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Assessing the Effectiveness of Farmer to Farmer Extension (F2Fe) in Adamawa State, Nigeria

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ABSTRACT

In Adamawa State, slow pace of agricultural development has been viewed as a system problem and F2Fe method seems to have a potential to reverse the trend. The focus of this study was to analyze the effectiveness of farmer to farmer extension. Specifically, respondent's perception of effectiveness and factors influencing F2Fe in the study area were examined. Structured questionnaire were used to collect data from 354 respondents using multistage random sampling technique from three (3) LGAs purposively selected. Analytical tools used were descriptive statistics while inferential statistics used was the multiple regression analysis. The result revealed that the overall effectiveness score of the group was ($\bar{X}$) 1.9 indicating that F2Fe was effective on the average based on the pre-determined a priori mean range of 1.0 – 1.4 low effective, 1.5 – 2.4 moderately effective, 2.5 and above highly effective. The result further identified factors influencing F2Fe in the study area based on the regression outcome, R^2 value was found to be 65.5%, adjusted R^2 value is 54.6%, F-value was 72.46 and was significant at 5% level of significance, the estimated parameter age was negative (coefficient of -0.54629 and significant at 5% level of probability ($T = -1.88$)). Farm size was negative and significant at 5% level (coefficient of -0.59311 and $T = 2.23^{**}$). The educational level, extension contact and membership of farmers' association were all positively significant at 5% level of probability (coefficient of 2.00203, 0.69652, 1.09152 and $T = 7.93^{**}$, 3.90^{**} , 5.05^{**} respectively). Farming experience was negatively significant at 5% level (coefficient of -1.013241 and $T = -3.30^{**}$). The study thus concludes that F2Fe is effective and that farmers in the study area prefer the F2Fe method due to its attributes of transferring agricultural technologies at a faster, easier and more effective way. Based on these findings, the study recommends that government should adopt the use of F2Fe method to complement public extension service in order to reduce the ratio of extension agent to farmer for efficient extension service delivery. Furthermore, extension service providers should collaborate with lead farmers and other stakeholders in a public-private partnership (PPP) to disseminate innovative technologies to farmers via the F2Fe platform.

Introduction

In Nigeria and Adamawa State in particular, public extension service is being practiced and the ratio of extension output to farmer is 1:3000 (Tiddy and Madugu, 2022; Ladele, 2015), this ratio is a very wide margin and too much for an agent to meet up. Therefore diverse ways of supplementing the public extension services to farmers for a wide range coverage in disseminating technologies which will in turn improve agricultural productivity is what farmers and researchers alike are desperately looking for (Ladele, 2015).

Several agricultural extension approaches such as the training and Visit (T and V) and the Unified Agricultural Extension System (UAES) have been tried to meet the challenges of agricultural production in Nigeria. However, these technologies designed for farmers were reported to have failed to meet their goals due to insufficient and inappropriate agricultural technology dissemination to farmers and disproportionate extension-farmer ratio (Kassem, 2015).

Adamawa State is one of the major crop production and marketing areas in Nigeria, however, slow pace of development has been observed over the years. This was viewed as a system problem and F2Fe method seems to have a potential to reverse the trend. Most farmers in Adamawa State are smallholder farmers that depend mostly on agricultural production as their means of income and livelihoods, hence harnessing the effectiveness of Farmer to Farmer extension (F2Fe) on crop and livestock technologies in the area will assist in guiding farmers and stakeholders to make informed decision on how to promote effective transfer of technology through F2Fe (Madugu, 2017). F2Fe is a method that facilitates generation, transfer and acceptance of improved agricultural technologies, it has been a practice since the 1980s (Rhoades and Booth, 1982). The F2Fe approach relies on capacity of experienced farmers to partner

with extension agents to disseminate innovation and information on improved agricultural technologies and practices to other farmers, This usually happens when farmers do not have access to formal extension and use information from fellow farmers to enhance their productivity. They also support each other to learn and adopt improved agricultural practices. F2Fe has been viewed to be more cost effective as agricultural messages can reach more farmers within limited time and resources. It is based on the principle that farmers learn better from practical experience and that the best educators of farmers have been found to be other farmers, this is based on the fact that farmers learn best and better with their peers (Dawi, 2022).

