, and in decision-making for the pricing of goods, while men dominate in most activities involving hard work, such as land preparation, transport and wholesale selling (FAO, 2018). Merely 6% of extension staff are female (FAO, 2018).

Both sexes participate in agriculture with some crops attached to gender and some level of division of farming operations. For example, staple food and cash crops such as maize, rice, sorghum, millet, groundnut, sesame, cowpea and cotton are predominantly produced by men while spices and vegetables such as peppers, ginger, cloves, onion, amaranths, sorrel etc. are produced by women. Men are responsible for ploughing, planting, weeding, rearing of large ruminants, and women are responsible mostly for harvesting, threshing, processing, rearing of small ruminants and poultry production (FAO, 2018; Ufuoma et al., 2010).

### *Policies supporting rural women and achievement of SDG*

Despite their significant contribution to agricultural labour that promotes national food security, women did not get any formal recognition by way of a policy pronouncement to encourage, protect and facilitate their access to inputs and services until 1986. In 1986, a government policy directive was

developed to establish the Women in Agriculture (WIA) component of Agricultural Development Programmes (ADPs) that were responsible for grassroots extension and advisory services in all states of Nigeria (FAO, 2018). The overall objective of the policy was to integrate women into national agricultural development, through the mainstreaming of women into the ADPs system, to enable them equal access to agricultural inputs, credit, loans and extension services (FAO, 2018). This broad objective was intended to achieve the following specific goals: i. to develop innovative gender specific programmes for women farmers in close collaboration with national agricultural research institutions; ii. to promote the development and use of appropriate agricultural technologies which reduce drudgery and meet the needs of women in poverty alleviation; iii. to assist in linking women farmers to sources of credit; iv. to increase the agricultural productivity and income of women farmers; v. to improve the skills of women in food processing, utilization and marketing to enhance income; vi. to organize women into cooperative groups for effective group action; and vii. to encourage women farmers to keep livestock to improve their nutritional status (FAO, 2018). The instruments used to achieve the stated objectives were provision of input subsidies (provision of livestock to women, simple processing machines for farm produce) provision of extension services (using women extension agents to reach women farmers as the solution to the gender segregation of the area and organizing and mobilizing women into cooperatives to achieve economies of scale in production, resource sourcing and marketing). The programmes under the policy helped in creating awareness of the importance of women in agricultural production and promoted capacity-building for women to adopt new production and processing technologies, and also fostered collaboration with research institutes to promote labour saving devices for women. However, it was observed and confirmed by ADP WIA officials that the WIA programme never achieved the stated objectives, even with World Bank support for the ADPs. Basically because the targeted number of female extension agents (EA) was never achieved in most states; the critically needed commitment to funding and the political will to back the policy with appropriate legislation were never provided, especially after the termination of World Bank support to the ADPs; no prominent policy existed to provide for women's access to land and production inputs (FAO, 2018).

In 1990, women's development strategies were implemented under the National Fadama development project with the partnership of the World Bank that aimed to sustainably increase the incomes of participating rural community dwellers. Target groups included the rural poor engaged in economic activities (farmers, pastoralists, fishers, nomads, traders, processors, hunters and gatherers); disadvantaged groups (widows, the handicapped, the sick and other vulnerable groups, including people living with HIV/AIDS and unemployed youth) (World Bank 2008). The impact assessment of Fadama I and II revealed that women, the poor and other disadvantaged groups were given a voice through the project (FAO, 2018). The project pro-actively supported women's organizations participating in project-related activities. Women were trained to be useful economic agents, thus making meaningful contributions to the quality of life of their beneficiaries and the local economy (World Bank, 2008). The instruments used were input subsidies (provision of low-cost improved irrigation technology) and extension service provision (training women in different farm and off-farm activities, most especially processing of farm produce into different byproducts) However, the programme was later replaced by the National Programme for Food Security (NPFS). Another gender empowerment programme was USAID MARKETS II that aimed to improve the performance, income, nutrition, and food security of poor rural farmers in an environmentally friendly manner in Nigeria. The key objectives included ensuring smallholder farmer's access to increased income, ready markets, better inputs (improved seeds and optimal use of fertilizer), adequate finance, better water and pesticide management, appropriate technologies and extension services. The programme also included the goal of ensuring gender equality in food security, so that both men and women have significant influence on household spending (USAID, 2017). The instruments used to achieve the policy objectives were: credit support (liaison between farmers and lending institutions and using cooperative farms as collateral) input subsidies (provision of improved seed, fertilizer and raw-materials for aquaculture and fish feed); extension services (teaching women soy bean farmers to uptake close planting, which ensures quick canopy closure and controls weeds, and linking them to processing companies to get more competitive prices by eliminating the intervening of middlemen) (USAID, 2017).

