WOMEN EMPOWERMENT AND IMPLEMENTATION OF NUTRITION-SENSITIVE AGRICULTURE AMONG FEMALE COOPERATIVE FARMERS IN ENUGU STATE, NIGERIA

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ABSTRACT

This study investigates the role of women empowerment in the implementation of nutrition sensitive agriculture among female cooperative farmers in Enugu state. Using a multi-stage sampling method, 300 female cooperative famers were selected from the 4000 females registered in cooperatives in Enugu state. Data was analyzed using Abbreviated Women Empowerment in Agriculture Index (A-WEAI), Likert-scale ratings and poison regression. The mean empowerment scores reveal that female farmers in Enugu State are most empowered in income-related decisions (0.66) and leadership (0.59), while they experience the lowest levels

of empowerment in agricultural production (0.15) and time allocation (0.33).The perceived factors influencing level of women empowerment included marital status, gender-based violence and discrimination, lack of participation in community associations, limited access to basic infrastructure, lack of access to healthcare facilities, lack of skills and training and lack of awareness on respondents'rights.The variables which were statistically significant to production diversity of the respondents were; food knowledge (P<0.10), off farm income (P<0.05), primary occupation (P<0.05) and years of farming experience (P<0.05).The study calls for development and implementation of gender-inclusive policies and programs that will improve the socio-economic lifestyle of female farmers to have the potential to be effective for improving nutrition security. These policies and programs should have primary goal such as income generation or provision of social amenities like improved water facilities, access to needed farm inputs and incentives

Keywords: women's empowerment, nutrition, agriculture, cooperatives farmers
JEL Code: I38, Q13

1. INTRODUCTION

Agriculture can be a significant apparatus of growth, poverty reduction and food security. It is alleged as a male-dominated area but as an apparatus of growth and development, it ought to offer better acknowledgement of the importance of women (Alkire et al., 2013). Women in agriculture lack empowerment and they are less productive because of the restricted access to production resources and opportunities (FAO, 2018). The literature advocates four domains of empowerment: economic, social, political, and psychological (Fox & Romero, 2016) in which the approach for developing policy measures for women's empowerment ought to be sturdily connected with the interdependence of economic and social empowerment. One of the most used measurement for women's empowerment in agriculture is Women's Empowerment in Agriculture Index (WEAI), introduced in 2012. The methodology was developed by United States Agency for International Development (USAID), the International Food Policy Research Institute (IFPRI), and the Oxford Poverty and Human Development Initiative (OPHI). WEAI was the first comprehensive and standardized measure to unswervingly capture women's empowerment, agency, and inclusion of women in the agricultural segment (Alkire et al., 2013; Malapit et al., 2015). After introducing the WEAI in many non-European counties, few editions were done, and new form, the Abbreviated Women's Empowerment in Agriculture Index (A-WEAI) was introduced in 2015. A-WEAI measures empowerment in five domains: Production, Resources, Income, Leadership and Time allocation (Alkire et al., 2013).

The activities of women in agriculture cannot be over-emphasized. In many countries of the world, women play substantial role in ensuring food availability for growing population of the world. Women are found working all year-round in producing food crops, while men perform only replanting tasks which occupy small part of the agricultural year (Banji & Okunade, 2011). Women have been found to contribute hugely to food security in Nigeria. Enugu State, located in southeastern Nigeria, exemplifies the high involvement of women in agricultural projects in the areas of: animal rearing and sales (96.7%), corn processing units (91.7%), seasonal crop production and processing (90.0%), household animal and dairy (88.3%), formation of cooperative societies (85.0%) and cassava grafting outfits (60.0%)(Asadu et al., 2019). This implies that women are actively and heavily involved in agricultural activities in the state,

Despite the recognition of the crucial role of nutrition-sensitive agriculture in improving food and nutrition security, the issue of malnutrition remains prevalent in many developing countries. Women, who play an important role in food production and nutrition, are disproportionately affected by malnutrition due to gender-based discrimination, limited access to resources, and low levels of empowerment (FAO, 2018). Women face challenges in availability of finances, which restricts their capability to invest in their farms and improve their productivity (Dzanku et al., 2013). Researchers have found that when women are mistreated and don't have access to the tools they need, they often can't get enough food to eat. This is especially true for women who are very poor or ignored by society (Aziz et al..,2022).Furthermore, women's role in agriculture often goes unrecognized, and they receive less support from governments and development agencies (IFPRI, 2014).

Women's empowerment has been recognized as a key factor in improving their ability to contribute to food and nutrition security (Malapert et al., 2019). There have been studies in the past that have established connections between women's empowerment and the implementation of nutrition sensitive agriculture but still, there is shortage of substantial experimental evidence that confirms the notion that implementing strategies to empower women can lead to improved nutritional agriculture (Heckert.,2019).However, several studies have been done with regard to woman empowerment, for instance Iziko, et al., (2020), Kassie, et al., (2020); Botreaua and Cohen(2020); Njuki, et al., (2022); Abdu, et al., (2022); Manasoe et al., (2022), but none of the works jointly looked at women empowerment as well as determine the effect of women empowerment on their production diversity. In addition, how agriculture can be improved to enhance human nutrition is missing Rule, et al., (2018), especially among women in cooperative society (Nwachukwu, et al., 2024). Therefore, pooling resources to empower individuals in cooperatives would help to overcome financial barriers, enhance productivity and achieve economic empowerment (Olawoye et al., 2022).

