

Prioritization of Zero Hunger Target: Farmers' Empowerment and Agricultural Extension Service Delivery in Osun State, Nigeria

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Abstract

The contribution of extension service to the development of agricultural sector is in no small measure, but, the extension service delivery system has been passive and non-functional in many areas. This has disproportionately impacted on the farmers and the food systems, which have also created unequal ground for both men and women farmers to operate, and in particular, inadequate opportunities for women farmers to thrive. Using the African feminism theory, this study interrogated the current state of extension service delivery, examined the farmers' empowerment and food security status, and examined the effect of extension service delivery on farmers' food security status in the study area.

The study elicited data from 252 randomly selected arable crop farmers in Osun State, and analyzed the data with descriptive statistics, while Gender Equality for Food Security (GE4FS) measure technique was adopted to estimate and categorize the farmers into continuums of empowerment and food security status. Binary probit regression model was fitted to examine effect of extension service delivery on farmers' food security status.

From the results, extension service delivery appeared to be non-functional in the study area, while many of the farmers were also food insecure. The farmers appeared to be slightly empowered in the aspect of agriculture empowerment, while economic, social and civic engagement empowerments seemed to be insufficient, and this also led to majority of the farmers being disempowered. Empowerment status, extension service delivery, and farmers' personal features were also indicated to significantly affect farmers' food security status in the study area.

Given the findings, the study recommended that policy actions and efforts on agri-food sector development should be directed towards these highlighted areas.

Keywords: Food security, empowerment, extension service, GE4FS, binary probit, Nigeria

Background Information

Development policy makers and planners are becoming increasingly aware of the crucial contributions of women farmers to agricultural production and food security. Sadly, in Nigeria, various agricultural policies instituted by government establishments at all levels are yet to adequately address the needs and agitations of women farmers. In many instances, where the roles and needs of women farmers are in principle recognized in different agricultural development policies, these actions appear not to have adequately translated into proper planning and implementations of different agricultural development programs (Food and Agriculture Organization (FAO), 2019).

Until recently, most agricultural researches are generally focused on the improvement of production and technologies; they often give inadequate attention to women farmers and their societal and livelihood needs, and this always renders the women folks to a vulnerable state. As noted by FAO (2017), women in conjunction with their men counterparts are often responsible for different agricultural tasks and crops, where women in particular are at the forefront of agricultural products processing and value addition, as well as marketing activities. Evidently, this is where the role and efforts of agricultural extension and rural advisory service delivery need to be intensified because women, globally play an important role in agricultural food chain from the production stage to the final consumers, yet, they still are marginalized in terms of access to agricultural policies, extension and rural advisory services (Quaye *et al.* 2019).

Women's access to agricultural extension was very low, and the interaction between extension agents and women was highly influenced by cultural factors that in turn limited interaction between females and males who were not their spouses. This position aligns with the submission of Jones *et al.* (2017) who also reported that gender inequality constrains women's opportunities in the agricultural sector, in terms of achieving food security and increasing agricultural productivity. The authors further explained that investment in gender-responsive programming which promotes women's empowerment can help to overcome these constraints. Farnworth *et al.* (2017) also supported gender-equitable strategies for achieving more balanced use of agro-inputs such as fertilizers. In a similar manner, Mudege *et al.* (2015) explored the interaction between extension services and gender relations in order to suggest ways and strategies that can be useful in ensuring that extension services are gender-equitable and empowering for women. Findings from their study revealed the underlying gender and cultural norms mediate access to extension services and information. This is a situation where some men

regard themselves as representatives of their households and therefore could receive first-hand information for further dissemination to their female counterparts. The study also indicated that gender norms related to household decision-making impact on the ability of women to access training opportunities.

As witnessed in Ghana, extension service provision is male-dominated and this may contribute to gender bias in terms of access to information, participation, implementation and innovation by female farmers; the limitations women face in accessing extension and rural advisory services are related to social and cultural constructions (Quaye *et al.* 2019). According to Meinzen-Dick *et al.* (2010), extension agents usually have the tendency to approach male farmers more often than females' farmers because of cultural restrictions and also because of the general misconception that extension advice will eventually 'trickle down' from male heads to other household members. Many extant studies have equally established that female extension agents are central to reducing problems for female farmers in accessing agricultural extension services (Hird-Younger and Simpson, 2013; Kondylis *et al.* 2016). The studies further demonstrated how adding a female extension agent could address a gender bias in dissemination of improved agricultural technologies in Mozambique. Inclusion of female extension agents to the already existing male personnel was found to improve outreach to farmers; their addition was also indicated to encourage women to seek advice and more relevant information on improved farming practices (Kondylis *et al.* 2016).