After the acceptance of Sustainable Development Goals (SDGs) by member states of the United Nations, Nigeria conducted a SDGs Data Mapping Exercise, conducting baseline surveys in collaboration with the UNDP whose results have been useful in developing indicators for SDG implementation, monitoring and reporting in the country. In addition, the UNDP conducted various advocacy and awareness activities with several government ministries, departments, and agencies, to support initiatives aimed at promoting strategic engagement around the SDGs. For example, the UNDP supported the government-developed private sector engagement strategy which provided for and recommended the establishment of the first-ever private sector advisory group on SDGs, providing both technical and financial support towards ongoing efforts aimed at integrating the SDGs, particularly "No poverty", "Zero hunger", "Gender equity" and "Life on land", into national and state-level policies, plans and budgets (UNDP, 2017).

### *Rural infrastructure*

The level of road connectivity, accessibility and transport services are generally poor and inadequate in rural Nigeria (Usman, 2014, Aderamo and Magaji 2010). 87% of rural roads are in poor condition (World Bank, 2019). Only 30.95% of rural households in Nigeria had access to electricity in 2018 (World Bank, 2018a).

Rural markets, generally, do not have infrastructure to tackle any produce that requires specialized handling and waste management. Rural market usually takes place once in a week, but some retailing is commonly practiced by women within or in front of their house. The small and medium-size

enterprises (SMEs) that operate in rural markets, many of which are owned by women, usually do not have access to credit and are not aware of modern business practices (World Bank, 2019).

## Data Collection

A multi-stage sampling technique was used in purposively selecting the western agricultural zone from the three agricultural zones of the state. Further, three out of seven local government areas in the western agricultural zone of Bauchi State were purposively selected, based on the dominance of women farmers in those areas; these were: Bauchi, Alkaleri and Dass local government areas. Ten wards were selected using a simple random sampling technique from the three local government areas and 5% of registered women farmers were randomly selected across the wards, based on the list of farmer's groups provided by the Bauchi State Agricultural Development Programme (BSADP), making a total of 134 respondents as the sample size of the study. The semi-structured questionnaire was pre-tested and adapted accordingly. One of the co-authors with the help of 3 enumerators collected the data using face-to-face interviews with women farmers in 2017. The questionnaire included socio-economic characteristics of the respondents (e.g. age, years of formal education, family size), types of off-farm activities, and available infrastructure in their villages such as electricity, roads, and markets.

## Data analysis

Descriptive statistics and a chi-square test were used to summarize, group, and describe the data collected. Logistic regression models were used in determining the factors that influence women's participation in different off-farm livelihood activities.

## Logistic regression modell

The participation in off-farm livelihood activities has two options, either to participate or not. As the dependent variables were binary in nature, this makes the Logistic regression model appropriate for the analysis (Iqbal et al., 2015; Rizwan et al., 2017; Nazir et al., 2018).