Despite the acknowledgement of the significance of women's empowerment, the understanding of the relationship between women's empowerment and nutrition-sensitive agriculture, remains understudied, particularly in Enugu state. Therefore, this study examined the role of women's empowerment in nutrition-sensitive agriculture among female cooperative farmers in Enugu state. This study's objectives determined the level of empowerment of the female cooperative farmers; assessed the factors militating against the level of empowerment of the female cooperative farmers and determined the effect of women empowerment on their production diversity.

2. LITERATURE REVIEW

2.1 Theoretical Literature

A theoretical framework acts as a structural foundation for a research study's theory. It entails introducing and elucidating the theory that provides an explanation for the existence of the research problem being investigated (Swanson, 2013). The following theories guide the theoretical framework for this study; the empowerment theory and gender and development theory.

Empowerment Theory

This theory examines the processes and conditions necessary for individuals or groups to gain power and control over their lives. This framework highlights key elements of empowerment, including access to resources and information, agency, decision-making power, and participation in decision-making processes. In the context of this study, the Empowerment theory can be used to understand how women's empowerment influences their ability to implement nutrition-sensitive practices within their farm households. These frameworks can provide a solid foundation for understanding the underlying mechanisms and facilitating meaningful policy recommendations to support women's empowerment and nutrition security.

Gender and Development Theory

This framework incorporates key insights from Gender and Development Theory, which emphasizes the social construction of gender roles and the importance of gender equality in development processes. It recognizes that gender disparities exist within society, including access to resources, power dynamics, and division of labor. By adopting this framework, it can explore how women's empowerment can challenge and transform these existing gender inequalities, enabling women in farm households to engage more effectively in nutrition-sensitive practices.

2.2 Empirical Review

Empirical studies further illustrate the significant contributions of women empowerment in ensuring nutrition sensitive agriculture.Quisumbing, 1996; Udry et al., 1996), in their study, demonstrated a strong relationship between women empowerment and nutrition outcomes. They posited that agricultural productivity increases drastically when women get the same amount of inputs as men. The authors discovered that in Sub-Saharan Africa, women have less access to education, labor, fertilizer, and other inputs than men do and that when women obtain the same levels of education, experience, and farm inputs that currently benefit the average male farmer, they increase their yields for maize, beans, and cowpeas by 22 percent. Atsiya et al., (2019) investigated the impact of women's land ownership on household decision-making power and how it influences child health outcomes, particularly stunting and wasting among children in Nigeria. It found that land ownership empowers women economically by giving them security, access to credit, and control over resources which translates into better nutrition and healthcare decisions for their children.

Lentz et al., (2025), in a study on adapting the women's empowerment in nutrition index highlighted a strong relationship between women empowerment and nutrition outcomes, the study highlighted that women's empowerment has been shown to be important to women's own diet quality and nutritional outcomes. Similarly, Quisumbing et al. (1999), highlighted that gender differences in property rights hinder natural resource management. A person's gender affects the property rights—the rights to use and manage land resources—that person holds. Property rights greatly influence land care. Further studies on the impact of economic resource transfers to women versus men by Yoong et al. (2012), emphasized that targeting transfers to women can improve children's well-being.The authors reported that outcomes for objective indicators of well-being were improved, especially in the form of investments in children's health and education.

Contrarily, Manon et al. (2024), on a study on 'do we contribute to women's empowerment? insights from a nutrition-sensitive agriculture' challenged the assumption that women empowerment can be used as a means to achieve food and nutrition security but noted that from a materialistic perspective, an increase in women empowerment was seen, as their study indicated that the nutrition sensitive agriculture project contributed to household resources and capacity to address food and nutrition security. Also, Pratley, (2016) argued that the relationship that exist between empowerment of the women and child nutrition is inconclusive. This study aims to provide empirical insights that can inform evidence-based policies to support the empowerment of women in agriculture towards implementation of nutrition sensitive practices that can improve nutrition outcomes of households

3. METHODOLOGY

3.1 Theoretical framework

The theoretical literature of this study adopts the empowerment theory as the most suitable theoretical framework to explore the relationship between women empowerment and achieving nutrition sensitive agriculture. The frameworks understanding of power and social change relates to Naila Kabeer's theory of women empowerment: Resources, Agency and Achievement: Reflections on the measurement of Women Empowerment. Kabeer has been dynamic in developing frameworks and methodologies for integrating gender issues into policy and planning. The idea of reducing the differences in opportunities and treatment between genders has been suggested as a fundamental right for all people, and a crucial move towards reaching the Sustainable Development Goals that focus on improving both nutrition and the security of food within households (Abdu et al., 2022).