In the same vein, Abdul-Raheem and Worth (2016) reported that public sector extension in West Africa is undergoing transformation which includes decentralization and outsourcing extension services in the context of adopting a pluralistic system of extension delivery. Extension delivery in Africa has witnessed significant transformation from the age-long traditional methods which involves the use of farmer field schools (FFSs) and on-farm demonstrations which are characterized by high cost and limited audience in terms of outreach, to the use of modern technique known as community based extension services delivery and e-extension systems (Quaye *et al.* 2019). However, all these cannot be said of many regions and states in Nigeria, including the study area, hence, the need for this study.

Review of relevant literature

The importance of gender is highlighted in the Rome Declaration on World Food Security and the World Food Summit Plan of Action of 1996, which states that governments should work to ensure an enabling political, social, and economic environment designed to create

the best conditions for the eradication of poverty and for durable peace, based on full and equal participation of women and men, which is most conducive to achieving sustainable food security for all (Population Council, 1996). Many extant literatures have demonstrated that gender inequality is associated with food insecurity (for instance; Adebo and Falowo, 2015; Melese *et al.* 2021; Fanelli, 2022).

Gender equality, and by extension women's empowerment in the context of food security and nutrition comprises a complex set of issues and dynamics. This complexity, however, is no reason to avoid the challenges, given the obligations and expectations for the achievement of both SDG 2 and SDG 5. There are huge opportunities to advance the gender equality vis-a-vis empowerment to drive the elimination of hunger and malnutrition in the society. It is important to be clear that gender equality is a human right, as enshrined in international law (UN Assembly, 1979). Most importantly, the right to food is also a human right. and realizing both requires concomitant resources and support. But the right to food will not be fully realized without parallel progress regarding women's rights, and rights to equality, as there is a mutually reinforcing relationship between gender equality and food security (CARE, 2020).

In sub-Saharan Africa, women contribute 60% to 80% of the labour in food production for household consumption and for sale. A survey of national sectoral reports for Benin, Burkina Faso, the Congo, Mauritania, Morocco, Namibia, Sudan, Tanzania, and Zimbabwe found that women's contributions to household food production range from 30% in Sudan to 80% in the Congo, while the proportion of women in the economically active labour force in agriculture ranges from 48% in Burkina Faso to 73% in the Congo (FAO, 2017).

Discriminatory social norms, practices and roles shape the gendered distribution of paid and unpaid work, limit women's access to assets, productive resources and markets, and undermine the self-confidence and leadership potential of women (Logeswari and Thiruchenduran, 2016). They can also facilitate exploitation and violence. But the denial of rights and entitlements, through formal and informal institutions and laws, is also central to the problem. The widespread and systematic institutional discrimination and bias against women in access to assets, services and information such as land, credit, education, training and extension, employment opportunities, mobility, climate and market information, and agricultural inputs and technologies, can equally be attributed to the dual challenges of harmful socio-cultural norms and practices and rights denial (Kassie *et al.* 2015). Likewise, as shown in figure 1, lack of access to resources, limited decision-making power, lower educational status and restricted


mobility of many women and girls make it difficult for them to meet their nutritional needs, receive adequate nutrition education or access health services (Harris-Fry *et al.* 2018). All these amplifying threats, livelihood shocks and emergencies, and its disproportionate impact on farmers are exacerbating an already alarming situation in the food systems (FAO, 2019).

GENDER EQUALITY & FOOD SECURITY: WOMEN'S EMPOWERMENT AS A TOOL AGAINST HUNGER

Persistent gender inequalities that prevail in the Asia-Pacific region constrain women's potential for contributing more effectively to agriculture, rural development, food and nutrition security, which undermine the region's goal of long-term food security.