It is against this background that this study is focusing on the effectiveness of farmer to farmer extension in Adamawa State, Nigeria. Specifically, the study dwelled on respondent's perception of effectiveness and factors influencing F2Fe in the study area.

Methodology

The Study Area

This study was conducted in Adamawa state, it lies between Latitude 7.15°N and 10.58°N of the equator and Longitudes 11.09°E and 13.47°E of the Greenwich Meridian. It has a total land mass of about 39, 972.3 square kilometers with a population of 4,504, 337 (2006) Census projected figure. Mean annual rainfall ranges from 700mm to 1000mm Adebayo, *et al.*, (2020). The temperature is typical to that of West African Savannah climate characterized by high temperature almost throughout the year due to high solar radiation which is relatively evenly distributed throughout the year. Maximum temperature reaches 40°C particularly in April, while minimum temperature 18°C between December and January. Mean monthly temperature ranges from 26.7°C to 27.8°C. Agriculture is the major economic activity in

the state. Food crops grown include; sorghum, maize, rice, yam, cassava, millet and sweet potatoes and cash crops include, groundnut, sugar cane, benni seed, bambara nut and cotton.

Method of Data Collection/Source of Data

Data for this study was obtained majorly from primary source; the primary data was collected with the aid of structured questionnaire administered to the respondents. While secondary data was obtained from journals, internet, and ADP achieves of the respective LGAs.

Sample Size and Sampling Technique

Multi Stage Random Sampling Technique was used for this study, in stage one (1) three local government areas were randomly selected, stage two (2) involved the random selection of two districts from each of the selected local government areas while stage three (3) further involved the random selection of two (2) wards in each of the selected districts. Finally Three hundred and fifty four (354) respondents (registered farmers with ADP) were randomly selected from the twelve (12) wards proportional to farmers sampling frame in each of the Local Government Areas.

Analytical Technique

i. The analytical tools that were used for this study included descriptive and inferential statistics such as percentages (%), frequencies, tables, and means. The likert type rating scale was employed to address Farmer's perception of effectiveness of F2Fe method, this was determined by respondent's perception of the indicators (capacity building, increase in technology uptake, information flow, improved production, increase in income, food availability, increased access to inputs, relevance/appropriateness of technology, multiplier effect (reaching more farmers) and contact with other farmers). It was measured on a 3-point likert type rating scale: 1=

ineffective, 2= effective while 3= highly effective. A total score was obtained for each respondent as indicated on Table 1. A mean score was computed by summing the values for high, moderate and low effectiveness. A mean score of 1.5 and above was considered effective while a mean score of 1.4 and below was ineffective.

The multiple regression analysis was used to examine the factors that influence effectiveness of F2Fe. Four functional forms; linear function, double log function; exponential function; and semi log function were tested. It is given by;

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_nX_n + U_i$$

Where Y=Perception of the effectiveness of F2Fe (perceived effectiveness scores in Nos.)

a = Constant

b = Coefficients

X₁ = Age of respondent (years)

X₂ = Sex (male 1, female 2)

X₃ = farm size (Ha)

X₄ = Household size (No. of persons)

X₅ = Educational qualification (years)

X₆ = Years of experience (years)

X₇ = Extension contact (visit between farmers)

X₈ = Membership in an association (member 1, otherwise 2)

X₉ = Average income (₦)

U_i = Error term.

Criteria used for selecting the lead equation conformed to the apriori expected economic criteria for the signs of coefficients, significance and size of coefficients of multiple determinations R² as well as F and t- ratios. Age, educational status, experience, farm size, membership in association, extension contact and household size are expected to be positive and thus positively affect perceived effectiveness of F2Fe of the study area.