Women's role especially in agriculture often goes unrecognized, and they receive less support from governments and development agencies (IFPRI, 2014). Women's empowerment has been recognized as a key factor in improving their ability to contribute to food and nutrition security (Malapit et al., 2019). The concept of nutrition sensitive agriculture through empowerment of women focuses on the various dimensions of women's empowerment that could influence the implementation of nutrition-sensitive practices. These dimensions could include economic empowerment, such as access to credit, land ownership, and income generation opportunities. It could also encompass social empowerment, such as education, participation in decision-making processes, and access to information and resources. Nutrition-sensitive agriculture highlights the linkages between agriculture and nutrition outcomes, emphasizing the potential for addressing malnutrition and improving food security through women's empowerment in Enugu state.

3.2 Sampling Method

The study area was Enugu State, Nigeria with a focus on six out seventeen local government areas (LGAs) of the state which includes;(Nsukka, Igbo-Eze South, Igbo-Eze North, Udenu, Uzo-Uwani and Igbo-Etiti). Enugu state has latitudes of 50 561 N and 70 051 N of equator and longitudes 60 531 E and 70 551 E of Greenwich meridian (Enugu State Agricultural Development Project (ENADEP, 2009). Enugu state is an interesting area for this study because most of its rural population including women is involved in agriculture, which primarily comprises smallholdings of less than one hectare. Multi-stage sampling procedure was used to select the respondents from a list of 4000 women farmers registered in cooperatives in Enugu State, gotten from the ministry of capital development and poverty reduction, cooperatives division, Enugu. The three hundred (300) women cooperative farmers were selected for the study with five cooperative societies selected from each of the six LGAs to give thirty cooperative societies, then the last stage is random selection of ten women members from the thirty cooperative societies which gave a total sampled population of three hundred respondents for the study. Data for the study were collected using a set of structured, pre-tested and validated questionnaire. Women's Empowerment in Agriculture Index (A-WEAI), Likert rating scale and poison regression model were used in analyzing the data.

Table 1: **Study sample size distribution**

State	LGAs	Random selection of cooperative societies	Population	Random selection of women members
Enugu	Nsukka	5	4000	10
	Igbo-Eze South	5		10
	Igbo-Eze North	5		10

	Udenu	5		10
	Uzo- Uwani	5		10
	Igbo Etiti	5		10
Total	6	30	4000	300

Source: field survey; Author's computation, 2024.

3.3 Model specification

In every analysis, the nature and purpose of the study determine the type of analytical tool to be employed. The analytical framework of this study included; Abbreviated women empowerment in agriculture index (A-WEAI) model, the Likert scale rating and Poisson regression.

3.3.1 A-WEAI Model

The Abbreviated Women's Empowerment in Agriculture Index (A-WEAI) is a comprehensive tool designed to measure the empowerment, agency, and inclusion of women in agriculture. It evaluates five key domains of empowerment (5DE):

- Production: Decision-making over agricultural activities.
- Resources: Ownership and access to land, equipment, and financial resources.
- Income: Control over agricultural income.
- Leadership: Participation in community organizations.
- Time Allocation: Balance of workload and leisure time.

A-WEAI also includes the Gender Parity Index (GPI), which assesses the empowerment gap between men and women in the same household.

A-WEAI consists of two sub-indices:

1. 5DE (Five Domains of Empowerment Index) – Measures individual empowerment levels.
2. GPI (Gender Parity Index) – Measures the relative empowerment of women compared to men.

The empowerment score is calculated as follows:

$A-WEAI=0.9(5DE)+0.1(GPI)$ $A\text{-}WEAI = 0.9(5DE) + 0.1(GPI)$

where:

- 5DE = 1 - (disempowerment score)
- GPI = 1 - (gap in empowerment between men and women)

THE CUT OFF POINT

Empowered: $5DE \geq 0.80$

Disempowered: $5DE < 0.80$

If a female farmer scores **below 0.80**, she is **disempowered**, meaning she lacks sufficient control over multiple domains.

- If a female farmer scores **above 0.80**, she is considered **empowered** in agriculture.

Gender Parity Index (GPI) Cut-Off

The GPI component compares the empowerment of women relative to men in the household. It measures whether women achieve parity with their male counterparts.

$GPI=1-(\text{Empowerment Gap})$ $GPI = 1 - (\text{Empowerment Gap})$ $GPI=1-(\text{Empowerment Gap})$

GPI = 1: Full gender parity (women and men are equally empowered).

GPI < 1: Women are less empowered than men.

GPI = 0: Women have no empowerment relative to men.

Women are considered empowered in GPI if their score is at least 0.80 relative to men in their household. In the Nigerian context, Kassie, et al., (2020) have shown that many rural women score below the 0.80 cut-off due to limited access to land, credit, and agricultural decision-making power.

Quisumbing et al., (2021) collaborated with the A-WEAI framework, emphasizing its use for evaluating women's agencies in agriculture and recommended Probit and Poisson regression models to analyze determinants of empowerment. Nacka (2019) applied A-WEAI in North Macedonia, finding that women were significantly disempowered in ownership of assets, decision-making, and income control. Nacka (2019) further highlighted that 58% of women were disempowered compared to 33% of men, validating the use of GPI.

