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# Perceived Effectiveness of Agricultural Extension Services among Women Vegetable Farmers in the Calabar Agricultural Zone, Cross River State, Nigeria

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## Abstract

*The study examined vegetable farmers' perceptions of the effectiveness of agricultural extension services. A multi-stage sampling procedure was used to sample 171 vegetable farmers. Data were collected using structured questionnaires. Percentages, mean statistics and multiple regression were used for data analysis. The results showed that technical advisory services on pest and disease management ($\bar{x}$ = 2.96; SD = 0.77) had a moderate level of access. The most commonly used delivery method was individual farm/home visits (95.3%). The perception statement that recorded the highest level of effectiveness was "extension services have improved my knowledge of pest and disease control" ($\bar{x}$ = 2.35; SD = 0.84). However, the study identified cost efficiency/ affordability of services ($\bar{x}$ = 3.62; SD = 0.83) as a factor that mostly influenced farmers' perception of extension service effectiveness. There was a strong relationship ($R^2$= 0.656) between factors influencing vegetable farmers' perceptions and the perceived effectiveness of agricultural extension services. The study concluded that women vegetable farmers had moderate access to agricultural extension services, and their high perception of the effectiveness was mostly determined by cost efficiency/affordability. The study recommended that the extension services should be affordable to boost vegetable production.*

**Keywords:** Perceived effectiveness, extension services, Women vegetable farmers.

## Introduction

Agriculture plays a vital role in Nigeria's socio-economic development by providing employment and ensuring food availability for a substantial proportion of the population. Within the agricultural sector, vegetable production is particularly significant, serving as a key livelihood activity for many smallholder farmers, especially women, who depend on it as a major or supplementary source of income (Felix et al., 2025). Vegetables have a short growing period, strong market demand, and high nutritional benefits (Komolafe et al., 2020). The commonly grown vegetables in rural communities include okra, fluted pumpkin, pepper, tomatoes, garden egg, and various leafy vegetables (Enwerem et al., 2020). Their production demands careful management of inputs, pests, soil, and water resources through agricultural extension services.

Agricultural extension services play a vital role by offering timely advisory assistance and strengthening farmers' capacities through training and support (Ekenta et al., 2024). Agricultural extension service delivery involves systematically disseminating knowledge, innovations, skills, and advisory services from trained extension professionals to farmers to enhance productivity and improve livelihoods (Aya et al., 2026b). Through agricultural extension service delivery, farmers are expected to gain the knowledge and competencies required to improve production efficiency, adopt innovations, and make informed farming decisions (Aya et al., 2026a).

Delivery methods include a range of approaches designed to disseminate production, marketing, and sustainability information effectively. These include individual farm or home visits, farmer cooperative or group meetings, information and communication technologies (ICTs), and demonstration plots (Eremi et al., 2022). These methods are often combined in some cases to enhance the effectiveness and sustainability of extension services, particularly among smallholder and women vegetable farmers (Kughur et al.,2021)

Farmers' perceptions of extension services serve as a key indicator of the quality, usefulness, relevance, timeliness, accessibility, and participatory nature of extension services, as well as the competence and commitment of extension personnel (Pelemo et al., 2024). Nevertheless, the effectiveness of these services in many rural areas remains a subject of concern. Gaining a clear understanding of these perceptions can help identify gaps and inform stakeholders on how to improve extension delivery to boost vegetable production and strengthen rural livelihoods (Aya & Eremi, 2026). Studies indicate that farmers who perceive extension services as effective are more likely to utilise them (Akinwale et al., 2023; Ukwuaba et al., 2025; Kaya & Bostanbudak, 2021).

Agricultural extension in Nigeria has experienced various reforms aimed at enhancing farmers' knowledge, productivity, and adoption of improved agricultural technologies (Elusaiwe et al., 2025). Government institutions and development partners have implemented several initiatives to strengthen extension service delivery. Given the importance of vegetable farming and the crucial role of extension services in improving productivity, it remains unclear whether farmers perceive these services as effective, accessible, relevant, and beneficial to their vegetable production activities. Understanding farmers' perceptions is vital, as it shapes their readiness to adopt recommended practices and engage in extension programmes (Olatinwo et al., 2024).