60% OF THE UNDERNOURISHED GLOBALLY ARE WOMEN OR GIRLS

- UN estimates




GENDER EQUALITY CAN MAKE A SUBSTANTIAL CONTRIBUTION TO A COUNTRY'S ECONOMIC GROWTH, AND IS THE SINGLE MOST IMPORTANT DETERMINANT OF FOOD SECURITY


■ AGRICULTURAL GENDER GAPS




gender inequities in access to rural resources, services, labor market opportunities



undervaluation of women's roles and contributions




gender neutral policies




lack of gender specific data

■ IMPROVING WOMEN FOOD PRODUCERS' PRODUCTIVITY


A Food and Agriculture Organization of the United Nations (FAO) study estimates that **closing the gender gap** in access to productive resources such as land, credit, machinery, or chemicals could...



eliminate yield gaps of **20% - 30%** among men & women




increase domestic agricultural output by **2.5% - 4%**




100 million fewer people living in hunger

■ ADDRESSING THE PROBLEMS


A new report, *Gender Equality and Food Security - Women's Empowerment as a Tool against Hunger*, prepared jointly by the Asian Development Bank and the FAO, recommends the following to policymakers.




Tackle laws and regulations which discriminate against women, **PARTICULARLY IN LAND OWNERSHIP**




Initiate programs to **BOOST GENDER EQUALITY** in agriculture and the labor market



UPDATE EDUCATION & EMPLOYMENT POLICIES to make them more gender sensitive




DEVELOP FOOD SECURITY STRATEGIES to improve women's access to childcare, farmer support mechanisms, and credit & agricultural services



FINE-TUNE SOCIAL PROTECTION PROGRAMS such as active labor market programs with targets for women's employment

SOURCE

Asian Development Bank (2013). *Gender Equality and Food Security - Women's Empowerment as a Tool against Hunger*



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Furthermore, healthy enabling environments can accelerate the needed progress in agri-food sector significantly by confronting and changing social norms, capturing more and better

gender-related data, reforming and implementing laws, upholding rights and, establishing inclusive multi-stakeholder processes are among the areas where change can be enabled (FAO, 2018). Similarly, transparent, accountable and responsive legal and regulatory mechanisms and governance institutions, that are mandated and inclusive, are fundamental to progress, and the inclusion of women's voice at all levels of decision-making should be an immediate goal (FAO, 2018). There is a need to move beyond the treatment of gender as an issue between women and men, to address gender as relational, dynamic and transformational issue. Gender relations and the structures that underpin these can adjust in response to changes in policy contexts, in inter- and intra-household understanding, and in household- and community-level needs (FAO, 2019).

An important phenomenon found in many developed countries today is the "feminization of agriculture", or the growing dominance of women in agri-food sector (FAO, 2019). This trend makes it more imperative than ever for developing nations to take action to support women to be fully involved in agricultural production so as to enhance their contributions to food security in the society. Sadly, most of these nations' economic policies favour the development of other industries, at the expense of the agricultural sector, particularly the domestic food production. And, this has led to exodus of rural people to the urban centers in search of more income-earning opportunities (FAO, 2019).

From the foregoing, one can infer that development in agri-food sector is particularly an issue across many developing countries, such as Nigeria, and the need is urgent to address such issue for the nation's zero hunger target policy to be feasible, practicable and sustainable. Given this background, this study interrogated the current state of extension service delivery, examined the farmers' empowerment and food security status, and investigated the effect of extension service delivery on farmers' food security status in the study area. This research hypothesized that extension service has no effect on farmers' food security status in the study area.

Theoretical foundation of the research

African feminism theory is adopted for this study, and this theory particularly addresses the prevalent gender discrimination in the society across the globe (Barker, 2004; Ritzer and Goodman, 2004; Ihle, 2008). The approach demands the progress space for women to contribute in the running of their societies in the areas of empowering women with access to resources and inclusion in agricultural development policy issues and its implementation, through access to productive and non-productive assets such as agricultural inputs and machineries, health, education and housing, and other things that could make life more meaningful to the women

population (Ihle, 2008). African women's situation and the layers of oppression being characterized with is also reinforced by Ogundipe-Leslie (1984) who advocated for improvement in African women conditions within the socio-economic realities of culture and development. Importantly, African feminism theory did not promote a reduction in the power of men, rather it pushes for gender-just policies, designed to deal with the prevalent realities of African society on gender ascription (Heldke and O'Connor, 2004).

Materials and Methods

The study area

The study area is Osun State, Nigeria, located in the south-western part of Nigeria. The area is an inland state which lies on latitude of 8°10' N and longitude of 6°5'S (Babatunde, Omoniwa and Oluyemi, 2019). The state is also located in the rain forest region of Nigeria, and it enjoys luxuriant vegetation, which is also responsible for the predominance of agricultural and allied activities across the state. According to Akinbode and Bamire (2015), the state is divided into three Agricultural Development Program (ADP) zones, which are Ife/Ijesa, Iwo, and Osogbo ADP zones, based on administrative convenience.