Mathematical expression of the relationship in its non-linear form (sigmoid curve) is:

$$\frac{Pi}{1-Pi} = \frac{1+\exp(Zi)}{1+\exp(-Zi)} \quad ...(1)$$

When transformed into linear, this is:

$$Li = \ln\left[\frac{Zi}{(1-Pi)}\right]Zi \quad ...(2)$$

In this case, Pi/(1 − Pi) is the probability ratio that the female farmer will participate in off-farm livelihood activity. If a woman farmer engaged in off-farm activity, then the value of the dependent variable is 1, and 0 for the woman farmer who did not engage in off-farm activity. The data were analysed using STATA statistical software version 13.

ogistic regression model estimates:

$$y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \ldots \beta 11X11 + \varepsilon \quad \ldots (3)$$

Where;

y= dependent variable (participating in off-farm=1 otherwise=0)

β0 = constant

β1– β11 = logistic regression coefficients

X1– X11 = independent variables as described in table 1

The models were tested for multicollinearity and homogeneity using correlation, Variation Inflation Factor (VIF) and normality of the residuals, no signs for homogeneity and multicollinearity were found.

**Table 1: Description of the variables imported into the models**

| Variable | Item | Frequency (Percentage) * | Mean and SD ** |
|---|---|---|---|
| **Tailoring** | Yes | 20 (14.93) | |
| | No | 114 (85.07) | |
| **Trading (non-food)** | Yes | 31 (23.13) | |
| | No | 103 (76.87) | |
| **Food processing** | Yes | 29 (21.36) | |
| | No | 105 (78.64) | |
| **Food product sell** | Yes | 33 (24.63) | |
| | No | 101 (75.37) | |
| **Age** | | | 38.03 (10.00) |
| **Married** | Single | 32 (23.88) | |
| | Married | 102 (76.12) | |
| **Level of education** | No formal | 10 (7.46) | |
| | Primary | 42 (31.34) | |
| | Secondary | 53 (39.55) | |
| | Tertiary | 29 (21.64) | |
| **Number of dependents** | | | 3.28 (2.96) |
| **Remittance** | Yes | 33 (24.63) | |
| | No | 101 (75.37) | |
| **Land ownerships** | Yes | 78 (58.21) | |
| | No | 56 (41.79) | |
| **Farm size** | | | 1.88 (2.73) |
| **Extension contact/ year** | | | 1.73 (1.31) |
| **Access to credit** | Yes | 78 (58.21) | |
| | No | 56 (41.79) | |
| **Access to road** | Yes | 49 (36.56) | |
| | No | 85 (63.43) | |
| **Access to electricity** | Yes | 73 (54.48) | |
| | No | 61 (45.52) | |
| **Access to market** | Yes | 38 (28.36) | |
| | No | 96 (71.64) | |

* categorical variables; ** continuous variables

## Data analysis

The dependent variables in the four logistic models indicate the participation or not participation of women farmers in the following off-farm activities: i. tailoring, ii. trading of cosmetics, clothes, and food additives; iii. food processing and iv. food products sales. Other off-farm activities engaged by rural women farmers in the study area that were not included in the models because of low number of participants were hair dressing (7.5%) and bead and soap making (4.0%).

i. Tailoring: producing garments and clothes by using small manual equipment and electronic machines such as scissors,

zigzag and sewing machines. The businesses operated mostly in the home or in a shop very close to the women's house. This is common off-farm activity in rural Nigeria, Willebrands et al. (2012) reported 7% worked as tailors in his study in Nigeria. Ogunrinola et al. (2005) found that, in five rural communities of Nigeria, a woman tailor averagely saves ₦4,886 ($14) monthly as informal personal savings.

ii. Trading of non-food products such as cosmetics and clothes: retailing businesses where a trader serves as a middleman between the wholesaler and final consumer and the business usually operated in the residential environment mostly very close to potential customers. This is a common off-farm livelihood activity in rural Nigeria and is dominated by females (Fabusoro, 2010). Willebrands et al. (2012) reported that traders of clothes and food stuffs constituted 44% of small enterprises in Lagos, Nigeria. In the study by Ogunrinola (2011), traders saved averagely ₦3,390 ($9.41) as monthly informal savings.

iii. Food processing: a process of transforming raw food stuffs to ready to eat foods mostly at home and selling it at strategic places or prepared and sold at the same place outside the home. This is a common off-farm livelihood activity dominated by women in rural Nigeria (Dutse et. al., 2024; and Ogunrinola, 2011, Fabusoro, 2010). Willebrands et al. (2012) found that a rural woman that engage in food processing averagely saves ₦5,712 ($16) as monthly informal personal savings in Nigeria.

iv. Food product sales: retailing of food, when a trader serves as a middleman between food wholesalers and final consumers. This is a common off-farm livelihood activity in rural Nigeria dominated by females (Fabusoro, 2010). Ogunrinola et al. (2005) reported that a rural woman saves ₦3,330 ($9) informal monthly personal savings from food product sells.