However, empirical evidence on how vegetable farmers in the zone perceive the effectiveness of extension services is limited. This study assesses how women vegetable farmers perceive the effectiveness of agricultural extension service delivery. Specifically, the study examined:

(i) the level of women vegetable farmers' access to agricultural extension services;

(ii) assessed the different agricultural extension service delivery methods;

(iii) ascertained women vegetable farmers' perception of the effectiveness of agricultural extension service delivery; and

(iv) determined the factors influencing women vegetable farmers' perception of extension service effectiveness.

## Methodology

This study was carried out in the Calabar Agricultural Zone of Cross River State, Nigeria. Calabar Municipal, Calabar South, Bakassi, Akpabuyo, Akamkpa, Odukpani, and Biase make up the zone, and it lies between latitudes 5° 25° N and longitude 25° E of the meridian. It is bounded on the east by the great kwa river and the west by Calabar river, covers an area of 406 $km^2$ (157 $m^2$) with a density of about 910 $km^2$ (2400 $m^2$) and has a population of 371,022 as at 2006 census with temperature ranges from 25 to 28°C (Etuk et al. 2021). The zone has coastal plain soil that is fertile, well-drained, and aerated, suitable for all crops, especially vegetable production; hence, it is a significant activity in the zone. The main economic activity of most small-scale farmers in the zone is cultivating and selling vegetables (Felix et al., 2025).

The study used a multi-stage sampling procedure. In the first stage, four blocks were selected randomly from the seven blocks. In the second stage, three cells were also selected randomly from each of the four blocks, giving a total of (12) cells. In the third stage, using a list of registered women vegetable farmers, Taro Yamane's formula was used to determine the sample size of (171) respondents as follows;

$$n = \frac{N}{(k + N(e)^2)}$$

Where;

n = Sample size

N = Population size = 298

e = Sampling error = 5% (0.05)

K = constant (1)

In stage four, the proportionate sampling technique was used to assign respondents per cell. Data for this study were collected from primary sources using a structured questionnaire on the level of access, agricultural extension service delivery methods, perception of the effectiveness of agricultural extension service delivery and factors influencing vegetable farmers' perception of extension service effectiveness.

The level of women vegetable farmers' access to agricultural extension services was measured on a five-point Likert scale of very high=5, high=4, moderate=3, low=2, very low=1**.** The values were summed and divided by 5 to obtain a mean score of 3.0. Any variable with a mean ≥ 3.0 ranked in ascending order was high access; (mean ≥ 2.50 –2.99) was moderate access; and (mean < 2.50) was low access.

Agricultural extension service delivery methods were measured by asking women farmers to indicate "yes" or "no" on a list of methods used in delivering agricultural extension services to them. Any variable (≥ 50%) was regarded as a mostly used method; (< 50%) was a less-used method.

Vegetable farmers' perception of the effectiveness of agricultural extension service delivery was measured on a three-point Likert scale of very effective (3), effective (2), and less effective (1) on 13 perception statements. The values were summed and divided by 3 to obtain a mean score of 2.0. The decision rule stipulates that statements

with a mean score of 2.0 or higher are regarded as highly effective, whereas those with mean values below 2.0 are considered less effective.

Factors influencing farmers' perception of the effectiveness of extension services were rated on a five-point Likert scale of strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1). The values were summed and divided by 5 to obtain a mean score of 3.0. Any variable with (mean ≥ 3.0) ranked in ascending order was a major factor; (mean > 3.0) was minor.

Variables in the objectives were analysed using percentages, mean statistics and ranking. Multiple Regression Analysis was used to examine the relationship between factors influencing vegetable farmers' perceptions and the perceived effectiveness of agricultural extension service delivery among women vegetable farmers.

Model specification:

The multiple regression model is expressed as follows:

$Y = a+b_1x_1+b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 +b_6x_{6+e}$