Data

Cross-sectional research design was used for this study, and information was elicited from the respondents based on the study objectives. The data were collected from smallholder arable crop farmers who were randomly selected through a multi-stage sampling technique. In the first stage, a purposive selection of two Local Government Areas (LGAs) each from the three ADP zones in the state was carried out, while random sampling technique was applied in the second stage of sampling to pick two villages each from the LGAs selected in the first stage. Given consideration to varying population sizes across the villages in the selected LGAs, proportionate to size random sampling technique was instrumental in the third stage, to select the arable crop farmers used as sample size for this study. The study benefitted from the approach (sample size determination procedure for unknown population using confidence level technique of Z-score table) described in Shete *et al.* (2020) in the selection of the study's representative sample. Using the default 5% (0.05) error margin (which is 95% confidence interval), the sample size is calculated as follow:

$$n_0 = \frac{(1.96)^2 \times 0.5(1 - 0.5)}{(0.05)^2} = 384.16$$

However, 256 arable crop farmers were selected from this calculated sample size owing to the time and resource limitations, while responses from only 252 farmers were used for the final estimation because of incomplete responses.

Data Analytical Techniques

Descriptive statistics such as: frequency and percentages, mean value, standard deviation, and cross tabulation techniques were used to describe and profile the extension delivery services in the study area by gender. Similarly, access to extension services, frequency of extension visit, type of extension services enjoyed, and mode of extension service delivery were used as proxies to conceptualize agricultural extension service delivery in the study area. The methodological approach of Gender Equality for Food Security (GE4FS) measure (World Food Programme (WFP), 2020) was also applied to examine and categorize the farmers into the different continuum of empowerment and food security status (low empowerment = 0; moderate empowerment = 1; high empowerment = 2).

In line with Kassie *et al.* (2015) and WFP (2020), farmers' food security status was also estimated and broadly grouped into the following: 1 if household is food-secure – combining both food break-even (FBE) and food surplus (FS) individuals; then, 0, otherwise – combining chronic food insecurity (CFIS) and transitory food insecurity (TFIS). This approach is reliable and validated for the calculation of gender imbalance in empowerment and differences in the levels of food security status among individuals (WFP, 2020). In addition, binary probit regression model was applied to investigate the effect of extension service delivery on farmers' food security status in the study area.

Model Specifications: Probit Regression Model

Probit model is a statistical model applied to predict the probability of an event occurring. The model is particularly useful to predict the likelihood that “*an event will fall into one of a range of categories by estimating the probability that observation with specific features will belong to a particular category*” (Sebopetji and Belete, 2009). The response variable for the model is usually categorical in nature, and particularly in binary form. The probit model can be expressed as:

$$Pr(Y = 1|X) = \Phi(Z) = Z = \Phi(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n) \text{ where:}$$

Y = response variable, and represents the likelihood that the event will occur or not.

That is, Y = 1 or 0, given the variables X.

In this case, if a farmer is *food secure* = 1, and 0, otherwise)

Φ is the cumulative standard normal distribution function.

Z is the linear combination of explanatory variables (X_i) with coefficients ($\beta_0, \beta_1, \beta_2, \dots, \beta_n$)

Results and Discussion of Findings

This section presents the findings and discussions in order of the study objectives, as follow:

Respondents' socio-economic features and Current state of extension service delivery

The findings in Table 1 revealed the age-group distribution of the arable crop farmers in the study area. The findings showed the predominance of farmers who fall within the active age groups of the economy, with the estimated mean age of 52.5 years. To be precise, 0.4 percent, 28.6 percent and 34.1 percent of the arable crop farmers were in the age-group categories of within 35 years, 36-45 years, and 46-55 years, respectively. In the same vein, about 30 percent of the sampled arable crop farmers were within the age group range of 56-65 years, while only 7.5 percent of the arable crop farmers are 66-75 years of age. This result implies that majority of the farmers fall within the active and working age of the economy (which is good for farming activities) in line with the Malthusian theory of population. This finding agrees with Fawehinmi and Adeniyi (2014), but disagrees with Fapojuwo *et al.* (2018) who reported a much lesser mean age of the farmers.