The Abbreviated Women's Empowerment in Agriculture Index (A-WEAI) has been effectively utilized in Nigeria to assess women's empowerment in the agricultural sector. For instance, a study conducted in Northern Nigeria employed the A-WEAI to evaluate the relationship between women's empowerment and agricultural productivity. The findings indicated a positive correlation between women's empowerment and increased maize yields, highlighting the significance of empowerment in enhancing agricultural outcomes (Kassie, et al., 2020).
Similarly, research examining Yoruba men and women cassava producers in Nigeria's Southwest geopolitical zone utilized the A-WEAI to assess empowerment levels. This study combined A-WEAI survey data to provide insights into the empowerment status of these agricultural producers (Quisumbing et al., 2021).
Moreover, the International Food Policy Research Institute (IFPRI) has developed instructional guides on the A-WEAI, facilitating its application in various contexts, including Nigeria ((Kassie, et al., 2020). These studies underscore the applicability and effectiveness of the A-WEAI tool in measuring women's empowerment within Nigeria's agricultural sector.

3.3.2 Likert Scale Rating Technique

A rating scale is a psychometric scale, bipolar scaling technique and a bunch of arranged reaction items utilized in study examination to find out data on a quantitative or a subjective characteristic from respondents (Wuensch, 2005). In likert scale, every particular inquiry (or "thing") can have its reaction investigated independently, or have it added with other related items to make a score for a group of proclamations. This is likewise why Likert scales are called summative scales. likert scale has been used by several authors; Aba, (2011) on his study to determine the constraints facing farmers in the use of solid waste in tomato gardening in FCT Abuja with the rating of Very Important (4), Important (3), Less Important (2) and Not Important (1). Similarly, Otutoju (2008) used likert rating scale in his study to measure the constraints soybean farmers are faced with in Benue state, he categorized the constraints as Very Serious (4), Serious (3), Less Serious (2), and Not Serious (1).Likert scales are commonly utilized in survey-based research and find applications across various fields including marketing, psychology, and other social sciences (Bhandari, 2023). The benefit of using Likert Scales lies in their ability to avoid seeking solely binary responses of "yes" or "no" from respondents. Instead, they accommodate varying levels of opinion, and even the absence of an opinion (Mcleod 2023).

A 4-point rating scale technique was used in this study to access the factors militating against the level of empowerment of the women cooperative farmers, the 4-point rating scale was graded as strongly agree (SA) = 4, Agree (A) =3, Disagree (D) and Strongly Disagree (SD) = 1. The mean score of respondents based on the 4-point Likert rating scale was computed; 4 + 3 + 2 + 1 = 10/4 = 2.50 cut off point. Using the interval scale of 0.05, the upper limit cut-off point was 2.50 + 0.05 = 2.55; the lower limit was 2.50 – 0.05 = 2.45. On the basis of the limit, mean scores below 2.5, (i.e. MS < 2.5) were ranked "Rejected; while mean scores that were greater than or equal to 2.5 (i.e. MS ≥ 2.5) were considered Accepted.

3.3.3 Poisson Regression Model

In statistics, Poisson regression stands as a variant of generalized linear models, employed for the analysis of count data and contingency tables. This approach assumes that the response variable Y adheres to a Poisson distribution, with the added assumption that the natural logarithm of its anticipated value can be expressed as a linear combination of unspecified parameters. Sometimes, a Poisson regression model is referred to as a log-linear model, particularly when applied to contingency table. Poisson regression is employed for the examination of count-based information, like weekly beverage consumption or annual arrest rates. This statistical method is utilized to address inquiries related to identifying the factors that can forecast the occurrence rate of an event. Count data typically conform to a positively skewed Poisson distribution and often include a significant number of zero values (Lu 2007).

Poisson regression is a statistical tool specifically designed for count data. In this study, the count represents the number of diverse agricultural products produced by the women cooperative farmers. It is well-suited when dealing with non-negative integer data (like counts) that follow a Poisson distribution, which is often the case in production diversity analysis. Production diversity among farmers refers to the count or variety of different crops or products they produce on their farms. In Poisson regression, the dependent variable is the count of diverse agricultural products. The independent variables include various indicators of women's empowerment and relevant control variables. The model estimates the impact of women's empowerment on the count of diverse products while controlling for other factors. Poisson regression model was used to determine the effect of women empowerment on production diversity of the women cooperative farmers. In Poisson Regression, suppose that the Poisson frequency μ is determined by a set of *k* regression variables (the *X's) (*Nwachukwu, 2008).