Where: Y = Perceived effectiveness of extension service delivery

X1= Cost efficiency and affordability

X2= Quality and relevance of information

X3= Timeliness of extension services

X4= Feedback and participation mechanisms

X5= Clarity and accuracy of communication

X6= Competence and attitude of extension agents

X7= Advisory services useful to vegetable production

X8= Frequency and regularity of extension contact

X9= Availability of farm inputs

X10= Accessibility of services

X11= Method of service delivery

X12= Strong linkages and support services

X13= Cultural appropriateness of extension messages

X14= Previous experience with extension services

X15= Institutional and policy environment

a = constant, $b_1$-$b_9$ = Regression coefficient

e = error term

## Results and Discussion

### Level of Vegetable Farmers' Access to Agricultural Extension Services

Results from Table 1 showed that all 11 items had mean scores between 2.66 and 2.96, indicating that vegetable farmers had moderate access to extension services. The standard deviation ranged from 0.68-0.77, indicating that respondents' scores were close to the mean and to each other. Technical advisory services on pest and disease management ($\bar{x}$ = 2.96; SD = 0.77), Information on market demand, pricing, and communication services ($\bar{x}$ = 2.94; SD = 0.74), and input supply and linkage with the source of viable seeds and fertilisers ($\bar{x}$ = 2.91; SD = 0.72). The finding is consistent with the study by Bolarin et al. (2022), which reported a moderate level of access to agricultural extension services. Similarly, Okringbo & Amaegberi (2023) observed that farmers had limited access to extension services. According to these authors, the moderate level of access was largely due to the high cost of advisory services and insufficient extension outreach to farmers in remote areas. However, farmers' access to nutrition, food safety, and occupational health services was low ($\bar{x}$ = 2.46; SD = 0.66), ranking 11th among the service categories. This finding aligns with Tanimonure et al. (2020), who reported limited access to nutrition-sensitive extension services. The authors attributed this situation to the inadequate number of extension agents available to deliver training on health and nutrition issues, which consequently diminished both the availability and quality of such services.

**Table 1: Level of access to agricultural extension services**

| Level of access to agricultural extension services | Mean | SD |
|---|---|---|
| Technical advisory services on pest and disease management | 2.96 | 0.77 |
| Information on market demand, pricing, and communication services | 2.94 | 0.74 |
| Input supply and linkage with the source of viable seeds and fertilizers | 2.91 | 0.72 |
| Climate-smart and sustainable cropping guidance | 2.87 | 0.75 |
| Marketing and Agribusiness Support | 2.83 | 0.69 |
| Training on improved crop varieties and practices | 2.80 | 0.71 |
| Organizing capacity- building workshops | 2.79 | 0.78 |
| Farmers' cooperative services | 2.78 | 0.68 |
| Linking farmers to credit/ loan givers | 2.74 | 0.78 |
| Formation of women farmers' groups | 2.71 | 0.73 |
| Gender-Sensitive Extension Services | 2 66 | 0.75 |
| Provision of agro- processing equipment/ technology | 2.49 | 0.70 |
| Improvement of storage facilities | 2.48 | 0.65 |
| Farmers' nutrition, food safety, and occupational health | 2.46 | 0.66 |

**Source:** Field survey (2025)
< 2.50= low; ≥ 2.50 –2.99= moderate; ≥ 3.0 = high access

### Agricultural Extension Service Delivery Methods

Results from Table 2 reveal that all the listed methods were used. The majority (95.3%) of the services were delivered mostly through individual farm/home visits. This suggests that individual farm visits were a major approach extension agents used to deliver services to vegetable farmers. Such visits enhance the adoption of recommended practices, enable timely feedback, and foster trust between farmers and extension personnel. This finding is consistent with Ukwuaba & Ileka (2024), who

observed that farm visits are effective in identifying farm-specific challenges, offering tailored solutions, and facilitating the monitoring of farmers' adoption of recommended practices. Most (90.1%) were delivered through farmer group meetings/cooperatives. This implies that farmer group meetings provide opportunities for farmers to exchange experiences, engage in collective learning, and participate actively in discussions. Moreover, these meetings enable extension agents to reach many farmers at once. This aligns with the findings of George et al. (2020), who reported that regular group meetings enhance social networks, promote community participation, and create avenues for timely feedback, allowing extension programs to be tailored to farmers' specific needs.

**Table 2: Agricultural extension services delivery methods**

| Delivery methods | Percentages (%) |
|---|---|
| Individual farm/home visits | 95.3 |
| Farmer group meetings/ cooperative | 90.1 |
| Demonstration-based methods | 83.0 |
| Participatory and practical extension methods | 81.3 |
| Training workshops or seminars | 76.6 |
| Farmers' feedback methods | 74.3 |
| Discussion/ lecture-based approach | 63.2 |
| Mobile phone and ICT-based extension services | 56.1 |
| Radio and television agricultural programs | 51.5 |