## Independent variables (socio-economic, farm and institutional factors)

Independent variables were explored from the literature on off-farm livelihood activities in studies that mostly did not distinguish between genders (see Chapter 2).

# RESULTS AND DISCUSSION

## Women characteristics

Table 2 depicts characteristics of the women farmers which includes age, family size, marital status, level of education, farming experience, farm size and monthly off-farm income. About 47.8% of the women farmers are younger than 39 years, in their economically active and reproductive age.

**Table 2: Characteristics of the women famers (N=134)**

| Variable | Item | Frequency | Percentage | Mean (SD) |
|---|---|---|---|---|
| **Age (years)** | <29 | 24 | 17.9 | 38 |
| | 30-39 | 40 | 29.9 | |
| | 40-49 | 54 | 40.3 | |
| | ≥50 | 16 | 11.9 | |
| **Marital status** | Single | 32 | 23.9 | |
| | Married | 102 | 76.1 | |
| **Highest level of education** | No formal | 10 | 7.46 | |
| | Primary | 42 | 31.34 | |
| | | 53 | 39.55 | |
| | Tertiary | 29 | 21.64 | |
| **Number of dependent** | | | | 3 (2) |
| **Household size** | 1-5 | 62 | 46.3 | 6 |
| | 6-9 | 58 | 43.3 | |
| | ≥10 | 14 | 10.6 | |
| **Farming experience (years)** | 1-5 | 40 | 29.9 | 10 |
| | 6-10 | 36 | 26.9 | |
| | 11-15 | 20 | 14.9 | |
| | >15 | 38 | 28.3 | |
| **Land ownership** | Yes | 78 | 58.21 | |
| | No | 56 | 41.79 | |
| **Farm size (ha)** | <1 | 58 | 43.3 | 1.5 |
| | 1-2 | 29 | 21.7 | |
| | 2.1-4 | 24 | 17.9 | |
| | >4 | 23 | 17.2 | |
| **Off-farm income ($/month)[1]** | <27.8 | 48 | 35.8 | 39.9 |
| | 27.8-55.5 | 66 | 49.3 | |
| | >55.5 | 20 | 14.9 | |

[1]the original categories were in Nigerian currency (<10,000, 10,000-20,000 and >20,000), 1$=360 Naira in December, 2019.

## Factors influencing women farmers' participation in off-farm livelihood activities

The results of regression analysis (table 3) show the socio-economic, farm and institutional factors that are influencing women farmers to participate in different type of off-farm livelihood activities in our case study in rural Bauchi state, Nigeria.

**Table 3: Logistic regression results of factors influencing women's off-farm participation**

| Variable | Tailoring | Trading | Food processing | Food product sales |
|---|---|---|---|---|
| **Age** | 0.0263 (0.309) | -0.0016 (0.198) | 0.0124 (0.188) | -0.0673 (0.207) * |
| **Married** | -0.1342 (0.749) ** | 0.1881 (0.877) ** | 0.0889 (0.652) | 0.2919 (0.963) ** |
| **Level of education** | 0.0063 (0.438) | 0.0183 (0.359) | 0.0577 (0.331) * | 0.1125 (0.369) |
| **Number of dependents** | -0.0046 (0.124) | -0.0195 (0.111) | 0.0269 (0.130) ** | -0.0219 (0.136) |