The expression is;

$\mu_I = E(Y_i) = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \cdots + \beta_k X_{ki}$ ..... (i)

$\beta 1$ is the intercept while the regression coefficient $\beta_2, \beta_3, \ldots\ldots\ldots, \beta_k$ are unknown parameters that are estimated from the data. Hence, the Poisson Regression model for an observation 'i' is written as;

$Y_i = \frac{\mu^Y e^{-\mu}}{Y!} +$

ε_i .....(ii)

That is, for a given set of values of the independent variables the outcome follows the Poisson distribution. The model for estimation in this study is:

μ_i = Ln (Production Diversity of Farmers (PDF)) = $\beta 1 + \beta_2 Xi + \beta_3 Xi + \ldots\ldots\ldots\ldots + \beta nXni$ ……. (iii)

Where:

PDF = Production Diversity of Farmers (Count data: number of production diversities of women farmers; 0, 1, 2, 3…. n)

X_1 = Food agency (could be decision making as regards food and household nutrition Binary variable: yes=1; No=0)

X_2 = Food knowledge ;(knowledge on food nutrition; binary response; yes=1 otherwise=0**)**

X_3 = Health resources; risk of injury or health problem (binary response; yes= 1 otherwise=0)

X_4 = Health agency (Binary variable: Yes=1, No=0)

X_5 = Health knowledge (Binary variable: yes=1, no=0)

X_6 = Age (Years)

X_7 = Household size (measured in numbers)

X_8 = Farm income (naira)

X_9 = Off farm income (naira)
X_{10} = Primary occupation (farming, trading, civil servant, artisan)
X_{11} = Years of farming experience (years)
X_{12} = Distance to market (Km)
X_{13} = Years of formal education (no of years spent in school)
X_{14} = Ownership of land (Own=1, rent= 2)
X_{15} = Household participation in farming (numbers)
X_{16} = Membership of farmers organization (Binary variable Yes=1, No=0)
μ = Error term

4. RESULT AND DISCUSSION OF FINDINGS

This section presented and discussed the distribution of the level of empowerment of the female cooperative farmers in the study area.

Mean Empowerment Score Analysis

A summary of the mean respondents' empowerment scores is presented in Table 4.1:

Table 4.1: Respondents' empowerments mean scores.

Statistic	Empowerment Score
Mean	0.38
Median	0.42
Minimum	0.23
Maximum	0.52
Standard Deviation	0.11

Field Survey, 2024.

The mean empowerment score of 0.38 suggests that majority of the female farmers in Enugu State experience moderate levels of empowerment. However, the minimum value of 0.23 highlights the presence of severely disempowered women, reinforcing the need for targeted interventions.

This indicates that a significant proportion of women have relatively low empowerment levels, which aligns with findings by Kassie, et al., (2020), who reported that rural women in Nigeria face systemic barriers to empowerment due to land ownership restrictions, financial exclusion, and limited market access. This empowerment variability suggests that empowerment is not uniformly distributed among female farmers, likely due to disparities in education levels, farm income, and institutional support (Iziko, et al., 2020). Okonkwo, et al., (2022), also proposed the need for intervention in agriculture to promote food security and reduce poverty in Nigeria. Hence, encouraging women empowerment could be one of those interventions that will not only reduce poverty but enhance the nutritional value among women in Nigeria.

A summary of the respondents' empowerment scores is presented in Table 4.2:

Table 4.2: Respondents' empowerments mean scores across domains

Statistic	Production	Resources	Income	Leadership	Time Allocation

Mean	0.15	0.38	0.66	0.59	0.33
Median	0.00	0.25	0.75	0.50	0.25
Minimum	0.00	0.00	0.00	0.00	0.00
Maximum	0.75	1.00	1.00	1.00	1.00
Standard Deviation	0.20	0.27	0.25	0.27	0.23

Field Survey, 2024.

Mean Empowerment Score Analysis across domains

The mean empowerment scores reveal that female farmers in Enugu State are most empowered in income-related decisions (0.66) and leadership (0.59), while they experience the lowest levels of empowerment in agricultural production (0.15) and time allocation (0.33). This aligns with findings by Njuki, et al., (2022), who emphasized that despite women's increasing participation in agriculture, their role in decision-making and resource control remains limited.