**Source:** Field survey (2025) * multiple responses: ≥ 50%= mostly used method; < 50%= less used method

## Vegetable Farmers' Perception of the Effectiveness of Agricultural Extension Service Delivery

Results from Table 3 showed that all 13-perception statements had mean scores ranging from 2.06 to 2.35, with standard deviations between 0.76 and 0.88. This indicates that vegetable farmers perceived agricultural extension service delivery as highly effective, with standard deviations relatively close to the mean values and to one another. The statement with the highest perceived effectiveness was "extension services have improved my knowledge of pest and disease control" ($\bar{x}$ = 2.35; SD = 0.84). This implies that vegetable crops are highly prone to pest and disease infestations, making timely and relevant extension information essential for early identification and effective control, thereby reducing yield losses. This finding is consistent with Eremi et al. (2026b), who highlighted that the relevance of extension information is vital for vegetable farmers because it directly influences productivity, profitability, and the long-term sustainability of vegetable production systems. Farmers perceived the training messages received from extension personnel as practical and applicable to vegetable farming ($\bar{x}$ = 2.33; SD = 0.83). Such training programmes provide farmers with up-to-date and relevant knowledge needed for improved production practices. This finding agrees with Aya et al. (2026c), who reported that extension services improve farmers' access to information and strengthen their capacity through training on sustainable agricultural practices.

**Table 3: Vegetable farmers' perception of the effectiveness of agricultural extension services**

| Vegetable farmers' perception | Mean | SD |
|---|---|---|
| Extension services have improved my knowledge of pest and disease control | 2 35 | 0.84 |
| The trainings/ messages received from extension personnel are practical and applicable to vegetable farming. | 2.33 | 0.83 |
| Extension services promote group formation and cooperation among vegetable farmers | 2.31 | 0.81 |
| The information provided by extension agents is relevant to vegetable production. | 2.28 | 0.80 |
| Extension officers make routine farm visits and offer guidance and practical help. | 2.26 | 0.79 |
| Extension services have helped me adopt improved vegetable farming technologies. | 2.25 | 0.86 |
| Services of the extension have helped increase my income in vegetable production. | 2.22 | 0.88 |
| Extension activities have enhanced my decision-making in farm operations. | 2.20 | 0.85 |
| I receive timely information from extension workers when new technologies or practices emerge | 2.19 | 0.78 |
| Extension workers provide up-to-date information on improved vegetable varieties and agronomic practices. | 2.17 | 0.79 |
| Extension workers quickly update me whenever new practices or technologies are being introduced. | 2.13 | 0.82 |
| Extension services have contributed to reducing production losses on my farm. | 2.09 | 0.77 |
| The advice received from extension workers has increased my farm productivity. | 2.06 | 0.76 |

**Source: Field survey (2025):** M ≥ 2.0= Highly effective; M < 2.0= less effective

## Factors Influencing Farmers' Perception of Extension Service Effectiveness

Results from Table 4 revealed that cost efficiency/affordability of services ($\bar{x}$ = 3.62; SD = 0.83) influenced farmers' perception of extension service effectiveness. This indicates that providing extension services at low or affordable cost reduces financial constraints, thereby allowing more farmers to access and apply improved agricultural knowledge. This finding aligns with Girmachew et al. (2020), who reported that affordable extension services contribute to increased productivity, improved farmers' incomes, and the promotion of inclusive agricultural development. Quality and relevance of information to vegetable production ($\bar{x}$ = 3.55; SD = 0.79). The effectiveness of extension services is strongly influenced by the quality and relevance of the information provided, as these factors shape vegetable farmers' understanding,

confidence, and willingness to apply recommended practices. This finding aligns with Akinnagbe et al. (2024), who reported that providing high-quality, relevant information significantly enhances farmers' adoption of extension services.

**Table 4: Factors influencing farmers' perception of extension service effectiveness**

| Variables | Mean | SD |
|---|---|---|
| Cost efficiency/affordability of services | 3.62 | 0.83 |
| Quality and relevance of information to vegetable production | 3.55 | 0.79 |
| Timeliness of extension services | 3.49 | 0.82 |
| Feedback and participation mechanisms | 3.43 | 0.81 |
| Clarity and accuracy of communication | 3.34 | 0.75 |
| Competence and attitude of extension agents | 3.27 | 0.78 |
| Advisory services useful to vegetable production | 3 24 | 0.76 |
| Frequency and regularity of extension contact | 3 21 | 0.80 |
| Availability of farm inputs | 3.19 | 0 77 |
| Accessibility of services | 3.17 | 0.84 |
| Method of service delivery | 3.15 | 0.74 |
| Strong linkages and support services | 3.09 | 0.85 |
| Cultural appropriateness of extension messages | 3 07 | 0.87 |
| Previous experience with extension services | 3.06 | 0.71 |
| Institutional and policy environment | 3.05 | 0.72 |