| | | | | |
|---|---|---|---|---|
| **Remittance** | 0.1826 (1.241) * | 0.0302 (0.866) | 0.0776 (1.056) | 0.2143 (0.421) |
| **Land ownerships** | 0.0209 (0.973) | 0.1854 (0.769) ** | -0.1187 (0.705) * | -0.1017 (0.785) * |
| **Farm size** | -0.0145 (0.255) | -0.4167 (0.199) * | 0.0031 (0.114) | -0.5969 (0.158) ** |
| **Extension contact** | 0.0294 (0.279) ** | -0.0239 (0.223) | 0.0368 (0.247) | -0.0441 (0.282) |
| **Access to credit** | -0.1127 (0.289) | 0.0159 (0.218) | 0.0749 (0.326) ** | 0.0097 (0.229) |
| **Access to road** | 0.1363 (0.409) ** | -0.2116 (0.189) | 0.1430 (0.177) ** | -0.0763 (0.307) |
| **Access to electricity** | 0.0634 (0.714) * | 0.0012 (0.531) | 0.1450 (0.595) ** | 0.1019 (0.587) |
| **Access to market** | 0.0245 (0.781) | 0.1790 (0.607) ** | -0.0312 (0.659) | 0.0693 (0.689) |
| **Number of** | **134** | **134** | **134** | **134** |
| **Prob>Chi²** | **0.0084** | **0.0099** | **0.0029** | **0.0036** |
| **Pseudo R²** | **0.3259** | **0.2500** | **0.2971** | **0.2884** |

Marginal effect and standard error are reported (figures in parenthesis are standard error)

**significant at 0.05 and *significant at 0.10

The results of regression analysis revealed that age has a statistically significant negative effect on women farmers' participation in food product sales with a marginal effect of -0.0673. This implies that an increase of one year in age leads to decreased chances of a woman farmer's participating in food product sales of 6%. This finding supports the expectation provided by Beyene (2008) that, because of the different marginal value of free time, at a younger age the probability of working off-farm increases. Similarly, Rizwan et al. (2017) found that increases in age significantly decrease the likelihood chances of participating in self-employment, migration, and other off-farm livelihood activities among rice farmers in the Punjab, Pakistan. Also, Shehu et al. (2024a) revealed that younger males and females participate more in marketing of cowpea Nigeria. Several other studies support the finding that young farmers are more likely to be self-employed to augment their agricultural income (Yusuf et al., 2016; Eshetu and Mekonne, 2016 and Apind et al., 2015; Dary and Kuunibe, 2012).

On the one hand, married women farmers participated in trading and food product selling statistically significantly more than single women with marginal effects of 0.1881 and 0.2919. On the other hand, married women participated less than single women farmers in tailoring with a marginal effect of -0.1342. The positive influence of being married on trading and food product sales may be explained by the financial need of her family which is in line with the results of Xie et al. (2019b) for rural Sichuan, China. The result that married women farmers are less likely to participate in tailoring than single woman farmers by 13% may be attributed to the fact that a woman farmer must attend some level of training before she can participate in it, and household responsibilities might not give her a chance to do that training. Further, the tailoring business is time-consuming, which competes with the hours needed for household duties.

An increase in educational level increases the likelihood of women farmers' participation in food processing off-farm livelihood activities by 5.7% in our model. Education is needed as any food processing business operation requires formal registration with government agencies in the study area, such as with the Corporate Affairs Commission (CAC) and the National Agency for Food and Drugs Administration and Control (NAFDAC) and every package of processed foods and drugs should have an operational permit and registration number after meeting the stipulated standards. The result is in line with several studies that found that increases in education have a significant positive effect on self-employment and public service off-farm livelihood activities (Mapfumo & Mushunje, 2022; Dary and Kuunibe, 2012; Iqbal et al., 2017; Akaakohol and Aye 2014; Akhtar et al., 2019).

Increases in the number of dependents increase the likelihood of a woman farmer participating in food processing off-farm livelihood activities by 2.6%. More dependents imply a higher cost of living as the average number of dependent members is 3 persons in the area. Low farm income may be insufficient to cater for the whole household. This agreed with the results of previous studies that found a positive effect of the dependency ratio on business off-farm participation (Iqbal et al., 2015; Rizwan et al., 2017; Xia and Simon, 2004).