Distribution and Correlations of Empowerment Scores

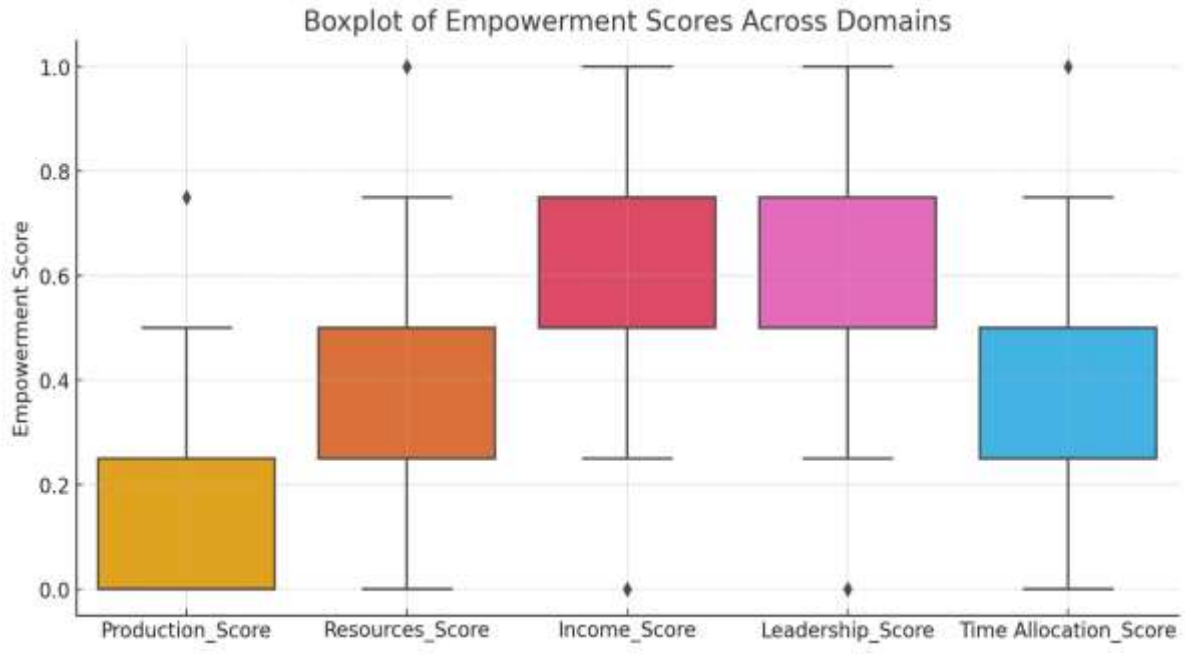

Figure 1: Boxplot of Empowerment scores across domains

A boxplot of respondents' empowerment scores is presented in Figure 1:

The boxplot illustrates the variations in empowerment scores across different domains. The high variability in income and leadership scores indicates that some women have substantial financial control, while others remain financially dependent. The heatmap (Figure 1) shows a strong correlation between resource access and income empowerment (r = 0.78), highlighting that ownership of land and financial assets significantly enhances economic independence (Ogheneruemu and Victor, 2023).

4.2. Perceived factors to the level of empowerment of the female farmers

Table 4.2 below shows results of the factors militating against the empowerment of the female farmers. A 4- point likert scale rating technique was used, the decision rule in the Likert scale

was to accept factors that have a mean score of 2.5 and above, and reject any factor whose mean score is less than 2.5. The factors and their mean score are presented below;

Table 4.2 Perceived factors to the level of empowerment of the female farmers in the study area.

Factors	$\bar{x}$	Σ	Decision
Marital status	2.5	1.1	Accept
Cultural and traditional beliefs and practices	2.4	1.1	Reject
Societal norms and expectations	2.4	1.0	Reject
Illiteracy	1.6	1.3	Reject
Poverty	1.3	0.8	Reject
Access to credit facilities	1.6	0.6	Reject
Access to land or secure tenure	1.8	0.8	Reject
Gender-based violence and discrimination	2.5	1.1	Accept
Participation in community associations	2.9	1.1	Accept
Access to basic infrastructure like water and sanitation facilities	2.5	1.0	Accept
Access to healthcare facilities	2.6	1.2	Accept
Road infrastructure	1.7	1.0	Reject
Access to information and communication technologies	2.1	0.8	Reject

Source: field survey, 2024

From Table 4.2 above, the perceived factors affecting the level of empowerment of the female farmers with their corresponding mean scores were indicated to include; marital status (2.5), gender-based violence and discrimination (2.5), lack of participation in community associations (2.9), Access to basic infrastructure like water and sanitation facilities (2.5), lack of access to healthcare facilities (2.6), lack of skills and training (2.5), and lack of awareness about their rights (2.5). The findings of this study showed that empowerment and level of women's participation in agriculture are related to marital status. This is in accordance with the findings of Bakut, et al., (2021) on factors that influence the level of women participation in agriculture, whose studies reported significant relationship between women empowerment and level of women participation in agriculture with some household characteristics such as marital status and education etc. The study indicated that 83.7% of married women studied were disempowered with a Chi-squared tests providing strong evidence ($p = 0.021$, 95% confidence level [CI]) of an association between marital status and women's empowerment. The findings of this study may be because their husbands control household resources and time allocation. However, other factors including local customs and norms may contribute to married women's disempowerment,

Gender-based violence and discrimination are reported in literature to directly affect women's empowerment especially in agricultural sector of the developing world such as Nigeria. These discriminations and restrictions against the women range from acquisition of basic production resources including land, credit and freedom of association. Atsiya et l., (2019) in their study on land ownership, household bargaining power and child health outcomes found that women's

landownership empowers women economically by giving them security, access to credit, and control over resource which translates into better nutrition and health care decisions for their household. Social norms often restrict women's decision-making power and limit their ability to manage farms independently (East-West Seed knowledge transfer, 2025)