Table 1: Perception of Effectiveness of F2Fe

Indicators	Highly effective = 3	Effective =2	Ineffective = 1	Total
Capacity building	A			A
Increase Tech. Uptake		B		B
Appropriateness of Tech	A			A
Information flow	A			A
Improved production			C	C
Increased income		B		B
Food availability		B		B
Increase access to inputs		B		B
Multiplier effect	A			A
Contact with other farmers			C	C
Total	A	B	C	A+B+C

Where:

A = High perception of effectiveness

B = Moderate perception of effectiveness

C = Low perception of effectiveness

Results and Discussion

Respondents Perception of Farmer to Farmer Extension method

Generalized perception of F2Fe

Table 2 indicates that 24.0% of the respondents had a high perception of the F2Fe, 67.2% perceived moderately while 8.8% of the

respondents had a low perception of the F2Fe in the study area. This implies that majority of the respondents are well aware and have a favourable disposition about the F2Fe, It could further indicate that respondents are willing to be involved in information dissemination among their peers.

Table 2: Generalized Perception of F2Fe Approach

Perception	Frequency	Percentage	Mean (x)
High	85	24.0	
Moderate	238	67.2	
Low	31	8.8	118
Total	354	100	

Source: Field Survey, 2021.

Respondents Perception of the Effectiveness of F2Fe Approach

The perception of respondents with regards to effectiveness of F2Fe method as measured by the indicators is presented in Table 3. The result revealed a 55.5% respondents perception on food production which was ranked the 1st followed by food availability 47.5%, appropriateness of technology 45.8%, increased technology uptake 40.1% and capacity building 35.3% which were ranked 2nd to 5th respectively, this implies that these indicators were the most important determinants of F2Fe approach and interaction among the respondents and this signifies high

effectiveness. Other indicators such as information flow, contact with farmers and increased access to inputs were ranked 6th to 8th respectively and were perceived as moderate by the respondents thereby signifying moderate effectiveness level and it implies that such indicators had a moderate influence on information flow between respondents. It further implies that there are possibilities of weak linkages with wider relationships in terms of farmer interactions which might suggest that farmers are not sharing enough information such as new/improved technologies or market outlets

among and between themselves to bring about multiplier effect and increased income.

On the other hand, respondent's perception about increased income 17.5% and multiplier effect 7.3% was low, these were ranked the least, 9th and 10th respectively, These were considered not important and therefore ineffective which could imply that there is a low or nonexistent interaction between farmers and providers of such services.

The overall effectiveness score for the group was found to be $\bar{X} = 1.9$ indicating that F2Fe approach among this group of farmers is effective based on the pre-determined apriori mean range: 1.0-1.4 = low, 1.5-2.4 = moderate and 2.5 and above = high.. This indicates that most of the indicators are positive determinants of F2Fe approach among the respondents. Though some of the indicators were perceived as moderate, the overall mean scores suggests that they are significant and

can therefore influence effectiveness of F2Fe among the respondents to a certain extent except for those indicators perceived as non-effective.

This outcome is in accordance with the findings of mohammed *et al.*, (2019) whom in her study observed a high overall mean effectiveness score ($\bar{X}=4.00$), indicating that respondents perception on some effectiveness indicators (increased productivity, appropriate technology and improved food consumption) will enhance effectiveness of F2Fe in southern Borno State, Nigeria. On the other hand, Ssemakula and Mutimba (2011) observed a low effectiveness between learning (capacity building) and linkage capabilities (information flow) of farmers in Musaka and Tororo district of Uganda indicating low effectiveness of linkages between the respondents in the study area based on their perception on some effectiveness indicators.

Table 3: Respondent's Perception of the Effectiveness of F2Fe Approach

	High 3	Moderate 2	Low 1	Rank	Mean
Capacity building	125(35.3%)	120	6	5 th	1.9
Increased technology uptake	142(40.1%)	178 (150%)	34 (9.6%)	4 th	
Improved production	166 (46.)	196(55.6%)	25 (7.3%)	1 st	
Food availability	148 (41%)	168 (47%)	38 (10.7%)	2 nd	
Information flow	103 (29.)	177 (50%)	74 (21.0%)	6 th	
Increase assess to input	120 (33.)	170 (48%)	64 (18.1%)	8 th	
Contact with farmers	85(24.0%)	193 (54.5%)	76 (21.5%)	7 th	
Multiplier effect	97 (27.1%)	25(7.3%)	61 (17.2%)	10 th	
Appropriateness of technology	119 (33.6%)	162 (45.8%)	73 (20.6%)	3 rd	
Increase income	120 (33.9%)	172 (48.6%)	62 (17.5%)	9 th	