The results further revealed that a woman farmer that is receiving remittances is more likely to participate in tailoring by 18%. The possible reason is that the remittances can serve as starting capital.

The result shows that a woman farmer that owned land is more likely to participate in trading by 18% than a landless woman farmer and is less likely to participate in food processing (by 12%) and food product sales (by 10%). The finding partly agrees with studies of Taverner et al. (1997); Woldehanna et al. (2000); Kousar and Abdulai (2016) that reported positive effect of land ownership and land tenure security on off-farm livelihood activities in the U.S, Germany and Pakistan respectively.

Increasing farm size statistically significantly decreases the likelihood of participating in trading by 41%. This can be explained by lesser economic necessity to participate in off-farm activities as the economies of scale of larger farm size allow families to produce more food and to achieve higher incomes. Other studies also reported this significant negative effect of increasing land size on participation in off-farm livelihood activities (Akhtar et al., 2019; Rizwan et al., 2017; Corsi and Salvioni, 2012; Beyene, 2008).

Increases in frequency of extension contact increases the likelihood of participation in tailoring by 2.9%. This shows the importance of the Women in Agriculture (WIA) programme that provides women farmers with training in farm and off-farm innovations to improve their living standards (FAO, 2018) and distributes sewing machines after the training in some cases. This is in line with Shehu et al. (2024b) who found some traditional information channels increases commercialization of cowpea.

Woman farmers with access to credit are more likely to participate in food processing by 7.4% compared to woman farmers without access to credit. Credit may serve as the necessary starting capital to establish and engage in a new busi-

ness in food processing. Similarly, the studies by Hitayezu et al. (2014); Akaakohol and Aye (2014); Beyene (2008) revealed that access to credit or microfinance institutions has a statistical positive effect on participating in off-farm livelihood activities.

Women farmers with access to a road are more likely to participate in trading and food processing by 13.6 and 14.3% than the women without access to it. The reason is that access and distance to a road can affect or facilitate the movement of inputs and products from the producer/provider to the consumer. Rizwan et al. (2017) reported a significant positive effect of access to roads on participation in off-farm livelihood activities among rice farmers of the Punjab, Pakistan.

Further results show that woman farmers with access to electricity are more likely to participate in tailoring and food processing by 6.3 and 14.5% respectively than a woman farmer without access to it. The possible reason for that is that the availability of electricity creates the opportunity for women farmers to use small electronic equipment such as zigzag sewing machines, mixers and grinding machines that are used in both tailoring and food processing off-fam livelihood activities. Chowdhury (2010) found a significant positive effect of access to electricity on participation in rural self-employment off-farm livelihood activities among rural women in Bangladesh as electronic machines may be used in tailoring and food processing, which is a similar finding to that of Gibson & Olivia (2010), also, in line with the study of Isgut (2004), who recorded that households with electricity have more rural non-farm income and self-employment than households without electricity in rural Honduras.

A woman farmer with access to a market is by 17.9% more likely to participate in trading than a woman farmer without access to a market. Markets create opportunities to meet a large number of potential customers that creates demand for goods and services. This finding agreed with that of Akaakohol and Aye (2014) and Beyene (2008) who found that distance to market has a significant negative effect on participation in off-farm livelihood activities.

Further results (appendix 1) on distribution of rural women farmers' participation in different types of off-farm activities in respect to rural infrastructure accessibility revealed a statistically significant difference between those that participated in tailoring and food processing off-farm livelihood activities and those who did not so participate in regarding to participants having better access to credit, to roads and higher access to electricity.

## CONCLUSIONS

The study revealed, as expected, that different factors affect the involvement in various types of the off-farm entrepreneurial activities investigated such as tailoring, food processing and trading. Factors such as access to extension services, to roads, electricity and markets have significant effects on women farmers' participation in different off-farm livelihood activities in our model. Food processing and tailoring required higher starting capital (and thus access to credit or remittances increased the probability of being involved) and access to electricity as use of machines is needed. The requirements of trading are lower and, in particular, access to a market increases the probability of being involved. Based on these results, provision of extension services, rural credit facilitation programmes, rural electrification, and road and market structure development are instruments that would support women farmers' involvement in off-farm activities.