The findings in Table 1 also revealed that nearly one-third (30.6%) of the sampled arable crop farmers are female, while the rest 69.4 percent are male. It is important to reiterate that the proportion of female individuals in the sampled population appears to be a good representation since the distribution of male and female population in the study area was not equal, as evident from the probability sampling technique employed. By implication, this result suggests male dominance in the study area, and this is in line with Aboaba, Fadiji and Hussayn (2020) as well as Alao, Bamiwuye and Adedokun (2020) who reported similar findings in their separate studies conducted in South-West Nigeria.

Similarly, the results in Table 1 showed the distribution of arable crop farmers based on their access to extension service. The results indicated that most (93.6%) of the arable crop farmers have no access to extension services, while very few (6.4%) of the sampled arable crop farmers in the study area did have access to extension service. The implication of this result is that majority of the arable crop farmers have no access to institutional engagement in the study area, which is very bad for agricultural development in terms of information sharing and

diffusion of modern farming techniques. The finding is in tandem with Akinbode and Bamire (2015), Idris-Adeniyi *et al.* (2021), as well as Olanrewaju *et al.* (2021) who all reported in their separate studies that many farmers lack access to extension services in Osun State and Oyo State, respectively, and this has even become worsened, given the current trend of deteriorating situation in the extension unit of Osun State, Nigeria, as reported by the farmers.

The findings in Table 1 equally revealed the distribution of arable crop farmers by the frequency of contact with the extension workers. The results indicated that most (93.6%) of the arable crop farmers did not have any contact with extension service workers, while very few (6.4%) accessed extension services fortnightly, while the estimated average number of contact with the extension workers is approximately 2 times in a month. In all, the results suggested that most of the arable crop farmers do not currently have engagements with the extension workers. The revelation from this finding is worrisome owing to the non-engagement of the limited extension workers with the farmers. Even, the very few farmers who reported contacts with the extension workers revealed that the extension service units are no longer functioning as it was before. The implication of this finding is that institutional engagements with the farmers suffer significantly, hence impacts negatively on the effectiveness of the extension service, and agricultural development. The result agrees with Akinbode and Bamire (2015) who also reported low engagements of extension workers with the farmers in Osun State, Nigeria.

In a like manner, the results in Table 1 also revealed the distribution of arable crop farmers by the major types of extension services accessed. The results indicated that very few (5.5% and 5.2%) of the arable crop farmers received trainings on modern farming techniques and trainings on soil management, respectively. Similarly, very few (4.4%) of the arable crop farmers who accessed extension services received trainings on pest control management and fertilizer application techniques. The implication of this result is that majority of the farmers do not have access to extension service which does not look good for agricultural development in the state. Meanwhile, the type of extension services received by the few farmers who have access to extension services appears to follow a similar trend with what Akinbode and Bamire (2015) reported in their study in Osun State, Nigeria.

The distribution of arable crop farmers based on the mode of extension services delivered to them, as shown in Table 1 revealed that very few (6.3%) farmers mainly accessed extension services through face to face contacts with the extension agents, while very few (1.2%) farmers mainly accessed extension service through social media method of extension delivery.

Conversely, few (1.9%) of the arable crop farmers who have access to extension services mainly accessed it through both face to face and social media delivery methods. By implication, majority of the farmers who accessed extension services benefitted from its delivery through face to face contact with the extension agents. This result agrees with Akinwale and Omobuwa (2021) who also reported similar findings in their study conducted in Osun State, Nigeria.

Table 1: Distribution of arable crop farmers' socio-economic characteristics and access to extension service delivery (n = 252)

Variables	Frequency	Percentage	Mean	Std. Dev.
Age-group (years)			52.5	9.04
≤ 35	1	0.4		
36-45	72	28.6		
46-55	86	34.1		
56-65	74	29.4		
66-75	19	7.5		
Gender			-	-
Male	175	69.4		
Female	77	30.6		
Access to extension services				
Have access	16	6.4		
No access	236	93.6		
Frequency of extension contact			1.87	0.48
Fortnightly	16	6.4		
None	236	93.6		
*Type of extension services accessed			-	-
None	236	93.6		
Trainings on soil management	13	5.2		
Modern farming techniques	14	5.5		
Pest control and fertilizer application	11	4.4		
*Mode of extension delivery			-	-
None	236	93.6		
Face to face contact	16	6.3		
Social media	3	1.2		

Both 5 1.9

* - Multiple response

Source: Field survey, 2022

Farmers' empowerment categories/components and food security status

Given the mean values associated with the empowerment categories and the components, as well as the estimated values attributed to their departure from the mean values (standard deviation), the results in Table 2 indicated that the farmers seemed to be empowered only in the agriculture empowerment category, while they were disempowered in economic, social and civic empowerment categories, given the magnitude of their departure from the mean values.