Women in this part of the world are faced with unhealthy restrictions associated with cultural beliefs and norms limiting them from social relations which can provide them with access to information and knowledge on new innovation. The result of this study showed that women lack freedom of participation in community associations. Olawoye et al., (2022), reported a positive relationship between women membership of farmers' group like cooperatives and economic empowerment. The study highlighted that membership of cooperative society provide financial support and bargaining power for the women. It further reported that credit access through cooperatives significantly reduced poverty in sub-Saharan Africa Olawoye et al., (2022),Similarly, East-West Seed knowledge transfer (2025) in a related study found that community support initiatives that foster collaboration among women farmers and connect them to market actors enable them to scale their efforts. According to Kassie et al., (2020) the disempowerment of the women arose largely because of a lack of time (high workloads) and a lack of leadership opportunities in the community (group membership). Attitudinal barriers against women as reported by Amaechina (2002) are deeply rooted in patriarchal-based socialization where men are considered superior to women in socio-economic activities, resulting in low women presence in decision making bodies

Access to basic infrastructure like water and sanitation facilities were perceived as factors to women empowerment in the study area. The synergistic interactions between goals, such as between SDG 6 for clean water and sanitation and SDG 5 and 10 to reduce gender and other inequalities, have increasingly been promoted (Fisher et al., 2017; Abdu, et al., 2022).Dickins et al.,(2021), reported an association between women's empowerment and type of water and sanitation facilities. Their study also reported that a greater proportion of empowered women relative to disempowered women used a water source on premises or an improved sanitation facility, compared to those using lower service levels. Access to safe water and sanitation, sustainable Development Goal (SDG) 6, is necessary for human development, but is seen as particularly critical for women and girls and for making progress towards SDG 5 to achieve gender equality and empower all women and girls (Abdu, et al., 2022). Prevalent social norms assign the majority of water collection work for domestic purposes to women in many low- and middle-income countries (Fisher et al., 2017). Such division of tasks results in women often bearing more of the burden associated with household water and sanitation insecurity, such as disproportionate health and social burdens including greater exposure to water-related disease, discriminatory taboos, and unrealized economic productivity (Gupta &Obani, 2016) Water and sanitation infrastructure are often argued to empower women, particularly through pathways associated with reducing the time spent on collecting water. Similarly, the Water Project states that "With closer water supplies, women have more time in the domestic setting, with the added time, women are given more opportunities to work outside of the home to bring in extra income for their families" (Sentlinger,2019).

Healthcare facilities was reported in this study to be a factor to level of women empowerment. The result agrees with the findings by Adeniyi et al., (2023) who found that medical facilities and personnel were not relatively in health-care centers to the satisfaction of the users, therefore, they opted for self-medication folk medicine, disguising and spiritual remedies. The East West Seed foundation (2025), also reported that training and capacity building provide knowledge on modern farming techniques, pest and disease management, and financial

literacy. Many women lack technical knowledge of modern farming practices, reducing their efficiency and yields (East-West Seed knowledge transfer, 2025)

Attaining equality between women and men and eliminating all forms of discrimination against women are fundamental human rights and United Nations values. Women around the world nevertheless regularly suffer violations of their human rights throughout their lives, and realizing women's human rights has not always been a priority. Achieving equality between women and men requires a comprehensive understanding of the ways in which women experience discrimination and are denied equality so as to develop appropriate strategies to eliminate such discrimination (United Nations human rights, 2014).The empowerment of women farmers is not just an agricultural imperative but a societal one. By addressing these challenges, we can unlock the potential of women farmers, ensuring better productivity, improved livelihoods, and greater food security. If women are empowered, they will more actively participate in agricultural decision making and might allocate land, labor, and other productive inputs differently from men and other household members, with more focus on producing a greater diversity of crops, including more nutrient-rich crops.

4.4 Effect of women empowerment on production diversity of the respondents

The table below shows results from the Poisson regression analysis that was used to determine the effect of women empowerment on production diversity. Poisson regression was chosen as the method of analysis as the dependent variable (Production diversity which was used as a proxy for nutrition sensitive farming) is a count distribution and not a continuous variable.

Table 4.3: Poisson Regression result on the effect of women empowerment on production diversity in the study area

Variable	Coef.	Std. Err.	Z– Value	P-Value
Food agency	.0198319	.0316288	0.63	0.531
Food knowledge	.0014214	.000789	1.80	0.072*
Health resources	.597216	.0456874	1.31	0.191
Health agency	.0001468	.0094752	0.02	0.988
Health knowledge	-.1057528	.0659596	-1.60	0.109
Age	-.0035987	.0121809	-0.30	0.768
Household size	-.0162898	.017196	-0.95	0.343
Farm income	.0008254	.0005956	1.39	0.166
Off-farm income	-.0469528	.0205543	-2.28	0.022**
Primary occupation	.0039419	.0018354	2.15	0.032**
Years of farming experience	.0448176	.019934	2.25	0.025**
Distance to the market	.0199189	.0213622	0.93	0.351
Years of formal education	.0072228	.0109172	0.66	0.508
Own rented land	-.0112987	.028363	-0.40	0.690
Members of household participation	.0164143	.0218062	-0.12	0.452
Farmers organization	-.0070481	.0574365	-0.12	0.902

Statistics: No. of observations =	300
LR chi2(7) =	38.46
Prob > chi^2 =	0.0021
Pseudo R^2 =	0.0533

Source: field survey, 2024, *, ** indicates significant at 10% and 5% respectively.