Source: Field Survey, 2021. Percentages are based on multiple responses

Key: 3 = Highly effective, 2 = Moderate effective, 1 = Low effective

Factors influencing effectiveness of F2Fe Approach

The regression results in Table 4 shows the factors influencing F2Fe approach in the study area. The exponential regression function was selected as the lead equation or line of best fit based on the economic and econometric criteria. The R² value which measures the proportion of the variation in dependent variable (Y) that is explained by the

independent variables included in the model was 65.5%. Furthermore, the adjusted R² which is the correlation coefficient was found to be 64.6% which indicates a strong degree of relationship between independent variables and the dependent variable of the study. The F-value was 72.46 and was significant at 5% level of probability; this implies that all the variables included in the model were highly important in explaining the variations that

occurred in the effectiveness of farmer to farmer extension approach in the study area.

The estimated parameter age of the respondents was negative (coef of -0.54689) and significant at 5% level of probability ($t = -1.88$) **. This implies that an increase in age of the respondents would lead to decrease in the level of effectiveness of farmer to farmer extension approach in the study area. Farm size used was found to be negative and significant at 5% significant level (coef of -0.59311 and $t = -2.23$ **), meaning that an increase in farm size by one unit will result to decrease in the level of effectiveness of farmer to farmer extension approach. The educational level, extension contact and membership of farmers' association were all positively significant at 5% level of probability (coef of 2.00203, 0.69652, 1.09152 and $t = 7.93$ **, 3.90**, 5.05**) respectively. This result obtained was in line with the apriori

expectation and thus, suggested that increase in these variables will lead to increase in the level effectiveness of farmer to farmer extension approach. Lastly, years of farming experience was negatively significant at 5%. This implies that a year increase in farming experience would lead to decrease in the level of effectiveness of farmer to farmer extension approach by 1.01% in the study area.

The negative coefficient of the result obtained as against the expected a priori (that was supposed to be positive) could be as a result of omitted variables (Key variables that should have been included were omitted) or it could also be that lead farmers may not be always accessed to share information directly with other farmers and that only smaller farmers are able to link up and interact, meaning that the same information is repeatedly circulating among and between farmers.

Table 4: Regression Result of Factors Influencing Effectiveness of F2Fe Approach

Variables	Coef.	Std. Err.	t
Constant	0.8349402	0.0955062	8.74***
Age	-0.5468888	0.290666	-1.88**
Sex	-0.5145462	0.3356926	-1.53
Farm size	-0.5931198	0.2662346	-2.23**
Household size	0.4445054	0.3465676	1.28
Educational level.	2.002032	0.252489	7.93**
Years of farming exp.	-1.013241	0.3072494	-3.30**
Extension contact	0.6965261	0.1786724	3.90**
Membership of ass.	1.091523	0.2161315	5.05**
Average income	0.0723234	0.1318875	0.55
Number of observations	354		
F value	72.46		
Probability	0.000		
R-squared	0.6547		
Adj R-squared	0.6456		
Root MSE	0.53044		

Source: computed results, 2021

** = significant at 5%; *** = significant at 10%

Conclusion and Recommendations

Based on the outcome of the study, it was concluded that respondents prefer the F2Fe method due to its attributes of transferring agricultural technologies to farmers in their respective communities at a faster, easier and more effective way. Furthermore, the overall

mean perception score ($\bar{X} = 1.9$) and the high regression value (R^2 65.5% of) suggests that the F2Fe method is effective in the study area. It was thus recommended that government should adopt the use of F2Fe method as a complement to public extension service in

order to reduce the ratio of extension agent to farmer for efficient extension service delivery. Furthermore, extension service providers should collaborate with lead farmers and other stakeholders in a public-private partnership (PPP) to plan and disseminate innovative technologies to farmers via the F2Fe platform.

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