In the overall, female farmers appeared to be highly empowered than the male counterparts who were found to be largely disempowered, and only 17.1 percent of the sampled population was found to be food secure. This estimate suggests that very small proportion of the farmers were found in the food break-even and food surplus food security categories.

From these results, it can be deduced that economic, social and civic empowerments seemed to be lacking which led to majority of the farmers being disempowered. In the study area, extension service delivery appeared to be non-functional, and many of the farmers are food insecure. More so, since extension service delivery has been indicated to have effect (in both directions) on farmers' food security status, the null hypothesis is hereby not accepted.

Table 2: Empowerment components and food security status of farmers (n = 252)

Empowerment / Food security status	Frequency	Percentage	Mean	Std. dev.
Agriculture empowerment	-	-	0.9142	0.6965
<i>Component 1</i>	-	-	0.9325	0.2513
<i>Component 2</i>	-	-	0.9285	0.2580
<i>Component 3</i>	-	-	0.3373	0.4737
<i>Component 4</i>	-	-	0.2539	0.4361
Economic empowerment	-	-	1.0143	0.8601
<i>Component 5</i>	-	-	0.6666	0.4723
<i>Component 6</i>	-	-	0.9523	0.2133
<i>Component 7</i>	-	-	0.7817	0.4138
<i>Component 8</i>	-	-	0.4682	0.4999
<i>Component 9</i>	-	-	0.1825	0.3870
<i>Component 10</i>	-	-	0.1666	0.3734

Social empowerment	-	-	0.6715	0.8334
<i>Component 11</i>	-	-	0.9365	0.2443
<i>Component 12</i>	-	-	0.9047	0.2941
<i>Component 13</i>	-	-	0.1230	0.3291
Civic empowerment	-	-	1.2940	0.8067
<i>Component 14</i>	-	-	0.2817	0.4507
<i>Component 15</i>	-	-	0.2142	0.4111
<i>Component 16</i>	-	-	0.5198	0.5006
<i>Component 17</i>	-	-	0.7380	0.4405
<i>Component 18</i>	-	-	0.0555	0.2295
Empowerment status (by gender)				
High (empowered)				
<i>Male</i>	0	0.0	-	-
<i>Female</i>	29	11.5	-	-
Low/Moderate (disempowered)				
<i>Male</i>	175	69.4	-	-
<i>Female</i>	48	19.1	-	-
Food security status (pooled)				
<i>Food secure</i>	43	17.1	-	-
<i>Food insecure</i>	209	82.9	-	-

Note: For details on each of the components of empowerment categories (see WFP, 2020)

Source: Field survey, 2022

Effect of extension service delivery on farmers' food security status

The results in Table 3 present the margins estimates of the fitted probit model that was applied to investigate the effect of extension service delivery on arable crop farmers' food security status in the study area. The margins approach is particularly useful to estimate the average marginal effect, which is also an indication of the average slope of all tangents for all values of a variable.

The findings revealed that one unit change in household size decreases the probability of a farmer to be food secure by 0.1541, all else equal. This implies that large household size negatively and significantly ($p < 0.05$) affect farmers' food security status. This result is in tandem with Kehinde *et al.* (2021). In a similar manner, the type of extension services accessed

by farmers was indicated to significantly ($p<0.01$) decrease the likelihood of farmers' food security status by 1.1624. The implication of this result is that farmers' interests and needs are perhaps not considered in the design and implementation of development programs and other improved agricultural techniques in the study area. This aspect was also stressed in a study conducted by Akinbode and Bamire (2015) in Osun state Nigeria.

The findings also indicated that economic and civic empowerments decrease the probability of farmers' food security status by 0.4375 and 0.3612 respectively. The results suggest that increase in economic and civic empowerment have inverse and significant ($p<0.05$ and $p<0.01$) effects on the food security status of the farmers in the study area. This revelation is not surprising, and it further lends credence to the earlier discussed result which revealed that large proportion of the farmers in the study area were disempowered across many of the empowerment categories, given their respective deviations from the mean values. This indication is also likely to impact negatively on their food security status.