To improve access to credit, in particular landless women farmers need to be considered, as most of the time land is used as collateral. One alternative is disbursement of credits among cooperatives. Credit scheme programmes are important as they can serve as start-up and investment capital for off-farm livelihood activities. Further, it gives them purchasing power to expand the land under their cultivation as the majority of them cultivate less than one hectare.

Only about one third of rural households have access to electricity in Nigeria (World Bank, 2019), provision of electricity is imperative to the promotion of off-farm livelihood activities. Further, 87% of rural roads are in poor condition in rural Nigeria. Rural markets, generally, do not have the infrastructure to tackle any produce that requires specialized handling and waste management. Therefore, investment in rural roads, rural electrification and rural market infrastructures which were not included specially in the previous and current gender equality promoting policies may be needed to be incorporated. The improvement of rural infrastructure will promote women's involvement in off-farm livelihoods which will result in complementing the objective of Women in Agriculture and Fadama programmes.

Further results show that more educated women farmers are more involved in food processing than those with a low level of education. Food processing is very important as a large portion of farm products go to waste during harvest and post-harvest as a result of poor processing, storage facilities and transport networks in most developing countries. The need of education of female children is often neglected in rural Nigeria. The result of this study regarding food processing provides evidence of the positive effect of female education on involvement in household livelihood activities.

This study cannot be generalized to all categories of women as the data represent only women farmers in the rural areas. Further studies that focus on the effect of the participation in various off-farm activities on women farmers' income and the livelihood of the household as well as on behavioural drivers could bring interesting results.

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## APPENDICES

| Off-farm | | Access to credit | | | Access to road | | | Access to electricity | | | Access to market | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Yes | No | Sig[1] | Yes | No | Sig[1] | Yes | No | Sig[1] | Yes | No | Sig[1] |
| **Tailoring** | **Yes** | 19 *(95%)* | 1 *(5%)* | **0.034** | 18 *(90.0%)* | 2 *(10.0%)* | **0.041** | 19 *(95.0%)* | 1 *(5.0%)* | **0.036** | 14 (70.0%) | 6 (30.0%) | 0.190 |
| | **No** | 59 *(51.8%)* | 55 | | 31 *(27.2%)* | 83 *(72.8%)* | | 54 *(47.4%)* | 60 *(52.6%)* | | 24 (21.1%) | 90 (78.9%) | |
| **Trading (non-food)** | **Yes** | 20 *(64.5%)* | 11 | 0.124 | 17 *(54.8%)* | 14 *(45.2%)* | 0.180 | 18 *(58.1%)* | 13 *(41.9%)* | 0.291 | 30 | 1 (3.2%) | **0.002** |
| | **No** | 58 *(56.3%)* | 45 | | 32 *(31.1%)* | 71 *(68.9%)* | | 55 *(53.0%)* | 48 *(46.6%)* | | 8 (7.8%) | 95 (92.2%) | |
| **Food processing** | **Yes** | 27 *(93.1%)* | 2 | **0.022** | 25 *(86.2%)* | 4 *(13.8%)* | **0.008** | 28 *(96.5%)* | 1 *(3.5%)* | **0.005** | 20 (69.0%) | 9 (31.0%) | 0.265 |
| | **No** | 51 *(48.6)* | 54 | | 24 *(22.9%)* | 81 *(77.1%)* | | 45 (42.9%) | 60 (57.1%) | | 18 (17.1%) | 87 (82.9%) | |
| **Food product sell** | **Yes** | 14 *(42.4%)* | 19 | 0.465 | 21 *(63.6%)* | 12 *(36.4%)* | 0.256 | 19 (57.6%) | 14 (42.4%) | 0.209 | 25 (75.8%) | 8 (24.2%) | 0.011 |
| | **No** | 64 *(63.4%)* | 37 | | 28 *(27.7%)* | 73 *(72.8%)* | | 54 (53.5%) | 47 (46.5%) | | 13 (12.9%) | 88 (87.1%) | |