**Source:** Field survey (2025)

**Relationship Between Factors Influencing Vegetable Farmers' Perceptions and the Perceived Effectiveness of Agricultural Extension Service Delivery Among Women Vegetable Farmers.**

Results presented in Table 5 indicate that the nine perception factors collectively had a significant impact on vegetable farmers' perceptions of the effectiveness of agricultural extension service delivery. Quality and relevance of information, timeliness of extension services, feedback and participation mechanisms, clarity and accuracy of communication, and frequency and regularity of extension contact were statistically significant at the 1% level. Cost efficiency and affordability, method of service delivery, and strong linkages and support services were significant at the 5% level, while advisory services relevant to vegetable production were significant at the 10% level. Among the significant predictors, the quality and relevance of information contributed most to the model ($\beta = 0.490$), followed by the timeliness of extension services ($\beta = 0.322$). The finding aligns with Eremi et al. (2026a), who reported that access to relevant information strengthens farmers' confidence in adopting new technologies, enhances their productivity, and promotes sustainable agricultural practices. Conversely, six of the perception factors were insignificant. Furthermore, the regression model was statistically significant ($F = 19.84$, $p < 0.001$). The coefficient of determination ($R^2 = 0.656$) indicates that the perception factors jointly accounted for 65.6% of the variation in perceived effectiveness of agricultural extension service delivery. The adjusted $R^2$ value of 0.621 suggests that, after controlling for the number of predictors, 62.1% of the variation remained explained, confirming that the model was not overstated by including multiple variables. The standard error of estimate (0.42) further indicates an acceptable level of prediction accuracy. Consequently, we rejected the null hypothesis.

**Table 5: Relationship between Factors influencing vegetable farmers' perceptions and the perceived effectiveness of agricultural extension service delivery**

| Variable | B | Std. Error | Beta | T |
|---|---|---|---|---|
| Constant | 10.980 | 1.912 | | 5.742 |
| Cost efficiency and affordability | 0.215 | 0.066 | 0.251 | 3.257 |
| Quality and relevance of information | 0.186 | 0.071 | 0.490 | 2.619 |
| Timeliness of extension services | 0.248 | 0.056 | 0.322*** | 4.428 |
| Feedback and participation mechanisms | -0.162 | 0.064 | 0.173*** | -2.531 |
| Clarity and accuracy of communication | 0.201 | 0.062 | 0.221*** | 3.241 |
| Competence and attitude of extension agents | 0.147 | 0.073 | 0.134 | 2.014 |
| Advisory services useful to vegetable production | 0.096 | 0.052 | 0.202* | 1.846 |
| Frequency and regularity of extension contact | 0.124 | 0.060 | 0.140*** | 2.067 |
| Availability of farm inputs | 0.173 | 0.057 | 0.211 | 3.035 |
| Accessibility of services | -0.055 | 0.041 | 0.063 | -1.341 |
| Method of service delivery | 0.110 | 0.052 | 0.121** | -2.115 |
| Strong linkages and support services | 0.157 | 0.068 | 0.182** | 2.308 |
| Cultural appropriateness of extension messages | 0.223 | 0.054 | 0.270 | 4.129 |
| Previous experience with extension services | -0.042 | 0.041 | 0.051 | -1.024 |
| Institutional and policy environment | 0.197 | 0.063 | 0.232 | 3.127 |
| $R^2$= 0.656 | | | | |
| Adj $R^2$= 0.621 | | | | |
| F= 19.84 | | | | |
| P= 0.001 | | | | |

**Source: Field survey (2025)** ***P≤0.05**

## Conclusion and Recommendations

Women vegetable farmers have moderate access to agricultural extension services, with individual farm and home visits as the most commonly used delivery method. Overall, respondents perceived extension service delivery as highly effective, suggesting that although the services are beneficial, notable gaps still exist in farmers' access. Furthermore, farmers' perceptions of effectiveness were significantly influenced by factors such as cost efficiency and affordability of services, the quality and relevance of information related to vegetable production, the timeliness of extension delivery, effective feedback and participation mechanisms, and the clarity and accuracy of communication. To make extension services more relevant, vegetable

farmers should be able to access them through delivery methods that align with their preferences.

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