On the other hand, one unit increase in years of farming experience was found to increase the probability of farmers' food security status by 0.0536, all things being equal. By implication, the result indicated that human capital expressed by the farmers' years of experience in farming has a direct and significant ($p<0.01$) effect on farmers' food security status. This is as expected because experience plays a major role in the optimization of scarce resources in farming operations. Similarly, one unit increase in farmers' access to extension services induces a significant ($p<0.05$) increase in the probability of farmers being food secure by 0.0536. This is an indication that extension service is very vital to the realization of the nation's zero hunger targets, and the more reason for immediately revitalization of the extension delivery unit in the study area, because as indicated earlier, most of the sampled farmers reported non-access to extension service delivery in the study area.

In the same vein and as expected, mode of extension delivery was indicated to induce a significant ($p<0.01$) increase in the probability of farmers' being food secure by 0.3104. On this, the few farmers who reported access to extension services also indicated face to face contact and social media as the prevalent methods of extension service delivery in the study area. By implication, this mix-method of extension service delivery is commendable and will effectively communicate important agricultural development information to the farmers, with a view to have positive effects on their production output, food security status, and general welfare condition.

Table 3: Probit regression: Effect of extension service delivery on farmers' food security status

Food security status	Coefficient	Margins estimate (dy/dx)
Gender	0.4086	0.0693 (1.35)
Age	-0.0055	-0.0009 (-0.26)
Years of formal education	0.0267	0.0045 (0.87)
Marital status	0.9559	0.1622 (1.03)
Household size	-0.1541	-0.0261 (-2.07)**
Years of farming experience	0.0536	0.0091 (3.32)*
Access to extension	1.7495	0.2969 (2.31)**
Type of extension services accessed	-1.1624	-0.1972 (-4.01)*
Mode of extension service delivery	0.3104	0.0526 (1.81)***
Agriculture empowerment	0.0108	0.0018 (0.06)
Economic empowerment	-0.4375	-0.0742 (-2.48)**
Social empowerment	-0.1831	-0.0310 (-1.28)
Civic empowerment	-0.3612	-0.0613 (-1.87)***
Constant	-2.3021	-

dy/dx – average marginal effects estimate, Figures in parentheses are z-values

* - $p < 0.01$; ** - $p < 0.05$; *** - $p < 0.1$ probability levels respectively,

$LR\text{-}chi^2(13) = 73.87$; $Prob > chi^2 = 0.0000$; $Pseudo\text{-}R^2 = 0.3208$, Number of observations = 252

Source: Data analysis, 2022

Conclusion and Policy Recommendations

From the foregoing, the study has shown how various categories of empowerment, extension service delivery and other dynamics significantly affect the farmers' food security status in the study area. It is anticipated that efforts on agri-food policy actions by government and non-governmental development agencies will be directed towards these highlighted areas of

empowerments. And, the following policy recommendations are of importance to the realization of zero hunger target and gender-just empowerment and development programs:

- Gender-balanced policies on food and nutrition security should be put in place to accommodate and reward women's roles and responsibilities in the agri-food value chain.
- Efforts should be directed at designing and implementing agricultural development programs aimed at empowering the farming population (male and female farmers) especially the smallholder farmers. Such empowerment programs should cover all the components in relation to the outlined empowerment categories (agriculture, economic, social and civic empowerments).
- As much good as farmers' family members represent unpaid labour in farming operations, which is also expected to minimize the running cost of labour employment, both formal and informal campaign strategies should be embraced by the government on the need for the resource poor farmers to adopt birth control measures, as this move becomes imperative to address the negative effect of large family size on farmers' food security status.
- Because of the poor performance of extension service delivery in the study area, there is an urgent need for the revitalization of extension service unit across all the ADP zones. In doing this, emphasis should be placed on the use of social media in the dissemination and diffusion of agricultural information. Complimentarily, social media approach can be used alongside face to face contact method of extension service delivery to disseminate and diffuse new and important agricultural information since extension service delivery in the study area appears to be passive, and/or non-functional, at the moment.
- Alternative arrangement in terms of reform in extension service can also be pushed forward by the government. Such reform could take the form of decentralization, as recently proposed by a study conducted in Ghana. In this approach, delivery of extension services will be outsourced to non-governmental agencies with requisite technical know-how on social dialogue, and the agencies will be guided by some sets of performance indicators. Such approach symbolizes a pluralistic system of extension service, and may ultimately bring about the needed change to the extension service system in the study area.

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