The result of the Poisson regression showed that the included women empowerment indicators, alongside the socioeconomic characteristics of the women farmers had statistically significant effect on production diversity of farmers. This is evident as the probability level was greater than the chi^2 value with 0.0021 and this suggests a statistically significant relationship. The Pseudo R-square showed that included empowerment indicators and socioeconomic characteristics account for only about 5% of the changes in production diversity of the respondents. On the individual explanatory variables, the result showed that food knowledge, off farm income, primary occupation, and farming experience were the variables that were statistically significant.

Food knowledge: This had positive relationship with women empowerment on production diversity and was significant at 10% level of probability, with a P-value of (0.072) implying that women empowerment was dependent on food knowledge of production diversity of farmers. The results agree with Rukmini et al., (2018); Ozioko, et al., (2020) whose studies examined the relationship between women's literacy and access to information, including food knowledge, and their participation and productivity in agriculture. It reported how improved food knowledge can positively influence production diversity.

Off farm income: This had a negative relationship with women empowerment on production diversity and was significant at 5% level of probability with a P-value of 0.022; implying that production diversity of women farmers in the study area was dependent on their off-farm income. This may be true because farm income only comes during the farming season and from observations, the profits gotten from these farm products may not sustain the household till the next farming season, this is especially true for women farmers that deals majorly on crop production.

Primary occupation: This had positive relationship with women empowerment on production diversity of farmers and was significant at 5% level of probability with P-value (0.032) implying that production diversity of the women farmers is dependent on their primary occupation. From the distribution of frequencies on the socio-economic characteristics of the respondents, it was shown that most women had their primary occupation as farming, so, they can be more diversified on their production, thereby increasing nutrition sensitive agriculture.

Years of farming experience: the years of farming experience of the female farmers was positive and significantly related with women empowerment on production diversity at 5% level of probability. Experience most often comes with age, and in traditional societies, the older a woman gets, the more her opinion is respected and sought after, in decision making. Moreover, experienced women farmers may be more versatile with regards to the production systems and may therefore be better able to assess the risks involved in farming than inexperienced ones (Emote et al.,2002).

5. CONCLUSION AND POLICY RECOMMENDATIONS

Women's empowerment within agriculture can be a major driver of agricultural development and household food security in rural households, contributing to the development of sustainable

food systems. Results from this study will contribute towards rural household poverty alleviation and better nutrition within households since women are primarily responsible for household nutrition. The study investigated women empowerment and implementation of nutrition-sensitive agriculture among female cooperative farmers**.** The mean empowerment score of 0.38 suggests that majority of the female farmers in Enugu State experience moderate levels of empowerment. However, the minimum value of 0.23 highlights the presence of severely disempowered women, this is an indication that a significant proportion of women have relatively low empowerment levels, reinforcing the need for targeted interventions. The result reveal that female farmers in Enugu State are most empowered in income-related decisions (0.66) and leadership (0.59), while they experience the lowest levels of empowerment in agricultural production (0.15) and time allocation (0.33).Empowering women will enhance production diversification and food productivity within households resulting in a sustainable food security.

These results suggest that policies and strategies should be developed by the Ministry of Agriculture and Rural Development that will enable women to participate fully in social and economic activities, and especially in making productive decisions with respect to key resources such as land, time, and credit facilities. The Ministry of Agriculture and Rural Development and policy makers should develop and implement targeted policies and programs that are gender-inclusive that will improve the socio-economic lifestyle of female farmers to have the potential to be effective for improving nutrition security. These policies and programs should have primary goal such as income generation or provision of social amenities like improved water facilities, access to needed farm inputs and incentives. This can also involve measures such as land rights for women and access to agricultural extension services and educational programs aimed at enhancing the food knowledge of women in agriculture. This can include training on diverse crop cultivation and dietary diversity to improve production diversity. The A-WEAI index works to measure empowerment by efficiently considering a number of multifaceted factors while also allowing researchers, evaluators, and practitioners to understand the contributions of individual factors towards establishing empowerment. The results from this assessment leveraging the A-WEAI suggest that the Ministry of Agriculture and Rural Development, community leaders and the development agencies in their future programs that aim to improve women's empowerment should ensure a meaningful engagement of men, particularly as it relates to productive decision making, control over production resources, time allocation, cultural issues etc. This is because, men need to feel they have a seat at the table as well as a positive role in the empowerment of their wives, daughters, and other women close to them. Also, approaches to mitigate the risk of and decrease gender- based violence should be scaled up by the government, policy makers and community leaders. This can include gender and community dialogues and approaches that increase intra-household distribution of economic resources and cooperation.

Our study had some limitations. Firstly, is financial constraint associated with data collection as this study was not sponsored? Secondly, some of the sampled locations were faced with security threats which affected the authors during data collection but we engaged the services of trained enumerators familiar with those locations to surmount this challenge. Future studies can, therefore, focus on women's empowerment at the level of traditional food value chains. Scholars can also apply the gender parity sub-index of WEAI in their investigations of traditional food value chains.

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